CLINICAL & EXPERIMENTAL STUDIES

FROM THE

ROYAL MATERNITY & SIMPSON MEMORIAL HOSPITAL.

PART 1.

General Statistics of the Hospital

I beg to present a general view of the statistics of the Royal Maternity Hospital from the year 1820 to August 1880. This comprises the whole time during which reliable records are to be found.

I have most carefully gone over all these records and beg now to present Table I as the outcome of my investigations.

The records of the Hospital are very imperfect in the Earlier books and here ~~and~~, there and there, are gaps extending sometimes over an entire year.

In my table I have given only those facts which can be observed over all the period mentioned.

In the later books much greater accuracy has been observed.

The table has been constructed as clearly and accurately as lies

A Clinical and Experimental Study of the Bladder during Parturition

The object of the present enquiry is to ascertain the extent and manner in which the bladder and its contents are influenced by parturient efforts.

The means taken to ascertain this will be hereafter described.

Before reaching this main issue several questions naturally fall to be discussed.

It is therefore convenient at this outset to arrange our study as follows:—

1st To examine the question of uterine pressure during Parturition

2nd The topographical anatomy of the bladder during Pregnancy & parturition and some clinical observations connected with it.

3d. Experiments to estimate bladder pressure during labour - its amount - distribution & cause.

4th The Results arrived at.

The estimation of uterine pressure, that is of the intensity of the uterine contractions, is a question upon which very considerable attention has been bestowed by Poppel, Haughton, Duncan, Joulin, Schatz, Ribemont, Roellet & others.

It forms no part of my present task to enter in detail into this question yet it is essential that these investigations should be shortly stated in order that the points may be established.

1st The amount of force exerted during Parturition —

2nd How that force is expended or distributed —

First. The amount of force :—

Different methods have been adopted by different observers in order to arrive at a solution of the problem.

Poppel, Matthews Duncan & Ribemont have estimated the force necessary to rupture the membranes and have considered that force as representing approximately the intensity of the uterine

of ten uterine contractions

Poppel found that on an average
= 9.4 lbs ..... a force of 4.248 Kilos was required to
rupture a surface of membrane having
= 1.9 inches ..... 5 centimeter of diameter
= 2.8 lbs ..... The lowest number was 1.301 Kilogramme.
= 13.2 lbs ..... The highest number was 6.002 Kilogramme
He made the same researches upon a
= 3.93 inches .... surface of 10 centimetre in diameter
and found :—
= 21.7 lbs ..... The highest figure 9.876 Kilogramme
= 4.6 lbs ..... The lowest figure 2.134 "
= 13.4 lbs ..... average figure 6.162 "

The conclusion he draws from ten
calculations is that in normal deliveries
4.4 to 20.9 lbs ..... a force from 2 Kilogr. to 9.5 Kilogram.
is required to expel the foetus.

Matthews Duncan judging by his
own experiments conducted in the
same lines as Poppel "enunciates
the almost certain conclusion that
"a great mass of easy and use-
"merely the easiest labours are
"terminated by a power little in excess
"of that required to rupture the bag
"of membranes. The steepest membrane
"found in this experiment indicated,
"by the pressure required to burst
"it, an extending force of 37½ lbs.

"We may therefore, I think, safely
"venture to assert as a highly probably
"conclusion that the great majority
"of labours are completed by a
"propelling force not exceeding 40 lbs

"If we regard the figure
"of 4 lbs given by Poppel as equal
"to the power exerted in the easiest
"labour he has observed, or the
"corresponding figure of 6 lbs according
"to my calculations, and keep in
"mind that the average weights
"of the adult foetus exceeds either

"of these weights we are led to the
"conclusion that in the easiest
"labours almost no resistance is
"encountered by the child: that
"it glides into the world propelled
"by the smallest force capable of
"doing so."

Duncan in an essay on the
extreme power of labour further
states "Having had extensive and
"varied experience in the case of the
"forceps in difficult labour, and
"having also made some rough
"experiments with the dynamometer,
"to ascertain the power I have applied
"by this instrument, I regard 56 pounds
"extended of a hundredweight as
"the maximum force of the parturient
"function as too high.

"I do not deny that, in
"very rare cases, such a force may
"possibly be produced: but I am sure
"that it is nearer the truth to
"estimate the maximum of uterine
"power of labour — including with-

"the uterine contractions the resistant
"expulsive efforts — as not exceeding
80 lbs"

Ribemont made his experiments
with great care and found that
over an orifice of 10 centimetres
the membrane ruptured under a
mean pressure of :—
10.300 Kilogrammes = 22.8 lbs
The maximum of resistance
11.179 Kilogrammes = 24.4 lbs
The amnion alone resisted up to
7.988 Kilogrammes = 17.3 lbs.
whilst the chorion and decidua
without the amnion ruptured under
a pressure of :—
5.660 Kilogrammes. = 12.3 lbs

Joulin by means of forceps
to which he attached a dynamometer
found the maximum force about
104 lbs.

