

"PAINLESS LABOUR WITH SPECIAL REFERENCE TO THE  
NEWER THERAPEUTIC MEASURES".

by

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## INTRODUCTION.

My experience of types of labour has been collected in a large teaching hospital in Scotland and several cases in general practice. In the course of the past six years I have seen women who have "suffered more than others" and in my mind contrasted them with those who have had an "easy confinement". This thesis is an attempt to point out where, show how those who 'suffered more than others' might have had an 'easier' confinement and why certain females had an 'easy' confinement - all this with the purpose that in future confinements may all be 'easy'.

In the third Chapter of Genesis, 16th verse, we read that The Lord God said unto the Woman 'I will greatly multiply thy sorrow and thy conception; in sorrow thou shalt bring forth children; and thy desire shall be to thy husband and he shall rule over thee'. Such was the Curse laid in the Beginning. This Thesis which I have entitled "Painless Labour with Special Reference to the Newer Therapeutic Measures" is not a statement that I have discovered a Modern way of having a painless childbirth and lifting this Curse. I am not a person able to lift curses nor yet in a position to state whether confinements of the future will be painless, but there are so many examples of the Lord/

Lord relieving suffering that I feel He did not intend that "in sorrow" be meant "in pain" as the laity take it. I have therefore endeavoured to approach The Truth of this Biblical Statement by explaining how painless childbirth may be with the latest therapeutic aids available and to point out those, which in my opinion are most satisfactory or successful in attaining this end.

One might ask is there any need for all this as operations can be done painlessly under chloroform? But I can assure you that such an argument is very small and pointed - childbirth is not an operation requiring complete anaesthesia but a natural process in the life of man.

The lay-press at the moment is loud in its cries about "Maternal Mortality" - The welfare of Mothers is always a topic for any paper and particularly of the kind which has its titles in large block letters. Although the pangs and pains of childbirth are not given bold print it is not because there is no call for it but because "Maternal Mortality" is the leading medical topic of today.

Why does the expecting father walk the house, chew cigarettes and do everything but sit down when it is his wife who is in childbirth? Is it because he wants to know if it is a boy, or twins or perhaps quintuplets? Why are the neighbours such a nuisance in a long labour? It/

It is because they are frightened that the wife is being hurt - PAIN or the fear of it. I believe that the anticipation of something painful is worse than the pain itself. No one will deny that the effects after the pain are not often as bad or worse than the original pain - or why the "post operative shock" "post traumatic shock" or the shock following burns, anything painful even cardiac and asthmatic attacks occur some time after certain stimuli. If all this can occur after pain, what happens during the time in anticipating it? Allay the pain and there will be less (or nothing) to be afraid of.

Wm. G. Watson (Ref.2 1934) states "a woman's first confinement is often a very painful and dreadful experience, productive of lasting physiological traumata which tend to increase the difficulties of her subsequent easier labours. A painless first confinement would avoid all this. Surely a woman is entitled to "fair play"! How true. It is a blessing that in man's mental make up he tends to forget unpleasant happenings before the pleasant ones - but as Watson says certain associations will bring back the unpleasant ones which have been lying dormant subconsciously - and so it is with childbirth.

Does the Medical profession ask for any alleviation of the Mother's pains? Candidly I do not think they do and I say that because I have seen and worked amongst so/

so much needless suffering that I have formed the opinion that many doctors do not realise what suffering means to the patient or that the suffering is often needless. So although the Medical profession does not ask for an expression of this alleviation I consider they require it. The Modern conception of Medicine is that pain can be avoided or greatly mitigated and I believe that this is true. Dr James W. Hamilton created quite a heated discussion from his correspondence (Ref.3 1934) where he stated his opinion that "woman is becoming more unfitted (using the term in its broadest sense) to carry through an unaided labour" and of the factors causing this the third was "the overuse of some form of anaesthetic in labour" and "we are apparently bent on teaching modern woman that interference in some form is indispensable in labour" and therefore in her mental attitude fear is more encouraged. In his next paragraph he states "No woman, in fact no human being - is to be so admired as the woman who enters her first labour determined to make the best use of her physical powers and completes her primary functions with bravery, fortitude and endurance. A correct mental attitude can shorten a woman's labour by hours and save her a corresponding time of pain, etc." Yes, there are some who see further than others - I am not going to discuss or criticise this letter, but I agree that some women are "overdosed" but there are others to whom the doctor does/

does not attempt to give a painless labour.

A normal labour is conventionally defined as a labour in which the child presents by the vertex, in which there are no complications, and which is completed by the natural unaided efforts of the mother within twenty-four hours.

Has then a normal labour no pain or agony attached to it, or is that just not considered? How many women in labour have been heard to ask "Nurse, are you married?", and on being answered in the negative have said "Don't, it's not worth it". Or hear a woman say "never again", or "This is my last baby" or "Oh Doctor, can't you do something - take it away from me"? Is all this normal? I think it is unnecessary and can be avoided and indeed is contra-beneficial. The mother carrying her first child may be anxious, over-estimating her fears and be hysterical - assurance and the mein of her attendant will probably satisfy her anxiety - but should the pains become too much for her to bear ordinarily - what is she to have? What can be given her that will not delay or affect the birth and yet relieve, diminish or abolish the agonising moments? That is what I am attempting to answer.

Now is the time to emphasise the best form of anaesthetic or analgesic. The latest measures have been out long enough for their effectiveness to be noted.

I maintain that the normal delivery should be as above and, that the mother should have no great anxiety or pain which is unbearable and no memories afterwards of distressing moments. I have seen such deliveries without any drug or 'dope' and know that they are possible - but the others - what of the vast majority whose cries make it necessary that the labour wings of institutions be apart from the main buildings? They shall have something. Something that will put their mind at ease before the time comes when they require it, will not affect the delivery adversely but will allow them to bear their offspring without misery and not look back on the confinement as something fearful. It may be said that if a mother does not suffer for her young she will not love and fight for them to the same extent - I maintain that it will be a love and not a memory of pain having, and fear of losing them, that will make her cherish them closer.

The nurse and midwife attends to a large proportion of confinements - What is she to give the mother? Is what she is permitted by her association etc., sufficient or must she call in a doctor to give more? She should be able to give something safe, effective, reliable and easily carried in her bag - or why is she a 'certified midwife' and not merely a 'trained mother's help'?

This agent to produce a painless labour must have many/

many qualifications to be ideal, the leading ones being:-

1. It must be moderately cheap.
2. It must be easily given.
3. It must be not harmful to mother or child. If possible it should be an adjuvant.
4. Overdose easily avoided and easily combatted or of no importance. If dosage be important - then it must be easily calculated.
5. It must be able to be given to take effect when the pains are becoming unbearable, although not at the actual time of delivery.
6. If possible all cases should have the same agent. General practitioners should be satisfied with the methods they were taught and not have to resort to other methods in practice.
7. If the agent be insufficient or surgical anaesthesia be required - it shall not be a contra-indication to deeper anaesthesia but, preferably be able to be used for that purpose itself.

Naturally it must be effective, reliable and stable on keeping and in ordinary variations of climate.

The difficulties are that approximately 60-70% of confinements are conducted by midwives, (In Scotland approximately 30%), 20-30% by G.P. and the remaining 10-20% in institutions, which means that deliveries are to take place in all manner of places with different degrees of assistance and by different types of persons. It is probably asking too much to find one agent to suit all, but in the course of my thesis I will show which is/

is best for each and attempt to unify it.

A 'Gas' apparatus is not small although many are compact - if they are small the gas capacity is insufficient for reserve and a G.P. cannot always be relied upon to test his cylinder on return from a case and when he has a half empty one, to carry a full one and a spare. Expense too is a consideration, although only a few would object to an initial outlay if the method were to be cheaper in the long run. Midwives would object to carrying a heavy or cumbersome apparatus although the expense might be borne by their association. Full surgical anaesthesia by midwives I think, is a mistake, as it would encourage their interference in a normal case where so often inactivity on the part of the accoucheur is so important. Any apparatus must therefore be cheap or at least moderate, light and not cumbersome, mechanically reliable, with a reserve in case of a prolonged labour or emergency, and as simple as possible.

I have used  $N_2O$  for forceps deliveries and often for surgical anaesthesia, alone with air, oxygen, ethyl chloride and ether vapour.

Liquids for inhalation must be pleasant to take and without irritant effect. They should be applied easily, e.g. by capsule, Schimmelbusch mask and dropper bottle, Junker inhaler, etc., without the possibility of the mother accidentally getting the liquid/

liquid direct instead of as a vapour.

Edinburgh might be called the home of chloroform. Its use was discovered there in 1847 and the Edinburgh school has advocated its use for general anaesthesia since. As a student, I was taught to induce with it and continue with Ether, and therefore I have based my subsequent knowledge of anaesthetics on that anaesthesia. What G.P. has not got a bottle of Chloroform in his Midwifery bag? It is the anaesthetic that is mostly used in childbirth. Most of my cases have been with Chloroform and an occasional one with  $\text{CHCl}_3$  followed by ether.

In general anaesthesia I have used Ether and Ethyl Chloride by the open method and with apparatus.

During the past few years, Chloroform has been put up in absorbent covered glass capsules containing 20 minims, so that the chloroform may be used by crushing the capsule between the finger and thumb and inhaling. This is an extremely satisfactory way of handling and using small quantities of chloroform.

I have used Boyles' and Junker's apparatus, many forms of dropper bottles and different types of masks in childbirth cases, and Shipways, Walton, Clover's and McKesson apparatus for general anaesthesia. I have not used any apparatus where rebreathing was used employing a Carbon Dioxide absorbent.

Oral administrations must be non-irritant to avoid the/

the possibility of vomiting and should part be so lost it must not be a contra-indication to subsequent anaesthetic or analgesic. The oral medicaments I have used in childbirth have been Chloral hydrate and Bromides, and Nembutal and Chloral Hydrate.

Hypodermic - spinal, local, intramuscular and intravenous injections must be simply and aseptically prepared. Busy institutions cannot afford the time of additional tests to see that the solution is the correct pH etc. Nurses and midwives cannot be expected to perform chemical tests or hunt for veins etc., therefore this category is in the field of the institution case. The solution must be non-irritant if accidentally not all given intravenously and it must act when it is required. Labour pains come on gradually and in cycles: an anaesthetic that requires assistants to hold the patient's arm because he lapses suddenly into unconsciousness is obviously not in the correct category.

I have given Morphine, Morphine-Scopolamine, and Pudendal-nerve block anaesthetics for childbirth and Spinal and Evipan-Sodium intravenously for general anaesthesia.

Rectal medication - It must be remembered that most obstetricians like the large bowel cleared and an enema given prior to the second stage - this medication must not interfere with that and there should/

should be no chance of the solution being lost during the descent of the head. Personally, I dislike that form of medication in an area which is septic, so close to an area where one is attempting principles of asepsis and antisepsis. Doctors could not be expected to give enemata - that is more the line of a nurse. Avertin has been the only rectal anaesthetic I have given in general surgery.

The advent of Midwifery forceps, Aseptic and Antiseptic methods and Chloroform have probably been the greatest strides made in Obstetrics. With reference to this thesis the main modern improvements have been: the importance of antenatal care: the understanding and teaching of students of the anatomy and physiology of labour etc.: the importance of Midwifery has in the final medical examinations of students: improvements and axis-traction in midwifery forceps: the improvements in anaesthetics and anaesthetic technique: the advent of spinal nerve block anaesthetics, basal hypnotics and that wonderful complexity of drugs based on urea or Barbituric acid, and last and by no means least the improvements and inventions of modern times.

Improvements today are arising in geometrical progression - thousands of research workers are constantly finding something 'new' and wanting it 'tried out'. This thesis does not contain all 'the very/

very latest' drugs in its line (it would have to be a weekly publication if it did!) but they can be allocated to one or other of its groups. It therefore behoves me to review the measures at hand and advise upon the best.

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HISTORICAL.

To live until he produces his offspring, is an essential in life of man if his cycle is to be continued: and so it is that Surgery or the Treatment of Wounds and Childbearing have commanded attention throughout the Ages. At first men attended to the wounds and women to the parturient mothers, later with the increased skill of Barber-surgeons and Doctors part of the work of Midwives was taken over by them. Today both sexes do the work of either, even to the extent of specialising in it.

The care of the Childbearing Woman may be taken as an index to the degree of civilisation of a community. Civilisation, like a flock of sheep following a shepherd, slowly follows the work and guidance of certain people - the History of Medicine has many such.

The uncivilised people of today have their children as their ancestors did centuries before - they are not tacked down by civilisation. They lived together and were segregated - they adapted themselves to their conditions and they had children suited to their size of pelvis. Manual exercise, fresh food and an open-air existence made them physically fit and probably the function of childbirth passed off naturally and 'easily'. There was always the fear of an/

an abnormal lie or position - if the child was not born the mother died in the attempt - it was selection by survival and survival of the fittest.

With the coming of Civilisation - the covering of the body with clothes, eating prepared and cooked food, living in shelters and protected from the sun and fresh air and often lacking in both, and with the coming of social and religious manners and rites - the mother's real misery commenced.

I will not describe the horrors and tortures that our ancestors went through during pregnancy and puerperium, but it was not until Medical Science intervened that any degree of relief became apparent.

The Greeks were the first to assimilate the good of previous civilisations and in the hands of the Greek Priests of Aesculapius that Modern Medicine first took form. Hippocrates (460 BC - 357 BC) is probably Medicine's first shepherd. Midwives in Greece were at that time organised and assisted by physicians although there was sometimes contempt attached to these 'He-grandmothers'. The Greeks went to Rome and practised and mal-practised there, so that under the Greek and Roman Civilisations the Mother was fairly well cared for. With the decline of these Empires the care of the Childbearing Woman also declined.

Rational medicine was replaced by superstition and humbug. The teachings of the Greek Physicians were/

were lost and forgotten. Women were deprived of the assistance and civilisation was taking its toll by making childbearing more hazardous - and yet this was a Christian Era!

Mediaeval Christians saw in labour-pains the expiation of carnal sin and it was not until the Renaissance or Revival of Classical Learning which began about 1450 when Greek Scholars settled in France and began to teach the language that any advance was made. The mother's condition was looked upon with the understanding that it was a woman's function and not as 'a sin' and so we come to the next shepherd - Paré.

The Frenchman Ambrose Paré (1517-1590) who is well known for the introduction of the ligature after amputation and in bleeding wounds - previously treatment was the red-hot cautery, and also for his soothing applications instead of boiling oil for gunshot wounds is noted for his advocating turning the child in its mother's womb before delivery in certain cases - not that these things had not been done previously but it was the man's skill and personality that emphasised them and persuaded others to copy him.

Midwifery as the name suggests was originally the work of women - the midwives or Sages-femmes. Books intended for them were often printed in the 16th Century in France, England and Germany. Scientific Obstetric/

Obstetric works were produced especially in France in the second half of the 17th Century. The midwives were for the most part dirty, ignorant, unskilled and superstitious. The loss of life and ill-health that resulted from their mishandling must have been enormous. For a long time the treatment of the parturient woman by man was objected to, but it was bound to come and be associated with Medicine and Surgery.

In the light of modern instruments these sharp toothed instruments for the extraction of the head after the death of a child: the dilators and forceps for opening the mouth of the womb, looked gruesome and it was not until about the end of the 16th or beginning of the 17th century that Peter Chamberlen of Huguenot descent invented forceps for the extraction of the living child. Owing to the invention being kept a family (Chambellan later Chamberlen) secret, it was not until about the third generation of that family that the secret became at all widely known. Since then it has undergone so many changes and yet basically the same, that the evolution of the present day instrument from the original makes a very interesting study.

The position taken by the mother in the act of labour is interesting. The ancient Jews used Obstetrical Chairs or Midwives seats (Ref.4) horse-shoe shaped and these were in general use till about 17th century and often used as late as the 19th. Nowadays,  
of/

of course the 'civilised' position is recumbent. Sitting on the haunches is a common position in the Eastern countries of today and I believe that many mothers in India and Burma expel the child in that position. I have heard that some mothers sit on their husbands lap for assistance. The squatting position allowed the primitive and early type of woman to hold on to a tree trunk, or friends, etc. Is not prayer on the bended knee of today, not highly symbolical of the parturient mother crying for relief? The Greeks were probably the first to use the reclining or lying position of today - like the Romans they even fed that way.

The discovery of Anaesthesia and the antiseptic method in the course of the 19th Century, made a dramatic change in the whole aspect of obstetrics and midwifery.

The word "Anaesthesia" is of American origin (1846). In 1800 Sir Humphry Davy started the controversy on anaesthesia when he remarked upon the possibility of using Nitrous Oxide in surgical operations. Nitrous Oxide or Laughing Gas was introduced by the American dentist Horace Wells (1815-1845) of Hartford, Connecticut, in 1844 and recommended for Childbirth by Klikowitch of St Petersburg in 1880.

Dr Long of Athens, Georgia, a country practitioner had/

had observed the effects of Ether inhalation and indeed done an operation under its anaesthetic effect four years previous to Morton's celebrated demonstration in the Massachusetts General Hospital on October 16th 1846 - indeed the doctor's bill for two dollars is still preserved! These facts did not become known till twelve years afterwards (1854) when an award was being made to the discoverer of anaesthesia. It was, however, to William Thomas Green Morton (1819-1868) who demonstrated the safety and simplicity of Ether Anaesthesia that its success was due. The idea immediately caught on and before the close of that year (1846) it was being used in Great Britain. In January 1847, Sir James Young Simpson (1811-1870) was using it in Edinburgh for obstetric purposes. A few months later he adopted chloroform which had been first prepared by <sup>t</sup>Jusus Liebig in 1832. Women in childbirth were found to bear chloroform peculiarly well and its use in midwifery steadily spread despite opposition in which Sir James Young Simpson heartily combatted. His 'Answers to the Religious Objection against the Employment of Anaesthetic Agents in Midwifery and Surgery' (1847) is a masterpiece.

Naturally, anaesthetics provoked the introduction of other methods of producing painless states of a part without losing consciousness. In 1884 at Vienna Cocain was used for the eye, nose and other parts and soon/

soon it was being injected for small operations.

W.S. Halstead (1855- ) and later Harvey Cushing (1869- ) performed nerve blocks about 1885 and 1889 and then J.L. Corning (1885- ) another American surgeon introduced spinal anaesthesia.

'Twilight Sleep' (i.e. the combination of Morphine and Scopolamine) was introduced in 1899. When this method was used three years later for childbirth, reports stated that the painless childbirth had at last been obtained - subsequent knowledge however showed this very successful agent only suitable for certain types of cases.

In 1908 G.W. Crile (1864- ) introduced the method of combining local and general anaesthesia whereby he diminished the effects of surgical shock.

The official adoption of drugs of proprietary origin in the British Pharmacopoeia is one of the greatest tributes that can be paid to those who devise them. Of the Barbiturates, Methyl-Sulphonal was patented in 1888 and soon found its way in to the "British Pharmacopoeia" as 'Trional' and introduced under the registered name 'Veronal' in 1903. Evipan-Sodium was introduced to the profession about 1931 and since then the permutations and combinations of Urea derivatives has been something phenomenal - it would appear that each firm has its research chemist produce about three new ones per year!

About/

About 1928 injections of Magnesium Sulphate combined with Morphine and Ether dissolves in Olive Oil were tried but the success obtained by this method has not been outstanding.

All these people figured in the Historical aspect of my subject and many others beside. William Harvey, Florence Nightingale, Pasteur, Lister and many others indirectly guided the flock - of those others I will mention Ludwig Ignaz Philipp Semmelweiss (1818-1865) who showed the world the cause of Puerperal Fever and died in the cause: Louis XIV of France who opened the way for male midwifery by calling in Boucher instead of a midwife to the confinement of his mistress and to Queen Victoria for accepting chloroform in 1853 for the delivery of her seventh child and so bearing influence on the use of anaesthesia and analgesia in childbirth. The method of giving chloroform 'à la reine' is named after her.

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MECHANISM AND COURSE OF LABOUR.

Labour is the process of expulsion of the child and products of conception from the mother's womb via the natural passages to the exterior occurring when the child has reached 'term' or approximately ten months gestation. In the expulsion the child has to pass through the pelvic girdle and for this to take place the cervical canal and vaginal passage have to dilate and the uterus and the accessory muscles supply the expelling force. After the child, placenta and membranes have been expelled it is necessary that the uterus remains in a state of contraction to prevent bleeding from the placental site.

Labour is divided into three stages: first, second and third. The first stage being from the commencement of uterine contraction or labour pains to full dilatation of the cervix. In a primipara or first labour this usually lasts 15 - 16 hours, in a multipara - 10 hours.

Second stage - from full dilatation of the cervix to the completion of the expulsion of the child. This lasts about 2 hours in a primipara,  $1\frac{1}{2}$  in a multipara.

Third stage: from expulsion of the child to the completion of the expulsion of the placenta and membranes. This lasts about thirty minutes.

Labour/

Labour is divided into Normal Labour (Eutocia) and Abnormal Labour (Dystocia). A normal labour as I have stated above is conventionally defined as a labour in which the child presents by the vertex, in which there are no complications, and which is completed by the natural unaided efforts of the mother within twenty-four hours.

Abnormal labours are not usually referred to as such, but usually called by their conditions, e.g. breech presentation, antepartum haemorrhage, rigid perineum, contracted pelvis etc.

As labour is a process of expulsion it will be understood that if the conditions of expulsion are easily mechanically, it will be easy for the mother to deliver herself than if they were not so. This is a very important point. The child must therefore be so positioned that it will pass to its best advantage.

Labour is more complex, liable to a greater number of complications and fraught with more pain than in the lower animals, mainly because:-

1. The pelvic axis is curved, that of the outlet is almost right angles to the inlet. The centre of the foetal head follows the 'curve of carus'.
2. The large size of the foetal head: its diameters are larger than the body. Labour in the bulldog is for this reason more difficult than in other bitches.

3. The diameters of the pelvis vary from above downwards. In animals it is more or less cylindrical: in woman the transverse is the largest diameter at the inlet and the antero-posterior at the outlet - thus for an ovoid presenting part to accommodate itself to the passage it has to rotate in its descent.

The factors influencing labour may be grouped under three headings: 1. the Powers or forces concerned: 2. the passages: 3. the Passenger or body passing.

The "Powers" are the uterine forces and the accessory muscles. In the first stage only the former are involved. The uterine forces are involuntary, the accessory forces only partly so. The uterus, like the bladder, has the power of contracting and not fully relaxing - this is known as 'contraction and retraction'. During the latter part of the pregnancy, mild contractions have been passing over the uterus which, with the onset of labour become definite. They are called 'Pains' because they are associated with referred pain to the region of the cutaneous distribution of the 12th Thoracic, 1st and 2nd Lumbar nerves, i.e. from the small of the back over the hips and down the groin.

The origin and cause of the mother's suffering is due to two things - the uterine contractions and the dilatation of the Passages. I will refer to the latter/

latter under 'Passages' later.

The contracting muscle fibres squeeze the nerve endings in the uterine wall as in cramp and although the means of production of the pain referred to, the particular area, is still uncertain - afferent impulses to the segment or segments of the spinal cord in some way are responsible for the localisation of the pain to the distribution of the nerves of that segment. The pains come on gradually, become more and more marked, reach a maximum which is maintained for a moment or two and then decline and pass off until the next one comes. At first the interval may be 5 - 10 - 15 minutes, and the pain lasting a few seconds. As labour advances the pains become more regular, more often, stronger and are associated with more suffering to the mother. The uterus can be felt during a pain to firm - harden and then soften.

In the second stage these pains are assisted by the accessory forces - the abdominal wall tightens, the mother fills her lungs and holding her breath presses down as at stool, that is she assists the uterus in pushing the child through the passages. Towards the end of the second stage the pains are often continuous and the accessory muscles act involuntarily in concert with the uterine contractions. The midwife asks the patient to breath through her mouth or say "Oh nurse" with a view to reducing the accessory forces during/

during the birth of the head.

Should for mechanical reasons, the child be unable to pass through the passages, the uterine contractions become so strong that the uterus goes into tonic contraction. This is associated with extreme pain and bears out the fact that Pain has a protective aspect - it is useful in warning the patient against harmful agencies or deterring the sufferer from attempting something which would be harmful to the condition underlying the pain. This therefore, is one of the reasons that childbirth must not be made absolutely painless, unless so supervised that such harmful conditions cannot arise. I therefore mention now that all patients to be delivered by midwives should not be given complete anaesthesia and that if they are to be given an anaesthetic or strong analgesic they should be passed ante:natally by a doctor as likely to be 'normal deliveries'.

When labour commences the body of the uterus contracts and the cervix dilates (ordinarily the cervix is contracted and the body relaxed). This phenomenon is known as the 'polarity of the uterus' and is also found in the bladder, rectum etc., the musculature and sphincters being analogous. This allows of the expulsion of the child without undue intra-uterine pressure. The portion of the body of the uterus above the internal os (the isthmus of the uterus) becomes/

thinned owing to the fact that there the muscle fibres are mostly longitudinal with relatively few transverse fibres - this is known as the 'formation of the lower uterine segment'. This relative stretching causes separation of the foetal membranes there and the commencement of the 'bag of waters' or fluid wedge of membranes containing amniotic fluid.

The progressive shortening and thickening of the upper segment of the uterus produced by the contraction and retraction of the muscle, leads to the formation of the 'retraction ring' which is a ridge between the lower and upper uterine segments. It can be felt fairly frequently and in cases of obstructed labour, becomes very definite and rises to a higher level as the lower uterine segment becomes stretched. In such cases it can be seen as a transverse ridge on the abdomen and it is associated with very great pain. If the mother does not collapse with exhaustion the condition may continue until the lower uterine segment ruptures - a grave obstetrical calamity. Sometimes the polarity of the uterus does not take place and while the uterus contracts the cervix does not dilate. This is due to some abnormality in the neuro-muscular reflexes. Irregular uterine contractions are extremely painful and are due to disease in the uterine walls, or exhaustion caused by obstruction, mismanagement or malpresentation. Occasionally the cervix dilates with difficulty/

difficulty owing to scar formation resultant from a previous cervical tear. Both of these conditions are associated with considerable agony to the mother.

The factors which influence the suffering of the mother relative 'to the Powers' are mainly -general state of patient and musculature, type and physique of patient, duration of labour and mechanical difficulties.

A healthy well built and well nourished woman will naturally have an easier labour than the spare lightly built undernourished person. Labour is a physical work and as such is made easier under optimum conditions. The open air, farmer type of woman who is accustomed to fairly heavy manual labour usually does not have a more painless labour than the hard working, moderately well fed miner's wife living in a two roomed house but there is a considerable difference from them to the better class or 'educated' or 'society' who is inclined to be lazy and have others do the manual work for her: she usually has considerable pain in the first stage and has to have chloroform à la reine some time before delivery - because she has relatively less muscle tone and is feeling the effects of the physical part.

Mental worry: anxiety, emotion, domestic, marital and financial troubles all tend to prevent a woman doing her best and giving her whole attention to pressing down.

Fear/

Fear plays a great part in causing weak contractions - it is the woman with the contented and care-free mind who has the spontaneous labour. The mother's confidence in everything is essential to modify the course of labour and for her to make full use of her pains.

The duration of a labour bears considerable relationship to the mother's suffering. Sometimes a multipara has a few 'niggeling pains' (of slight duration) and a few very good pains and baby is born - such is unusual and usually indicative of a previous cervical tear or a gaping os due to multiparity. Such pains are usually well borne and require no analgesic. The converse where the duration is 48 hours or over (this is referred to as a 'long' labour) - are often very distressing in their agony.

Any mechanical difficulty added will require more muscular effort and so more pain - these will be more fully dealt with under 'Passages' and 'Passenger' but reference has already been made to a rigid cervix. The Uterine forces must be applied in the optimum direction, e.g. a pendulous and an oblique uterus require a binder and pads. The sitting posture for delivery is favourable in this respect, but as I have mentioned in the Historical note, has not been used in this country for some time as routine. It is customary, however, to have the patient on her feet or walking about until well into the second stage or the pains fairly strong and regular.

The/

The Passages constitute the bony pelvic girdle and the soft tissues around the birth canal.

The pelvic girdle is composed of the fused segments of the sacrum posteriorly with the coccyx attached to the caudal end; and the two innominate bones, one on each side of the sacrum united anteriorly by the symphysis pubis. There is a slight range of movement between these bones towards the end of pregnancy. It will be apparent therefore that if the size of the pelvis is known, one may be able to forecast the probabilities of the labour and prevent some complications. There are three measurements which assist one in this way: the interspinous, the intercrystal and the obstetrical conjugate.