Schatz has endeavored to estimate the pressure exerted during labour in a different way. He used the following apparatus which he denominates a Tokodynamometer. This consists of a little balloon of caoutchouc filled with water which is introduced into the uterus between the foetus and the uterine walls and which by tubes of Caoutchouc is put in communication with a manometer

This has attached to it a corresponding register which traces on paper, curves similar to Sphygmographic tracings indicating the variations to which the balloon is subjected in the uterus under the influence of expulsive forces

I embrace the opportunity of pointing out what appears to me an obvious fallacy in this method of investigation and which I refer to more fully in my calculations as to bladder pressure.

It consists in the fact that the

force was conveyed through an apparatus of elastic material. Before any absolute deductions as to the force exerted by the uterus can be made from the movements of the mercury it would be necessary to add on the force lost on the elastic walls of India rubber bag. This has not been done indeed it is scarcely difficult to see how it could be done. This would vitiate the entire results.

He found that the pressure exerted by the uterine and abdominal muscles at the end of labour varied from

80 to 250 millimetres

that is 3.2 to 10 inches

of mercurial pressure.

According to him the expulsion of the foetus required a force of from

8.500 Kilogrammes to 27.500 Kilogrammes.

i.e. 17½ lbs to 60½ lbs.

Poullet of Lyons attempted to settle the question of uterine pressure by means of an instrument which he called the Tocograph. His observations were conducted by means of two balls of caoutchouc one of which was inserted into the rectum and the other into the uterus. In this showed, as he supposed, the entire expulsive force employed in parturition. On the one hand the balloon in the uterus showed the expulsive power of this organ while, on the other hand, the balloon in the rectum showed the expulsive force of the abdominal muscles. I need not add that each of these balls was attached to two each of which was connected with a column of mercury and a registered scale. His results are open to the same objections as Schatz's, they are very uncertain and need not be recorded in full here. They are to be found in the Bulletin de la Société de chirurgie 1879. p. 8.

The Reverend Samuel Haughton approached the subject from an entirely different point of view -

Studying first the force of the uterine muscle he finds the mean weight of this muscle derived from Hewitt Montgomery and Lecrab to be 1.56 lbs the mean thickness of the muscular wall to 0.1519 inch, and the tensile strain of uterine wall per inch to be 15.577 lbs; and from these data he concludes that the maximum hydrostatical pressure produced by uterine contraction is 3.4 lbs on the Square inch.

Then citing the experiments of Duncan on the pressure necessary to rupture the membrane, who found the greatest pressure was 3.1 lb and the least 0.26 lb giving a mean 1.2 lb, and combining this experimental result with his calculation, he concludes that the uterine muscle are capable of rupturing the membrane in every case once pressure in general nearly the requisite power to complete labour

The extreme force of uterine contraction he estimates produce or rather is equivalent to a pressure 54.1 lbs differing, it will be observed, very considerably from Inslie and Duncan

Houghton then discusses the force brought in by the abdominal muscles which are four in number viz Rectus abdominis, obliques externus, obliques internus and Transversalis.

He formed by experiments upon three young men, multiplying the curvature into the tension of the abdominal muscles at the navel, that the result was an effective force of 32.926 lbs on the square inch, available to assist the uterus in completing the second stage of labour.

Adding combined force we get:—

Involuntary Muscle 54.10 lbs

Voluntary Muscles 523.65 lbs

Total 577.75 lbs. av.

Between 577·75 lbs of Haughton and 80 lbs of Duncan there is obviously a marked difference and it comes to be an interesting question to ascertain how this remarkable divergency has arisen. As I have just shewn the two observers approach the Subject from different standpoints. The one calculating from the data I have mentioned the entire strength of the uterine and abdominal wall contractions the other by observations on his body being effected calculating the force effected on it.

Is it possible then to explain this discrepancy? I think it is. In the explanation I am brought directly to the subject of my enquiry.

First, then, of the three elements entering into Haughtons calculation, the one is the tensile strain of the uterine muscle which must be taken with very great reservation. The calculation is on the "breaking strain". Such may be the breaking strain but then such strain is not a fair calculation for Take an

analogy from engineering a square inch of good iron will rupture on the application of a force of 50,000 lbs but in actual work 10,000 lbs would only be allowed per square inch so giving a factor of safety of 5. It is scarcely to be supposed that nature will work at the "breaking strain" That nature does work up to the "breaking strain" is of course occasionally a fact. This is shown in cases of spontaneous uterine rupture. Even here, however, the rupture does not take place in the tissue tested by Haughton but at the weakest part of the organ - the union of cervix and body. What factor of safety nature allows it is, I presume, impossible to say. Engineers allow 10 as a factor of safety in a dynamic load and 5 as a factor of safety in a static load. It must be at least very obvious that in the majority of labours the work done must be at a strain very much within the breaking strain and therefore a very considerable deduction must be made on the head alone from Haughtons figures

But I will not press this point to its utmost limits for although Duncan has shown that Houghton has overestimated the expulsive power of the uterus and abdominal muscles in ordinary labours and ridiculed his statement that "on an emergency somewhat more than a quarter of a ton of pressure "can be brought to bear on a refractory "child which refuses to come into the "world in the usual manner" yet it is not impossible that Houghton figures may approximately describe the "breaking strain" It must be kept in view that even in cases of rupture of the uterus the rupture does not accurately represent the breaking strain of the healthy uterine muscle

My point is simply this allowing a factor of safety in Houghtons experiments in using his figures, in proportion as the factor of safety is large or small, very considerably down.

But secondly, and this is a point to which so far as I know no allusion has been made and which, to some extent, goes to reconcile the great discrepancy in the results of Houghton on the one hand and Duncan, Doubleday and Others on the other. While Houghton, puts the Cubic Inches I have alluded to, calculating the entire pressure of abdominal muscles and uterus Duncan and Others estimate only the pressure on the foetal head. It is obvious, therefore, that pure Houghton total sum there falls to be deducted the force lost on the hard & bony pelvis. In other words allowing Duncan's 80 lbs is correct and allowing a large factor of safety pure Houghton's figures the difference between the two may amount to the sum of the difference force lost on the girdle of Conbact., whenever and whatever that, for the time, may happen to be. That such pressure does exist upon

upon part of the contents of the pelvis
and that to a very considerable extent the
result of this enquiry will show

If it is possible to calculate
the pressure - which is to be subtracted
from the entire uterine pressure - that
on the bladder during parturition
further experiments may be made to
ascertain approximately the amount of
pressure left upon other portions of
the pelvis and its contents. It is
only then that a true estimate
of uterine force can be obtained
for while Duncan is no doubt
near the truth when he estimates
the amount of pressure at 80 lbs
in labor in and 40 lbs in easy
labours yet it must be very clearly
kept in view that this is no
estimate of the entire amount
of uterine force exerted in any
given labour, but merely the
pressure exerted on the head.

The pressure dissipated on the
passages is entirely left out of the

See Note B

calculation. This brings me directly to the task I have set myself, viz to ascertain the amount and distribution of the pressure exerted on the bladder during parturition

Relations of the Bladder

Following out the plan laid down at the commencement of this paper it becomes my duty to examine into the relations and conditions of the female bladder. It would be foreign to the present subject to enter into a lengthy description of the viscus. I must be confine my remarks entirely to the relations of the bladder so far as they affect the enquiry on hand.

In the unimpregnated condition it is necessary to state generally that the female bladder lies lower in the pelvis than the male; placed between the pubes anteriorly, the uterus posteriorly the vagina & cervix inferiorly and the intestine superiorly where simply it lies forward on the Symphysis occupies but little space and slightly overtops it.

When partially or entirely filled it rises above the pubes to a varying extent. It is consequently a pelvic or pelvi abdominal organ according to its repletion

Beyond these general facts there are some points to which attention

must be specially drawn and which are characteristic of the female bladder

1st It is flatter in women than in men. I now speak of the moderately distended organ. In man it is ovoid Its lower fundus admits of peculiar distention laterally in women owing to the obvious arrangement of the vagina and pelvic organs generally. A glance at the accompanying diagrams will show this. These diagrams are specially valuable as showing this fact, because they were drawn with a totally different object and only incidentally show the point in question They are taken from Pettigrew's monograph on the muscular fibres of the bladder and were sketched ✗ to show their arrangement. In these diagrams this flattening and broadening of the female bladder as compared with the male organ will very clearly appear.

The fact is noteworthy that this flattening and broadening of the bladder is more marked in multiparous women. In these the whole organ

has more headache than height.
This was noted by Haller. It may
be accepted as a fact. Indeed it
would a priori seem to be natural.
For if the normal bladder is normally
broad & flat it is but to be expected
that, in repeated pregnancies the weight
of the uterus pressing on it and inter-
fering with its expansion upwards will
tend to make it expand laterally.
With the repeated occurrence of pregnancy
this lateral expansion will become
more & more marked. To the clinical
observer nothing is better recognised
than this flat condition of the bladder
in multiparae. In making a bi-manual
examination the difficulty of mapping
out the broad moderately distended
bladder admits of ready demonstration.
The explanation just offered seems
a feasible one. Barkow, however,
doubts its value. He has found
that this want of pyramidal
form or flattening occurs in men
in whom, of course, no such cause

did account for it. In some multiparous women he has not found this condition

He mentions one case especially of the bladder of a woman who died of Phthisis aet 41 after bearing ten children. In this case he expected to find broadening and shortening but he did find an oval bladder

Barkow offers a different explanation. He attributes this Special form less to the effect of pressure of the pregnant uterus than to the movements of the uterus and its annexa which lie behind the bladder. There drag on the bladder, being about contractions of the organ and cause Shortening. Barkow simply mentions the fact. It seems to me that a. the freer movements of this parous uterus b. its greater weight c. its lower situation. d. The frequency of displacements both of the uterus and vaginal walls all seem to give great weight to his suggestion. It is scarcely possible to exclude the

pregnant uterus as a factor in the production of this shape. Both influence no doubt are concerned in imparting this shape to the organ. Whichever preponderate the fact remains that the female bladder is markedly flat and that in parous women the preponderance of breadth over height is remarkable.

2ndly (N) The Sexual

2nd The female bladder is marked by lateral asymmetry.