The interspinous diameter is from the one anterior superior iliac spine to the other and is usually  $9\frac{1}{2}$ -10 ins. (24-25 cms.).

The intercrystal diameter is the greatest transverse measurement between the outer lips of the iliac crests and is usually  $10\frac{1}{2}$  - 11 ( $26\frac{1}{2}$ -28 cms.) or one inch more than the intercrystal.

The obstetrical conjugate cannot be satisfactorily measured directly as it is the distance from the promontory of the sacrum to the nearest point on the posterior surface of the symphysis pubis. It can be obtained by measuring Baudelocque's diameter - the direct distance between the anterior aspect of the symphysis/

symphysis pubis and the tip of the spine of the last lumbar vertebra - this usually measures  $7\frac{1}{2}$ -8 ins. (19 cms.) and subtracting at least  $3\frac{1}{2}$  ins. for the thickness of the tissues the resultant figure is approximately that of the obstetrical diameter. A second and more satisfactory method is to measure the diagonal conjugate per vaginam. It is the distance from the promontory of the sacrum to the lower margin of the symphysis:  $\frac{3}{4}$  of an inch is subtracted to give the obstetrical conjugate. It is advisable to use this method towards the 36th week of gestation when the tissues are lax.

The difference between the interspinous and the intercrystal diameters (1 inch normally) gives an idea of the curve of the iliac crests and so the type of pelvis.

If this difference is reduced a flat type of pelvis is suspected - probably due to rickets. Smaller measurements indicate smaller pelvises. The obstetrical conjugate is ordinarily the narrowest portion of the pelvic canal and is normally  $4-4\frac{1}{2}$  ins. A measurement of under 3 ins. is a major degree of contraction and the patient should be referred for Caesarean section as delivery of a living child per vias naturales is extremely improbable, even if it were possible for the child to be delivered at all. Moderate degrees of contraction with conjugates of

3-3 $\frac{3}{4}$  ins. require very great supervision as they are given the 'test of labour' if induction of labour has not been tried. This means the patient is given an attempt to deliver herself, forceps assisted if need be, or Caesarean section may be done. These types of patient require hospitalisation with anaesthetics and analgesics according to their requirements. Mild degrees of contraction with a conjugate over 3 $\frac{3}{4}$  ins. are cases which give a considerable amount of trouble to the attendant - they may require induction of labour, or be delivered by forceps, or have a spontaneous labour. It depends upon the relative size of the foetal head and the way it moulds to the passages. In flat pelves the obstetrical conjugate may be increased almost half an inch by using the Walcher position.

When the measurements are average and there is no apparent abnormality such as a coccyx protruding forwards and fixed or the ischia approximated, the bony canal may be taken as satisfactory from its point of size.

The soft tissues of the passages are the cervix, vagina, perineum and surrounding tissues and organs. The cervix we have seen above ordinarily dilates with the uterine contractions - it is necessary that it be fully dilated or nearly so for the child to pass through it. Old scars and ulceration may cause it to be/

be rigid. The vagina dilates fairly easily and provided time is taken, not painfully. The perineum composed of more fibrous tissue than the other parts stretches with considerable difficulty and it has greater cutaneous sensibility. The keeping of the perineum moist greatly assists it to stretch, and a seven eighths lithotomy position is better than a full one. A tear or episiotomy are to be avoided if it is at all possible because besides being painful are a site for infection. The acme of pain is usually when the head is being 'crowned', i.e. when the largest diameter of the head is passing the perineum. Malformations of vagina, hymen, tumours of soft passages; prolapse of anterior vaginal wall and impaction of anterior lip of cervix are mechanical causes of obstruction. The surrounding tissues of importance are the bladder, urethra, rectum, ovaries and nerve trunks. The importance of the bladder is that if it contains much urine it may obstruct the passenger. Pressure on the urethra prevents the bladder being emptied either mechanically or on account of the pain interfering with micturition. A distended bladder is a cause of pain which may prevent the pains being used to their full extent besides being a mechanical obstruction. The rectum is the most important surrounding organ - a loaded rectum acting as an obstruction. On rare occasions ovarian cysts or fibroids/

fibroids act as obstructions. The ovaries are raised out of the pelvis minor by the enlarging of the uterus and are not pressed upon during the descent of the passenger - but they may be squeezed by the attendant and cause considerable shock when he is assisting the expulsion of the placenta. The nerve trunks are only injured during the mal-application of forceps.

For the delivery to take place per vias naturales it is essential that the passenger be able to traverse the passages. The smaller the passenger or the larger the passages - the easier will this be accomplished. Multipara who have already had the passages dilated already therefore have on an average an easier and shorter labour than primipara.

Premature labours are usually easy, postmature - owing to the larger size of the child often difficult and prolonged. Labours could be made easier by making the labour take place earlier than is natural - this is done in some cases of contracted pelvis, but is not universal as it is found that the child has a better chance of survival if left to the natural onset of labour.

The passenger in order of occurrence in 96% of cases is the fluid wedge of amniotic liquor in the membranes (if it has not burst), the foetal head preceding the body and lastly the placenta with the attached/

attached membranes. The fluid wedge is the best dilator of the soft passages. Abnormality in its shape suggests that the presenting part is not closely fitting the passages and it demands investigation. Excess liquor amnii prevents contractions and over-distends the lower uterine segment. Absence of or too little liquor is due to early escape or pathological conditions and results in the absence of the fluid wedge with a difficult and delayed labour. The fluid wedge should be conserved if possible till full dilatation. The wedge may be absent because the membranes are adherent to the uterine walls.

The important point regarding the passenger is the size of the head as it has the largest diameters of the passenger. The shape of the foetal head is such that the smallest diameters are the sub-occipito-bregmatic and the sub-mento-bregmatic. The vertical diameter is the largest. This means that in the child passing through the passages, the smallest diameters are being engaged when the head is in extreme flexion or extreme extension. Extreme flexion is the natural position of the head in the foetal ovoid and this is regarded as the most satisfactory way for the head to be delivered. For the child to be delivered most easily - mechanically - it is of paramount importance that the foetal diameters be utilised to their best advantage and herein lies the Art of Midwifery/

Midwifery. A delivery may be able to complete itself unhelped but a little assistance and skill in the application of the knowledge of the relative sizes can convert a difficult labour into an easy one, e.g. the assistance of rotation in an Occipito-posterior presentation.

A large foetus - from a big heavily built father or from a prolonged gestation or the premature ossification of the foetal skull tend to make labour more difficult. Malformations such as foetal ascites, hydrothorax, tumours, distended bladder, cystic kidneys, etc., also cause mechanical obstruction while complications such as a prolapsed hand, the cord wound round the neck, placenta praevia, extended legs etc., hinder flexion of the head, flexion of the body or cause mal-presentation which interferes with the conditions of maximum mechanical advantage and make the labour more difficult and so more painful.

I do not consider Pain need be completely abolished but what there is should not be unbearable. Tolerance to pain varies so much that each case must be judged on its own merits. Ordinarily multipara do not require any analgesic till the second stage. Some primipara do not require anything till late in the first stage. When there is a likelihood of a long or difficult labour - the analgesic is best given early to avoid the patient getting tired and worn out. Some/

Some primipara are inclined to get hysterical at the onset of pains - the correct treatment for this is a frank explanation of the pains and their use, suggestion, getting the patient's confidence and holding up the sedatives till later.

'After-pains' - pains occurring after delivery are due to the uterus trying to expel blood clots. This is most common in multipara and they may be very painful. They may be partly avoided by keeping the uterus well contracted with ergot.

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1. Complete anaesthesia or loss of consciousness
  2. Incomplete anaesthesia but no memory of the pain (anesthesia) or loss of consciousness (anesthesia)
  3. Responder to lesser pain.

### METHODS OF SECURING ANALGESIA AND ANAESTHESIA.

The amount of pain suffered by the mother varies considerably according to the manner and skill with which the labour is conducted by the Accoucheur. Anaesthetics and analgesics should not be used to cover up badly conducted midwifery. I therefore stipulate that anaesthetics and analgesics should be used to assist natural labour and good midwifery. No greater quantity should be used than that amount which relieves the mother of agony and suffering.

It is a mistake to group these relieving measures into first and second stage groups, because it is difficult to say when the cervix is fully dilated and so define the stages. As tolerance to pain varies it is better that the measures used should be to combat the discomfort or pain as it arises rather than to give it according to the degree of advancement in labour.

This degree of relief may resolve itself into:

1. Complete anaesthesia or loss of consciousness
2. Incomplete anaesthesia but no memory of the pain (amnesia) or loss of sensibility to pain (analgesia).
3. Measures to lessen the pain.

Complete anaesthesia is essential if any operative work is to be done e.g. application of forceps, craniotomy and some cases of manipulation requiring abdominal relaxation e.g. version. It might be mentioned however that/

that sometimes spinal anaesthesia with preoperative treatment is used under these circumstances.

Incomplete anaesthesia is desirable for the crowning of the head in primipara, when a tear is expected and episiotomies should have at least this degree and some cases of 'tests of labour' require it.

Measures to lessen the pain are required in cases of difficulty - mild degrees of contraction where there is some moulding taking place, occipito-posterior presentations during the 'long internal rotation of the head', cases of 'dry labour' after early rupture of the membranes and hysterical patients requiring a sedative etc. in the average normal case.

A prolonged semi-conscious state is not required if a temporary analgesia of the duration of the pain could be obtained. It is the intermittency that is the difficulty - a prolonged semi-narcosis has a bad effect on the child and the mother, and the only way for obtaining this intermittency at present is by using a gas or vapour that diffuses rapidly so that with a few breaths the tension in the blood is great enough to cause the analgesic effects.

Anaesthetics cannot be satisfactorily grouped under these headings as they are rather degrees of sensation. One anaesthetic may give all these grades depending upon the dose given and the length of time elapsed after it has been given. Hence I propose to group the/  
the/

the methods of securing anaesthesia and analgesia under four simple headings and describe the drugs and measures in each.

1. Inhalation anaesthesia including chloroform, nitrous oxide, ethyl-chloride and oxygen.
2. Hypnotic and analgesic drugs including morphine, scopolamine, chloral, bromides and the barbiturates, paraldehyde.
3. Local anaesthesia including caudal and spinal
4. Hypnosis and suggestion

#### Inhalation Anaesthesia.

The latest theory of anaesthesia by inhalation of vaporised drugs or gases is that after being carried into the pulmonary alveoli by breathing, the diffusion into the blood stream takes place until the pressure of the gas in the alveoli is equal to the tension of it in the blood. The drug is held in solution or loose chemical combination, both in the plasma and in the corpuscles, and gives rise to certain changes in the blood. Since metabolism measured by oxygen consumption, is reduced in normal sleep and anaesthesia under various drugs, and since a restriction of oxygen administered also produces unconsciousness it appears that anaesthesia is the result of hypo-oxygenation of the nervous tissues. Unconsciousness results from the cutting down of the oxygen supply but asphyxia results. The reason for this appears to be in the question of the solubility/

solubility of the gases in the blood (ref. 5 ).

Nitrogen is almost insoluble and would produce asphyxia.

Nitrous oxide is extremely soluble in blood plasma and is an anaesthetic. In some cases it probably causes an interference with the selective permeability of the surface membranes of the cells and that the greater the lipoid solubility of the drug compared with water, the greater its narcotic power. Chloroform is strongly lipo-soluble.

The action of each anaesthetic will be given under the description of that drug but a few general points are known. Some inhalation gases are lipo-soluble (chloroform, ether etc) their effect is greater, more lasting and consequently more dangerous than those which are not lipo-soluble. Spectroscopic examination of the blood in Nitrous oxide, Ethylene, Acetylene and Propylene anaesthesiae discloses no bands that indicate any combination with Haemoglobin (ref. 5).

All types of general and local anaesthesia cause a leucocytosis which begins during the operation and reaches a maximum in about 24 hours and returns to normal in 4 - 5 days (ref 6). The Alkali reserve of the blood is diminished under lipoid-soluble anaesthetics and in a long anaesthesia a ketosis results.

The main action of anaesthetics is on the nervous system or conversely the nerve tissues have a selective affinity for anaesthetics. Nerve tissues are particularly/

particularly rich in lipoids, and as one would expect, lipid soluble anaesthetics have their greatest concentration in nervous tissues during anaesthesia. Certain areas of the nervous system are selected more than others and it is found that the cortical cells, - which have a higher oxygen consumption rate than the others, are especially selected by the anaesthetic. The order in which the different parts of the Central Nervous System are affected is the reverse to that of their development, the highly specialised cortical areas being put out of action first and the vital medullary centres last. In this scale the cardiac and respiratory centres are at the foot, parturition like defaecation higher up, while sensation is still higher and the mental process of discrimination and judgment at the top. We do not want to interfere with the natural processes of parturition but to prevent the painful sensations reaching or remaining in consciousness.

#### Chloroform.

Chloroform ( $\text{CHCl}_3$ ) is a volatile liquid which boils at  $62^\circ\text{C}$ . It is slightly soluble in water (1 in 210) but miscible in all proportions with alcohol, ether, the fixed and volatile oils. Chloroform on the skin may produce burns, the vapour is irritating in strong concentrations but not irritating in the concentrations/

concentrations that are used in inducing anaesthesia. Chloroform liquid exposed to the light or the vapour exposed to a flame oxydises to form traces of Phosgene (Carbonyl chloride  $\text{COCl}_2$ ) which is a violently toxic substance. About 1% of Ethyl alcohol is added to the chloroform to act as a reducing agent and to prevent this reaction occurring. It has a burning sweet taste and a characteristic penetrating odour.

Chloroform is a very powerful anaesthetic for 0.035% by weight in the blood produces anaesthesia and 0.06% is a fatal concentration. A concentration of 2% (by volume)  $\text{CHCl}_3$  in the air is used to induce anaesthesia and a concentration of 1% to maintain anaesthesia. (ref. 7)

For some reason it is said that the pregnant woman is peculiarly tolerant and responsive to chloroform and that most women are kept sufficiently under with a surprisingly small dose. (contrast Dr Hallauer's method under 'Hypnosis') As a surgical anaesthetic it is a very powerful, strongly lipo-soluble toxic agent.

For surgical anaesthesia it has a shorter induction period than Ether and if not given too rapidly has very little excitement. The anaesthetic stage is more dangerous than with Ether as there is a gradual but progressive fall in Blood pressure even if the administration is managed carefully. The fall is due to the depression/

depression of the cardiac muscle and possibly to that of the vaso-motor centre. The respiratory centre is also depressed. These are the objections to chloroform in childbirth. The anaesthetic is given a criticism for Surgical anaesthesia - which unfortunately many parturient mothers receive during which the labour is almost brought to a stand-still and forceps are applied. Chloroform under such conditions also causes the following:

Reduction of oxygen content of blood (possibly some affinity between chloroform and the R.B.C.)

Increased % Carbon Dioxide in the blood.

Haemoglobin is reduced and a distinct anaemia is produced.

Haemolysis is increased.

Coagulation time is prolonged.

Grave changes in the Liver - impairment of function for some time afterwards.

Poisoning of neuro-muscular mechanism of the heart.

Shock is assisted by sensitising the capillaries to the action of Histamine so that its effects are increased (ref. 60.) also the case with ether but not Nitrous oxide.

Relaxation of muscles.

Diminished uterine contraction - even to the extent of relaxation.

Post-anaesthetic discomfort - nausea, sickness, taste in the mouth etc. depending upon dysfunction caused in liver, blood etc.

The changes are most definite after a prolonged administration or when the patient is allowed to come to and  
ls/

is then re-anaesthetised. This is seen in cases of Delayed Chloroform Poisoning where there is a generalised fatty degeneration especially marked in the liver and resembling Acute Yellow Atrophy.

Heart failure can occur as a result of the anaesthesia from (1) delayed chloroform poisoning. (2) over-dosage during anaesthesia (3) during very light anaesthesia as at induction.

The first is described above and the second can be readily understood. The third condition is due to failure of the neuro-muscular mechanism, to vagal inhibition or ventricular fibrillation. It usually always occurs in a patient who has been very excited in the initial stages of induction or who has a full stomach as after a recent meal. It is said to be caused by the inhalation of a strong concentration of chloroform in the inspired air. It seems however that the normal risk of primary cardiac failure in light chloroform anaesthesia is diminished in labour (ref 8 ). I consider that the reason is that the parturient woman is desirous of having an anaesthetic and being relieved whereas the fatal cases have been dreading the anaesthetic and have been resisting it.

It is therefore quite obvious that it is disadvantageous to give chloroform in a normal delivery by surgical anaesthesia and that it is contra-indicated in/  
in/

in toxæmias of pregnancy. Chloroform 'à la reine' by dropper bottle or capsule is not associated with all these drawbacks. By this method very weak inhalations are given with the onset of the pain during the expulsive stage - when the pains are becoming unbearable. The inhalations are increased in duration and concentration up to the crowning of the perineum as the suffering of the mother demands, but at no time should she reach the stage of Surgical anaesthesia. Given this way she has relief from her agony, she uses her accessory powers to the full, she does not have any post-anaesthetic discomfort and judging by the latter I think she does not have any blood or liver dysfunction as referred to above.

Chloroform vapour can also be given by blowing air, oxygen or other anaesthetic gas over or through the liquid chloroform. Junker's Inhaler is a special bottle containing chloroform which has air blown over it by means of hand bulb bellows - the vapour being led to a mask the rim of which has a perforated tube through the holes of which the vapour passes. For surgical operations the anaesthetist works the hand bulb and holds the mask. It has been advocated that the parturient mother works the hand bulb and lies with her face close to the mask (ref. 9 ). When she has a pain she is told to press the bulb and inhale the vapour. By this means she administers the chloroform according to/

to her demand for analgesia because she can only work the bellows when she is conscious enough to feel the pain and be able to do it. I have seen several cases that were nearly fatalities owing to the Junker bottle falling on its side and liquid chloroform being squirted along the tubes and since then I have been prejudiced against this method. It has been advocated hanging the bottle on to the bed head - but there is always the case where this cannot be done, or the patient is required transversely in the bed. Unspillable bottles, e.g. Mennell's Modified Junker bottle is a great improvement but tubes of the apparatus can still be laid on and compressed or pulled off the connections. The apparatus also has the disadvantage that during the acme of a uterine contraction the patient is apt to squeeze the bulb and forget to pump and it is quite possible to give herself an overdose by rapid pumping and holding her breath and then breathing the concentrated vapour. I dislike intensely this method of administration as there are too many risks associated with it.

There are several other pieces of apparatus which will deliver chloroform vapour. Shipway's Apparatus is not unlike an elaborate Junker - it will deliver warm ether vapour or chloroform vapour. Boyle's apparatus is primarily intended to give Nitrous Oxide with air or oxygen but by turning a tap either Chloroform or ether/

ether vapour or both may be added. This is an extremely useful piece of apparatus for giving a surgical anaesthesia. Again, I have the greatest dislike to giving chloroform by either of these methods. By the mere turning of a tap a little chloroform vapour is given and by turning it a few degrees more a lot may or may not be given - it is variable. Should the conditions be satisfactory for vaporisation, the patient breathing deeply, the theatre warm, the gas inlet baffle just above the level of the chloroform or the gas bubbling through the chloroform - there is the chance that the patient get a very high concentration indeed and immediately get an overdose. The apparatus is satisfactory in the hands of a capable anaesthetist and when the anaesthesia is steady, but it is when a variation in depth of anaesthesia is required that the trouble commences. I wonder how many anaesthetists smell the mixture they expect their patient to inhale? Some would get a surprise at its ghastliness. I do not recommend these methods for giving chloroform vapour.

### Ether.

Ether ( $C_2H_5OC_2H_5$ ) is a volatile liquid which boils at  $35^{\circ}C$ , is soluble in water (1 in 12 parts) and miscible with alcohol. Its vapour is highly inflammable and when mixed with air forms an explosive mixture. Various peroxides are formed when Ether is exposed to light/

light and air. Di-oxyethyl peroxide has been shown to be a powerful irritant in low concentrations - Ether should therefore be kept in the dark and in sealed bottles to avoid this change taking place.

Ether is a weaker anaesthetic than Chloroform.

The concentration of Ether necessary to produce anaesthesia is about 6% by volume or 15% by weight in inspired air and anaesthesia occurs when the concentration of Ether in the blood reaches 0.14% (ref. 10 ) Ether vapour is less irritant than an equal concentration of Chloroform but since three times the concentration of Ether in the air (four times in the blood) is required to produce the same action as chloroform, Ether, in practice, produces a much greater irritation of the respiratory passages. Owing to its low evaporation temperature it produces a reduction in temperature and the patient inhales a cold vapour which is further irritant. A concentration of Ether which can be breathed without discomfort at 90°F is irrespirable at 45°F. This irritant effect of ether is the greatest disadvantage the drug has as an anaesthetic. Its smell is more disagreeable than chloroform and patients dislike it more.

Compared with chloroform it has a longer induction period and more struggling, it is less toxic but not associated with primary heart failure, it gives less muscular relaxation and is eliminated a little less slowly/

slowly. It produces a certain amount of injury to the liver and kidneys for acetic and diacetic acid appear in the urine after Ether anaesthesia in 50% cases and albumen and casts are present in the urine of 25% of cases. Delayed poisoning however does not occur. In ether anaesthesia the haemoglobin is somewhat reduced and a slight anaemia may be present for a week. Haemolysis is not appreciably increased but the coagulation time is definitely prolonged. There is an increase of Carbon Dioxide in the blood during anaesthesia with a slight diminution of the Oxygen content.

Ether depresses all parts of the Central Nervous System, The vital centres of the medulla being involved late in the anaesthesia - a fact which enhances the safety of this anaesthetic. The respiratory centre is the first of the vital centres to be involved. Later there is a depression of the vaso-motor centre and consequent fall in blood pressure.

Its action on Uterine contractions is to inhibit them both in frequency and in strength of contraction. It is noticeable however that very light anaesthesia or on recovery from anaesthesia that the contractions are stronger. This is due to a reflex stimulation from the irritant effect on the respiratory tract and is also noted in its action on the heart. It can be used in labour as an analgesic. Compared with chloroform it is less toxic but more irritant and when using minimal doses/

doses less satisfactory analgesic results are obtained. Some obstetricians use chloroform but recommend ether on account of its safeness and this can be understood when there is no liability to primary cardiac failure and that it requires a very considerable quantity to be fatal from overdosage. The lethal molecular concentration on isolated mammalian hearts of chloroform and ether are as 1 to 30.

Like chloroform it can be administered by inhaling the liquid or the vapours produced when air or gas is passed over the liquid - warmed if necessary. It can also be given by the rectum dissolved in oil.

When ether is given alone it is either given with a Clover's inhaler or dropped on a Schimmelbusch mask. The Clover's inhaler is a very satisfactory instrument to use but it requires some skill. Being a closed method the percentage of Carbon Dioxide is higher than the other methods and thus a deep respiration is maintained with a fairly rapid induction. The temperature of the respired air is also higher than in the open method.

By the open method with the mask, six layers of domette material are used, on which the ether is regularly dropped. As it is difficult to obtain the required concentration it is advisable to have a cotton wool pad between the mask and face and a towel arranged like a tunnel or funnel above the domette so that the expired etherised air does not diffuse into the atmosphere but is rebreathed. By this method the percentage/

percentage of Carbon dioxide does not greatly increase.

The disadvantages of both these methods is that there is often considerable irritation of the respiratory tract due to the cooling effect of the low vapourising point of the ether and that the induction has to be slow and gradual or the patient coughs or holds her breath and when just going under becomes restless. The administration of ether owing to its irritant effect is associated with considerable salivation and mucous secretion of the bronchi - therefore any respiratory catarrh is made worse and if greater than a slight degree is a contra-indication to its being given. The anaesthetic can be given intermittently but it is very unsatisfactory and it is better to keep the patient at a slightly deeper degree and administer it steadily.

When ether is given in an apparatus such as a Boyle or McKesson, it is usually to supplement Nitrous Oxide. That is a very satisfactory method of deepening an anaesthesia as the flow of gas through it does not vary greatly.

When ether is given per rectum, it is either given according to Gwathmey's Synergic method (see later) or simply 2 - 6 ozs of ether dissolved in 4 ozs. of olive oil. The oil acts as a vehicle, and prevents any local irritation. It is said to increase the rate of absorption. Given per rectum the onset of anaesthesia is slower than by inhalation. Overdosage is difficult to/



to combat - bowel lavage is not entirely satisfactory. The ether is excreted by the lungs and respiratory irritation is still a disadvantage, indeed pulmonary deaths have followed this method of use (ref. 11 - Trans. Soc. of Anaest., vol 2) This method therefore has little if any advantage over inhalation. While Ether boils at a low temperature ( $34.6^{\circ}\text{C}.$ ) it does not escape as violently from an oil-ether mixture as from an aqueous mixture. When the mixture is heated higher, namely the body temperature of  $37^{\circ}\text{C}$  the rate of separation from the oil quickly acquires a definite and fairly fixed speed (ref 12). The significance of this cannot fail to be of great import for by this means the proper content of ether may be maintained in the blood to produce any desired physiological effect that has a quantitative relation thereto - for example in the third or surgical stage of anaesthesia. Gwathmey also utilises this fact in his synergic technique (see later). As the plane of surgical anaesthesia is constant it is now definitely established that the patient absorbs about two ounces of Ether per hour - a smaller amount than by any other method in common use - but it is necessary to give it all at once - this total amount - the dose being determined by the weight and general condition of the patient. Such an Ether anaesthesia does not vary without outside stimulation and it is impossible to withdraw the oil and the Ether separately/

separately from the mixture. The union between the oil and the Ether is only broken when vaporisation occurs. It will therefore be understood that this is a very satisfactory method for maintaining a state of anaesthesia which can be supplemented by other methods but that it is dangerous if it is to be used as a whole means for producing anaesthesia.

### Nitrous Oxide.

I have mentioned above that the anaesthesia depends upon the solubility of the gas in the blood. Nitrous oxide ( $N_2O$ ) is extremely soluble in blood plasma, in fact more than 100 times as soluble as oxygen. Further it has so far as is known no action on cells or tissues (ref. 13) so it should prove a most suitable gas.

The gas, Nitrous Oxide ( $N_2O$ ) is easily liquified under pressure and is so stored in steel cylinders and used direct from the cylinder by allowing it to assume the gaseous state by decreasing the pressure. Owing to the steel cylinders the apparatus is a little heavy and cumbersome.

Nitrous Oxide boils below  $-83^{\circ}C$ , is readily soluble in water, is colourless and has a slight, characteristic, sweetish odour. It produces unconsciousness so rapidly that it is difficult to trace the stage of anaesthesia. In partial anaesthesia and during recovery, loss of emotional control is so marked that the gas is popularly known as "Laughing Gas". The anaesthesia/

anaesthesia can be maintained for a very considerable time without ill effects (forty-eight hours in animals (ref. 61.) and recovery time is practically as rapid as induction. We conclude that Nitrous Oxide acts in a purely physical way by limiting the oxygen supply to the cells of the Cerebral Cortex.

Narcosis is produced when the gas is inhaled in concentrations over 80% by volume. A mixture of 80% Nitrous Oxide and 20% Air only contains 4% Oxygen and therefore the inhalation of such a mixture rapidly produces lack of oxygen and the administration cannot be continued with safety for more than a minute. If such an anaesthesia be continued the blood pressure rises, the lips and face become cyanosed, the pupil becomes fixed and dilated, the respiration having been fast and shallow slows down and finally ceases while the blood pressure falls. This is the only risk in the administration of Nitrous Oxide I know. By allowing the patient to breathe air, or better, Oxygen, this anoxaemia soon disappears.

If at the point when respiration ceases, or just before it, the lungs are inflated with a high percentage of Oxygen, the respiration continues naturally; this is known as 'Secondary Saturation' and although practised in some countries is to be deprecated owing to the cardiac risk. Consequently the proportion for continuous administration should be about 90%. Nitrous Oxide and/

and 10% of Oxygen or one breath of air to every four of Nitrous Oxide if no oxygen is available. Complete anaesthesia and relaxation cannot be produced at normal atmospheric pressure without production of some asphyxial effects. This difficulty can be overcome by giving the gas under pressure for if a mixture of 80% Nitrous Oxide and 20% Oxygen be given at a pressure of one and one fifth atmospheres, then the pressure of Nitrous oxide in the mixture will be one atmosphere and this will suffice to produce full anaesthesia. The administration of the gas under pressure requires however, special apparatus.

The effects produced by the various mixtures of Nitrous oxide and air on relaxation etc. have been summarised as shown in Table I by Connell (ref 14 ).

This lack of muscular relaxation, if sufficient oxygen is given, and that can be judged by avoiding cyanosis, is a great advantage because it means that the accessory powers are but little affected and there is no restriction of the uterine contractions. Indeed, the uterine contractions are unaffected or increased in frequency and severity (see table 2 ). As the action of the gas is mostly physical there are few changes in the blood and organs. Haemoglobin is not decreased and no anaemia follows. Haemolysis is not increased and there is but little change in the coagulation time (ref 15 ).

The gas has no unpleasant after effects on the mother, /

other, she wakens with her mind clear and no feeling of sickness. There is no harm to the child, indeed, gas' babies usually cry when born. This is due to a lightly raised carbon dioxide tension in their blood causing stimulation of the respiratory centre.

The gas has therefore great advantages - it is analgesic or anaesthetic, definite in operation, degree of anaesthesia easily controlled, has no lasting effect on the mother, does not interrupt labour and does not harm the child. Nitrous oxide is a measure of pre-eminence in relieving the parturient mother. The disadvantages are the weight and size of the apparatus with which it is given and the relative cost of Nitrous oxide compared with the drugs commonly given.

#### Ethyl Chloride.

Ethyl chloride ( $C_2H_5Cl$ ) is a very volatile, inflammable liquid which boils at  $50^{\circ}C$ . It has an agreeable odour and a sweet burning taste. It is used as a local anaesthetic when it is sprayed on the skin and by vaporizing, refrigerates the area making it anaesthetic. It is used quite a lot in general anaesthesia, for short anaesthesias - particularly in children, e.g. tonsillectomies, dentistry etc. It is also used for induction prior to ether.

Its action resembles that of chloroform. It has a very rapid induction, a similar concentration of it

n/

in the blood producing anaesthesia. It is said to have less toxic action on the heart than chloroform. Owing to its toxicity and difficulty in handling it is not much used except for short anaesthetics. Personally I dislike Ethyl chloride as a general anaesthetic for in addition to the above reasons, I find that the induction is so rapid, that it is associated with vasomotor disturbance - the patient sees stars and flashes of light etc. and feels an objectionable beating in the head.

#### Ethylene.

Ethylene ( $\text{CH}_2:\text{CH}_2$ ) is a gas that is extensively used in America. Its general action appears to be intermediate between that of Nitrous Oxide and Ether. It has a slightly sweet odour and taste when pure, (commercial productions have a strong unpleasant garlic-like smell). It is solid below  $-169.4^\circ\text{C}$  and boils at  $-103.9^\circ\text{C}$  so it can be stored in steel cylinders. It is inflammable and with Oxygen or air forms very explosive mixtures.

It may be regarded as acting in a way similar to Nitrous oxide, as an Oxygen replacer and having in addition a slight lipid soluble action. It can usefully be employed in operations that require more relaxation than is obtained with nitrous oxide - oxygen for which the addition of ether is undesirable. The patient/

patient does not notice the smell as induction is so rapid, there is no respiratory irritation and it does not promote salivary secretion.

Ethylene has been employed with success in midwifery (ref 16 ). My opinion is that this gas has the advantages of nitrous oxide and the disadvantages of chloroform and besides being highly explosive is expensive as well. I do not consider it an advance on the more common anaesthetics at hand and with the same views I dismiss Acetylene, Propylene and Cyclopropane.

B. METHODS OF PRODUCING ANALGESIA AND ANAESTHESIA BY HYPNOTIC AND ANALGESIC DRUGS.

Scopolamine.

Scopolamine or Hyoscine is an alkaloid derived from the same Group of plants (Solanaceae) that Atropin is derived from. Like Atropin it is a mydriatic and has power to paralyse the Cranio-sacral autonomic (Para-sympathetic) nerve endings. It differs from Atropin which in moderate doses acts as a cerebral stimulant and only in toxic doses does it produce depression, while Scopolamine acts as a depressant in small doses although in larger doses it may produce convulsant effects.

Scopolamine is excellent for quietening motor excitement and tending to produce sleep but is of little use in relieving pain.

The effect of the drug in labour, especially when combined with a hypnotic is to produce an amnesic effect. Several workers say that there is an increased liability to postpartum haemorrhage.

The action of the uterus to the drug is irregular, for it receives motor and inhibitor fibres from the Sympathetic System and there is no evidence that any efferent fibres from the Parasympathetic System pass to this organ, with the result that the knowledge of the anatomy of the nerves does not elucidate the action.

The/

he fluid extracts of Hyoscine certainly have a more markedly sedative action on urinary unstriated muscles than their Atropin counterparts.

It has been claimed by Chasser Moir (Ref 17) that it is only laevo- (rotary) hyoscine that is active in producing amnesia, in depressing the intelligence and in controlling restlessness (ref 17). This may account for some of the variations noted in the drug's use, for example, some people have an idiosyncrasy to it and become wildly excited.

Although there are several forms in which the drug can be administered, the most satisfactory is to give Hyoscine Hydrobromide (Scopolamine Hydrobromide)

( $C_{17}H_{21}NO_4 \cdot HBr \cdot 3H_2O$ ) subcutaneously. The dose is from  $\frac{1}{200}$  to  $\frac{1}{100}$  of a grain.

The combination of Morphine with Scopolamine in "Twilight Sleep" is one of the best examples of synergism - it will be described in the next section.

Hyoscine has also been employed in Labour alone and with Chloroform. Van Hoosen gives the dose (as quoted by Jennings, B.M.J. 2nd Nov 1929) as three doses of one hundredth of a grain of Hyoscin Hydrobromide hypodermically at half hourly intervals and thereafter one hundredth of a grain every two hours as long as labour lasts. This technique has been followed by Claye (ref. 18) and Barnett (Ref. 19), whose results are noted under the respective tables. The effect of the first injection is slight and the actual injection is always remembered/

remembered by the patient. After the second injection in some few susceptible patients, semi-coma develops, the woman sleeping deeply between the pains and only stirring very slightly during the contractions. The vast majority still complain of pain after the second injection and the third is then given. After the third injection amnesia is well developed in most cases - many patients remember being given the second injection but they are all oblivious to the third. When fully under the influence of Hyoscine the patient sleeps quietly in the intervals between the pains. During the contractions she wakes up, moves the legs and arms, sometimes talks incoherently but does not cry out. At any time she can be roused sufficiently to open her eyes but cannot answer simple questions. If she can carry on a conversation or if she cries out with the pains a further injection is required. By this means the patient is expected to have no memory of the actual delivery and the amnesia extends some hours afterwards.

It is essential that the uterine contractions be occurring regularly and with some strength before the Hyoscine treatment is commenced. Claye commences in Primipara not before the cervix is three fingers dilated, and Barnett states that the cervix must be taken up and should admit two fingers and that Hyoscine is not/

not given while an elongated cervix can be felt.

The occasional disastrous effects on the child noted in 'Twilight Sleep' appear from results to be absent when hyoscin is given without morphia.

The drawback to the more general application of the Hyoscine method is the restlessness which occurs in about half the cases. The restlessness varies from simple agitation during the pains to the more decided efforts to get off the bed and which require nursing attendants. The percentage of these very difficult cases is small but they cannot be identified previously. It is not necessarily the nervous or hysterical patient who will give the trouble. In Barnett's series, in none of the cases did the restlessness extend beyond the pains and all lapsed into somnolence during the intervals.

James Clark advocates (ref 20) the giving of the initial injection of one hundredth grain of Hyoscine under light chloroform anaesthesia, repeating half this amount of Hyoscine at intervals of half to one hour till the patient is definitely drowsy and quiet between the pains. Any returning awareness being controlled by chloroform and subsequent injection of Hyoscine.

As labour progresses the dose of hyoscine is diminished to one three-to four-hundredth grain and the intervals lengthened or shortened according to the judgment of the practitioner but avoiding Hyoscine and giving Chloroform/

Chloroform from the time the anus assumes the D shape until the head is born.

By this technique he has a quiet confinement which he can conduct at the patient's home with only one nurse. He finds that Chloroform controls the restlessness which the Hyoscine may produce. This however, in his own words, being "rarely necessary, as the initial administration of chloroform seems to have a subduing effect throughout." It is difficult to assess how much of the restlessness is quietened by light chloroform or whether it is chloroform anaesthesia, which I have shown before is disadvantageous. It would seem that 'half the cure' is for controlling the ill-effects of the 'other half of the cure'. However, the fact remains, that Hyoscine has a very satisfactory amnesic effect in childbirth.

The disadvantages of the Hyoscine amnesia is this idiosyncrasy of some patients necessitating additional staff to control the restlessness. Even the low grade delirium requires supervision by someone acquainted with this type of treatment. Although the restlessness may be controlled by attendants - this is a very real disadvantage because it is difficult to guard the perineum etc. on a patient that is moving about and doing everything but cooperate. Labour, as the very word implies, is an expenditure of/

of energy on part of the patient - should all this waste of energy take place in all this purposeless moving about? I think not.

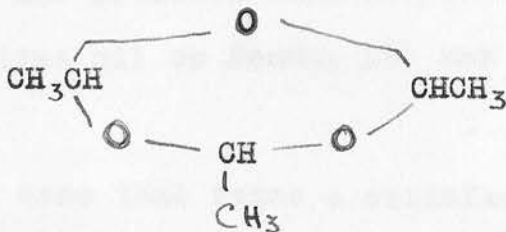
Occasionally in the quiet patient there is a lack of the accessory powers with the resultant more frequent need of instruments, and in the second stage the accoucheur seeing the head on the perineum and no visible bearing down efforts is more inclined to apply forceps.

I do not recommend Hyoscine for routine administration.

I will refer to the use of Hyoscine with Sodium Amytal under the Barbiturates and with Morphine in the next section.

### Paraldehyde.

Paraldehyde  $(\text{CH}_3\text{COH})_3$  is a polymerisation product of Acetaldehyde  $(\text{CH}_3\text{COH})$  which is derived from an alcohol by oxidisation. It has no reducing action like Acetaldehyde - this is probably due to the 'Bridge Oxygens' in its formula:



Paraldehyde/

Paraldehyde resembles alcohol in its effects although it is a much more powerful narcotic and rarely induces any symptoms of excitement. It is soluble in water (1 in 10 parts) freely soluble in Ether and Alcohol and it has a disagreeable odour. It does not affect the heart directly even in large doses although it dilates the blood vessels. It has no effects on the protein metabolism as has been observed under the prolonged administration of Chloral, (Trichloroacetaldehyde). Paraldehyde is excreted by the urine and lungs and consequently the odour persists in the breath. It acts rapidly and produces sleep which closely resembles natural sleep. Its prompt efficient action and low toxicity make it a valuable hypnotic despite its disagreeable odour. The possibility of habit arising is unlikely in labour.

#### Technique.

Paraldehyde is given in the first stage of labour by the rectal route in doses of one dram (or less) per stone body weight, in ten ounces of normal saline solution. It has produced some unpleasant cases of proctitis. Olive oil or Peanut oil may also be used as a vehicle.

In a case that takes a satisfactory course it is very successful. The effect begins to take place in fifteen/

fifteen minutes and a deep sleep lasts up to six hours. If this administration is followed by one of the anaesthetics of value in the second stage the woman will have little or no knowledge of having passed through a confinement.

The drug has in its favour that it is non-toxic and is not a contraindication to being supplemented by another anaesthetic should it prove insufficient in the second stage.

#### Technique of Combining Paraldehyde with a Barbiturate.

One of the disadvantages of the Barbiturate type of drugs is that they are accompanied by various degrees of excitation on the part of the patient. To overcome this excitement phase Rosenfield & Davidoff (ref 21) gave rectal ether and the barbiturate with scopolamine with results that were in their experience not satisfactory. They found that Paraldehyde fulfilled their desires in augmenting the barbiturate combination in their action, reducing the undesirable excitement to a minimum without endangering the mother or foetus or delaying labour.

The procedure in active labour after the enema was given, is to give seven and a half grains of Nembutal which produces sleep in 10 - 15 mins. It is desirable that/

that the contractions be strong or the Nembutal may stop labour if it is not well established. This is followed in 15 to 30 minutes by rectal instillation of 4-6 drams of Paraldehyde in one and a half ozs. of Olive oil (amount based roughly on weight of patient). The rectal administration being facilitated by the use of the apparatus designed and described by McCormick (ref 22 ) or if that is not available by using a 3 oz. glass aseptic syringe with plunger attached, to a No 22 F rectal tube. A bubble should be left in the syringe to cause all the solution to be injected into the rectum but care taken not to have air in the rectum as it might be a tendency to cause expulsion of the solution.

If the contractions were weak or troublesome, six grains of Sodium Amytal was given (Nembutal may stop labour if not well established, when Sodium Amytal has no such effect). The Labour is then allowed to continue and four and a half grains of Nembutal in one hour followed by the rectal mixture in 15 - 30 mins. thereafter. This procedure can be instituted, provided labour is definitely established, regardless of the dilatation of the cervix.

When the presenting part is on the perineum, Gas and Oxygen is administered and the crowning vertex lifted over the perineum with prophylactic low forceps.

It/

It is usually 5 - 6 hours before the patients show sign of wakening. In the early stage of labour a rectal examination is made and if cervix is four or more fingers dilated and presenting part low patient can be carried on with Gas and Oxygen to delivery. If the examination shows that there will be several hours yet, Paraldehyde (2-4 drams) in Olive Oil (1 oz.) to which has been added one and a half to three grains of Nembutal (dissolved in water) is instilled into the rectum. With this the patient rapidly falls asleep and remains so to completion of labour; Gas and Oxygen being used as the presenting part is on the perineum.

The authors introduced this technique because they found the restlessness and excitement of the Barbiturate type of drug the disadvantage against its use. They claim for it:-

1. Production of a prolonged amnesia and analgesia.
2. Freedom from danger to Mother and Foetus.
3. Reduction of excitement to a minimum.
4. Avoidancy of delay in labour.
5. Simplicity in administration.

The disadvantages I consider it has, are:-

1. A prolonged amnesia is unnecessary.
  2. The excitation of one drug is controlled by the contrary action of a second.- Why not eliminate the excitant? The excitant being a Barbiturate -
- I will discuss whether or not they are of use in labour.

3. The administration is not the acme of simplicity. The dose has to be varied to suit the advancement in labour: several drugs are used and they are all given separately and at different intervals of time: Gas and Oxygen is used in addition during crowning and in this country 'prophylactic low forceps' would be considered 'de trop'. 'Prophylactic' presumably to avoid a tear, but would they not be used because there is the suggestion of delay or because the accoucher is getting tired of working with a doped patient? I am afraid all this is more in the sphere of a well run institution with a doctor in attendance.
4. Many would object to the smell of Paraldehyde pervading the air of the institution and the breath of the patient.
5. I have found that there is a liability to secondary bronchitis and bronchopneumonia arising, owing to the excretion of Paraldehyde via the respiratory system.
6. When Paraldehyde is given in water (or saline) it requires a great bulk of it to dissolve it. It is necessary that it be dissolved or severe irritation may be caused. This bulk may cause the rectal injection to be returned and the effect of the drug/

drug thereby lost. This disadvantage can be partly got over by using Olive Oil or peanut oil as a vehicle. Until the nurse becomes proficient in giving the solution (P.R.) to be retained there will be cases where the analgesia is imperfect.

#### Gwathmey's Synergic Method.

Magnesium Sulphate ( $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ) is well known as a saline purgative under the lay term of 'Epsom's Salts'. Its action as a purgative is owing to its power of retaining water and the bulk causing peristaltic stimulation and so flushing out the intestine. Mathew Hay (ref.23) has shown that none of the salt is absorbed from dilute solutions given orally, that when a concentrated solution is given to a thirsty animal, a large proportion was absorbed and excreted in the urine. Magnesium salts, when injected do not produce purgation but anaesthesia. Magnesium is absorbed slowly by the gut and excreted quickly by the kidneys and hence the hypnotic action of Magnesium Sulphate very rarely appears when the drug is given by mouth. If much is absorbed it acts as a diuretic and promotes the removal of dropsy especially in heart disease.

When a soluble salt of Magnesium (the sulphate being freely soluble in water but insoluble in alcohol/

alcohol) is injected intravenously into a rabbit it produces a complete loss of excitability in all parts of the Nervous System, not only is the Central Nervous System paralysed but the drug also produces a curariform action and paralyses the motor nerve endings. This action is immediately abolished by injecting an equal concentration of Calcium - one of the most remarkable examples of antagonism that is known. Most hypnotics act first upon the higher centres of the brain and produce a descending paralysis of the Central Nervous System, but Magnesium acts indifferently upon all parts of the system. Magnesium Sulphate depresses the muscles and the Central and Peripheral Nervous Systems.

Morphia despite its several disadvantages - diminishing uterine contractions, delaying labour, apnoeic effect on the child, - has a very satisfactory amnesic effect on childbirth. The combination of Magnesium Sulphate and Morphia enhances the action of the morphia owing to the synergistic action of the two drugs, prolonging its effect and increasing its effectiveness (200-500% Gwathmey - ref.24).

Magnesium Sulphate also synergises with Ether by decreasing the amount of Ether used in the second stage.

Gwathmey's Synergic Method takes advantage of the Synergic action of Morphia, Magnesium Sulphate and Ether/

Ether and it has a definite progression as labour and the mother's agony advances.

Gwathmey's Technique. (Ref.24).

Analgesia is secured in the first stage of labour by three intramuscular injections of 2cc of a 50% aqueous solution of Magnesium Sulphate, with the first injection of which one quarter grain of Morphia is combined. The injections are at 2-3 hourly intervals or longer as required. The pains should be occurring at four to five minute intervals and lasting for about half a minute when the treatment is commenced. Primi-para should be three to four fingers dilated.

With the increase of pains, a further degree of narcosis is secured by injecting into the rectum (preferably before the head has descended into the pelvis) the following Ether-Olive Oil mixture:

Quinine Alkaloid	20 grains
Alcohol	40 Mins.
Ether	2½ oz.
Petrolatum Liq. or Ol. Olivae	ad 4 ozs.

(In earlier publications it was stated that a smaller dose of the mixture without the Quinine might again be given four hours later if required).

The rectal instillation of the compounds in the mixture is as far as can be obtained for the following reasons.

Ether: this is to deepen the narcosis into a state of/

of anaesthesia during the expulsive stage. Gwathmey considers it is a more satisfactory way of giving the drug than by inhalation and that it is devoid of the disadvantage - nausea, vomiting etc.

Quinine: Gwathmey states that if it is omitted, the method is a failure. It is a safe drug used well below toxic doses. It is absorbed into the blood and appears in the urine.

Alcohol: only sufficient is used to dissolve the Quinine. Heavy Liquid Petroleum or Olive Oil is used as a solvent instead of water as it diminishes the bulk and absolutely prevents irritation. Before the final technique was decided upon, two ounces of olive oil were injected per rectum prior to the above mixture to prevent irritation, but this has been discarded.

It is pointed out that in this 'Obstetrical Analgesia' the full depth of surgical anaesthesia is never reached, the effect on the patients varies from a sedative one to analgesia, with some unconsciousness and amnesia.

It is claimed that forceps rate is not increased, that Occipito-posterior presentations rotate forward with the usual frequency. Only one in nine get unsatisfactory relief.

In over fourteen thousand cases at the Lying-in Hospital, New York, in which the rectal instillation has been used, the rectum and colon are said to have never/

never been washed out afterwards and yet a slight diarrhoea or blood in the stools have occurred in less than a dozen cases. Gwathmey attributes these to a preceeding condition, a pre-existing colitis, fistula in ano, or other diseased condition of the rectum. He blames the slight transient, burning sensation when the mixture is first introduced as probably caused by the passage of the Ether and Quinine through the mucous membrane.

If a case ordinarily would be allowed to go into labour the use of this anaesthesia is not contra-indicated. The contra-indications to the method are Colitis, True Diabetes and Auditory disturbance. The reasons, although not stated, are to avoid irritation of a diseased area, the danger of upsetting further a metabolic disturbance, quinine causing further auditory disturbance.

The risk of abscess formation as a result of the intra-muscular injections is no more frequent than with other hypodermic injections.

Many advantages are claimed for the method, including the fact that 90% of patients secure relief, it is relatively inexpensive, and safe, can be used in home and hospitals, requires no special attention, the Physician's attention is not required throughout, the patient is quiet and if there is any excitement it is very slight and finally that the method compares favourably/

favourably, statistically with other methods.

Gwathmey realises the degree of anaesthesia parturient mothers should have and that many practitioners overdose their patients. He emphasises that it is an 'Obstetrical Analgesia, and not an anaesthesia. This is a point to be borne in mind.

I consider the disadvantages as follows:-

1. That the routine use of giving an analgesic in the first stage is unnecessary. Therefore I do not recommend the method for routine use.
2. That the multiplicity of directions, although straightforward is in the sphere of an institution or at home only with a very good nurse.
3. That the repetition of hypodermic injections would be disliked by the patient and practitioners will tell you that intramuscular injections are more difficult to give than subcutaneous ones - the type nurses are in the habit of giving.
4. That Morphia is only indicated in certain cases and certainly not as a routine. That the use of Morphia, although an excellent analgesic, delays labour and is probably the cause for the introduction of the Quinine in the Rectal mixture. That the Morphia (and a quarter grain at that) may be repeated at so short an interval as four hours (Ref.25) makes one very doubtful of accepting/

accepting the fact that labour is not delayed. Unless Morphia is given within three hours of the birth I think there is little chance of respiratory embarrassment. But it also must be remembered that the author did not intend narcotic doses of morphia to be given.

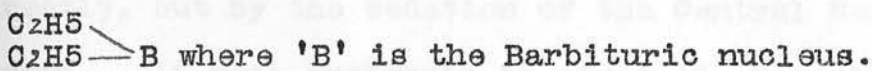
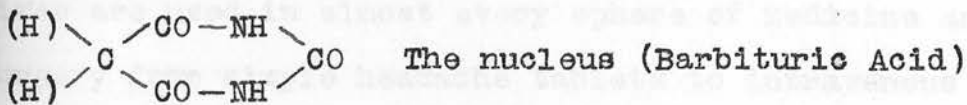
5. Although I believe in a warm soap and water enema, I dislike rectal instillations and should any of the solution be lost, it cannot be returned, and so the dose is upset. The four ounces can hardly be said to be an obstruction to the passages - most of it passes into the colon. The injection is to be given 'preferably' before the head descends into the pelvis - in normal Multipara the pains are never troublesome until the head has descended and in Primipara - those most likely to have the most painful labour - the head is 'fixed', i.e. partly descended a fortnight before labour begins!

His method after so many thousands of cases must have developed considerable finesse in technique and his staff in carrying out the instructions. It is an example of practice making perfect. Our Midwives and young practitioners have not the opportunity of this practice and therefore something more simple must be given them. As an improvement on the Morphine-Scopolamine/

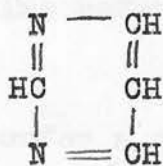
Scopolamine Narcosis for routine work, I think it is a great improvement owing to its safeness and lack of excitability. But as Morphine-Scopolamine is not indicated for routine use, so with this method. The indications for its use are the same as for Morphine-Scopolamine Narcosis viz. any case that is expected to be long or tedious, elderly primipara, minor degrees of contraction, some cases of tests of labour, occipito-posteriors etc.

METHODS OF PRODUCING ANAESTHESIA AND ANALGESIA BY MEANS OF:-Barbiturate Derivatives.

The Barbiturates are a group of drugs derived from Urea. Almost all the compounds are based around a barbituric nucleus which is constant. Veronal (Bayer, the original 'Barbitone', is Di-ethyl-barbituric acid and may be represented by -

Barbituric Acid.

The nucleus may be referred to as Malonyl-urea by the derivation from Malonic acid and Urea, or as a member of the Pyrimidine group which is:-



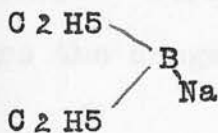
This nucleus has very plastic side chains and the Ethyl groups can be changed for many others and each time a new Barbiturate is obtained.

Di-ethyl-barbituric acid is slightly soluble in water, absorbed quickly, and has a hypnotic action which begins in about half an hour. Suitable doses induce sleep apparently without any other effect but large/

large doses produce a very prolonged hypnotic action. The drug is excreted very slowly and it is doubtful if it is all excreted by three to four days, consequently cumulative poisoning is very likely if several doses are given.

The analgesic effect of the Barbituric Acid derivatives is small, despite the claims made by a few manufacturers, as they do not relieve the pain directly, but by the sedation of the Central Nervous System. If real analgesia is aimed at, Narcotic doses will be required. Despite this, these derivatives are used in almost every sphere of Medicine and Surgery from simple headache tablets to intravenous anaesthetics. So far, most of these compounds have created a sensation in Medical circles and reports extolling their virtues appear, especially Continental Journals, but as many are comparatively new it will be some time before their Therapeutic value is correctly assessed.

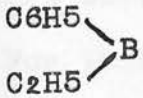
To confer a greater solubility to the drug a Sodium radicle is added to the Nucleus without disturbing the essential ring formation - Sodium Di-ethyl barbiturate is formed it is also known as 'Soluble Barbitone', Sodium Barbitone or 'Medinal' (Schering K.A.G.) and it may be represented as:-



This/

This drug, Sodium di-ethyl-barbiturate is freely soluble in water and has the same properties as Di-ethyl barbiturate with a more rapid action.

By replacing one Ethyl group ( $C_2H_5$ ) by a Phenyl group ( $C_6H_5$ ) an anti-epileptic quality is formed as in Phenyl-ethyl-barbiturate or Luminal or Phenobarbital or 'Gardenal' (May and Baker). This combination has a special depressant power over the motor cortex. It is represented by:-



Thus does the replacing go on, the list in section 6 shows some of the more common compounds. Most of the Basal narcotics are Sodium compounds, the drug being more soluble can be injected. It is not known if these more complicated drugs possess any greatly different properties, each is boosted by its manufacturer as being 'safer, less toxic or causing less excitement' than its neighbour.

Speaking generally, the Barbiturates have a similar action to Di-ethyl barbiturate - the duration of their effects differs and the differences depend partly upon the rate of excretion of the unaltered drug and partly on the rate of destruction of the drug in the body. Barbituric Acid itself is inert and therefore the drugs are rendered inert by the oxydiation/

oxydisation of their side chains so that the drugs with the least stable side chains produce the shortest actions. Sodium Amytal and Nembutal are shortacting. Sodium Evipan is oxydised the most rapidly of all. The short acting members are quickly detoxified. Long acting compounds on account of their slow rate of destruction and elimination are liable to injure healthy parenchymatous tissue, and so, the more toxic members given in therapeutic doses may be safer than the more slowly eliminated and less toxic members.

For this reason it is necessary to utilise the drug which will have a therapeutic effect most in keeping with the nervous depression required of it. Therefore in the second stage of labour one would want to give a fairly large dose of a 'toxic' or quick acting barbiturate which would soon produce an almost surgical anaesthesia, whereas in the first stage one would prefer to give a 'slower acting' barbiturate with a view to producing a mild narcosis and supplementing it during 'crowning'.

The drugs are removed from the body by oxidisation and detoxication, principally in the liver, and eliminated through the kidneys. In the case of Sodium Evipan, apparently these processes occur with such rapidity that the effects of an overdose soon pass off provided that the respiration and circulation can/

can be prevented from failing completely.

The most noteworthy point to be emphasised is the striking contrast between the gaseous anaesthetics and these solid narcotics, in absorption, in action and in excretion. On the one hand the gaseous anaesthetics are absorbed in the lungs, the amount in the body at a particular time can be controlled with remarkable precision (particularly with Nitrous Oxide, Ethylene, etc.) and they are excreted by the lungs without detectable alteration in their composition. Chloroform, Ethyl Chloride are to some extent destroyed by the tissues. On the other hand the problems of absorption, action and elimination of the solid narcotics are much more complicated. Absorption depends upon the method of administration and although these drugs are greatly appreciated by most patients, their effective dose is difficult to control. The supplementary use of an inhalation anaesthetic is a great advantage when using the sub-hypnotic doses. The action of the drug, so long as its composition is unchanged, is probably constant, but the process of detoxication and elimination begin immediately the drug appears in the circulation. Therefore the duration and depth of the narcosis depends upon the nature of the drug, the dose, the type and temperament of the patient, the state of the patient's circulation and the efficiency of the liver and kidneys. With general anaesthesia most/

most of these problems can be dealt with as the anaesthesia proceeds for the dose is controlled from minute to minute, but all the points have to be taken into consideration most carefully beforehand when administering an effective dose of a solid narcotic. After a solid narcotic has been injected, reduction of the effect of the drug is almost beyond the power of the administrator.

#### Methods of administration:-

1. By mouth, e.g. Nembutal, Amytal, etc.
2. Intravenously, e.g. Pernocton, Amytal, Dialurethane, etc.
3. Intramuscularly - most can be given this way if necessary.