The accompanying diagrams taken depleted from bladders depicted by Barkow show this.

The following observations are from actual author

out of 35 bladders of Adult women

In 10 asymmetry was minor

in 21 " " major

out the 35 only 4 were completely symmetrical

I wish to draw special attention to the fact that the asymmetry is much more marked on the

on the Right than on the left.

Right ____ 18

Left ____ 9

Again this asymmetry, though characteristic of the female bladder generally, is so constantly present in the bladders of parous women that it may be regarded as the normal condition.

There is a fallacy however in assuming that a bladder will distend when removed from the body or even in the body after the viscera have been removed, in the same way as it would when in the closed abdominal cavity. For instance in a section of a female pelvis of a girl aet 18 by Legueu. He shows the bladder distended but as one would expect in a young girl. Braune shows this probably came from the bladder being distended after the viscera had been removed.

3d. In regard to the relative capacity of the male & female bladder there is a very great diversity of opinion

For example:—

Haller says It seemed to me greater in women so that it contained the urine longer.

Rosenmuller It is rounder and smaller than in the male

Mr. Weber Rounder broader and roomier than in the male

Krause It is roomier than in the male

Hyrtyl does not strikingly contain much less urine than the male

Encyclopedia It is generally very capacious in women especially those who have borne children.

Such are a few of the opinion with regard to the relative size of male and female bladders. The weight of opinion seems to be that the female bladder especially that of multipara is more capacious than that of man

Barkow found in making experiments to which reference has already been made [35 adult females] that female bladders they contained a quantity of urine equal to that contained by the male bladder

The flattened appearance, shortened as it is in its vertical diameter, which the female bladder presents has no doubt given rise to this difference of opinion in its capacity. Clinical observation will hardly bear out those who would limit its capacity to less than the male. A reference to retention of urine in the female would seem to show that scarcely any limit can be assigned to the capacity of the female bladder. Rupture of the bladder from distension is practically unknown.

The natural capacity which women have of being able to retain urine in the bladder to relatively two times longer than men cannot, however, be urged as an argument in favor of the greater capacity of the female organ. This is not a matter of capacity. Habit no doubt has something to do with it. Its deep situation in the pelvis, its broad base, its expansion laterally must be kept in view in studying the question. It is no part of my present purpose to discuss generally the capacity. It varies much under different circumstances for example in addition to sex and habit, age, position of the body health and disease especially the latter — from a few drops to a pint — exert a marked influence. A further examination of these points would lead beyond the scope of the present enquiry

I am now led to examine the influence exerted on the bladder.

B. By Pregnancy

a. In the earlier months

Among the most prominent effects of early pregnancy is a diminution of the capacity of the bladder. The simple weight of the heavy uterus is of itself sufficient to cause this.

The early pregnant uterus lies in a state between version and flexion It is easy to satisfy oneself by a bi-manual examination of the intimate relation existing between the pregnant uterus and the posterior bladder wall.

The low position of the early pregnant uterus as well as its weight will check at once the upward distention of the bladder and its vessel appear probable that so long as the uterus maintains this relation - say for the first three months - the bladder will not contain an amount of urine beyond that which can be accommodated by the walls distending

laterally or the fundus sinking down
in the vagina. That is the bladder like
all other sacs containing fluid will
expand in the direction of least resistance
and this, in the case of the bladder,
will be transversely. Whenever the
bladder begins to distend longitudinally
the weight of the uterus will act by increas-
ing the resistance and hence either directly
or reflexly require the expulsion of its
contents. It is, therefore, only in exceptional
circumstances that the bladder becomes
an abdominal organ in early pregnancy.
It is, as a rule, pelvic.
As the uterus comes to be a pelvic
organ and with advancing pregnancy
rises into the abdomen pressure on the
bladder from this cause will be modi-
fied. Clinically this is so for frequent
micturition is more common in the first
months than at mid term. Still all
through pregnancy the expanding space
of the viscera is limited.
But if, as is often the case, the pregnant
uterus is inclined backwards without

being in a state of retroversion or flexion the bladder will be interfered with in two ways.

1st As urine accumulates in the bladder and when vertical distension begins the bladder must of necessity drag on the cellular tissue lying between it and the uterus. From the position of the uterus this tissue will easily be put on the stretch and an early check will be placed on the capacity of the bladder. The bladder will probably be emptied. If not it will distend further and as it distends the posterior displacement of the uterus will be so far remedied and the whole uterus and cervix now closely applied to the posterior surface of the bladder will rise en masse with it.

So far distension of the bladder will have the effect of rectifying a backward inclination of the uterus. The experiments of Scanzoni and Barnes show this. There were conducted on cadavera once showed that when the utero-vesical duplicatures were severed once the bladder

distended marked retroversion was the result, but when they were left intact distension of the bladder only served to place the anterior ~~wall~~ wall of the uterus and the posterior wall of the bladder in closer contact. Such a case has been under my observation.