#### The advantages of the Barbituric Derivatives.

1. Absence of apprehension. They are given during the first stage of labour.
2. Less general anaesthetic is necessary if they are supplemented by it.

There is less after pain, labour can be painless when they are given satisfactorily, the frequency of uterine contractions is unaffected and the placenta is born speedily. There is no embarrassment of the child if the mother is not comatose.

#### The disadvantages.

1. Routine dosage is difficult, unless supplemented by a general anaesthetic. Most other methods take some time and involve calculation of the dose.

2./

2. Restlessness is troublesome and in some cases amounts to violent excitement. Good midwifery requires the head to be delivered steadily and quietly - if the patient moves about this cannot be done.
3. More nursing care is required especially if the patient is narcotised.
4. Diminished or absent reflexes after an operation may be disadvantageous and after effects may be prolonged.
5. Oral administration often results in incomplete analgesia owing to irregular absorption of the drug. ~~Child's respiration may be depressed.~~
6. Intravenous administration, if not given slowly may cause a drop in blood pressure - in any case it is advisable to have half a grain of Ephedrine ready. Intravenous work is not to be recommended for routine cases.
7. Idiosyncrasy. An erythema or a papular rash occurs in some people who are susceptible to Barbiturates.
8. Cumulative poisoning must be borne in mind if repeated doses are given or if additional sedatives are given.
9. Prolonged administration of Barbiturates causes an agranulocytic anaemia. (Ref. 26).
10. The Barbiturates themselves have little depressant action on the sensory system and with a view to combatting this defect there are several compounds of Barbiturates with Amidopyrine, viz. Allonal, Cibalgin, Optalidon, Veramon etc. These drugs are more analgesics but I can find no reference of them having been extensively used in Childbirth.

The potency of the particular Barbiturate is of less importance than the margin of safety between the hypnotic dose and the lethal one. This can be represented by the ratio of Minimum Hypnotic Dose/Minimum Therapeutic Dose. The higher the figure the safer/

safer the drug. Quoting from the literature (Ref.27) Luminal is 1.3, Barbitone 1.6, Soneryl, Nembutal and Phanoform 2.4, Dial 2.5, Evipan 5. From these figures it would appear that it is not very safe to employ Luminal in full hypnotic doses. That is correct, for although it is free from immediate risk in sedative or epileptic doses it is not a drug of choice for hypnosis.

I have mentioned that the Barbiturates are referred to as "long" or "short" acting.

The authority giving these figures (Ref.27) gives the duration of effects for these drugs as follows.

Human therapeutic dose Evipan Sodium intravenously 20 minutes and orally 2 hours. Rats with coma dose: Nembutal  $4\frac{1}{2}$  hours, Pernocton 5 hours, Amytal 6-30 hours, Luminal, Dial and Allurate 18-24 hours, Barbitone 18-36 hours. Evipan and Nembutal are thus adjudged the best as regards safety and duration and practical experience bears this out as they are undoubtedly the most widely used.

As I have mentioned above the toxicity and cumulative dangers of the drugs depends upon the completeness and efficiency by which it is detoxified or excreted from the body. Frethwurst, Halberkann and Reiche (Ref.28) could recover 75% of a given dose of Barbitone from the urine, 65% of Pernocton, only 35% of Dial, between 10 and 40% of Luminal and no Amytal/

Amytal or Neonal at all. Evipan is said to be metabolised completely in a few hours. The continued excretion of a drug in the urine after a single administration is proof of the difficulty the kidney is having in ridding the body of it. It is advisable not to use such a drug during pregnancy or parturition as the kidneys are already being hard worked with the increased metabolism. Where the drug is wholly metabolised, therapeutic trial or clinical evidence is the only test of value. With many of the Barbiturates, they are partly excreted and partly detoxified or metabolised.

Barbitone it is known (Ref.29) is very slowly excreted as the following analysis show: 8% appears in the urine in the first twelve hours, 20% in the first twenty four hours, 36% in the first forty eight hours and traces can be found as long as nine days after a single dose. Barbitone is known as a 'long acting' barbiturate. The disadvantages of a drug such as this are quite obvious. The chemical composition of Barbitone does not vary greatly from the 'short acting' Barbiturates. It is therefore advisable to avoid exhibiting Barbiturates in any case of doubtful impairment of liver or kidney function.

The effect on the renal function is variable as so many factors, - humidity, quantity of drink recently etc., make its study difficult and comparisons difficult to draw./

draw. It seems reasonable to think that a diuresis is caused. Lethal overdosage shows that the tubules are seriously affected and so with the liver where there is evidence of fatty degeneration.

All members of the Barbiturate acid series depress the Respiratory system when given in doses sufficient to produce deep narcosis. The respiratory excursion usually becoming more shallow. The "short acting" barbiturates produce death in overdosage by respiratory paralysis in which cases the lungs are always congested and show inflammatory changes.

The effect on the Nervous system varies with the dose, small doses increase the deep reflexes, with larger doses both deep and superficial reflexes are diminished or they may be abolished. Under deep narcosis skin and sphincter reflexes disappear. The 'long acting' barbiturates have a slightly modified action, the reflexes are augmented in all stages and the drug although capable of controlling convulsions if given in large doses may produce clonic and tonic convulsions. This increase of deep reflexes is often noticed in the psychological effect. Under quiet surroundings fear and apprehension are allayed but with noise or disturbance the patient is irritable, restless or even excitable. Lethal overdosage shows considerable congestion of brain meninges and frequently perivascular oedema.

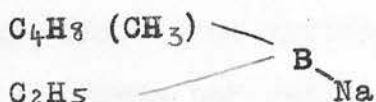
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The Barbiturates may cause a fall in Blood pressure. This is most evident, with intravenous injections and is greatest with Sodium Amytal, but even oral administration of Nembutal may cause pallor and lowered blood pressure in apparently normal people. This change must be considered when giving Barbiturates to a patient suffering from heart disease. Usually a full dose of Sodium Amytal or Nembutal injected intravenously just before full dilatation will produce a painless labour. The drug does not affect the frequency of uterine contractions, it usually appears to increase the expulsive force, and the drug does not lead to any embarrassment of the child. The placenta is born speedily and in Featherstone's experience post-partum haemorrhage is reduced (Ref.30). The customary time, however, to give Barbiturates, is in the first stage of labour. The effect is one of drowsiness followed by a varying period of sleep, the depth of narcosis amounting in some patients to being wakened by the pains, some being roused and others remaining asleep. Small doses definitely having no retarding effect on the uterine contractions but allaying the apprehension of them.

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Nembutal.

Nembutal (Abbott Laboratories) is the most satisfactory and widely used Barbiturate in Labour. It is also known as Pentobarbital. Its chemical formula is sodium-ethyl, iso-Methyl-Butyl Barbiturate and is presented as



Nembutal is grouped amongst the 'short acting' barbiturates. Contrasted with the other Barbiturates it produces surgical anaesthesia in the lower animals in much smaller doses, has a shorter duration of effect resulting in a rapid recovery with practically no excitement or delirium stage.

Nembutal has been employed in Obstetrics alone and in combination with other drugs.

Nembutal (Alone)

The method used by Professor McGuinness (Ref 31) is to commence treatment in a primipara when the os is three fingers dilated and in a multipara when the os is two fingers dilated. He gives a patient of 160 lbs six grains of Nembutal as an initial dose - smaller doses were found to be unsatisfactory, a second dose of three grains not later than three hours after the first dose, and one and a half grains every succeeding two hours or more if amnesia is not complete, till the patient is delivered/

delivered. The drug is given orally in capsule form. The capsules containing one and a half grains of embutal, they should be given on an empty stomach with warm water. The drug is given orally on account of the simplicity of administration. The reaction is not so quick nor the dose so accurate as in the intravenous administration but the fact that the drug has a cumulative action reduces the variation in dosage. The capsules may be given per rectum. The room is darkened and all unnecessary noises avoided. As the barbiturates are highly hypnotic and have a low analgesic efficiency, hypnosis and not an analgesia is aimed at. The effect of the drug is noticed to commence about fifteen minutes after oral administration. A certain percentage of patients are definitely restless and for this reason someone should be present with the patient throughout labour.

During the first stage there is very little influence on the force and frequency of the contractions. The interval at first is usually slightly increased but in some - especially multiparae - it is definitely decreased.

In the second stage the involuntary contractions are usually stronger and the majority of cases progress normally to delivery. Chloroform or ether may be required to supplement the delivery of the head and shoulders of the child.

During/

During the third stage there is no interference with uterine contraction or retraction and no increase in post-partum haemorrhage. After delivery the patient sleeps for a varying period, usually 2 - 3 hours and wakes noticeably free from post-partum exhaustion and frequently asking when she is going to have baby.

#### Nembutal in Combination with Other Drugs.

Nembutal has been employed in Obstetrics along with several other drugs. Morphine should never be employed with Nembutal or any other Barbiturate as the combination has a very definite depressant action both on the mother and the foetus. This effect is greater than with Scopolamine. The combination of Nembutal and Chloral Hydrate is left to the next section, the combinations of Nembutal with Scopolamine, Nembutal and Paraldehyde and Nembutal and Rectal Ether are as follows.

#### Nembutal and Scopolamine. (Refs 32 & 33)

Best results are obtained by giving six grains of Nembutal made up into 4 capsules, each  $1\frac{1}{2}$  grains, orally at one time and Scopolamine Hydrobromide one hundredth of a grain hypodermically at one time. This treatment is commenced when labour is definitely established with satisfactory uterine contractions at least every five minutes or when the cervix is partially effaced and two fingers/

ingers dilated. A certain number of cases require additional medication, usually three grains of Nembutal and one hundred and fiftieth grain of Scopolamine. The average duration of amnesia following labour was two hours. Nitrous oxide and Oxygen was administered at the end of the second stage of labour in all cases described by Averett. (Ref 32)

The clinical effect of the drugs is drowsiness followed in fifteen to thirty minutes by profound sleep. Some patients awaken from time to time with the pains, others are only partially, while a few do not move at all as the pains occur. Some patients can be aroused easily and talk and answer simple questions while others are aroused only with great difficulty, answering questions slowly and dropping back to sleep during questioning. Another group of patients cannot be aroused sufficiently to answer any questions, while a small number although not awake are noisy during labour pains.

The pupils are moderately dilated and in some the conjunctival and corneal reflexes absent. The frequency and severity of the uterine contractions are not interfered with. Averett delivers the majority of his cases by 'perineal' (low) forceps and a lateral episiotomy. A very high majority of his cases experience a complete amnesia after medication and in only a few is a complete failure experienced. The majority of the babies either breathed or cried immediately after delivery/

delivery. These patients require watching until they have recovered consciousness.

It is interesting to note that in January 1934 (Ref 33) it is stated of Nembutal ( Pentobarbital ) and Scopolamine: "It is now standard method used at the Boston Lying-in Hospital, since by its use we expect 83% absolute loss of memory of Labour, 14% of incomplete loss and no failures. Its sole objection is its fairly high percentage of restlessness which we control by the supplementary instillation of Rectal Ether." Not only do I consider this complete amnesia unnecessary but I also believe this is an example of the value of statistical evidence being grossly overestimated.

Nembutal and Paraldehyde.

With a view to avoiding the restlessness of Scopolamine and Nembutal, Paraldehyde has been tried.

Although Rosenfield and Davidoff found the method very satisfactory (Ref. 21 ) Irving, Berman and Nelson (Ref. 33 ) remark that the excitement incidence was highest in their series of cases and they felt that in their hands the combination of drugs had not been sufficiently successful to warrant its continued use.

The Technique is as follows: (Ref. 34)

In active labour after a soap and water enema has been given, seven and a half grains of Nembutal is given the patient who falls asleep in ten to fifteen minutes.

is desirable that the contractions be strong or the Numbutal may stop the labour if it is not well established. In fifteen to thirty minutes the Numbutal is followed by the Rectal instillation of four to six drams of Paraldehyde in one and a half ounces of olive oil. (the amount of Paraldehyde being based roughly on the weight of the patient). The rectal administration is simplified by the use of the apparatus described ( Rosenfield & Davidoff Ref. 21). Paraldehyde is perceptible in the breath in three to four minutes. The patient quickly falls in a deep sleep only moving from side to side during the contractions and sleeping deeply in the intervals. Labour continues and no further medicine is needed. When the presenting part is on the perineum Gas and Oxygen is administered and the crowning vertex lifted over the perineum with a trophylactic low forceps. Five to six hours usually elapse before the patients show signs of wakening.

In the early stage of labour a rectal examination is made and if the cervix has been effaced and is four or more fingers dilated and the presenting part low the patient can be carried on to delivery with Gas and oxygen. If the examination shows that it will be several hours yet, Paraldehyde two to four drams in one ounce of Olive oil to which has been added one and half to three grains of Numbutal (dissolved in water) is instilled into the rectum. Following this the patient rapidly falls asleep and remains/

remains so to the completion of labour - Gas and Oxygen being used during crowning. The patients do not resist inhalation anaesthesia and the time consumed in administering of Gas and Oxygen is less.

At the outset of the series of Rosenfield's cases, to ascertain the dose of Paraldehyde, twelve drams in single dose were given with no undue effects. The patient slept intermittently for thirty-six hours and could be roused to take nourishment but quickly fell asleep. Infants breathed readily but were drowsy for twenty-four hours.

Amount of Paraldehyde used	4-10 drams	(latter divided
" Nembutal	" 6-11 $\frac{1}{2}$ grs	( " dose)

The average duration of Gas and Oxygen was one hour including delivery and repair.

No evidence of delay, but on the contrary there seems a relaxation of the lower uterine segment with subsequent shortening of the time required to completely dilate the cervix. No evidence of Postpartum haemorrhage or rectal idiosyncrasy of the patient was noted.

#### Nembutal and Rectal Ether.

This combination (ref 33 ) causes little restlessness compared with the other barbiturate compounds but the amnesia is not all that is desired. The large majority of children breathe immediately at birth.

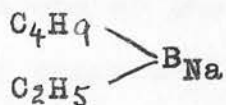
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the authors place this combination as more satisfactory than Nembutal and Paraldehyde and less satisfactory than Nembutal and Scopolamine which they consider the best of the series of compounds they tried out.

The authors do not state their technique or doses but I presume them to be briefly as follows. Six or seven and a half grain of Nembutal is given orally in capsule form and two to six ounces of Ether dissolved in four ounces of Olive oil are given per rectum; the treatment being only started when labour has definitely commenced. Crowning being supplemented with Gas and oxygen anaesthesia.

#### Sodium Soneryl.

Sodium Soneryl is another Barbiturate that has been tried out in some Maternity Hospitals. It is also known as Sodium Buto-barbital and is chemically - Sodium Butyl-ethyl barbiturate. It is represented by



the drug is issued in capsules of two and a quarter grains (0.15 Gm.)

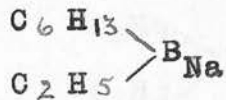
the method of use is as follows: Labour should be definitely established - regular pains present and the cervix two fifths dilated in primipara and one fifth to two/

o fifths in multipara. Never more than six to eight capsules should be given altogether. Treatment is commenced with one to three capsules and two hours later followed by one or two capsules. It is inadvisable to allow a longer interval than four hours elapse between first and second doses.

Restlessness is again the drawback of this drug.

#### Hebaral Sodium.

Hebaral sodium is another Barbiturate that is rapidly destroyed and of relatively low toxicity. It is Sodium - hexyl - ethyl barbiturate and is represented



Massive doses given to dogs show no demonstrable amount of the drug can be found in the brain, kidney or liver. The makers (Parke Davis & Co.) give the following instructions for the use of the drug in labour.

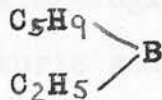
The the first stage when the pains are becoming unbearable six grains (two capsules) should be given by mouth. A dose of three to six grains (one or two capsules) is repeated every two to three hours thereafter as long as may be required, bearing in mind the maximum dose permissible. It is not advisable to exceed fifteen grains (one gram) in the twenty-four hours. The patient becomes drowsy and semi-conscious although/

though she can be roused without difficulty and at times recognises her physician. Between the pains the doses and following labour falls into a restful sleep. The drug does not cause confusion or delirium in the patient nor induce any narcotic effect upon the child. The progress of labour is not retarded and there appears to be no relaxation of the uterus with the possibility of haemorrhage.

#### Amytal.

Amytal (Iso-amyl ethyl barbituric acid) has been tried in animals as an anaesthetic (ref. 35 ).

It is represented by



Given orally the action is slow and uncertain. The intravenous administration is liable to have severe circulatory disturbances unless carried out very slowly, the intramuscular or intraperitoneal route being the route of election. Garry states that as an anaesthetic in physiological research work in animals it has been disappointing. He however gives some interesting pharmacological properties of the drug in comparison with man.

The intraperitoneal injection of a 10% solution is painless and subsequently shows no sign of peritoneal irritation/

irritation. The quantity of drug required in milligrams per kilogram body weight is less in man than in animals. 20 - 25 Mg. per kilo. body weight being required in man for a complete surgical anaesthesia and - 20 Mg. was found sufficient to lower the dose of complementary volatile anaesthetics, e.g. Ether, Nitrous oxide and Oxygen to one quarter of the usual amount required (ref. Lundy & Osterberg: Proc. Staff Meetings Mayo Clinic 1929, IV. 386).

Amytal anaesthesia has a less disturbing effect on carbohydrate metabolism than the majority of other anaesthetics in general use. Large doses given rapidly (intravenously) may cause heart block, ventricular fibrillation and death, and in clinical use may lower the blood pressure alarmingly.

Although Barbituric acid derivatives have a specific affinity for the nervous system, Amytal even in large doses leaves the bulbo-spinal reflexes of animals at little affected. The action on the involuntary nervous system is peculiar in that the inhibitory action of the Vagus on the heart is abolished - several hours lapsing in the cat, before this returns to normal. Intestinal motility is decreased and there is pyloric spasm with the result that oral administration of glucose is negligible and greatly delayed even when injected directly into the duodenum. In vitro amytal even in high concentration has no effect on the guinea-pig uterus and the response to pitocin is unaffected/

unaffected (ref. 36). Amytal does not appear as such in the urine of dogs whatever the route of administration (ref. 37). Like other anaesthetics Amytal inhibits water diuresis (ref. 38).

Sodium Amytal. (Ref. 39).

**Oral Administration:** In a primipara towards the end of the first stage or soon after labour starts in multipara Nine grains of Sodium Amytal (three three grains capsules) are given orally. If the patient is not sleeping quietly between the pains or is not comfortable in twenty minutes another dose of six grains is given. Doses of three grains are given every hour or hour and a half until the cervix is three quarters dilated when a supplementary anaesthesia, e.g. Nitrous oxide and Oxygen, is commenced and continued to delivery. Some workers restrict the total dose to fifteen grains in the twenty four hours and it would appear wise to do so in view of the fact that only a little more volatile anaesthetic would be required and so lessen the chance of overdosage. This drug has a relatively long hypnosis as it is less readily excreted than the other barbiturates.

**Intravenous Administration:** The intravenous technique is to give fifteen grains of Sodium Amytal in ten per cent solution. It is given just before the cervix is fully dilated and must be given very slowly into  
 he/

he vein. This produces a painless delivery with no bad effect noted on the child. The frequency of the uterine contractions are not affected and their strength appears if anything to be increased. There is considerable danger of the child being born precipitately with perineal tear. The dose given earlier in labour produces six to ten hours analgesia with a dim memory of pain subsequently. Smaller doses may be given.

The disadvantage of this drug is restlessness - so common with the barbiturates. Given intravenously almost all patients become very irrational and almost impossible to manage. With the object of keeping down this restlessness and with a previous working knowledge of Pantopon (Morphine) and Scopolamine, Nelson, (ref. 40) combines Scopolamine with Sodium Amytal given orally.

Sodium Amytal and Scopolamine. (ref. 40)

A standard initial dose of nine grains of Sodium Amytal orally followed in half an hour by one hundredth of a grain of Scopolamine hypodermically, for a patient weighing one hundred and thirty pounds (9 stone 4 lbs) was agreed upon and considered safe for a person of his size. For a person of less weight six grains of Sodium Amytal were given and for one of over one hundred and ninety pounds (13 stone 8 lbs) twelve grains of Sodium Amytal were given. The patients were given the injection when the os was one and a half fingers or more/

more dilated. An additional dose of three grains of Sodium Amytal and one hundred and fiftieth of Scopolamine was given after three hours, When the patient seemed too rational for a perfect end result, although this conclusion was arrived at with difficulty because some patients seemed quite rational and yet had complete amnesia. Nelson does not state if they all had Gas and Oxygen during expulsion but remarks that the necessary amount of Gas and Oxygen at time of delivery is reduced.

I consider this complete amnesia unnecessary and that the irrationality, excitability and restlessness necessitating careful watching make this drug and these techniques of little use and therefore I do not recommend them.

Sodium Amytal and Paraldehyde. (refs. 21 & 33).

Sodium Amytal - six grains orally - is substituted for Nembutal in the Nembutal and Paraldehyde technique when the contractions are weak and troublesome, as the Nembutal would stop labour if not well established, whereas Sodium Amytal has no such effect. In one hour four and a half grains of Nembutal are given, followed in fifteen to thirty minutes by the rectal mixture of four to six drams of Paraldehyde in one and a half ounces of Olive oil and the technique as for Nembutal and/

and paraldehyde being followed. The expulsive stage is supplemented by Nitrous Oxide and Oxygen and 'Low' forceps.

Sodium Amytal and Rectal Ether.

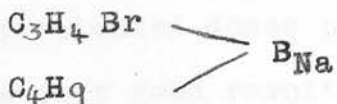
This combination has also been used and the results of one hundred cases are given in (ref 33). There is little restlessness with it and a fair percentage of cases with amnesia.

Pernocton. (ref. 9)

This drug has been more frequently used in Germany and America than in this country. It is given intravenously or intramuscularly. If it escapes into the tissues around the vein during an intravenous injection it may produce necrosis - it is advisable that it be administered by a competent person or the Physician. In the body it is transformed first into Acetonyl parbituric acid and then into other substances which are inert and practically non-toxic. They have been given to animals but do not produce a hypnotic effect. It has not been possible to trace Pernocton in the urine but only these transformation products in a quantity which corresponds to about one fifth of the Pernocton administered.

Pernocton is marketed in a ten per cent solution in ampoules of 2.2 cc. each containing  $3\frac{1}{4}$  grains of  
he/

the drug - the sodium salt of Butyl brom-allyl barbit-  
ric acid. It is represented by



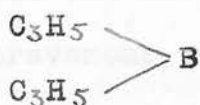
The suggested dose is 4.4 cc. given intravenously,  
the injection being between the pains and never faster  
than one cubic centimeter per minute and preferably  
one cc. every two minutes. The importance of the slow  
injection is emphasised. Underweight patients should  
receive 2.2 cc. and overweight patients a maximum of  
4.4 cc. This averages at one cubic centimeter per  
thirty pounds body weight. The patient falls asleep  
during the injection and the analgesia lasts about two  
hours varying from thirty minutes to four to five hours.  
The dose may be repeated if necessary at the end of  
three hours in half the original dose. The majority of  
cases require supplementary anaesthesia either Nitrous  
oxide or Ether during the actual delivery.

It is noted that in a number of cases when Pernocton  
is given early in the second stage - delivery follows  
almost precipitously. The undesirable effect noted  
is restlessness and marked motor excitability - the  
patient continually rolling and tossing about in bed  
and crying out between the pains and often requiring  
restraint. Irving, Berman and Nelson consider that  
this drug is not suitable during labour (Ref. 33).

A form of Twilight Sleep has been tried out in America by following the preliminary injection of scopolamine by repeated doses of Scopolamine and it is said to give very good results.

#### Dial Urethane.

Dial or Di-allyl barbituric acid is an unsaturated compound containing two double chained atoms of carbon and on this account is easily attacked by oxidising agents. It is represented by



The makers (Ciba Ltd) state that from experiments on dogs, cats and guinea-pigs have shown that the introduction of the unsaturated allyl group in the molecule of Barbituric acid, increases its hypnotic effect to a greater extent than is the case with ethyl, propyl or phenyl radicals - consequently small doses are used. Dial consists of colourless odourless crystals which are sparingly soluble in water - but an aqueous solution may be prepared from a mixture of Dial, Urethane and Mono-ethyl-urea. Advantage is taken of this fact in making the ampoule solution which is frequently referred to as 'Dial' but which obviously should be referred to as 'Dial-urethane' because the latter drug undoubtedly contributes to the effect noted after administration/

Administration of the solution. Ethyl urethane is a mild hypnotic but the Mono-ethyl-urea is stated to have no hypnotic action. The Dial urethane solution is marketed in two cc. ampoules in which form it is said to be stable for an indefinite period of time. Dial can also be obtained in tablet form.

The Dial Urethane can be given intramuscularly or intravenously. The intramuscular injection must be given deep otherwise, owing to the hypertonicity of the solution, severe local tissue damage will occur. The intravenous method is to be preferred because it is prompter and to avoid the discomfort of an intramuscular injection. The intravenous injection must be given very slowly.

Nelson advocated (Quote ref. 41) an initial injection of two cubic centimeters of the solution into an arm vein as soon as labour was established. In from thirty minutes to an hour and a half, depending on the rapidity of labour and the force of pains, a second similar injection was given. Four cubic centimeters suffice in some cases; more often a third injection must be made, approximately half an hour before termination of the second stage. He was able to perform "many difficult procedures, such as forceps, versions and extractions, episiotomies and necessary repair without the necessity of additional anaesthetic".

Porter Brown (ref 41) states he has excellent results/

results with some cases but instances of a refractoriness as encountered and he proceeded to make the technique more elastic and to utilise the 'Biological dose' method .e. injecting the solution slowly until the patient falls asleep. As soon as labour is established he commences treatment. The patient is told she will feel relaxed and sleepy from the injection; a matter of some importance because otherwise alarm may be experienced over the peculiar sensation. Four cubic centimeters are drawn up into a five cubic centimeter syringe and the intravenous injection begun. The injection is made slowly, the patient being constantly questioned and the injection being discontinued when she no longer responds, in some cases two cubic centimeters of the solution will suffice, in others it may be necessary to inject the full four cubic centimeters. He has never given in excess of this in any single injection. If sound sleep does not occur between pains, a second injection of two cubic centimeters is given in thirty minutes. Further injections each of two cc. may be given but Porter Brown has not exceeded a total of eight cc. in the course of a labour. He has used the method in cases of influenza and encountered no evidence of unoward results in which cases he considered Ether would have been dangerous. One must remember that in America, ether is the standard volatile anaesthetic and not chloroform as in the Edinburgh School. With the Dial urethane carried out as described it is possible/

ossible to rouse the patients at any time sufficiently  
o have them take liquids and this is always done in  
ases of prolonged labour.

In most cases Dial urethane is responsible for  
rompt delivery - although in some rare cases it may  
ause some delay it is not clear how this result is  
ecomplished. Cervical relaxation seems favoured and  
orter Brown has the impression that uterine contrac-  
ions are increased in force and frequency - but  
efinite proof of this is lacking. He has no undue  
endency to post-partum bleeding but it is his routine  
ractice to inject 1 cc. of Pituitary solution at the  
onclusion of the third stage. In all his cases re-  
quiring Episiotomy or perineal repair provision was  
ade for administering Ether by inhalation - a few  
ases require a small amount of Ether and others do not.  
estlessness has been practically absent in his series  
(one having to be restrained in fifty-six patients).  
few others were slightly restless but not sufficiently  
s to be particularly annoying - yet it cannot be too  
trongly stressed that they have to be constantly under  
bservation of a responsible attendant until the case  
as fully recovered.

There is a slight fall in blood pressure after in-  
ection which soon returns to normal. Injected at  
he rate of one cc. per minute he has no disturbances  
uch as respiratory depression. Double vision is not  
nfrequent but soon passes off. Cutaneous rashes have  
ot/

not occurred in any of his patients but may result from the administration of Dial. He has had no still births in his series.

At any time if the patient is slow to recover or seems depressed the condition may be corrected by the intravenous injection of Coramine (ampoule). Porter Brown has not found it necessary for the mother but always has the ampoules on the table for injection into the umbilical vein in case the infant manifests respiratory depression.

#### Evipan Sodium.

Evipan Sodium is the Sodium salt of N-methyl-C-cyclohexenyl-methyl barbituric acid. It is supplied as a powder of one gram in sealed ampoules to be dissolved in water just before use and for this purpose supplied along with the Evipan are ampoules containing ten and a half cc. of distilled water. The solution is made by transferring ten cc. of the water into the Evipan ampoule by means of a syringe and then aspirating and expelling the contents from the syringe until dissolved. It is advisable to have the solution very thoroughly dissolved and operative excitement disappears if the solution is injected at body temperature. If a second injection of Evipan sodium is to be given the remainder of the solution in the syringe can be used without hesitation as long as the syringe is in an aseptic condition and the solution not more than

two to three hours old - otherwise a fresh solution must be made up.

Evipan sodium has been much used in minor surgery where an anaesthetic of short duration is required. Eight to ten cubic centimeters given intravenously usually procuring a state of anaesthesia which lasts about twenty minutes - it can thus be used during the final stages of labour and appears to have no bad effect on the mother or child. The art of anaesthesia lies in individual dosage and particularly with the non-controllable anaesthetics is especial care and experience necessary. These principles also hold good in Evipan sodium anaesthesia. It is consequently usual to give the injection into medial cephalic vein of the arm at a rate of one cc. per fifteen seconds and to regulate the dosage by exact observation of the patient. The patient is requested to count and maintaining a constant rate of injection - the moment the patient falls asleep - the jaw falls back - the effect is dramatic in its suddenness - somewhat too dramatic for one's peace of mind until accustomed to it. This is the 'induction dose' and it is advisable to pause now for a moment before continuing as it obviates any probable trouble due to a sluggish circulation. A young and strong patient is given a further quantity equal to the induction dose and if a long anaesthesia is wanted - twice the induction dose. The highest single dose recommended/

recommended is ten cubic centimeters, although to twelve cc. can be given in exceptional circumstances it is preferable to give additional inhalation narcosis in good time. Complete relaxation follows the cessation of the counting and this is usually recognised by the dropping of the jaw although this does not necessarily happen in every case. With this full anaesthesia sometimes spontaneous labour cannot be established for the strength of the pains and the action of the abdominal muscles are inhibited: a dose such as this is for manipulation or caesarean section.

A condition of Twilight sleep may also be obtained (ref. 42) by giving four to five cc. of Evipan sodium which produces in a few seconds a sleep lasting a variable time and amnesia for a considerable time. This injection should be given when the pains are following one another fairly rapidly. There is scarcely any interruption of strength of the pains although there might be slight delay. As usual in Twilight sleep the patient groans or wakes with the pains. If a sensible answer is given to a question and statements or questions are remembered for a short time a subsequent dose may be given; this will vary between two to three cc. according to the condition of the patient and the state of labour. This dose, which should not be exceeded can be repeated as often as necessary in the circumstances until delivery is completed/

completed. In a very long labour (about 36 hours) the dose of eighteen cc. of Evipan sodium has not been exceeded.

Evipan sodium should not be administered single handed as assistance is required to hold the arm during injection and throughout the anaesthesia it is essential to maintain the airway and the patient should not be left alone until she is completely awake.

In conclusion it may be said that in Obstetrics Evipan sodium in an initial dose of four to five cc. and subsequent repeated doses of two to three cc. will produce a perfect Twilight sleep with complete amnesia hereafter. During the twilight sleep it is not only possible to administer uterine stimulants in the usual way and to make use of any posture which will accelerate parturition but by giving another five to eight cc. twilight sleep may be converted into anaesthesia in order to apply forceps or do other manipulation (ref 42).

Another method is concerned with only producing semi-anaesthesia during the last part of the second stage, this with a view of combatting the inhibitory effects produced by a full anaesthesia. Two and a half to three cc. of the solution when good pains are present and it is anticipated that spontaneous delivery will be effected in from ten to twenty minutes. If pain is complained of during the passage of the presenting part a second dose of one quarter to one half cc. may

e/

e used. If the head can be held back at the perineum for a minute or two, a larger injection of from four to six cc. is given for the child is very easily brought round from the anaesthesia that supervenes. The delivery of the placenta is sometimes delayed, but not interfered with.

An overdose of Sodium evipan will first affect the respiratory system and it is essential to keep the airways open and the patient breathing. Artificial respiration and Carbon dioxide or a mixture of Carbon dioxide and Oxygen ( $7\frac{1}{2}\%$ ) is usually all that is required. It is useful to have 'Icoral' a combined circulatory and respiratory analeptic on the anaesthetic table. The usual dose is one ampoule - two cc. - intramuscularly repeated if required. If a rapid response is required  $\frac{1}{4}$  - 1 cc. of the solution may be slowly injected intravenously, although any cardiac stimulant may be used in an emergency. Owing to the depressant action on the respiratory system - any patient who has had morphine or Opium should not be given this method of treatment.

Since Evipan sodium is detoxicated in the liver its use is contraindicated in Hyperemesis gravidarum, cases of severe toxæmia, albuminuria and jaundice. Special care should be taken in those suffering from diseases of the respiratory and circulatory systems, general metabolic diseases - diabetes, acidosis, cases that are seriously ill, have a low blood pressure, are obese, anaemic, /

aemic, septic or feverish etc. In these cases ex-  
 ceptional care must be given to the estimation of the  
 dose which should be from two thirds to half of stan-  
 dard dose. Owing to the time restriction it can only  
 be given in the second stage and in long labours another  
 method should be sought. It seems to me that for all  
 the trouble and risk involved equally satisfactory and  
 simpler methods can be employed than this.

#### Avertin.

Avertin or tri-brom-ethyl alcohol is a drug now  
 largely used in Surgery and Gynaecology as a pre-  
 operative basal analgesic dosage 0.08 - 0.1 Gram per  
 kilogram body weight when it induces a deep uncon-  
 sciousness lasting several hours. The drug is given  
 per rectum dissolved in water - only after the solu-  
 tion has been tested to exclude free irritant. In  
 obstetrics a dose of 0.075 Gram per kilogram body weight  
 is advised. If any deeper anaesthetic is required it  
 is induced by means of additional use of Chloroform or  
 some other drug. It is stated that the injection can  
 be repeated but most people would prefer to follow on  
 with one of the inhalation anaesthetics (ref. 43).  
 By supplementing the analgesia with intermittent  
 Nitrous Oxide and Oxygen the method is made more  
 practicable and may be very satisfactory.

method/

method (ref. 44).

Apparatus required.

- Graduated glass cylinder with tightly fitting cork to hold about 300 cc.
- A small 10 cc. measure.
- A 2 oz. funnel with about 3 feet of tubing ending in a glass connection to join with:
- A No.10 soft rubber catheter.
- Farenheit thermometer.
- A small bottle of Congo red solution 1 : 1,000.
- A bottle of distilled water containing up to 1,000 cc.
- Avertin fluid.
- Vaseline.
- Jug of hot water
- 1. Table of dosage (supplied by makers - Bayer )

method of administration.

The directed amount of distilled water to make a two and a half per cent solution (as read off from the tables for the weight of the patient) is put into the graduated measure and immersed in a jug of hot water to raise the temperature to 100<sup>o</sup>F. The amount of Avertin fluid (as calculated from the table) is measured into the 100 cc. measure and added to the distilled water and shaken vigorously.

As the crystalline Avertin is soluble in water at one hundred and four degrees Fahrenheit up to thirty five per cent and decomposes if heated above one hundred and thirteen degrees Fahrenheit with the liberation of/

di-brom-acetaldehyde - a toxic irritant to the intestinal mucosa as it liberates hydrobromic acid. A test must therefore be prepared.

A few cc of the solution is taken back into the small measure and a couple of drops of Congo red solution added. The colour must not change. A blue discoloration shows the presence of di-brom-acetaldehyde and the solution must be discarded and a fresh one prepared. Raise the temperature again up to one hundred degrees Fahrenheit and the solution is ready for use.

It is difficult to judge the favourable moment to give the injection with the time limit of the anaesthesia lasting one and a half to two hours, and as with all rectal injections during labour there is occasionally some difficulty in getting the patient to retain the drug. On admission to the labour ward the toilet, bathing, shaving and a simple enema is given. Morphine cannot be administered unless an enema has been given and the rectum empty.

The injection can be given either when labour is definitely established but before such times as the pains are sufficiently strong to really upset the patient - i.e. in the case of a primipara when the os is about one fifth dilated (size of a florin). If given too late the disturbance caused by each contraction is too great to allow of the analgesic effect to be instituted - but in such cases Chloroform administered/

ministered during the first five or six pains after giving the Avertin will generally allow the desired effect to be obtained. Some writers (Connell ref 45 and Morgan Ref. 46) advise that the drug should be given at the commencement of the second stage in a primipara and at about half or three quarters dilatation in a multipara.

The patient should lie on her left side with the buttocks slightly raised. The catheter well vaselined inserted into the rectum for three to four inches and the solution run in from the funnel by gravity, about ten minutes being taken for the injection. Should a contraction occur during the administration, the flow must be stopped and pressure kept over the anus with a large swab and the pressure should be maintained during the actual contractions for about fifteen minutes after the injection is completed, in order to prevent the drug being forced out before it is absorbed.

Another method of injection is to wait until a good contraction has just passed off, then to pass the catheter high into the rectum and run in fifty cc. fairly quickly. When the next contraction (usually a small one) comes retain the fluid in the rectum by strong pressure and not letting the patient strain. When that contraction has passed off run in some more of the solution and repeat the process at such a rate that the whole of the solution has been used at the end of a quarter of an hour. Pressure on the anus must be repeated during each pain during the time and for a /

short while afterwards.

The patient must not be left alone and an adequate airway must be maintained.

The patient falls asleep during the injection - within three to five minutes after the commencement of the rectal administration she begins to feel sleepy and another five minutes is in a deep sleep. It is noted that the respirations decrease in rate but are increased in depth; the pulse remains the same; pupils contracted; reflexes subdued or absent except the swallowing reflex which remains brisk. There is no excitement. Muscular relaxation is complete except for uterine contractions which occur at regular intervals. When these occur the patient usually groans and moves her legs and arms but soon as the contraction has subsided she again sinks into oblivion. If the jaw and tongue are much relaxed there may be stertor which disappears with the reopening of the airway. The blood pressure may fall from ten to thirty mm. of mercury soon after the administration of the anaesthetic but quickly maintains its normal level the diastolic pressure remaining constant. Varying from one and a half to two hours the effect of the drug is worn off and the patient in active labour although drowsy, nevertheless again is conscious of actual pain with each contraction. If delivery has taken place she sleeps from two to three hours to a whole day. Finally she awakens from a natural sleep and is rested, has no nausea/

usea and has little or no memory of the events which took place after the administration of the drug. (ref. ).

Morgan (ref 46) found that the second stage was duly prolonged as the interval between the pains was increased with the administration of avertin.

Avertin is destroyed in the liver and excreted by the kidneys so it should not be used when the function of either of these organs is thought to be deficient. The drug is contra-indicated in acidosis and severe general conditions. An important disadvantage is that its action is not very prolonged, so that it may be insufficient for an ordinary second stage and since this if anything is increased by the administration of avertin its effects may have worn off by the time it is most required. The drug is contraindicated therefore in cases likely to have a prolonged second stage, disproportions and abnormal presentations. Occasionally the drug is uncertain in its action - probably owing to the rectum not being empty beforehand. The advantages are that it is safe and has no after effects on mother or child.

With all the trouble in its preparation, I do not think this drug is to be recommended at all as there are easier methods even Paraldehyde, which can be used with a complete certainty of success in the second stage.

## Local and Spinal Anaesthesia.

Methods of Local anaesthesia may be grouped according to the position where the sensory impulses are 'blocked off' or where the anaesthetic injection is made. The methods may therefore be in one of the following groups or combinations of them.

**Infiltration of the perineum, labia, etc.** By this method the anaesthetic is given from the perineum and the nerve branches and endings anaesthetised.

**Regional Block:** this is an infiltration in the proximity, or actually into, the Pudendal nerve so that the area peripheral to the injection is anaesthetised. This is also given from the perineum.

**Sacral or Caudal Block:** this is an extra-dural injection given via the Sacral Hiatus and the nerve roots are anaesthetised prior to leaving the vertebral canal.

**Spinal block:** an intra-dural injection given in a lumbar inter-vertebral space and the nerve roots are anaesthetised on emerging from the Spinal cord.

Cornelius T. O'Connor speaking of Local anaesthesia (ref. 48) feels "that there is a definite field in obstetrics for its use, and that it deserves more consideration than is given it." In its support he gives the following reasons which I have abbreviated, why it is not more often used.

1. Some surgeons are temperamentally not adapted to it as it requires deliberation, anatomical knowledge, patience and frequently gentleness.
2. Many obstetricians do not use the method because they have not realised the excellent relaxation that can be obtained when it is correctly done.
3. The term "massive infiltration" frightens them.
4. Apprehensive individuals are not good subjects for local anaesthesia - but this is no longer a factor if hypnotics are used in the first stage.
5. There is the fear of reaction from Novocain.
6. It is not used because of the persistence of the old notion that pregnant women tolerate anaesthetics very well.

Infiltration of the Perineum etc. O'Connor's Technique  
(ref. 48)

O'Connor uses a 'Dunn' syringe of three cc. calibre and a 10 cm. long needle - this is a continuous flow syringe where the upward motion of the piston automatically fills the barrel through a non-return valve at the base of the needle, where a tube is attached and connects the syringe with the supply of anaesthetic. For extensive infiltrations it saves a considerable amount of time and much trouble. Ampoules of five cc. twenty per cent. Novocain are diluted to one hundred cc. thereby making the solution one per cent. To this is added fifteen drops of one in a thousand Adrenaline because of the vascularity of the parts.

5 - 10 cc. are injected at the site of the episiotomy.

50 - 70 cc. are injected one centimeter medially and caudally to the Ischial tuberosity at a depth of even/

even and a half cms. keeping the syringe moving to avoid penetrating a vein. He recommends aspiration first to see if there is any blood. Thin women are given 50 - 60 cc. stout women 60 - 70 cc.

5 cc. are injected into each labium majus.

10 cc. are injected each side of the sphincter and about three centimeters deep.

O'Connor finds relaxation is complete if the injection is successful and finds that after twenty to thirty times has perfect results in thin women.

In the final stage for a normal delivery, he uses Barbiturate and Scopolamine and occasionally a small dose of Avertin in the second stage (forty-five milligrams per kilogram body weight)- this or Gas and Oxygen is invaluable in the type of patient who is restless.

do not see how he can inject all these areas from urethra to rectum, superficial and deep through a right and a left puncture and he does not mention commencing with an intra-dermal weal. I am not altogether surprised that he requires so much practise before he gets perfect results. It was to overcome this difficulty of anaesthetising the whole perineum that I tried the regional block and I found an infiltration such as this certainly gives a perineal relaxation but, the method lacks the ability to diminish the pain caused by the uterine contractions. The method is therefore not

complete analgesic during the expulsive stage and herefore has to be supplemented, as he has found, in most cases.

#### Regional Block.

This consists in injecting a quantity of the anaesthetic in close apposition to the Pudendal nerve as it lies on the medial wall of the Ischial tuberosity. The resulting anaesthesia being the area supplied by the peripheral portion of the nerve.

#### Caudal or Sacral Block.

This is the anaesthetising of the nerve roots extra-durally but in the vertebral canal. Consideration is taken of the anatomical fact that the tube of dura mater terminates about level of the second or third sacral segment by being directly applied to the inferior tapered end of the Conus medullaris, thereafter becoming the Filum terminale externum or fibrous thread which is attached to the posterior aspect of the Coccyx. That is to say the nerve roots are lying in the sacral canal covered with prolongations of Dura mater but outside the intra-dural space. The anaesthetic can be injected around these nerves by inserting the needle into the Sacral hiatus.

Technique/

Technique as used by J. St. George Wilson (ref. 49)

The margins of the sacral hiatus can be palpated in most people - in the obese when it cannot be felt it can be marked out at a point where the cleft between the buttocks fades out into the lower angle of the rhomboid of Michaelis.

With the patient on the left side - the skin is prepared with antiseptic and a stout needle four inches in length inserted in the middle line at right angles to the surface, just below the ridge of bone forming the upper margin of the notch. After passing through the skin, the penetration of the fibres covering the canal will be appreciated - the point of the needle should be swung in a headward direction. The direction of thrust being now almost parallel to the surface when the needle will be felt to enter the Sacral canal up which it may be pushed for two inches. An outflow of cerebro-spinal fluid will warn the operator of the undesirable penetration of the needle into the theca.

The injection of anaesthetic is made with a recording syringe as forcibly as possible - the fluid should flow in quite readily as there is ample space in the sacral canal. Difficulty in injection denotes that the needle is not lying free in the sacral canal - being outside altogether or is being forced into the wall of the canal.

Wilson obtained best results with one and a half per/

er cent Novocaine using forty ccs. of solution - the solution always being freshly prepared.

In the primipara the injection is made when the vulva is beginning to be stretched by the presenting part: In multipara when it is considered that the cervix is approaching full dilatation.

Anaesthesia develops in ten to fifteen minutes and lasts one and a half hours.

I have used the 'sacral block' in general surgery my main difference in technique being that during the injection and for five minutes after the patient lies on her face to ensure the hypo-tonic solution reaching the posterior (sensory) nerve roots. A woman with a gravid uterus cannot lie on her face and since the block does not relieve the pains of the contracting uterus I think there are simpler and more effective means for anaesthetising the perineum.

#### Spinal Block.

Spinal block or 'Spinal anaesthesia' as it is usually called also takes advantage of an anatomical condition. The spinal medulla usually terminates about the level of the second Lumbar vertebra, and below that the bundles of nerve roots are lying within the tube of dura mater which we have seen above terminates about the second sacral segment. The injection is given between the third and fourth or fourth and fifth Lumbar vertebrae/

vertebrae and the anaesthetic inserted intradurally  
around the nerve roots.

Spinal anaesthesia has been fairly frequently tried  
for the second stage of normal labour. One would ex-  
pect it to be a very satisfactory method but, in prac-  
tice it is only of use in certain special cases. In a  
normal labour under spinal anaesthesia it is found that  
the rhythmical contractions of the uterus cease - the  
circular muscle fibres constrict on the foetus while  
the voluntary powers are lost. The most satisfactory  
results are obtained in Caesarean sections and are  
described in the next section.

Methods of producing Anaesthesia and Analgesia by means  
of Suggestion and Hypnotism.

Labour pains are so susceptible to suggestion that  
I am discussing the whole subject of Suggestion and  
hypnotism in the next section. Although the efficacy  
of these measures is doubtful their use is of great  
importance as an adjuvant.

METHODS OF CHOICE AND SPECIAL INDICATIONS.

For the labour to be most satisfactory and therefore 'easiest', it is necessary that there be the greatest co-operation between patient and doctor or wife or all three. Besides being able to diagnose *xaemias* early, it is possible to give much advice regarding many other things, e.g. hygiene, care of the breasts, attention to the bowels and give valuable advice and attention to misproportions and malpresentations. I consider ante-natal attention essential. The patient should have nothing to fear before a confinement. Her mental attitude should be unfettered by domestic and financial worries - probably a difficult thing to attempt but a doctor can often give good advice on such subjects.

At the first sign of labour the doctor should be notified and he should see the patient as soon as possible. He should exclude false pains and confirm the fact that the patient is in Labour. He should look around and satisfy himself that everything is ready - arrangements made for transference to hospital or home as the case may be. As some first stages are rather long it is sometimes not advisable to send the patient straightway to hospital for her to sit about, without friends or relations, and hear babies crying, and least of all I hope, the agonies of mothers delivering.

delivering themselves. Absolute quiet and peace of surroundings are of very great importance and once any form of analgesic is commenced its optimum effect can only be obtained if the patient is left undisturbed.

In the first stage in multipara usually no drugs are required and it is only towards the end of the first stage in primipara, when the os is one fifth to two fifths dilated (the size of a florin) that the uterine contractions become strong, regular and unbearable.

Although it would be very nice to have a stock remedy for all cases, the best results will always be obtained by the selection of a method for a particular case.

The methods I recommend at this stage are:

- Chloral and Bromide.
- Nembutal and Chloral.
- Morphine.
- Morphine and Scopolamine.

These methods are given in order of their pain relieving qualities the first being the weakest. If a case had a satisfactory result with Nembutal and Chloral and I had another case that I anticipated would be easier, but yet required something to ease the pain, I would give her Chloral and Bromide. If the results were not good, I would not blame the drugs, but rather the fact that I had misjudged the prospects of the case. This shows the tremendous advantage of patients under midwives having ante-natal supervision by doctors who could/

could prescribe or advise the method of choice.

Morphine is indicated in special cases. Although Nitrous Oxide can be given over long periods it is unnecessary, and even with the most modern intermittent flow apparatus the method merely gives relief during a pain and no real rest, and the patient exhausts herself more quickly than without the apparatus. Nitrous Oxide is therefore more satisfactory during the expulsive period when it is of very real value.

#### Chloral Hydrate.

Chloral Hydrate ( $\text{CCl}_3\text{CH}(\text{OH})_2$ ) is a combination of a halogen derivative, Chloral ( $\text{CCl}_3\text{COH}$ ) and water. Chloral or Trichloroacetaldehyde being an aldehyde, is unstable, polymerising or showing marked reducing actions. Chloral Hydrate does not have this tendency and is therefore invariably used in medicine. Chloral Hydrate has an aromatic penetrating odour, a bitter caustic taste and is freely soluble in water. It is used extensively in medicine as a hypnotic, anodyne and antispasmodic. Owing to its derivation from Ethyl Alcohol and its halogen content and the comparison of the derivation of Chloroform from Ethyl Alcohol and Chloral one is not surprised that the side actions of the two drugs show some resemblance. Chloral is a powerful general depressant, chiefly of the cerebrum.

Small doses produce a feeling of weariness followed

by quiet sleep in which the pulse and respiration are slowed in the same manner as in normal sleep and the reflexes are not abolished. From this sleep, which is indistinguishable from natural sleep - the patient can be readily awakened and on waking there is neither confusion or headache and she feels refreshed.

Larger doses rapidly cause narcosis and abolition of reflexes. There is a slowing of the respiration rate and fall of blood pressure owing to the cutaneous vasodilatation. It is an efficacious hypnotic in insomnia due to nervous excitation and in large doses is suitable for overcoming convulsions of Delirium tremens, chorea, tetanus etc. It is said to be a depressant of the heart, so it should be given with great caution in cardiac degeneration, heart disease with decompensation or arterio-sclerosis.

The action of Chloral Hydrate on labour is to slightly delay the frequency of the pains and yet, by causing the lower uterine segment to relax and so allowing the cervix to dilate, the descent of the child is aided. This action is particularly noticeable in the rigid type of cervix found in the elderly primigravida.

Chloral Hydrate has the disadvantage that it does not relieve painful sensory stimuli.

Chloral hydrate is not broken down in the body, but is reduced to an alcohol which is paired with Glycuronic acid and is excreted as Urochloralic Acid. Owing to this method/

Method of excretion the drug is liable to cumulative effect and in cases of toxæmias of pregnancy be a further load on the function of the liver and kidneys.

The great advantages of Chloral Hydrate over many other hypnotics are that doses sufficient to produce deep sleep are not enough to cause gastro-intestinal irritation, cardiac or respiratory depression or other harmful effects. It is certain in its action - quickly produces sleep and there are no bad after-effects.

Chloral Hydrate is usually combined with a Bromide it is not a striking example of synergism, but the combination is found to be more satisfactory empirically, than giving either singly.

#### Potassium Bromide.

Potassium Bromide ( KBr ) is freely soluble in water and its action is to diminish reflex excitability and depress the motor areas of the cortex. It is very useful for relieving convulsions of cerebral or spinal origin for which reason it is given in epilepsy, or for lessening the nervous excitability in neurasthenia and hysteria. The sensory side of the nervous system is not affected, hence pain is not relieved.

The action of the Potassium, Ammonium and Sodium salts is approximately the same. The potassium salt has a speedier and stronger action and is excreted the most rapidly.

Chloral and Bromide.

The combination of 'Chloral and Bromide' is thirty grains of Chloral Hydrate and twenty to thirty grains of Potassium (or Sodium) Bromide. The mixture is given well diluted with water or preferably in a still lemon-juice or glucose solution. I usually have medicaments such as these made up to half a tumblerful and drunk slowly taking considerable time to it as I find that so given there is little tendency to it being vomited. The dose may be repeated - twenty grains of each at three or four hourly intervals. The combination is not a contraindication to inhalation anaesthesia but rather should be supplemented by Nitrous Oxide or light Chloroform anaesthesia during crowning.

The combination should be given with restraint in cases of heart disease and toxæmia.

It is a most excellent combination for eliminating fear and allowing the patient to have an un-apprehensive mind - she suffers what she feels and does not build up exaggerated agonies. The combination is indicated in:

Excitable and nervous patients who as a result of the excitement are being tired in the early stages of labour.

In primary uterine inertia, in order to give the patient a rest until the uterine contractions become effective.

It is a very satisfactory sedative for midwives to give primiparae.

For the case that Nembutal and Chloral are considered too much and yet the accoucheur wishes to give something - Chloral and Bromide supplemented by Chloroform capsules or Nitrous oxide and air is very satisfactory.

As a preliminary to more potent drugs later.

In prolonged labours given alternately with Morphine or other sedative when the prolonged administration of these latter drugs is not considered necessary or advisable.

Nembutal and Chloral.

For a labour that is being conducted single handed this method is very satisfactory. O'Sullivan and Laner (ref 50) have experimented regarding the dose and times of administration and their technique is now the one usually followed.

The routine examination of the patient should be carried out before administration. The room should then be dimly lit and quiet. It is advisable that someone be in constant attendance. The drugs are given separately - the Nembutal first, and they may be repeated. A total of seven and a half grains of Nembutal and one hundred and twenty grains of Chloral Hydrate should not be exceeded in twelve hours.

Treatment is commenced in a primipara when the os is two fifths to three fifths dilated and pains are occurring regularly: In a multipara when the os is one two fifths dilated and regular pains are present. If possible it is best to give the drugs on an empty stomach when the absorption is more regular and causes less variation.

The initial dose, three grains of Nembutal (two capsules) are given and washed down with some water and

in minutes later thirty grains of Chloral hydrate in  
 with lemonade and glucose. This interval is to lessen  
 the tendency of vomiting and the Chloral solution should  
 be sipped slowly. O'Sullivan and Craner recommend that  
 be given in small bulk (three ounces), others re-  
 commend that it be well diluted - but I think that the  
 leading factor is that it be as palatable as possible  
 and this depends on the lemonade.

The first repeat dose is given two hours after the  
 initial dose and subsequent ones are given every three  
 hours. The interval between doses should never exceed  
 four hours or the amnesia is never complete.

In heart cases to prevent the possibility of  
 restlessness, they advise, and I agree, that Morphia  
 in a twelfth to one sixth be given hypodermically  
 with the initial dose. The dose of Morphia should not  
 be repeated.

Restlessness in a mild degree is noted in some  
 patients. It may occur before the full effect of the  
 drug is established or during the stages of recovery  
 from its effects if the patient is still in strong  
 delirium. It usually consists in the patient showing  
 some voluntary effort in 'using' a pain and before and  
 after a pain in moving her head and hands. The patient  
 does not groan aloud or cry out. Between the pains she  
 rests peacefully with her eyes shut - often sleeping.  
 She can be roused to take a drink, but although able

answer questions, usually feels she cannot be troubled  
ing so.

There is usually no effect of the drugs on the  
ulse rate; the blood pressure may fall five to ten  
limeters of mercury which is usually only temporary.  
abnormalities are expected to be found in the exam-  
ation of the nervous system. In a series of sixty  
ses using this method, O'Sullivan and Craner had  
veral lesser signs and symptoms - absent conjunctival  
flex, coarse nystagmoid movements, and one patient  
th double vision for five hours.

Of the effects on Labour, there may be a slight  
elongation of the first stage and which is more  
equent in the second stage, but it is never excessive.  
is noted that the patient is able to bear down better  
th the pains. Chloroform is given with the crowning of  
e head in cases that require it, and manipulations  
e done under Gas and Oxygen and Ether. No prolonga-  
on is noted in the third stage. There is no tendency  
post-partum haemorrhage and no ill effect on mother  
child. The authors get satisfactory amnesic results  
a large majority of cases and only seven per cent of  
at they term failures.

#### indications for this method.

This is the handiest analgesic for the accoucheur  
o works alone and if the assistance of a handy-wife  
break chloroform capsules can be obtained, the  
coucheur/

coucheur need have little fear that his patient will suffer. There are no contra-indications to the use of the drugs: heart cases should have a small dose of Morphine which should not be repeated.

It is very suitable in cases where pain is expected, e.g. primigravida, in cases that are likely to be slightly prolonged, breech deliveries, occipito-posteriors etc. In some 'tests of labour' that are expected to be definitely prolonged, Morphine and Propylamine is probably a better method to employ.