A young multipara pregnant two months consulted me specially on account of frequent micturition. Bimanually I found the uterus slightly inclined backwards and there being no other condition present I concluded this was the cause acting in the way I have just described. I instructed the patient to resist the first call to micturate. This she did, and after the uterus was drawn forwards on the bladder and hard in position and the cervix so far remedied, the patient was able to retain her urine for hours. The result of distension of the bladder on the uterus when the latter organ is either normally situated or slightly inclined backwards is to displace the former organ further back, the cervix and fundus meanwhile retaining their

relative position. In the figure referred to by Braune he finds difficulty in accounting for the backward displacement of the uterus. whether it was ante or post mortem or how brought about. However it may have been brought about in this particular case whether by the violent death of the patient or as post mortem change I cannot say. This much I know clinically that such a position of the uterus in early pregnancy is by no means rare. Lately in any case of early pregnancy where I have been consulted and where still frequent micturition has been a Symptom I have, as occasion offered, made an examination and been struck with the frequency of this displacement.

This minor form of fixed retroversion as well as fixed retroversion generally in a pelvis rigid themselves. It is often met with fixed retroflexion. In such a case the capacity of the bladder is interfered with as in retroversion, and frequent micturition is an early Symptom, but if distension takes place the uterus is less

likely to be drawn into position and the well known phenomena of incarceration and retention are the result. The position of the bladder during this period - Early pregnancy - varies according to its distension. It seldom becomes an abdominal organ. Compressed as it is by the uterine body or its distension interfered with by the cervix it is usually either flattened out and of a somewhat triangular form or else it assumes the form of an irregular ovoid.

The exact shape of the ~~utterus~~ bladder during pregnancy is, of course, a matter difficult of accurate decision. The only section with which I am acquainted is Braune's and it shows the bladder contracted and flattened against the uterus. Clinically the bladder cannot be regarded as having any definite shape, at least when moderately distended its outlines are quite difficultly differentiated and are easily changed by the pressure of the finger. It can be regarded only as a water cushion with easily compressible walls and with its outlines in constant change.

The main points concerning the bladder in early pregnancy are:—

1st That it is a pelvic organ.

2nd That it distends transversely

3rd That its antero-posterior distension is limited

4th That its vertical distension is interfered with for the reasons described

For these reasons its capacity is very materially curtailed.

2nd Throughout Pregnancy.

The bladder in its moderately distended or empty condition remains a pelvic organ. Its capacity is interfered with but in a different way. The uterus has risen out of the pelvis. The bladder when even considerably filled with distended first transversely, then upwards and ultimately the base of the bladder will bulge the vaginal wall before upward expansion takes place. The distension, therefore, of the bladder during early and late pregnancy is somewhat different. In the one case the capacity is diminished by the

mode of

pressure of the uterine body which still remains a pelvic organ in the other the anterior segment of the pavid uterus is the main factor in limiting the dispansion of the organ. This is shown in diagrams in the accompanying volume

3rd. At the end of Pregnancy

in primiparae the capacity of the bladder is diminished owing to the low position of the lower uterine segment and foetal head and in multiparae, just at the end of pregnancy, the result is similar (tho' much less marked) owing to the descent of the uterus.

In any case it is to be observed that just before labour sets in the bladder is entirely a pelvic organ and that, except under unusual circumstances it remains so. It expands laterally, inferiorly and to some extent antero-posteriorly rather than superiorly because in that direction it meets with least resistance.

I now come to look at the bladder

During Parturition

The main point to be observed so far as my present subject is concerned is the fact that the urethra is elongated and the bladder elevated. This is well shewn in Braune's sections and has been specially drawn attention to by Hart. It is a fact which readily admits of clinical demonstration

The direction of the urethra

The length of retention required

The small quantity of urine

often drawn off, as well as,

the result of a vaginal examination

sufficiently prove that, under normal circumstances, during the 1st and 2nd Stage of labour the bladder has ceased to be a pelvic and become an abdominal organ

This is the case not only under circumstances of distension but as Braune's plates abundantly shew in the empty condition as well. The cause of this alteration in the position of the bladder is to be found in a study of the pelvic floor

during parturition and especially in its relations to the cervix. The intimate relations between the cervix and the anterior bladder wall sufficiently indicate the cause of this displacement. During the first and second stage of labour the cervix is stretched thinned and correspondingly drawn up. As it undergoes this change the bladder above it portion and rises until it - a movement which of which it is capable owing to its loose pubic attachments. Thus being pelvic it becomes abdominal. This is the case not in part but in whole - whether distended or empty. This altered position of the bladder during parturition is full of interest as bearing on various obstetric operations and manipulations. A reference to these points would lead me away from my present object. I am contented with drawing attention to the importance of keeping this position in view as in relation to bladder pressure

Clinically the distended bladder is readily recognised by inspection and

palpation forming a distinct tumour supra publically broader above than below separated from the surrounding uterine tumour by a transverse or oblique furrow. Its tenseness and fluctuation will further decide its nature.

I wish to take the opportunity of pointing out a further diagnostic point. The condition has not been drawn attention to. It may be and no doubt is familiar to practical accoucheurs but, if it is recorded, any notice of it has escaped my observation. The condition is pathognomonic but owing to the firmer relation of the tissues it is most marked in primiparae. I mean an alteration in the vaginal walls by which owing to the dragging up of the bladder a circular contraction is formed - most marked in front but extending all round the vagina The tenseness of the contraction varies with the amount of urine.