### Morphine.

Of the drugs that produce hypnosis and analgesia, Morphine is the best known. It is the principal and most active alkaloid extract of opium, and is used rather than Opium which has a somewhat variable action.

Morphine causes a specific central analgesic action, a depressant effect on the respiratory centre, stimulation of the vomiting centre followed by depression, a descending depressant action on the entire Central Nervous System including a constipating effect and a restriction in the force and an increased interval between the uterine contractions of the parturient woman. There is no local action of morphine on the uterus and there is much debate about the local action of enteral administration which plays a part in the causation of constipation.

The/

The systemic actions of Morphine are greatly dependent upon the dose given. The smallest doses producing therapeutic effects, result in the relief of pain; somewhat larger doses causing definite cerebral depression, leading to a more or less profound and prolonged sleep. Morphine is particularly useful in combatting sleeplessness which is due to pain.

Morphine is largely excreted through the alimentary tract and very little through the kidneys. The drug passes the placental barrier and if the child is born shortly after the administration of the drug - the child is invariably sleepy - cyanosis usually suggests that the mother has had an overdose. This effect on the child makes the use of Morphine very restricted and as the chances are that some form of resuscitation will have to be performed on the child it is desirable to avoid giving a parturient mother morphine at all.

Other Opium and Morphine preparations have been used with a view to lessening this toxic, soporific, asphyxial effect on the child. Examples of these preparations are Omnopon and Opoidine.

Omnopon (Hoffman - La - Roche) which is also known in America as 'Pantopon' is a preparation containing the total Opium alkaloids as hydrochlorides, the Morphine content being 52%.

Opoidine (J.F. Macfarland & Co.) is a preparation containing 50% anhydrous Morphine with 30% of the other alkaloids of Opium.

Morphine is indicated when one wants to ensure that the patient has a rest and yet allow the uterine contractions to continue in a modified form. This drug is of great value in cases of heart disease. As an example of the treatment for a heart case an accoucheur might commence early in the first stage with Chloral and Bromide. I prefer to do without pre-medication where possible. Morphine grains one twelfth to one sixth are given hypodermically when the pains are becoming unbearable in a dose varying with the patient's condition and expected duration of labour - he tries to avoid giving morphia within three hours of the birth to lessen foetal asphyxia. Nitrous Oxide and Oxygen supplements the analgesia during the compulsive stage. Should the patient become distressed it is often advisable to commence early with Nitrous Oxide with a large percentage of Oxygen in which case a full dose of morphia is an adjuvant. In urgent cases forceps should be applied when dilatation is nearly complete. This combination of Morphine and Scopolamine is the best for a heart case that is to deliver 'per vias naturales'.

Morphine is also indicated in cases of mild contraction of the pelvis where there is some moulding of the foetal head or where the cervix is rigid and the uterine contractions are very painful. It allows the labour to proceed more slowly and yet be a relief and rest to the mother.

Morphine is indicated in cases of shock, e.g. concealed haemorrhage from the placenta etc.

### Morphine and Scopolamine.

It is found that when Morphine and Scopolamine are given together, the effect of the two drugs is greater than the effect of the two drugs given singly. This enhancement is known as 'synergism' and follows Bergi's hypothesis (ref 51) which states that drugs having the same pharmacological action summarise their therapeutic effect when given together, but drugs of different pharmacological actions increase their activity markedly more than the sum of their action when given separately'. This synergistic action is perhaps seen at its best when morphine is given prior to an anaesthetic when very little of that anaesthetic is required to maintain anaesthesia. The combination of Morphine with Scopolamine is utilised in the 'Morphine Scopolamine Narcosis' or 'Night Sleep'. In America Pantopon is substituted for Morphine. Gwathmey's technique it will be remembered takes advantage of the synergic action of Morphine and Magnesium Sulphate.

The aim of the Morphine Scopolamine method is to render the patient amnesic and insensible to the progress of labour. Analgesia is not aimed at and the labour is not painless, but the patient should subsequently/

subsequently be unable to remember anything about the labour - hence the popular term 'Twilight Sleep'.

Should the patient come out of the influence of the drugs and then have to be put back, it is found that the patient remembers these "islands of memory" and may subsequently build up the whole labour from them. Consequently it is very important that the patient be kept under the influence of the drugs the whole time. It is advisable that there be an attendant throughout, near the patient, preferably a nurse who has had experience of the method. It is essential that the room in which the labour is being conducted should be absolutely quiet and as dark as is consistent with constant observation of the patient. All the preparations in the lying in room should be got over before labour begins, and the bath and enema and all other disturbances must be got over at the very commencement of labour.

Treatment is begun when the pains are coming regularly and are of fair strength in a multipara and when they are regular and strongly every seven to ten minutes and the os dilated one finger in primipara. Results are less good if treatment is commenced too late and the labour is inclined to be delayed if it is commenced too early.

#### Technique.

The first injection consists of Morphine (hydrochloride or tartarate) one quarter or one sixth of a grain/

grain with one hundredth or one hundred and fiftieth of Scopolamine (Hyoscine) hydrobromide given hypodermically - subcutaneously. The patient is then made comfortable and told to go to sleep. The patient usually falls asleep in a quarter of an hour to waken with the onset of each pain. She may groan and move about with the pains and as the contraction passes if she falls asleep again. The Scopolamine is repeated at intervals of one hour - the first often being required three-quarters of an hour after the initial injection. The repeat doses of Scopolamine are only one four hundred and fiftieth of a grain. It is inadvisable to repeat the injection of Morphia - except in very long labours where fifteen or twenty injections of Scopolamine have been given - because of the danger of respiratory depression of the child. The amount and frequency of the doses of Scopolamine can be judged by a simple memory test.

This is done by showing her two objects and asking her what they are and at the end of an hour, asking her what she has been shown, asking her what the objects are and if she remembers having seen them before. Complete loss of memory indicates full narcosis and when this is obtained, the patient is usually/

usually flushed and the pupils dilated. She sleeps between the pains but becomes restless or groans when they are occurring. If the patient is slow or in doubt over recognising the object the amnesia is only partial, while clear recollection indicates failure of the desired effect and a need for a further injection. The dose must be strictly controlled by observation of the patient.

When an injection is necessary and the delivery is expected shortly it is preferable to commence inhalation anaesthesia - Nitrous Oxide and Oxygen or slight Chloroform when it will be found that very little indeed suffices.

As the patient complains of great thirst, frequent drinks should be given and consequently the bladder level should be watched and attempts made to empty it when necessary - by catheterisation if need be.

Owing to the state of semi-narcosis, possibly the morphine, there is a greater tendency to post-partum haemorrhage. After delivery the patient sleeps for several hours.

This method is indicated in very nervous or hysterical patients in their first labours, in cases of prolonged labour, e.g. trial labours, slight degrees of disproportion, or rigidity of the passages.

The method is also suitable for cases of cardiac disease/

disease in which fatigue and strain must be avoided.

Although the method is not recommended for routine in primipara some practitioners use the method in general practice with slightly smaller doses. It is said that as the dilatation of the cervix is sometimes hastened it necessitates that they stay longer with their patients after having prescribed the treatment.

The method is criticised by those operators who are conservative in their use of Morphia during labour on the grounds of increased danger to mother and child, but where the administration is properly conducted and the injections begun some time before delivery asphyxia of the child due to Morphia is not obtained. Drowsiness of the child can usually be adequately dealt with by the administration of Carbon Dioxide. The morphinised baby is born in a state of blue asphyxia, the baby affected by Scopolamine alone is born in a state akin to white asphyxia. A combination of these two states - one or the other predominating is found in those affected by both drugs.

Owing to the length of labour with this method, abnormality in the foetal heart sounds, irregularity or any variation of more than twenty from normal - below one hundred and ten or over one hundred and sixty five per minute is to be regarded as a contra-indication to this method.

Nitrous Oxide.

When it was stated that Nitrous Oxide or as it is commonly called 'Gas' could be used over almost indefinite periods of time when combined with Oxygen without ill effect on the patient, it is true, but to be used intermittently for long periods in labour is not so satisfactory as one would have expected. It certainly causes an amnesia during the pains but it does not allow the patient to rest between the pains, and by the time the expulsion of the child is about due, the mother is often well exhausted. If she is working the automatic intermittent type of apparatus, she has to wait for the pain, press the mask on her face and push the valve - all of which is very tiring and exhausting after some time. An anaesthetist is a luxury. During the early stages of labour Nitrous oxide should not be used - it should be used in the late stages of labour only, as an adjuvant to another method or not as the case may be. It is rational to assuage the pangs of labour and begin at too early a stage - but once commenced, the anaesthetist may have to carry on a long continued and possibly dangerous anaesthetic in the case of other volatile anaesthetics or to the untimely recourse to instrumental interference. The unwary obstetrician may in this way find himself on the horns of a serious dilemma.

During the second stage, Nitrous Oxide either with  
air/

air or Oxygen is the best anaesthetic at our disposal. It can be used at the actual delivery - spontaneous or instrumental. It is unfortunate that the apparatus is a little cumbersome and expensive and requires a little more insight and understanding than the other volatile anaesthetics - but it gives the most satisfactory anaesthesia for the purpose. Should a deeper anaesthesia such as for manipulation, bipolar version etc. be required, more relaxation can be obtained by adding Ether vapour to the gas.

If no anaesthetist is available, there is the automatic intermittent flow type of apparatus which is used by the patient herself and without the accoucheur having to control the apparatus at all. All that she is required to do is to press the mask firmly to her face by a button valve on the face-piece and inhale with the onset of each pain. With the loss of consciousness or relaxation of her arms and release of pressure on the valve the administration of gas ceases - the gas is not lost because of the automatic intermittent flow.

There are several types of gas apparatus, the most usual for obstetrical work being as follows:-

1. Boyle's Nitrous Oxide-Oxygen-Chloroform and Ether vapour apparatus. This is essentially a hospital apparatus and probably the best all-round apparatus used/

used. It requires an administrator and with a competent one is economical in use. It is fairly simple in operation and can be used for light or surgical anaesthesia at will. It uses large (400 gallon) cylinders of Nitrous Oxide and of Oxygen, the mixed proportions of which are judged by their relative streams of bubbles through water. Either gas or both may be passed through the triple bottle attachment and have Ether and - or Chloroform vapour added. In my opinion Chloroform should never be used by a closed method as it is too dangerous and causes not infrequent scares. The Chloroform bottle should therefore always be left empty - or an apparatus got which does not incorporate one. A rebreathing bag with a three way valve fitted in the face-piece is used.

## 2. Elam's Nitrous Oxide-Oxygen & Ether Apparatus.

This is a very simple modification of Boyle's apparatus and is consequently cheaper. It can be had in a portable form. It has a small (100 gallon) cylinder of Oxygen and a small one of Nitrous Oxide.

It has the water and ether bottles and the three way valve in the face-piece. It requires an administrator.

Surgical anaesthesia can be obtained with this apparatus as easily as with the Boyle's apparatus.

It is a very handy piece of apparatus indeed and is the type I recommend for the qualified man who anaesthetises at confinements.

3. McKesson Obstetrical Apparatus. This is an intermittent flow apparatus - i.e. gas is only flowing when the patient is inhaling. It has a small cylinder of Nitrous Oxide and one of Oxygen and an Ether chamber, a small re-breathing bag and a valve in the face-piece which has to be pressed to allow the patient to inhale the mixture. This may be done by the patient herself. The apparatus is not built for rough usage and rough transit from ward to ward has often proved it to be in its present form rather delicate an apparatus for general hospital work.

#### 4. Minnett's Nitrous Oxide - Air Apparatus.

This is the simplest automatic intermittent flow apparatus I know of. It has two cylinders of Nitrous Oxide (one a reserve). It has a valve in the face-piece which is pressed by the patient herself when she wishes to inhale the gas. The intermittent flow apparatus is fairly sturdily made and delivers a fixed percentage of air along with the Nitrous Oxide when she inhales. With an apparatus such as this, after the cylinder of gas has been turned on, all the patient has to do is to press the mask to the face with the button and inhale with the pains. It is indeed simple in operation. Where a simple, easily worked, automatic flow and economic apparatus is required, this type of apparatus is recommended.

5. Magill's Apparatus. This is a large and rather complicated intermittent flow apparatus capable of supplying Nitrous Oxide and Oxygen in predetermined proportions or Oxygen only, under pressure if need be. It has also an Ether chamber and a rebreathing bag and has a valve fitted in the face-piece which can be used for personal administration. The apparatus can also add carbon dioxide in the mixture of gas. My opinion of this apparatus is that it is only of use in a hospital with a competent and experienced person working it.

These pieces of apparatus have three drawbacks: size, cost and weight. The size can hardly be reduced because of the cylinders. Elam's apparatus can be had in portable form. The apparatus costs more than a hypodermic set complete with drugs or a number of bottles and Nitrous Oxide is a relatively expensive gas but against this it is the best volatile anaesthetic and for apparatus one is getting as good value for one's money as with any other surgical instrument. A competent administrator can give as good an anaesthesia with Elam's apparatus as with a Boyle's and one is not long in becoming competent with these types of apparatus. As for the weight, it is greatly due to the cylinders. With the new steel "Vibrac" cylinders, the weight of each 100 gallon cylinder is reduced from  $10\frac{1}{2}$  pounds to/

to  $4\frac{1}{2}$  pounds. Unfortunately these are more expensive.

A disadvantage that sometimes arises during the administration of gas from an automatic flow apparatus is that the patient does not press the valve but shouts, or that when she presses she holds her breath. This is where the advantage of an anaesthetist comes in. The majority of women however, quickly understand and carry out the instructions.

There is no doubt that the degree of success obtained with Nitrous Oxide analgesia in labour is directly proportional to the ability and conscientiousness of those in charge of its administration. The simple types of apparatus are quite easily understood and worked, but they must be properly and firmly assembled, and gas and air leaks must not be tolerated. It should be explained to the patient that she will have relief from pain without loss of consciousness so that she knows what to expect of analgesia in a Gas-Air apparatus. When the patient is ready for 'pushing down' she must take four or five breaths before doing so - push down, take more breaths, then push again. Administration should be continuous during the actual birth of the child.

The indications for Nitrous Oxide - with air or Oxygen, are when a degree of anaesthesia varying from light to surgical is required. It can be used as an adjuvant to any other methods of premedication, e.g. during/

during crowning of the head or doing an episiotomy, for the application of forceps or a manipulation. The depth of anaesthesia being variable can be changed immediately at will and there is no waiting for its action to take place. It is the safest volatile anaesthetic and may be used in toxaemias, albuminurias, decompensated heart cases etc., when many other anaesthetics are contraindicated.

Many multiparae who require nothing throughout labour benefit from a few whiffs while the head is being crowned.

Should a greater degree of relaxation or a deeper anaesthesia be required as for a Caesarean section - this is obtained by the addition of Ether vapour. This method and Spinal anaesthesia are the methods of choice for Caesarean section.

#### Chloroform.

Chloroform we have seen in the last section, is a very toxic agent when given for surgical anaesthesia. Its advantages however, are that it is volatile, powerful and acts speedily. When it is given in very small concentration by inhaling the liquid with a large percentage of air it is not a dangerous drug. This method is utilised in giving Chloroform 'a la reine' which/

which is the correct method to give it in Midwifery. This method may be used alone or in combination with other methods of premedication.

The method of giving Chloroform 'a la reine' is as follows: When the pains are becoming severe and the mother requires an anaesthetic, a few weak inhalations are given when the pain is reaching its maximum, and between the pains nothing is given until the onset of the next pain when a few further inhalations are given as required. The quantity of Chloroform used is small, most being used up by vapourising between the pains when the patient is not getting any of it. As the pains become more frequent and stronger to the time when the head is being crowned - so the anaesthetic is given more frequently and a very little stronger. Immediately on delivery the anaesthesia is stopped. It is a bad practice to reanaesthetise with chloroform after the third stage to put in stitches etc. The stitches should be inserted in situ but not tied, after the birth but before the placenta is born. The reason for this is that chloroform is inclined to relax the uterine contraction and cause a little post-partum haemorrhage. Remember that the conservancy of maternal blood is the strongest force we have to combat puerperal infection and maternal mortality.

It can always be remembered that should the occasion arise a surgical anaesthesia can be obtained, although/

although it is advised to use another anaesthetic should one want this depth of anaesthesia for any length of time.

Given this way the patient knows and feels that the doctor will give her relief when she needs it and her mind is set at ease. She is conscious between the pains and can follow any verbal suggestions. The Uterine contraction takes place and she smells the characteristic smell and before the drug can have effect she assures herself that she is having the best and utilises her pains to the best of her ability. When the pains are becoming unbearable the analgesic effect is commencing and the patient although not unconscious is not suffering agonies. At the crowning of the head the patient usually cries, moans or becomes restless. It is at this moment that many attendants are inclined to give too much chloroform and convert the anaesthesia into a full surgical one. This must be avoided if possible.

#### Methods.

Dropper bottle and open mask  
 Junker's Inhaler and similar methods  
 Chloroform capsules  
 Christie Brown Method.

#### Dropper Bottle and Open Mask.

This is the method that most practitioners employ. Although only a few drams of Chloroform are used at the most/

most the customary size of the bottle is one to two ounces. Larger bottles are inclined to make one too liberal with the 'dope'. The mask should be of the Schimmelbusch pattern with a channel or gutter on the face edge as this type of mask avoids the damp lint coming in contact with the face and possibly burning it. Actually the mask should be held at a distance of about one inch from the face and the lint never so damp at the edge to allow this to happen. The mask should be covered with one layer of lint or domette as that quantity allows the best vaporisation with maximum aeration. It requires an attendant to hold the mask to the face during a pain and away from it between pains.

The method is economical, very satisfactory indeed and above all simple.

As it is customary to fill the dropper bottle out of a large bottle before commencing anaesthesia and at that time fix the stopper and see that it is dripping properly, there is little possibility of the stopper falling out during use. If the bottle is fitted with a rubber cork and two way metal tube (Bellamy-Gardner's stopper) there is little chance of the cork falling out.

#### Junker's Inhaler and similar Methods.

In this method air is blown through the Chloroform container by means of a rubber bulb or bellows/

bellows and the vapour then led to a mask. The bulb may be worked by an attendant or by the accoucheur squeezing the bulb under a sterile towel, or by the patient herself. I have used the original type of apparatus including the mask and consider it fraught with danger. Regarding the apparatus, the bottle is easily upset even when pinned to the anaesthetist's gown (leaning over something) and when the bottle is wrongly connected chloroform liquid may be squirted into the mask. With the rubber tubes lying on the bed, a restless patient can lie on them obstructing the flow or pull the connections apart. Regarding its administration, worked by an anaesthetist who is occupied in his job, it will be given satisfactorily. The method is not so successful when worked by the patient herself as occasionally when she feels a pain she grasps the bulb and forgets to pump or possibly pumps very rapidly and gets too strong a concentration. The Nitrous Oxide intermittent flow apparatus is more satisfactory in this respect. The accoucheur giving it himself is the most satisfactory method.

It was to overcome the disadvantages of the Junker Apparatus that Mennell's Modified Junker Bottle was introduced. This bottle can be connected up by either connection to pump or mask and will not allow liquid Chloroform to be pumped along it. It is unspillable and can be filled during its operation.

When/

When worked by the accoucheur who is single handed it is quite a satisfactory method. Some patients can be trusted to work the apparatus themselves but I do not think it is ever so satisfactory as an assistant or accoucheur doing it.

### Chloroform Capsules.

This method of putting up twenty minims of Chloroform in a capsule surrounded by cotton wool and silk like an Amyl Nitrite Capsule is quite a recent innovation and it is largely due to the National Birthday Trust Fund that it is so widely used and so popular.

When a whiff of Chloroform is desired a capsule is broken by sharply striking it in the hand on the corner of a hard object such as the bed rail, or by breaking off the end of the capsule with the thumb by squeezing. The capsule is then inhaled from between the folds of a handkerchief, and varying the concentration by the distance at which it is held from the face. Only one capsule should be inhaled at one time.

When the next pain occurs she is given the capsule to smell again and if the chloroform has all vaporised another is broken. The concentration this way can never be greater than the previous two methods and consequently it is of very great use when the 'handy wife' in the house is helping. The General Medical

Council/

Council would not call her help breaking the capsules, 'covering unqualified assistants' whereas they might find objection to her handling a mask and dropper bottle.

For the crowning of the head or if one wishes to break the sequence of the contractions to deliver the head between them - a capsule may be inhaled direct without the handkerchief.

It is only rarely that the accoucheur conducts a case absolutely on his own, but in such an instance I would prefer to pick up the capsules with a stout pair of dressing forceps, crush them and place them in the proximity of the patient's nose rather than work a Mennell's modified Junker inhaler with the possibility of having the patient rolling away or on to the mask.

These capsules have much to recommend them and in General Practice have a big future before them.

#### Christie Brown Method.

This apparatus is an aluminium container containing Chloroform, which is strapped to the patient's wrist and on giving the wrist a turning motion allows a few drops of Chloroform to impregnate a piece of wool. The patient on feeling a pain coming does this turning action and inhales and falls into semi-consciousness/

semi-consciousness and with the next pain turns her wrist again etc. With each turn only a certain amount of Chloroform can be obtained.

I have not yet seen the method in use, but I consider the method better than the patient working the bulb of a Mennell's inhaler herself.

### Hypnosis and Suggestion.

Those who have practised Hypnosis for anaesthesia have claimed the following advantages for it:

1. No abstinence from food or other preparation is necessary.
2. Nervous apprehension can be removed by appropriate suggestion.
3. Hypnosis is pleasant and absolutely free from danger.
4. It can be maintained indefinitely and terminated immediately at will.
5. The patient can be placed in any position without risk.
6. No tendency for sickness before or after operation.
7. Pain after operation or during subsequent dressings can be completely prevented.
8. The rapidity of the healing process, possibly as a result of the absence of pain is frequently remarked.

Hypnosis has the following disadvantages however:

As the full working mechanism of the conscious and unconscious mind is not understood or unanimously agreed upon, the process of Hypnotism is looked upon with scepticism and relegated to the sphere of the quack.

The general public dislike it because it is intangible and believe the patient to have weaker will power to be hypnotised, and have less will power as a result. Similarly that the hypnotist has greater mental power as a result of being able to hypnotise. This may result in the hypnotist keeping his results to himself with a certain amount of self elation from it, or the fear to publish them for fear of criticism from those jealous of his so called power or without criticising them, call him a quack.

My interest in hypnotism began when as a small boy I once had tea with 'Dr Walford Bodie', a well known theatrical man who 'put people in a trance' with awe-inspiring electrical apparatus, ticking machinery, and lights that would blink in and out. I knew the pros and cons of mesmerism and hypnotism before I knew where New Zealand is. The only books I ever read while standing in front of second hand book stalls were on this subject. To me they were more interesting than 'Twopenny Horribles' or 'Blood and Thunders'. By placing a piece of putty on the beak of a pullet and holding it still for a length of time, which usually was fifteen to twenty minutes, I found that the pullet would remain in a fixed position sitting, standing or lying on its side for a period up to about a minute and during that time its legs and wings/

wings could be handled and it would not want to run away. After the elapse of this short period the pullet would blink its eyes and apparently become aware of its surroundings and run away. This state is known as mesmerism (after a Viennese physician Friedrich Anton Mesmer 1734-1815). It also goes by other names, e.g. Animal Magnetism etc. and its production can be brought about by other means. The snake by fixing its eye on its victim, and being seen by the victim, is said to 'paralyse' it - at least the victim is unable to turn away. Many a hunter from abroad will tell you of the animal that did not attack him because he saw it first and kept looking at its eyes. Braid practised the 'gazing' method where he got his patient to concentrate on looking at a fixed object with the eyes in a position that they would tire, i.e. looking above the horizontal and requiring to accommodate a little. Finding that his experiments succeeded equally well with the blind he dropped his idea of hypnotism and developed the theory of 'suggestion' - merely another label. He found that hypnotism acts subjectively and objectively and that the expectant idea of the mind of the patient is the real agent.

Now hypnosis is not sleep, true, we can use hypnosis to send a patient to sleep, but, unless contrary suggestions are made he is wide awake, but his/

his attention is concentrated on the operator, his voice and action, and he can carry on a conversation if so desired.

In ordinary sleep on the other hand, as soon as consciousness is lost, the subject loses connection with the outside world. Hypnosis is purely a psychological state, whereas natural sleep is dependent in changes in the circulation and chemistry of the brain. Under hypnotic suggestion people fall into a sleep without fatigue to help them, and may be made to sleep so deeply that even surgical operations on them do not waken them, but ordinary sleep needs to be helped by fatigue and other physiological changes, and is often hindered by pain and pathological inhibitions.

Many of the patients who come to be hypnotised think they must fall into ordinary sleep. If they do so it only hinders the process.

Hollander (ref 52 ) states that the hypnotic state is largely a condition of more or less profound abstraction or absent mindedness. Psychologists would call it a state of disassociation. He does not get the patient to sleep but produces a state of passive concentration without conscious effort or strain so that the patient becomes unaware of his surroundings, pays no voluntary attention to his environment and very soon forgets he has a body and limbs - his senses are quiescent except for the direction that one or other is/

is given by the operator so as to concentrate his attention. The state produced is identical with the state of reverie when a person is meditating deeply and does not notice his sensations. Ecstasy is merely a superlative degree of attention. It is a state in which all sensations and thoughts are suspended except the one which forms the subject of contemplation - the same as in hypnosis.

The methods by which this state can be produced vary and are usually combined.

1. By fixing the attention to a certain object - usually by tiring the eye muscles.
2. Tiring the sensations, e.g. by monotonous sounds - a clock ticking; by gently blowing in the ear etc.
3. By suggestion - by telling the patient by progressive steps what he would be feeling going to sleep - "you are feeling tired" etc.
4. By touching, making strokes and passes. By touching the skin over the temples or the eyelids; by stroking always in one direction - downwards, the face, arms etc., or by making passes a few inches distant from the body.

The Yogis and Tibetians by rhythmical breathing and chanting can put their minds in a state of concentration or abstractiveness in analagous manners.

I invariably speak to my patients and tell them how well they are doing and converse with them without having them reply when I give them an anaesthetic. For a surgical anaesthesia I think there is nothing better than getting the patient to count aloud the expirations/

inspirations as she makes them. It ensures regular breathing, it gets monotonous and as she feels sleepier so she is aware that she is talking in a sleepy manner, which assists her by suggesting she is going to sleep.

Altogether quite a respectable number of confinements under hypnotism have been recorded but none I can find more recent than 40 years ago and they are all by foreign authors. Elliotson, a Cambridge graduate published a book in 1843 giving an account of about 200 operations he had performed on mesmerised patients (Ref. 53 ) with the remarks of Members of the Royal Medical and Chirurgical Society. A modern reader although impressed is however not convinced with the effectiveness of the proceedings.

Dr Hollander gives a detailed description of how he induces the hypnotic state (ref. 52) and I think it will be agreed that it is the best modern way. He says frankly that he has never induced hypnosis for a surgical operation - having only been asked to relieve pain after operations when the usual analgesic and hypnotic remedies had no effect. But while I write this I note in the press that a development of a technique of painless childbirth by hypnotism is claimed by Professor Platonov, of the Psycho-Neurological Academy of the Ukraine. Of ninety experiments carried out by him only 5 per cent showed negative results /

results, but where the pain was not completely eliminated it was considerably decreased. His method consists in building up a spirit of confidence in the mother before childbirth, as well as the use of hypnotism at the time of delivery.

Dr Hallauer (Ref 54) a specialist for diseases of women has performed painless operations in the following manner.

All preparations for the anaesthetic were gone through as usual. Once on the operating table he applied from ten to fifteen drops of Chloroform to the mask in full view of the patient and told her to breathe quite quietly. When there were any movements, struggling or coughing he removed the mask for a few minutes and carefully placed it again over the face as soon as this had subsided. Then he added from time to time two to three drops of Chloroform, mentioning the fact aloud as he did so and stroking the forehead or hair, always in one direction. He explained to the patient that she was getting sleepy and that sensation was gradually disappearing. The suggestion that complete unconsciousness was setting in came next, after actual drowsiness had begun. Hallauer's method did not require more than from twenty to forty drops of Chloroform for any one operation. As soon as the operation was over he told the patient to wake up which/

which she did without experiencing any ill after effects.

Even patients who had been a little restless during the operation declared that they had felt nothing.

One of the chief advantages of Hallauer's method is that if it fails early, it is easy to continue the administration of Chloroform in the usual manner.

If these facts can be taken as truthful and un-exaggerated - then this method is an improvement on Chloroform 'a la reine' as regards the possibility of chloroform toxicity and the suggestion part is well worthy of a much fuller investigation. The evidence is difficult to correlate. The fundamental process by which mind influences mind and the mind influences the bodily states and functions is still wrapt in mystery, but there is no doubt whatever that by his mein, behaviour and suggestion the attendant can assist all labours.