Let me illustrate what I mean by a few clinical examples :—

Case I. S. S. a primipara. had been in labour since morning saw her at

& Pln. found os dilated as large as a half-
-crown. In front of the cervix the vagina
was drawn into a ring with firm sharp
outline. Through this ring the cervix could
be felt.

Enquiry patient has not passed urine
since morning

3xi urine drawn off with a catheter

Result vaginal ring disappeared

case 2. R.B. primipara seen at morning
visit 9 am. os size of a penny piece
well marked ring in front of the
cervix

Enquiry no urine passed since last
on previous evening

3x urine drawn off with a catheter

Result Vaginal ring gone

Case 3 A patient was brought into the
maternity Hospital in labour having
come a long distance by train. The
os was dilated as big as a crown
piece. In front of the the vaginal
ring was well marked. The lumen
being on right side of the cervix.
The distended bladder formed a well

marked supra pubic tumour

Enquiry no urine for many hours

Exy drawn off into a catheter

Result Rigs disappeared.

I can see no good purpose to multiply examples and as I have not kept a record of all the cases in which this condition was observed I am not in a position to give a table.

There are one or two points which I think call for notice.

1st I have observed that the condition is most marked in primiparae altho it does occur in multiparae

2nd It occurs in the first stage

3d It does not occur in the non-gravid. This can be proved by experiment. I have again & again examined the vagina in women with full bladder and found no such ring.

now gravid

In primiparae even in the first stage this ring is pathognomonic of dilatation. It is contrary of course that a marked ring will be caused

even if the bladder is not distended to any very great amount that is to say - as I have shewn in the case recorded — ℥x will do it. I have not noticed it with less. Of course regard must be had to the condition of distension in labour and in the unpaid for though ℥xx may be allowed as an average moderately distended bladder ten times half that quantity must be regarded as moderately distended bladder in labour. Such distensions even moderate distension is a very rare thing in parturition. Although constantly referred to it must strike the practical accoucheur as a fact that except as routine and then with questionable benefit the catheter is comparatively seldom required in labour. The condition is deserving of a little close study.

1st The bladder has been seen & the abdominal

2nd The direction of distension must be transverse and longitudinal

The altering shape of the uterus and its contractions prevent antero-posterior

distension

3rd The swelling formed supra-publically by the moderately or markedly distended bladder is not as might be at the first glance expected central

I have observed this at the Hospital. Out of 15 cases of which I have kept notes the following is the result

15 cases of parturition pregnancy in which during inspection the characteristic swelling of the distended bladder was observed and in which after the use of the catheter it disappeared :—

In 8 swelling to Right of mesial line
" 4 " " Left " " "
" 3 " was Central

Of the 8 in every case the presentation was cranial and the fœtus L.O.A.

Of the 4 in 3 body was to Right
" 1 presentation undefinite

Of the 3 Two were pelvic 1 cranial L.O.A.

In looking for an explanation two considerations must be kept in view

1st That foetal destruction is to a certain extent prevented by the position of the head and body and the too whether the head is engaged or not.

2nd The natural asymmetry of the bladder

To this I have already adverted in detail.

In addition to the fact that the bladder in parturition is abdominal it is important to keep the two points, I have just mentioned, in view as affording additional explanation of the reason generally of urine required to make a supra-pubic vesical tumour during labour.

The first of these is very fully borne out by the short table I have given in which only of the 15 cases 11 were apparently influenced by the head and body or pelvis. The remaining 4 were too indefinite to draw conclusions from, but it is striking that in both of the head cases the bladder was emptied.

43.

Following the arrangement laid down at the commencement of this thesis I have now to describe the method adopted of arriving at an estimate of the amount of pressure exerted on the bladder during parturition and the results of that enquiry.

First

The method adopted in making the experiments

See diagram in vol ii

A bent U tube $\frac{1}{8}^{th}$ of inch in calibre was connected by the end B with a horizontal tube C in which a T branch F closed with a pinch-cock D

To the further end of C was attached a piece of india-rubber tubing of the same calibre. This was about 2 feet long and terminated in an soft-rubber catheter No 8 J

At the point of junction of the tube e and the Catheter another T branch G was connected. This was also closed with a pinch cock H

A scale divided in both directions was fixed between the limbs of the U tube and was capable of accurate adjustment to the mercurial level.

The instrument was arranged for observation in the following way

The whole apparatus was filled with water so as to exclude air. Mercury was then poured in at A so as to displace the water and until about 3 inch stood in each limb. The fluid in the limb A was then adjusted above the mercury until a column of the

same height remained as existed between the level of the mercury in B and the horizontal tube C

This ensured an equal weight of fluid in both limbs

The scale was then carefully adjusted till the Zero corresponded to the mercurial level.

The Catheter was then introduced into the bladder and the manometer placed on a support the same height as the bed

The pinch cocks H and D were opened and a little urine permitted to flow so as to secure complete exclusion of air and equalise the pressure on both sides of the mercury

Both cocks were then firmly secured and alterations in the mercurial level during each pain were observed.

When it was desired to ascertain the amount of urine in the bladder the tap H was opened and the urine was allowed to flow out.

In three cases where the bladder was found to be empty or nearly so 3ij of water were injected. This was done by connecting a Higginson syringe to the tube.

Table 1 shows that the observations extended over periods varying from 5 to 40 minutes and included from 2 to 9 observations

The table to which I now draw attention No 1. indicates the condition generally — showing the state of:— 1st The OS.

2. The membranes
3. Presentation & Position
4. Situation of the Head
5. Limits of Observation
6. Duration of Observation
7. Maximum rise
8 Minimum rise
9. Amount of Liquor.

This table gives a precis of the whole scope of the observations and from this table all the others have been constructed.

These observations were made exclusively in cases of head presentation

The cranial positions being:—

L.O.A....19

R.O.P....6

The Situation of the head was :-

Brim	Cavity	Outlet
4	26	5-

The Condition of the Membranes :-

Ruptured 16 Unruptured 17

The condition of the Os :-

Dilated 19 Undilated 13

In making these observations very considerable care had to be observed in eliminating any sources of fallacy more especially in the observations made during the early period of parturition. One such fallacy has explicitly been taken which I now show. I refer to the possibility of taking a reading during the first stage while the patient is making active exertions such as crying, bearing down vomiting and the like. Such exertions on the part of the patient altogether vitiate the reading because such voluntary efforts at once remove the reading from that of a first to that of a second stage. As the report will show I have endeavoured to make ample allowance for this.

Reading during interval

Among the first points which require to be settled is the reading of the mercury during the interval of a pain when uninfluenced by any of the factors of labour. This is uniformly ½ of which we get the reading under all circumstances during the interval of a pain. The contraction of the bladder as to repletion makes no difference. The mercury remained the same in a woman with three ounces in her bladder as in the case of a woman suffering from puerperal melancholia ext from whom nearly two pints were drawn off.

A very slight alteration in the position of the manometer will raise the mercury a point or two. When the patient is still and the bladder manometer on the same level the rise of the mercury is really inappreciable and cannot therefore be included in our calculations as in any way influencing the results

A series of experiments were tried with non pregnant women and the results were read by each Stillman and several positions of patient and

manometer leaves the mercurial column unaffected. We must attribute the readings during the intervals to the fact that the mercury was on a slightly lower level than the patient. In such a condition of matters can, indeed hardly be avoided from the fact of the patient lying on a non-rigid bed or from the varying thickness of the patients buttocks.

It, therefore, follows that during the intervals intra-vesical pressure amounts to nil.

Such being the condition of the pregnancy during the interval of pains a glance at Table ii will show at 68 once the influence which particular efforts have on the bladder. The table shows a range of readings varying from 3·2 to 1/. once the scale is wonderfully gradual. From a closer examination it will be seen that the highest reading occurs in a primipara aged 27. with regular pressure L.O.A. position dilated O. ruptured membranes and head in the cavity uses no pains in the second stage of labour and the lowest reading occurs in a primipara aged 27 regular pressure L.O.A. position O. the edge of a shilling ruptured membrane and head at the brim early, therefore, in the first stage of labor.

Such result is precisely what one would à priori expect. Between these two extremes, the readings may will vary & caused conditions of the labor. In the meantime the fact is established that pressure over that to a very considerable extent is incapable to act on the bladder during labor.

52

Having seen the limits of pressure viz the highest and lowest readings it is convenient here to enquire what the equivalents of these readings are in actual pressure.

Take, for example, the maximum in which the mercurial column rose 3·2 in. As all these readings refer only to the rise of one limb of the manometer they require to be doubled in order to represent the actual height of mercury supported by the bladder pressure for the time being. Accordingly 6·4 inches of mercury will represent the corresponding intra-vesical pressure in this observation. Now as 30 inches of mercury represent approximately a pressure of 15 lbs on the Square inch it becomes a simple question of proportion, to ascertain the amount of pressure corresponding to 6·4 inches

This I find to be 3·2 lbs per Square inch of bladder area

In tables 6.7.8 the manometric readings are converted from inches into lbs of pressure and these tables shows

the actual pressure per square inch of bladder in each of the Separate observations made. The lowest reading which was obtained was 2·1 which represents ·2 inches of a mercurial column since this again is equivalent to $\frac{1}{10}$ of a lb of pressure on the square inch.

Such being the highest and lowest readings it would be possible to determine the entire intra-vesical pressure provided always it were practicable to obtain

1st. The exact quantity of fluid contained in the viscus

2nd Sufficient data as regards the displacement of the walls to calculate the entire intra vesical area.

Such a calculation would serve no good purpose in indicating any solution as to the distribution of uterine force because as will be shown the chief factor in the causation of the pressure is a variable one resulting as it does from the action of one antagonistic segment of the uterus on an unknown area of the abdominal

walls and pubes. were the bladder a rigid cylinder and the uterine force acting directly upon the fluid contained within it, it would be easy to estimate the precise sum of the force expended on it which it would being none or only less elastic it would be necessary to determine for the Bo the degree and quality of that elasticity as a basis of any calculation in this direction. Means for such calculation are not at our disposal and then we must be contented with having ascertained the amount of uterine pressure dissipated on the bladder at various periods - per Isaac Lick.