If as much can be accomplished by suggestion towards making labours painless, as the quiet voice of a sympathetic anaesthetist makes for a quiet induction and good anaesthesia, then suggestion should be used at every confinement.

By means of the antenatal visits the patient's attitude towards the confinement is made as natural as possible. The patient should be told that confinements are taking place every day, that her mother bore/  
bore/

bore her, and that that is how the world goes on.-  
that she is taking part in the production of the race  
to which she belongs. That there will be some pain  
but that she will be able to bear it and that if it  
threatens to get too severe she will be given something  
for it. The fears and exaggerations of many mothers,  
whether illegitimate or not, can in almost all cases  
be allayed and a satisfactory outlook obtained and a  
determination to do the business satisfactorily and  
well. It is as well to inform the mother what to  
expect at the onset of labour, - to relieve her mind  
of the anxiety of wetting the bed when the waters  
break etc., to inform her of the meaning of the  
uterine pains and where baby will be born, etc.

The doctor should be called as soon as labour  
commences and he should attend at once and by his  
presence confirm the feeling that everything is in  
readiness. During the confinement, the accoucheur  
should observe the same type of technique as does a  
surgeon doing an operation under local anaesthesia.  
Everything should be done smoothly, quietly and without  
fuss or excitement. Suggestion should be freely used  
to encourage the patient and without doubt the family  
doctor is the best person to do this, but there is no  
reason why the midwife should not also create a satis-  
factory attitude in the mother, unless it be that a  
woman in time of need instinctively turns to a man for  
support and defence.

Local Anaesthesia - Regional Block.

In this method I attempted to perform a nerve block of each Pudendal Nerve as it enters and lies in each Ischio-rectal fossa on the medial aspect of the Ischial Tuberosity. The nerve accompanied by the internal pudendal vessels passes from the lesser Sciatic foramen into the perineum.

Being accustomed to using Novutox and Planocain in Minor Surgery I used these local anaesthetics for this purpose. Neither contain Cocain and both have the same chemical anaesthetic - para-amido-benzoyl-diethyl-amino-ethanol hydrochloride. Both have some Adrenalin added and Novutox is made up in Ringer's solution with the addition of Quinine derivatives and Benzoic acid - antiseptics which keep the solution sterile. I used Planocain two per cent in ampoules of 5 cc. but it can also be had in tablet form with Sodium Chloride to dissolve in sterile distilled water.

A one cc. syringe is three quarter filled with Novutox (one per cent) and an intradermal needle fitted. Ten or fifteen cc. of Planocain (two per cent) is put into a syringe to suit and a fine but fairly stiff needle about four inches fitted.

The technique is carried out when the head has almost completed its descent in the pelvis and delivery is expected in half to three quarters of an hour.

The/

The lithotomy position is the most satisfactory as during the injection it aids anatomical recognition and makes the injection easier to be carried out.

The perineum is swabbed and the customary asepsis of manipulation in these parts carried out. After touching the skin with Iodine Solution (2%) an intradermal weal about one inch medial and towards the posterior aspect of the ischial tuberosity is made on each side (right and left) using the small syringe. The finger is then inserted into the vagina and the medial wall of the Ischial tuberosity made out. Towards its inferior aspect, the ridge and fibrous covering over the pudendal nerve and internal pudendal vessels is felt. The needle on the long syringe is then inserted through the weal and about five cc. of the solution (Planocain 2%) injected around the nerve as far posterior as possible. The same is repeated on the other side. The reason for finding the vessels in this posterior position is that the Posterior Labial nerve is given off fairly far back and it should be included in the anaesthesia.

The anaesthesia takes about ten minutes before it begins to act and it lasts about one hour. The areas rendered insensitive are the perineum and perianal regions.

The/

The degree of anaesthesia may be tested by pinching the perineum with a pair of Kocher's Artery forceps. No question is asked because if the area is anaesthetic and patient is aware of something being done but feels no pain and if it is not anaesthetic she tells you.

The technique of the injection requires an anatomical understanding of the parts injected and considerable care in carrying it out.

It will be found that if the uterine contractions are strong as they usually are, the patient still suffers - unless fairly well 'doped' - and that she requires a subsidiary inhalation anaesthetic:- thereby proving that all the pain of crowning is not due to the perineum being stretched, but is partly uterine in origin.

For the time and trouble this method takes, and as it only partly relieves the pains, I consider that the method is of no great value in the alleviation of the pains of childbirth.

Spinal/

Spinal Block.

By far the most satisfactory results from the obstetrician's point of view are obtained for Caesarean section with Spinal anaesthesia. The amount of blood lost is very definitely less than when inhalation methods are used, the uterus contracting down very rapidly as soon as the child is delivered - in fact so rapidly that occasionally there may be slight difficulty in removing the placenta from the contracted uterus.

The spinal cord normally ends opposite the body of the first or second lumbar vertebra - being divided up into nerve roots below that level. The roots however are enclosed in a tube of dura mater to the level of the second or third Sacral segment, with the result that a needle can be inserted into the spinal canal between these levels without injuring the spinal cord and an anaesthetic inserted into the cerebro-spinal fluid and subarachnoid tissues. There is approximately sixty to one hundred cc. of cerebrospinal fluid and its specific gravity varies from 1.004 to/

to 1.010. This wide variation renders the employment of an exactly iso-baric solution impossible (solution having the same Sp. Gr.)

Many drugs used as local anaesthetics have been injected into the subarachnoid space, and spinal anaesthesia has developed by steps with the introduction of new and more satisfactory drugs. Cocain was soon recognised as dangerous and since then Stovaine, Novocaine and Tropacocaine have been extensively used. Their disadvantage is, that to be effective, they have to be given in a concentrated solution with the resultant hyper-baric effect (greater Sp. Gr.) so that when the patient is put in the Trendelenburg position they gravitate to the head. Preparations were therefore made by adding substances to alter the specific gravity of the Novocaine but it is found that when the fluids diffuse into the cerebro-spinal fluid the heavier constituents spread as before by gravitational diffusion. Durocaine and Gravocaine are such hyper-baric solutions.

Whereas the Trendelenburg position is the most satisfactory for Caesarean section it is impracticable for delivery 'per vias naturales' for which spinal anaesthesia has been occasionally used. Pitkin and McCormack (ref 55) saw this impracticability and made a hyperbaric solution by the increasing the strength of Novocain from ten to forty per cent and by adding Gliadin/

Gliadin - the mucilaginous content of wheat starch, which prevented the dissemination or mixing of the anaesthetic solution with the cerebrospinal fluid until the anaesthetic had been absorbed. Too much Gliadin eliminates all the anaesthetic properties or greatly delays its action and too little causes the solution to be devoid of all its controllable features. Gliadine does not ferment and will keep for at least a year without deterioration. An injection of the anaesthetic with Sodium Iodide which does not change the specific gravity, but is opaque to X-rays shows that the injection remains localised to the lower part of the subarachnoid space. The solution they use contains Novocaine 0.2 Gm., Gliadin Solution 0.13 Gm., Strychnine Sulphate 0.0022 Gm., Glucose 0.065 Gm., Normal Saline qs. I believe this solution is on the market as Gravocaine.

In describing their technique the authors (ref. 55) give some very good general advice for the conduction of spinal anaesthetics, e.g. that the paramount issue at all times is never to hurt the patient at any time, the advantages of a rustless steel needle, etc.

To perform the lumbar puncture, raise the head of the table 15 - 20 degrees using the tiltometer or have the patient sitting up with her feet over the bed and resting on an object. Ensure that the back is/  
is/

is well flexed. The patient remains in this position ten to twelve minutes till the anaesthetic becomes fixed or she may be immediately placed in a reclining position with the head of the table elevated or by the use of pillows. The patient should never be entirely flat or in the Trendelenburg position.

The authors do not consider pre-operative narcotics necessary. The injection is given without barbotage or mixing with the cerebro-spinal fluid but injected slowly through the third and fourth or fourth and fifth lumbar vertebral interspinous ligament. It should always be given in the mid line as there are always veins of the venous plexus to be encountered if it is given laterally or obliquely to the ligament.

This gives a large saddle shaped area of anaesthesia in the perineum, around the anus and lower part of sacrum besides the lower part of the pubis and the upper medial aspect of the legs. If the anaesthetic is desired higher the solution is aspirated and reinjected. Four cc. aspirated and reinjected gives an anaesthesia of the legs, six cc. anaesthesia to the umbilicus and eight cc. up to the costal margin. Anaesthesia occurs in one to three minutes and it is fixed in ten to twelve minutes. A semi reclining position must be maintained for one and a half to two hours after the delivery and some time must be allowed before the patient may have her head flat on the bed.

The/

The authors give a large list of indications for this method but it must be remembered that they were writing at a time when Spinal anaesthesia had not reached the finesse that it has to-day. The disadvantages of the method are that the anaesthesia does not last long enough for a difficult delivery and the fact that a spinal puncture is not a simple procedure. Further-more Percain has now replaced Novocaine in the field of Spinal anaesthesia.

Spinocaine was an attempt at a Hypobaric solution. It contains Novocaine and Strychnine Sulphate in a special solvent containing Alcohol (14.5%) and sterile water with the addition of an Amylo prolamin combination. This latter substance which is harmless is responsible for the viscosity of the solution and prevents its diffusion.

The weal and local anaesthesia is made with 1% Novocaine and at the same time half to one grain of Ephedrin is injected. Three cc. of the Spinocain solution which contains 0.3 Gm of Novocaine and 0.0022 Gm. of Strychnine Sulphate is held in a four cc. syringe and the spinal puncture made with the patient in the lateral position. One cc. of cerebro-spinal fluid is aspirated in to the syringe and two cc. of the mixture introduced into the spinal canal. Two cc. of the cerebro-spinal fluid is then drawn into the syringe and two cc. of the mixture introduced into the spinal canal.

A further two cc. of the Cerebro-spinal fluid is aspirated into the syringe and the mixture all injected into the spinal canal. It assists the mixing if on aspirating, the plunger of the syringe is rotated. Anaesthesia by this barbotage or mixing is then expected to be as high as the costal margin. The anaesthesia commences in about five minutes. When the desired level of anaesthesia has been reached the table should be tipped five degrees or more in the Trendelenburg position. The anaesthesia lasts about three quarters of an hour and the patient should be kept in the Trendelenburg position for at least two further hours. Some anaesthetists repeat the injection of Ephedrin at the end of the operation. Most vaso-motor disturbances, headache, nausea and vomiting are due to the fall in blood pressure and do not occur if the Ephedrin has been given. A steeper Trendelenburg position failing which five to ten minims of Adrenalin (1 in 1,000) should be administered, **if these troubles arise.**

With the introduction of Percain the whole situation of Spinal anaesthesia was changed and the Cocain and the Novocain groups of drugs are being to a considerable extent replaced by it.

Percaine (known in America as Nupercaine) although more toxic than either Cocaine or Novocaine - to which  
it/

it has no relation as it is a Quinoline derivative - can however be used in extreme dilutions and its action is of much greater duration. In spinal work a solution of one in fifteen hundred can be used which in a half per cent saline solution has a specific gravity of about 1.00345 (at 15 degrees Cent.) truly a hypo-baric solution. The subarachnoid space can be treated in exactly the same way as the tissues in infiltration anaesthesia, and this solution can be injected without the withdrawal of any cerebro-spinal fluid - the height of the resulting anaesthesia being proportional to the volume of the solution injected. This technique was evolved by Howard Jones (ref. 56) and gives results much more consistent than the old method of injecting small quantities of concentrated solutions and depending upon gravitational diffusion for the necessary spread. Some writers however prefer to use a more concentrated solution of Percain for pelvic work (one in two hundred). Compared with Stovaine, percain gives a more prolonged anaesthesia approximately one and three quarter hours and some six to seven hours semi-anaesthesia contrasted with the fifty minutes or so with Stovaine. The blood pressure too does not fall to such a low level. Muscular relaxation is more marked with Percain.

A curious result of using hypo-baric solutions is that if a patient be turned on her back immediately after the injection is made, a preponderating anterior root/

root block will occur owing to these roots being soaked more thoroughly in spite of the fact that sensory nerve fibres are more easily affected than motor fibres by any analgesic drug. The practical effect is that abdominal relaxation will probably be complete, but only partial analgesia will develop. This anomaly can be prevented by placing the patient on her side for three to four minutes then turning her on to the other side for the same length of time to ensure that the posterior nerves are anaesthetised. She is then placed in the dorsal position - a slight Trendelenburg position being an advantage and the operation may proceed after ten minutes have elapsed after the time of injection.

A fall of blood pressure occurs almost invariably with spinal anaesthesia, the lowest pressure occurring usually fifteen to twenty minutes after the injection. This is said to be due partly to absorption of the drug into the blood and to the paralysis of the Sympathetic nerve fibres which emerge from the anterior thoracic and lumbar roots, - course through the white rami communicantes and join the ganglia of the thoracic and abdominal sympathetic chain. The failure of the vasoconstrictor stimuli, which arise from the medullary and spinal centres - passing through these nerves to the blood vessels - results in their dilatation and this decrease in vascular tone causes a fall in blood pressure. The extent of the fall in blood pressure has been found to/

to be directly proportional to the degree of sympathetic paralysis, which in turn, may be gauged by the height of the anaesthesia in the body. The higher the anaesthesia the greater the number of vaso-constrictor fibres blocked. It has been found that variations in the blood pressure with the related nausea, vomiting, faintness and other discomforts can be satisfactorily controlled by the prophylactic administration of Ephedrine. This drug produces a rise in blood pressure by direct action on the ends of the vaso-constrictor fibres or perhaps on the muscular layer of the blood vessel itself. If Ephedrine has been administered about ten minutes before the anaesthetic, it has already exerted its peripheral action and vaso-dilatation does not follow in spite of the later blocking of the vaso-constrictor fibres in the white rami. The customary dose of Ephedrine is half to one and a half grains given hypodermically.

Apparatus required for Howard Jones technique.

Twenty cc. Record syringe and lumbar puncture needle to fit. It is preferable to use as fine a needle as possible. Pitkin's fine stainless steel needle size 24 is a most satisfactory one to use although one 1.2 mm. in diameter with the point ground to a short bevel - the lower edge being blunt, having a barrel length  $8\frac{1}{2}$  to 9 centimeters beyond the socket and containing no stylette is also satisfactory.

An Ampoule of Percain - twenty cc. of 1 : 1500 Percain in 0.5% saline - which is sterilised in spirit. As the solution is decomposed by alkalies the needle and syringe should be kept in spirit for at least an hour or alternatively boiled for 20 minutes in distilled water to which a small quantity of Hydrochloric acid has been added (2 cc. 10% HCl per litre).

A two cc. syringe for the administration of Ephedrin ( $1-1\frac{1}{2}$  grs.) and to blow out a needle if one should become blocked.

With the use of a fine needle - the authors state - it has not been found necessary to use a local anaesthetic for the introduction of the lumbar puncture needle, but if it seems advisable for any reason the site of the puncture may be injected with a small quantity of the Percain solution to anaesthetise the track of the needle.

Premedication : some premedication beforehand is of great value to an apprehensive patient. Where there seems to be no contraindication to premedication and the obstetrician does not object, Morphine or Morphine and Scopolamine (e.g.  $\frac{1}{8}$  gr. and  $\frac{1}{150}$  gr. respectively) is often given half to three quarters of an hour before the operation. Barbiturates are sometimes given orally, e.g. Nembutal 3 grains.

Procedure./

## Procedure.

All precautions are taken to carry out the procedure aseptically. The Ephedrine grains one to one and a half is given subcutaneously - a Tubunic ampoule is very handy for this. With the patient in the lateral position - the back flexed as much as possible the needle is introduced between the third and fourth or second and third lumbar vertebrae and on cerebro-spinal fluid appearing, the syringe is attached and twelve to fourteen cc. of Percain solution introduced. The needle is left in for a moment or two before it is withdrawn and the puncture sealed with collodion. The patient remains on that side for three to four minutes, turns to the other side for a similar length of time. She is then placed in the dorsal position, a slight Trendelenburg position being an advantage, and the operation may proceed after ten minutes have elapsed from the time of injection.

The best results are obtained when a spinal anaesthetic without any inhalation anaesthetic is used, but if the patient is unduly nervous and not calmed by preliminary medication Gas and Oxygen may be used in addition. It is advisable to use a fairly high percentage of Oxygen to keep the diaphragmatic excursion as small as possible.

The results of a spinal anaesthetic are not always satisfactory unless the patient is watched throughout the/

the procedure by some one who knows how to make the patient comfortable, allay fear and apprehension and who can often succeed in so absorbing their attention that the operation may be performed without their knowledge. He will understand what to do when nausea occurs and regulate the degree of Trendelenburg to maintain anaesthesia in the desired field and administer stimulants when required.

#### Post-operative treatment.

The patient should have the lower end of the bed blocked for twenty four hours and should be kept flat for another twelve hours and only gradually raised by the addition of pillows. A fluid diet is unnecessary and semi-solids and solids may be given as soon as the patient feels she can take them which is usually the following day. Owing to the semi-anaesthesia that lasts, post-operative morphia medication is often not required. A sixth or an eighth of Heroin should be given if it is required.

The main contra-indication to spinal anaesthesia for Caesarean section is sepsis at the site of the puncture. The other contraindications are:

1. Diseases of the cerebro-spinal system, such as meningitis, syphilis, tumours, and some cases of cranial and spinal haemorrhage.
2. Patients who have a low blood pressure - below one hundred and ten mm. of mercury.
3. Patients who are suffering from Aortic reflux and who will not stand the variations in blood pressure.

4. Patients with marked orthopnoea or marked pulmonary congestion for whom the post-operative treatment of lying flat is not suitable. (If Spinocaine be used the post-operative lying flat may be reduced to about three hours or a hyperbaric solution such as described by Pitkin and McCormack with Gravocaine and the patient is kept semi-reclining.)
5. General anaesthesia is advisable in a very nervous patient who might not be sufficiently quietened with preliminary medication.

Spinal anaesthesia is indicated in any other case for Caesarean section. In toxæmia, tuberculosis, Cardiac disease and cases with a metabolic disturbance such as Diabetes, Spinal anaesthesia or Gas and Oxygen with Ether if necessary are the methods of choice for Caesarean section.

When the Percaine solution of a dilution one in two hundred is used, 1.4 to 2 cc. of the solution are injected intra-theccally with the patient in a sitting position. For high interventions the lumbar puncture is made high between the twelfth thoracic and first lumbar vertebrae or first and second lumbar vertebrae. For low interventions in the third or fourth lumbar intervertebral spaces. From five to ten cc. of the cerebro-spinal fluid are removed according to the rate it flows out and the level to which it is decided to anaesthetise. For 1.5 cc. of Percain solution (low interventions) aspirate 6 cc. of fluid, for 2 cc. of Percain (high interventions) aspirate 8 - 10 cc. cerebro-spinal/

cerebro-spinal fluid thus obtaining in the syringe a one in a thousand solution of Percain in the cerebro-spinal fluid. After mixing the solution by shaking slowly inject the contents into the sub-arachnoid space. For high spinal anaesthesia, after slowly injecting the mixture immediately aspirate another five cc. of fluid and slowly reinject. Place the patient immediately in a more or less pronounced Trendelenburg position according to the level of anaesthesia which one desires to obtain, raising the head with a pillow. It is advisable to ascertain the level of anaesthesia and muscular relaxation after a minute or two to modify the tilt of the table if needed. It is advisable to wait at least fifteen minutes or preferably for high operations twenty to twenty five minutes before commencing operating, this is to ensure perfect anaesthesia and prevent the additional transitory hypotension of the blood caused by operative proceedings.

I can find no advantage for barbotage with the consequent complicating of technique that I prefer the simpler Howard Jones technique above.

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CLINICAL.

TABLE 1.

Effects produced by various mixtures of Nitrous Oxide and Oxygen (Summarised by Connell 1915 quoted from McMechan - American Year Book of Anaesthesia).

Composition of Tidal air % N <sub>2</sub> O      % O <sub>2</sub>	Depth of Anaesthesia.	Degree of Asphyxia.	Degree of Relaxation.	Utility.
80            20	Subconscious analgesia	nil	nil	Dentistry
86            14	Complete analgesia	nil	nil	Surface operation
89            11	Partial anaesthesia	slight	slight	Abdominal surgery
94            6	Complete anaesthesia	dangerous	partial	Dangerous.

CLINICAL.

TABLE 2.

Effect on Uterine contractions - observations every 15 minutes.

Anaesthetic	Frequency of Contract.		Length of Contract.		No. of cases.
	Less Same	More frequent	Shorter Same	Longer.	
Chloroform	18	22	3	29	40
Ether	12	5	1	7	18
C <sub>2</sub> E <sub>3</sub>	7	6	6	5	20
Gas & O <sub>2</sub>	8	35	6	35	17 *

\* 17 cases of toxæmia. Nitrous Oxide 4 parts, Oxygen 1 part at first.

With Gas and Oxygen length and frequency of contractions increased by 50% of cases and accessory muscles used more freely when appreciation of pain was dulled.

With Ether length of contractions increased in 60% but frequency diminished in 60%.

In all cases time interval very irregular.

TABLE 3.

## Length of Second Stage.

<u>Anaesthetic.</u>	<u>1 hour</u>	<u>2 hours</u>	<u>over 2 hours.</u>
Chloroform	27	20	5
Ether	7	7	5
C2E3	10	8	-
Gas & Oxygen	64	30	6 (5 abnormal)
No anaesthetic	32	56	12

Definite decrease in length of second stage with Gas and Oxygen compared with length of other anaesthetics.

50 cases of primiparae in which no anaesthetic was used showed further increase in length of second stage.

Accessory muscles not used so well with other anaesthetics as Gas and Oxygen, because with a diminished perception of pain there was also a certain degree of muscular relaxation.

With Ether it was difficult to get beyond the excitable stage and still maintain contractions, so the patients were difficult to control.

After Effects.

Gas & Oxygen: patient quickly round, vomiting very rare.

Chloroform & Ether: the patient was drowsy at the end of the second stage and took some little time to recover from the anaesthetic. Vomiting not uncommon because many came to hospital in labour directly after a meal.

TABLE 4. Pulse rate.

<u>Anaesthetic</u>	<u>Dropped</u>	<u>Unchanged</u>	<u>+ 10 beats</u>	<u>+ 20 beats.</u>	<u>Over 20</u>
Chloroform	15	17	12	3	5
Ether	4	5	3	5	2
O <sub>2</sub> E <sub>3</sub>	7	4	4	3	-
Gas & Oxygen	20	35	16	7	4

TABLE 5 Effect on Child.

<u>Anaesthetic</u>	<u>Cyanosed but crying.</u>	<u>Asphyxia</u>		<u>Drowsy &amp; full of mucus.</u>	<u>Normal</u>
		<u>Blue</u>	<u>White</u>		
Chloroform		7	1	2	40
Ether		3	2	1	13
O <sub>2</sub> E <sub>3</sub>		1	-	-	17
Gas & O <sub>2</sub>	10	4 *	2 *	2	82

\* (This Gas & Oxygen group includes infants of tox-  
aemic parents - of the Asphyxiated the 4 blue were  
all abnormal and one of the white was abnormal)

#### Chloroform Capsules. (Ref. 58)

Average interval between giving capsules 5 - 10 minutes.

#### Effect on Uterine Contraction.

No effect	1142	=	82.7 %
Force decreased or pains slowed	70	=	5 %
Force increased	170	=	12.3 %
	<u>1,382</u>		

Effect/

## Effect on Voluntary Effort.

Improved voluntary effort	35	=	15.8%
Unchanged " "	144	=	64.8%
Decreased " "	43	=	19.4%
Cases	<u>222</u>		

## Duration of Labour.

No change	604	=	66.6%
Prolonged	170	=	18.7%
Decreased	133	=	14.7%
Cases	<u>907</u>		

## Apparent Effect on Pain. Patient's Opinion.

None	86	=	7%	No use	70	=	5.6%
Definite	806	=	65%	Some use	500	=	40%
Great	<u>341</u>	=	28%	Great use	<u>663</u>	=	54.4%
					<u>1,233</u>		

Synergistic Colonic Analgesia - Gwathmey. (Ref. 24)

Total number of cases 20,000  
Approximate figures over three years

## Effect.

A. Analgesia, Amnesia, no delay, baby crying on delivery	58 %
B. Effect not sufficiently prolonged or less complete than group A.	30 %
C. Patient merely helped or only slight sedation . . . . .	11 %
D. No relief obtained . . . . .	1 %

## Hypodermic/

## Hypodermic treatment.

Sedative	95 %
Unchanged	5 %
Excited	- %

## Hypodermic and Enema.

Sedative	95 %
Unchanged	4 %
Excited	1 %

## Instillation.

Retained in	90 %
Expelled	9.6 %
Irritated	0.4 %

## Pains.

Decreased in	89 %
Increased	10.4 %
Not affected	0.6 %

## Post-partum haemorrhage

No	92 %
Yes	8 %

## Baby

Crying	83 %
Apnoeic	11 %
Asphyxia	6 %

Scopolamine Amnesia. (Ref 19)

Cases 50.

## Interval.- Initial dose till delivery in 47 cases

Primiparae	5.4 hours
Multiparae	4.5 hours

Injections.- 3 at  $\frac{1}{2}$  hourly intervals and subsequent injections at 2 hours. No case received less than 3 injections, 18 cases had 4 injections, no cases more.

## Restlessness.

23 cases (3 very restless requiring two attendants)  
27 cases quiet except for slight movements during pains (10 of which very quiet)

## Supplementary anaesthetic.

22 cases no other anaesthetic (15 quiet 7 restless)  
two of which were forceps deliveries.

28 cases had chloroform (during delivery of head, to  
prevent restlessness - eight of which had forceps  
applied. . . . (13 quiet 15 restless)

In no case was Post-partum Haemorrhage excessive or  
different from what experience has led Author to  
believe to be normal.

## Duration of Amnesia.

37 cases	.	.	.	4 - 6 hours
5 cases				under 4 hours
8 cases				over 6 hours

## Effect.

23 cases	-	no recollection of any event	$1\frac{1}{2}$ - 2 hours	before delivery
22 cases	"	"	"	3 - 5 hrs. "
4 cases	"	"	"	1 hr. "
1 case	"	"	"	$\frac{1}{2}$ hour before

delivery - last injection given 40 mins. before  
delivery.

In all cases no memory of actual delivery and  
amnesia extended for some hours afterwards

(40 cases 1 - 2 hrs.  
10 cases 3 - 5 hrs.)

Pantopon and Scopolamine. (Ref 33)

Cases 100.

Complete amnesia	39 %
Partial "	34 %
Failure	27 %

Excitement in	10 %
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Child breathed immediately at birth in 33 %  
(lowest of series).

Operative incidence highest of series.

Blood/

Blood loss highest no. of cases in series (25 %)

Average length of labour longest of series  
(Prim. 23 hrs. 46 min: Multip. 13 hrs. 24 min.)

Average interval between 1st medication and delivery  
longest of series.  
(Prim. 10 hrs. 8 min: Multip. 5 hrs. 18 min.)

Pantopon and Rectal Ether. (ref. 33)

Cases 100.

Complete amnesia	18 %
Partial "	57 %
Failure	25 %

Excitement in very few cases (4% - lowest of series)

Child breathed immediately at birth in 53% cases.

Blood loss: second highest no. of cases to Pantopon  
and Scopolamine (16%)

Avertin./

Avertin.

Avertin. (Ref. 46)

Dilatation of os.	Amount Avertin	Onset of drowsiness occurred in	Admin.-deliv.	Time interval Pains before after	Condition of child.
Case 1.	Primipara 26 yrs.				
3/4	2/3 dose	10 min.	2 h. 25 m.	1 1/2 4 1/2 min.	good.
	Successful, very drowsy but could be roused.				Painless delivery.
Case 2.	Primipara 21 yrs.				
3/4	2/3 dose	23 min.	8 h. 15 m.	5 8 min.	good.
	Unconscious during early part of second stage. Delay followed Avertin - effect worn off after 4 1/2 hours. Not satisfactory.				Delivery completed without anaesthetic.
Case 3.	Primipara 21 yrs.				
Full	2/3 dose	10 min.	1 h. 14 m.	2 3 min.	good.
	Completely successful, no delay, painless delivery.				
Case 4.	Primipara 17 yrs.				
Full & head coming down.	Total	10 min.	30 min.	5 4 min.	good.

Very drowsy but restless, no delay, satisfactory anaesthesia.



<u>Maker.</u>	<u>Name of Drug.</u>	<u>Chemical Composition.</u>	<u>Represented by.</u>
May & Baker Ltd.	Soneryl Sodium	Sodium butyl ethyl B	$\begin{matrix} C_4H_9 \\ C_2H_5 \end{matrix} > BNa$
Ciba	Dial	Di-allyl B	$\begin{matrix} C_3H_5 \\ C_3H_5 \end{matrix} > B$
Bayer	Evipan	N-methyl C.C. Cyclo-hexenyl methyl B	$\begin{matrix} C_6H_9 \\ C_6H_3 \end{matrix} > \begin{matrix} CH_3 \\ B \end{matrix}$
Bayer	Phenobarbital Luminal Gardenal Also Luminal Sodium	Phenyl ethyl B Sodium phenyl ethyl B	$\begin{matrix} C_6H_5 \\ C_2H_5 \end{matrix} > B$
Parke Davis & Co.	Hebaral Sodium	Sodium hexyl ethyl B	$\begin{matrix} C_6H_{13} \\ C_2H_5 \end{matrix} > BNa$
	Ipral	Calcium ethyl iso-propyl B	$\begin{matrix} C_3H_7 \\ C_2H_5 \end{matrix} > B_{Ca}$

<u>Maker.</u>	<u>Name of Drug.</u>	<u>Chemical Composition.</u>	<u>Represented by.</u>
Abbott Labs.	Nembutal Pentobarbital	Sodium ethyl iso-methyl- butyl B.	$\begin{matrix} C_4H_8 \\ C_2H_5 \end{matrix} (CH_3) \rightarrow BNa$
J.D. Riedel	Noctal	Brom-propenyl iso-propyl B	$\begin{matrix} C_3H_4 \\ C_3H_7 \end{matrix} Br \rightarrow B$
J.D. Riedel	Pernocton	Sodium butyl brom-allyl B	$\begin{matrix} C_3H_4 \\ C_4H_9 \end{matrix} Br \rightarrow BNa$
Bayer	Phanodorm	Cyclo-hexenyl ethyl B	$\begin{matrix} C_6H_9 \\ C_2H_5 \end{matrix} \rightarrow B$
Bayer	Prominal	N-methyl ethyl phenyl B	$\begin{matrix} C_6H_5 \\ C_2H_5 \end{matrix} \rightarrow B \begin{matrix} CH_3 \\   \\ CH_3 \end{matrix}$
	Proponal	Di-propyl B	$\begin{matrix} C_3H_7 \\ C_3H_7 \end{matrix} \rightarrow B$
Sandoz	Sandoptal	Iso-butyl allyl B	$\begin{matrix} C_4H_9 \\ C_3H_5 \end{matrix} \rightarrow B$
Hoffman la Roche	Somnifaine	Di-ethylamine salts of allyl iso-propyl B	

Nembutal alone. (Ref. 31)

Cases 140 (139 vertex & 1 Ant. parietal presentation)  
Primiparae 86, Multiparae 54 )

## Results.

Excellent - complete amnesia	73 cases	=	52.1 %
Good - partial	40	=	28.5 %
Fair - incomplete	16	=	11.4 %
Failures (a No. vomited after taking the drug)	11	=	8 %
Restlessness	7 cases	=	12.1 %

## Average duration of labour

Prim. 15 hrs.  
Multip. 9 hrs.

## Supplementary anaesthesia

73 cases - little or no additional anaesthetic  
40 cases - a few drops of Chloroform - Ether were given to deliver the head.

Forceps in 32 cases (Prim. 28, Multip. 4 cases)

Baby in 123 cases breathed normally on delivery.

Nembutal and Scopolamine (Ref. 32)

Cases 160 (ref. 32) Ref. 33 - 100 Cases and method of choice and standard method used in Boston Lying-in Hospital, Boston, Mass.

Prim.	126
Multip	34

## Supplementary anaesthesia

Nitrous Oxide & Oxygen administered in all cases.

## Average length of labour

Prim.  $9\frac{1}{2}$  hrs. (ref 33) 14 hr. 6 min.  
Multip. 5 hr 10 min. (ref 33) 9 hr 37 min.

Spontaneous delivery 25 = 15% 119 Perineal forceps, and episiotomies.  
(ref 33) Operative incidence 30%, 47% in Primiparae.

(ref 33) Excitement in 17% cases controlled by supplementary injection of Rectal Ether.

## Results./

## Results.

Complete amnesia	110 cases	= 68.5%	(Ref 33)	86 %
Partial	" 42	= 26.5%	"	14%
Failures	8	= 5 %	"	- %

The failures were all multiparae and too late in labour - delivered 1 -  $1\frac{1}{2}$  hrs. after medication.

## Child

152 cried immediately	= 95 %	(ref 33)	63 %
8 required mild resuscitation	(3 mid forceps, 1 breech with forceps to aftercoming head)		

## Note:

The variations in the figures of reference 33 and the figures of the other reference in this combination and others to follow is that those in Ref. 33 are obtained from institutional cases in America whereas the others are often from non-hospital practice.

Paraldehyde and Sodium Amytal/Nembutal.

Ref 21 Cases	50 (Prim. 30, Multip 20)
Ref 33 Cases	100 (using Nembutal and Paraldehyde.)

## Duration of Analgesia

Prim.	$9\frac{1}{2}$ hrs.	Multip.	$4\frac{1}{2}$ hrs. & 8 hrs	following delivery.
Ref 33 Prim.	$8\frac{1}{2}$ hrs.	Multip.	$4\frac{1}{2}$ hrs.	

## Results.

Complete Amnesia in	47 = 94 %	Ref. 33	64 %
Partial	" 3 = 6 %	"	20 %
Failures	- = -	"	16 %

## Restlessness.

Slight-moving slightly with pains	28 = 56 %
Moderate - turning side to side and attempting to sit up	18 = 36 %
A degree less than that of Twilight or straight Barbiturates	4 = 8 %

Ref 33. 24 % producing excitement (highest of series)

## Baby

45 cried or breathed immediately at delivery	= 90 %
Ref 33 do. do.	= 50 %

Ref 33 Blood Loss great in a very few cases (3 %)

Sodium Amytal and Rectal Ether. (Ref 33)

Cases 100.

## Results

Complete Amnesia	66 %
Partial "	28 %
Failure	6 %

Excitement in very few cases (4 %)

65% Children breathed immediately at birth  
(Highest of series)

Operative incidence high (42%, Primiparae 60%)

Average length of labour second longest of series  
(Prim. 19 hrs. 6 min., Multip. 13 hrs. 13 min)Average interval between first medication and delivery was second longest of series  
(Prim. 9 hrs. 42 min. Multip. 5 hrs. 23 min.)Sodium Amytal and Scopolamine.

Sodium Amytal given orally.

Ref 40 Cases 100 (Prim. 51, Multip. 49)

Ref 33 Cases 160

## Medication Started.

Dilatation	$1\frac{1}{2}$ fingers	-	45 cases
	$1\frac{1}{2}$ -2 "		29 "
	$2\frac{1}{2}$ or more		26 "

Standard initial dose given to 51 cases.

Additional dose given to 29 cases who were in labour over 3 hours.

Ref 33. Average interval between first medication and delivery  
Prim. 7 hrs 47 min. Multip. 6 hrs. 23 min.Duration of labour: Prim. 14 hrs. 45 min.  
Multip. 12 hrs. 45 min.

## Results.

Complete amnesia	84 cases	Ref 33	80 %
Partial "	10	"	20 %
Failures	6	"	-

Failures should have had Gas &amp; Oxygen as they were too far advanced in labour.

4 patients were irrational and a few restless in 2nd stage.  
Ref 33. Excitement in 17.5% cases.

Dial Urethane. (Ref. 41)

Total Cases 56.

Restlessness in one requiring restraint.

- Case 1. Primipara 21 yrs. 1.30 pm. 2 cc. Dial Urethane intravenously repeated at 1.50 p.m. Moaning slightly and roused for nourishment at 6 p.m. when further 2 cc. given. Spontaneous delivery at 11.30 p.m. Patient slept all night and had complete amnesia.
- Case 2. Primipara 19 yrs. 2 cc. Dial Urethane solution intravenously, repeated 30 minutes later. Complete amnesia.
- Case 3. Primipara 23 yrs. 2 cc. Dial Urethane intravenously at end of first stage, repeated in 30 minutes, neither injection having much effect. Inhalation anaesthesia resorted to. Second degree perineal laceration.

Pernocton. ) Ref. 59)

Cases 133. Ref 33 cases 100.

The majority of cases required supplementary anaesthesia either Nitrous Oxide or Ether during the actual delivery.

Prim. 120. Multip. 13.

## Time of Administration.

100 cases during first stage

47 early - cervix 3 fingers or less dilated.

56 late - 3 fingers to complete dilatation.

33 cases during second stage.

23 early - full dilatation

10 late - caput on pelvic floor.

## Interval between injection and delivery.

6 cases under 30 mins.

18 " 30 min - 1 hr. Ref 33 Prim. 4 hr. 40 min.

35 " 1 - 2 hrs. Multip. 2 hr. 22 min.

25 " 2 - 3 hrs. (Shortest time of series of

36 " over 3 hrs. drugs tried out)

## Delivery.

Spontaneous	90 cases
Low forceps	25 "
Mid "	2 "
Breech	3 "
Episiotomies	32 "

## Restlessness.

	Marked motor excitement. . . . .	6
	(3 unmanageable requiring restraint)	
	Moderately restless . . . . .	18
Ref 33.	Excitement in 15%.	

## Results.

Favourable - complete amnesia in	46 = 38 %	Ref33	42%
Moderately favourable - partial	72 = 59.5%	"	43%
No relief	3 = 2.5%	"	15%

## Baby.

10 slow in breathing requiring mild stimulation.

Nembutal and Chloral. (Ref 50)

Cases 60.

## Supplementary anaesthesia

20 cases given Chloroform (Junker's Inhaler) with crowning of head.

## Restlessness.

Slight in 10 cases.  
Severe in 2 "

## Effect on Labour First Stage.

No lengthening in 60 %  
Slightly prolonged in 40 % (never excessively)  
3 cases of Primary Uterine inertia - pains definitely stimulated.

## Second Stage.

No apparent lengthening in 50 %  
Slight lengthening & bearing down effort impaired in 50 %

During past  $2\frac{1}{2}$  years forceps rate has been 13.4% with this series it was 16.6%.

## Third Stage.

No prolongation.

Placenta expelled spontaneously or expressed from vagina without excessive bleeding in 54 cases.

## Babies.

In apnoea . . . . . 4  
White asphyxia (test of Labour cases) 2.  
All breathing regularly within 10 minutes.

## Results./

RESULTS

Results.

Painless - Complete amnesia in	37	=	62%
V.G. Result - " except for crowning	13	=	21%
Good - partial amnesia	6	=	10%
Failure - remembered pains	4	=	7%

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PERSONAL CASES.

Exemplifying methods of treatment under different conditions with their effects.

CASE 1. Mrs R.A.S. Para 2/0. First delivery normal. Pains commenced 7 a.m. Delivered M.A.Pm. child (30 weeks gestation  $15\frac{1}{2}$  inches long) at 4.40 p.m. Placenta and membranes at 4.50 p.m. Perineum intact loss very slight with child and slight after placenta. Puerperium normal.

A normal spontaneous labour which was easy mechanically owing to the small child and the mother had no more difficulty in parturition than in evacuating the rectum.

CASE 2. Mrs M.A.R. Para 11/0. Pains commenced 4.15 a.m. Delivered a F.A.M. child with placenta and membranes at 5.55 a.m.

A farmer's wife with large passages who had absolutely no pain on delivery.

To have given either of these cases any analgesic drugs would have been gross interference with the proceedings.

CASE 3. Mrs A.B. 29 yrs. Para 3/0. Blood stained discharge (4 hrs.) made her send for her doctor who found the os fully dilated and the membranes not ruptured/

ruptured. 2 units of pituitary extract were given 17 minutes before delivery, as there were no uterine contractions to be felt. A F.A. Pm. child was delivered, the breech presenting. A Chloroform capsule was given with the delivery of the head and the patient had an absolutely painless delivery. Gestation of child 30 weeks.

CASE 4. Mrs S.S. 31 yrs. Para 3. Interspino-  
intercrystal - Baudelocque's diameters =  $23\frac{1}{2}$  - 26 -  
21 cms. Previous deliveries normal and premature.  
Patient has mitral incompetence - recently cyanosed and  
feet swollen. Pulse rate 84 per min. No albuminuria  
R.O.A. 1st & 2nd stages  $7\frac{1}{2}$  hrs. 3rd-5 min. Membranes  
ruptured artificually 5 min. before delivery. Delivery  
spontaneous. During expulsion patient became very  
cyanosed but pulse never rose above 90 per min. and  
fell immediately to 80 after delivery. Puerperium  
satisfactory.

The increased cyanosis was due to the patient  
holding her breath. Although the Gas and Oxygen appar-  
atus was handy it was not used. A little gas with a  
high percentage of Oxygen would have been an advantage  
from the cardiological point of view, although it was  
not required for analgesia.

CASE 5./

CASE 5. Mrs M.M.P. 32 yrs Para 2. 1st & 2nd stages 19 hours, patient excitable. Given 20 grains of Bromide and 30 grains of Chloral Hydrate with satisfactory sedation. Delivered M.A.M., L.O.A. 8 lbs. Loss normal. Parturition satisfactory.

CASE 6. Mrs M.C.C. 28 yrs. Para 3 IS. etc. 20-24<sup>0</sup> 19 cms. R.O.A. F.A.M. 8 lbs. 1st stage 59 hrs. 2nd 6 $\frac{1}{2}$  hrs. 3rd 15 min. Chloral Hydrate 20 grains and Quinine Hydrate 5 grs. given after rupture of membranes. Pituitary  $\frac{1}{2}$  cc. 35 min. before delivery. Loss normal.

A case of prolonged labour and nervous inertia.

The Chloral was given to rest the patient.

CASE 7. Mrs I.C. 21 yrs. Para 3. Previous labours with 'Chloroform'. Patient had not slept for 3 nights and on being seen an hour before delivery was extremely restless, noisy and having very weak pains. Given 30 grains of Chloral Hydrate. She was in a state of terror of having pains and was trembling and perspiring. Pains were approximately every 10 mins. lasting 1 min.

She was given a Chloroform capsule and used her pains in a most satisfactory manner. 4 capsules used. 15 & 10 mins. before delivery and with crowning of head.

Perineum intact. Loss slight. M.A.M. 10 lbs.

Considerable loss some four hours after delivery.

In/

In this case the effect of the chloroform was that with the dulling of sensation, the uterine contractions became stronger and the patient made good use of them.

CASE 8. Mrs L.P. 19 yrs. Para 1. IS etc.  $9\frac{1}{4}$  -  $10\frac{1}{4}$  -  $6\frac{3}{4}$  ins. LOA M.A.M.  $5\frac{1}{2}$  lbs. Awoke with membranes ruptured. 1st & 2nd stages 3 hrs, 3rd 25 mins. 4 Chloroform capsules used. First 20 minutes before delivery. It put pains off but made them stronger, others for head, shoulders and hips. Cord twice round neck and arms extended. Patient conscious but no agony. Loss very slight. Patient surprised she did not have more pain.

CASE 9. Mrs A.C. 22 yrs. Para 1 IS etc. 22 - 26 - 21 cms. R.O.P. M A.M. 8 lbs. Stages:  $21\frac{1}{2}$  hrs - 20 min. 11 min. Loss average. Chloroform à la reine analgesia excellent.

CASE 10. Mrs J.C.J. 23 yrs Para 1. IS etc. 24 - 27 - 19 cms. Hydramnios R.M.P. M.A.M. 7 lb Stages:  $11\frac{1}{2}$  hrs, 4 hrs, 10 min. Chloroform à la reine. Perineum intact, loss normal, satisfactory analgesia,  $\frac{1}{2}$  cc. Pituitary extract given.

CASE 11. Mrs M.D.W. 27 yrs. Para 1, IS etc. 24.5 - 29 - 20.5 cms. Breech, L.S.A. F.A.Pm. Well compensated heart/

heart case. Chloroform à la reine with satisfactory results.

CASE 12. Mrs K. Para 1 IS. etc.  $10\frac{1}{2}$  -  $11\frac{1}{2}$  - 8. Breech L.S.A. with extended legs. Stages: 12 hrs.  $12\frac{1}{4}$  hrs 10 min. M.A.M. 8 lbs. Chloroform à la reine. Loss slight with placenta. 2 sutures inserted, during third stage. Delivery of child without complaint but restless having sutures inserted. Did not consider either painful.

CASE 13. Mrs L. 22 yrs. Para 1. L.O.A. IS etc. 22 -  $26\frac{1}{2}$  - 19 cms. Stages:  $13\frac{1}{2}$  hrs, 2 hr 25 min, 25 min. M.A.M.  $7\frac{1}{2}$  lbs loss normal, large perineal tear.

Chloroform à la reine during delivery and anaesthesia deepened to allow of repair of perineum.

CASE 14. Mrs M.M.M. 22 yrs. Para 1. IS etc. 22 - 27 - 20 cms. R.O.A. 1st & 2nd Stages  $23\frac{3}{4}$  hrs. 3rd 5 mins. M.A.M. 6 lbs. Loss excessive. Chloroform light anaesthesia.

This patient should have had more than chloroform during expulsion as the excessive loss was due to the chloroform being given too long and too deep. This might have been anticipated from the presentation being an R.O.A. and the interspinous diameter being less than average. Premedication or Nembutal & Chloral would have been more satisfactory than Chloroform alone.

CASE 15./

CASE 15. Mrs J.W. 29 yrs. Para 1. IS etc.  $8\frac{1}{2}$  -  $10\frac{1}{2}$  - 8 ins. L.O.A. F.A.M.  $7\frac{1}{2}$  lbs Stages:  $13\frac{1}{3}$  hrs. 1 hr. 10 min., 15 min. Spontaneous delivery, Nembutal and Chloral first given 4 hrs. before delivery and half dose 2 hrs. before.

Patient rested well between the pains but moved about slightly with them. Latterly did not use her pains so well as up to time of descent of head through pelvis. Perineum nicked and tear obvious so episiotomy decided on. A chloroform capsule given to inhale - patient cried out during episiotomy. Stitches inserted before placenta delivered. 2 capsules used while inserting 4 deep sutures.

To the accoucheur this appeared a very satisfactory analgesia. Questioned immediately afterwards the patient said she had pain all the time in her stomach, but no pain in the perineum, feels dosed but comfortable, is thirsty. Questioned some 12 hours later, during which period she had slept 5 hours she said she remembered nothing except the baby crying. She did feel an unbearable pain in the perineum - only at pressing time. She was frightened to wet the bed and get the nurses into trouble. Had terrible nightmares. Is dizzy sitting up.

CASE 16. Mrs G.B.P. 35 yrs. Para 5 LOA others normal. Stages :  $17\frac{1}{2}$  hrs. 38 min - 4 min. Rigid cervix causing delay. Morphine  $\frac{1}{4}$  grain and Scopolamine 1/100 gr./

gr.  $12\frac{1}{2}$  hours before delivery and Scopolamine  $1/100$  gr. 10, 6 and 4 hours before delivery. Spontaneous delivery of a M.A.M. child 6 lbs. 2 ozs. Loss normal. Analgesia satisfactory. Child cried on delivery.

CASE 17. Mrs E.P. 16 yrs. Para 1 L.O.A. IS etc. 22 - 24 - 18 cms. slightly contracted pelvis with slight disproportion. Three courses of Quinine induction. Morphine  $\frac{1}{4}$  gr. and Hyoscine Hydrobrom.  $\frac{1}{100}$   $9\frac{1}{4}$  hours before delivery and Hyoscine repeated 7, 5 and 3 hours before delivery. Stages:  $1\frac{1}{2}$  hrs. 11 hrs. 8 mins. Dry labour M.A.M.  $8\frac{1}{2}$  lbs Perineum rigid - slight tear (2 swgs.) Loss normal. Child very cyanosed but cried immediately on delivery. Puerperium satisfactory. Analgesia satisfactory.

CASE 18. Mrs M.C.M. 27 yrs. Para 1 IS etc.  $21\frac{1}{2}$  -  $24\frac{1}{2}$  -  $19\frac{1}{2}$ . A diminutive woman with kyphosis of the thoracic vertebrae, mitral stenosis and incompetence, dyspnoea on exertion, liver not enlarged but venous congestion noted, pulse rate about 120 per minute. Electrocardiogram shows 'left branch bundle block'. L.O.A. F.H.S. not heard. True conjugate  $3\frac{1}{2}$  -  $3\frac{1}{4}$  ins. Caesarean section arranged.

Patient's mentality was becoming doubtful and she was not sleeping so was given Bromide and Paraldehyde. False pains commenced. Owing to her mental condition Morphine/

Morphia had to be given. During the next day the head had descended partly due to restlessness and because labour had started. Her mental condition necessitated more morphia and she was hypnotised with a view to quietening her, but unsatisfactorily. Mid forceps delivery was decided under Nitrous Oxide and Oxygen and a M.Sb.Pm child  $6\frac{1}{4}$  lbs. 19 ins. long delivered. Patient's condition after delivery was better after the anaesthesia than before, but the patient died four hours after delivery.

This patient should never have become pregnant and who developing acute mania and being unfit for Caesarean section left operative delivery the only course available. Although the patient may have died of operative shock, the condition of her heart could fully explain her cause of death. The point of interest to us is that the labour was satisfactorily carried out under the combined influence of Morphia, Hypnosis and Nitrous Oxide and Oxygen.

CASE 19. Mrs C. Para 1 R.O.A. Approximately one hour before delivery  $\frac{1}{4}$  cc. Novutox injected intradermally and 7.5 cc. into the site of the Pudendal nerve. This was done on both sides. 1st and 2nd Stages  $11\frac{1}{2}$  hrs. 3rd 5 mins, Light Chloroform anaesthesia during crowning of head. Second degree perineal laceration, sutured while area still anaesthetic.

The/

The anaesthesia of the perineum was satisfactory but as the patient was having painful contractions of the uterus light chloroform was administered. The perineum was sutured without Chloroform.

CASE 20. Mrs S.B.M. 34 yrs. Para 5/1. Patient has Mitral Stenosis and cardiac incompetence. She has had auricular fibrillation. Crepitations present at both lung bases. Digitalis and Digitalein were given for three weeks until the patient was in a satisfactory condition to operate - approximately at the 7th month of gestation.

Preoperative treatment: 1 hour before operation.

Morphia  $\frac{1}{4}$  gr. B.P. 117/72. Ephedrin  $\frac{1}{2}$  gr. given before commencement of operation.

Lumbar puncture: Spinocain 2 cc. (200 Mg. Novocain) given with the patient in a lying position. Barbotage up to 6 cc. and the table put 15 degrees in Trendelenburg position - the level of anaesthesia being controlled by the table angle. Mid line incision kept as low as possible. As patient was nervous and moved legs and facial muscles Morphia gr.  $\frac{1}{4}$  was repeated.

Caesarean Section was completed. Delivery of premature twins both crying. Bilateral salpingectomy performed. Patient felt the insertion of the skin sutures. Pulse excellent condition, 60 per minute, B.P. 113/65.

Ephedrin/

Ephedrin gr.  $\frac{1}{2}$  repeated after operation. Operation was very satisfactory. Puerperium normal. Both twins died of prematurity.

CASE 21. Mrs E.R.M. 32 yrs. Mitral stenosis and incompetence, pulse 110 per minute, no oedema at present - occasional attacks of palpitation. B.P. 114 / 85.

Preoperative treatment: 1 hr. before operation Morphia gr  $\frac{1}{4}$  and Hyoscine gr  $\frac{1}{100}$ .

Ephedrine gr. 1 prior to lumbar puncture.

A weal and infiltration at the site of lumbar puncture was made with 10 cc. 1% Novocain and lumbar puncture needle inserted. 5 - 8 cc. of C.S.F. were allowed to drip and then 14 cc. 1 : 1,500 Percain solution inserted intrathecally while the patient was in a lateral position. The table was then put in a Trendelenburg position of 20 degrees with a pillow under the patient's head. The anaesthesia extended up to the nipples in 15 minutes. Caesarean section was performed and a F.A.M. child delivered which cried immediately on delivery. It was bluish black in colour and respirations slow but responded to simple measures and was shouting healthily in fifteen minutes. Relaxation of the abdominal wall was marked and lasted about 6 hours. B.P. after operation was 75 / 55.

The operation was conducted satisfactorily. The patient unfortunately developed a right sided cardiac failure seven days after the operation and died.

SUMMARY AND CONCLUSIONS.

Sect. 1. Introduction.

The author avers that the parturient mother should receive some anaesthetic or analgesic to relieve the pains of childbirth should they become unbearable.

The qualifications necessary for this agent.

Sect. 2. Historical.

The care of the child bearing mother may be taken as an index to the degree of civilisation of a community.

The great advances made in anaesthetics and hypnotics during the last century.

Sect. 3. Mechanism and Course of Labour.

The mechanics of labour under the Powers, the Passages and the Passenger.

The importance of the best mechanical delivery is stressed as being important in the production of an easy labour.

Sect. 4. Methods of Securing Analgesia and Anaesthesia.

Arranged under the headings: Inhalation anaesthesia, Hypnotic and analgesic drugs, Local anaesthesia and Hypnosis and suggestion.

The pharmacological action of the drugs with a view to their utility in securing painless labour.

Sect. 5./

### Sect. 5. Methods of Choice and Special Indications.

Chloral and Bromide, Nembutal and Chloral, Morphine, Morphine and Scopolamine are methods described as being satisfactory in the early stages - with a selection of method for the degree of pain anticipated.

Nitrous Oxide apparatus and apparatus for giving Chloroform à la reine are described.

The importance of suggestion is fully discussed.

The failure of regional anaesthesia and the excellence of Spinal anaesthesia with Percaine gone into.

### Sect. 6. Clinical.

The clinical effects of each method are tabulated under the corresponding method.

The author's personal cases are given exemplifying the methods of choice, with their effects under different conditions and notes of criticism about each.

The Author's conclusions.

### Sect. 7. Bibliography.

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CONCLUSIONS.

1. That a sufficient number of mothers do not get a satisfactory analgesic during parturition.
2. The importance of the best mechanical advantages of delivery cannot be overestimated in trying to get an 'easy' labour.
3. That surgical anaesthesia is too often obtained with chloroform, which is bad for the mother, instead of 'à la reine' method.
4. That Chloral and Bromide + Nembutal and Chloral might be much more freely used in the early stages.
5. That Morphine is a satisfactory drug to use during labour despite its disadvantages. Its use in Cardiac cases is beneficial.
6. That Morphia and Scopolamine is a very satisfactory combination to use in prolonged labours.
7. That Nitrous Oxide is satisfactory with Elam's or Minnett's apparatus and that the apparatus is not expensive pro value obtained.
8. That the bulkiness of a gas apparatus depends largely upon the size of the cylinders and they cannot be reduced without impairing the utility and reserve of the apparatus.
9. That full benefit is derived from suggestion both externally and during parturition.

9. That the weight of a Gas apparatus can be reduced by substituting 'Vibrac' steel cylinders for those ordinarily supplied.
10. That Nitrous Oxide (with Oxygen) is the most satisfactory analgesic or anaesthetic for normal labour, but its use should be kept to the expulsive stage.
11. To increase the relaxation or depth of anaesthesia of Nitrous Oxide anaesthesia - Ether vapour should be added.
12. That Chloroform should never be given by the closed method.
13. That the (original) Junker inhaler is a dangerous apparatus to use.
14. That most of the disadvantages of the (original) Junker apparatus itself, are overcome in Mennell's Modified Junker inhaler.
15. That Chloroform capsules are very handy, satisfactory, useful and safe when properly used.
16. That Chloroform should not be given when a surgical anaesthesia is desired, if a substitute can be obtained.
17. The paramount importance of Suggestion in Labour.
18. That full benefit is derived from Suggestion both antenatally and during parturition.

19. That Regional block anaesthesia for parturition is insufficient in itself.
20. That a prolonged state of semi-narcosis is unnecessary and detrimental to the health of the mother when a simpler analgesia would suffice.
21. That patients should not be given the methods of treatment routine, but that the method of choice should be selected to combat the degree of pain anticipated.
22. That patients who are to be delivered by Midwives, should have the method prescribed them by a doctor on whom they should attend ante-natally.
23. That Ephedrin should be given prior to a Spinal anaesthetic to prevent the fall in blood pressure.
24. That Percaine 1 : 1,500, is very satisfactory for Spinal anaesthesia.
25. That Anaesthesia and Analgesia should be used to supplement 'good' Midwifery and not as a 'mask' for 'bad' Midwifery.

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