5-5.

Is this pressure, then, uterine foetal or abdominal. If Is the foetal it is due to the advancing head of the child that it is not so is evident from the fact that it is greatest during the 2nd stage of labour when the head has, as I have already shewn, passed below the level of the bladder. The bladder has been drawn out of the pelvis into the abdomen and, therefore, away from direct pressure from the foetal head. The pressure cannot, therefore, be said to be the result of the foetal parts coming in direct contact with the viscera under observation. This fact is worthy of special notice because, unless the function of the bladder during labour is kept clearly in view one would very naturally attribute the pressure exercised on the bladder as a direct result of the advancing foetal head pressing on it. Such in reality is clearly erroneous. Little, if any, pressure is thrown on the bladder from this source.

5-6

There remain, therefore, two sources from which this pressure may arise

1st The contraction of the uterus

2nd ly. The contraction of the abdominal muscles.

3rd Uterine pulsation

I have just shown that there do exist each through the foetal head by communicating the pressure directly from the head to the bladder wall. This source of pressure must, therefore, to a great extent be diminished. Uterine contraction have a direct and powerful influence on the bladder. This is exerted in two ways

1st By altering the shape of the uterus

The effect of uterine contraction in altering the shape of the uterus is well recognised

Diagram

So wonder the end of pregnancy the uterus is moved in form during a pain it becomes more or less globular

The longitudinal and transverse diameters diminish while the antero posterior is enlarged in other words while the shortest form above downwards the longitudinal antero posterior i.e. in the direction of the bladder.

Further it must be noted that with a distended bladder the effect of this "form-restitution-power" will be more marked because, as a matter of fact, owing to the tightening of the broad and round ligaments the fundus uteri is drawn somewhat upwards so that the circumference at the umbilicus becomes proportionately greater than that between the umbilicus and Symphysis -

The case stands thus:

During a contraction in early labour before the abdominal muscles either reflexly or voluntarily have begun to aid the "form-restitution-power" of the uterus exerts a pressure on the bladder until the membranes are ruptured and the abdominal walls give. This influence in this Simple form will be observed early in labour.

5-8

Hence with ulterior contraction there must of course be a certain amount of pressure upon the altering shape of the atoms itself. This of course will be greater as the abdominal walls are tense and this form of pressure will be much marked in primipara in whom the condition is more pronounced For then the presence of the Ligaments Amnii will modify the form of pressure considerably, for its presence will increase the size of the atoms, especially in its Crown Segments, and so, with unexpected resistance, the force exerted by this form of pressure will be greater than after the Ligaments has escaped Amnii. Table IV shows clearly these and to this table I draw attention

But 2ndly another influence arising directly from uterine contractions must be overlooked viz the pressure exercised by the stretching of the cervix. As the cervix dilates it draws up and with it the posterior Vaginal wall. Now this dilatation of the cervix must be regarded simply or even perhaps mainly as a result of the pressure of the foetal head or the amniotic wedge but specially to the contraction of the longitudinal fibres of the lower uterine body & drawing up the cervix and with it the Vaginal to whose posterior wall it is firmly attached by the paravesical cellular tissue. Further the comparative thickness of the two cervical walls - anterior and posterior - during labour shows the anterior to be the thicker owing no doubt to its greater contractions. Thus we have a very important factor in Vaginal pressure coming directly on the cervix and reflexly giving rise to contractions of the Vagina and, under certain

circumstances to Spontaneous expulsion of its contents. The question of Spontaneous expulsion of urine during labour is an interesting one. I have noted the following facts with regard to it.

1st I have never seen it occur except during a pain when, therefore, both urethra and bladder are on the Stretch. I have not observed it occur during a pain except under the following circumstances

a During the introduction of forceps when a pain occurs. In this case two factors probably are at work viz The removal of pressure from the urethra by the hand and 2nd the dynamic action of the hand in the vagina.

b. During internal rotation. when this occurs suddenly especially when it is taken low down in the pelvis.

c In women with a lax vaginal wall and also in whom the pubic segment of the pelvic floor is not sufficiently to drag the bladder out of the pelvis

d. In old multipara with a
flaccid urethra.
e In cases with a large pelvis
and a small foetal head.

Other causes may, no doubt, be at work in producing this I have simply indicated those which have come under my own personal observation.

A further discussion of this question would lead me away now the object of my present Study. We have seen the modus operandi of pressure effected by the uterine contractions on the bladder. We shall see further on what this pressure amounts to. In the meantime regard must be had to another source of bladder pressure during labour viz 3 from contractions of the abdominal walls. As the table shows the pressure during the second stage gives the highest readings and as during the second stage the membranes are ruptured and the head in the pelvis the abdominal contractions would seem to be the source of the greater pressure.

the influence of the abdominal muscles will be brought to bear directly on the bladder pushing it against the resistant body of the foetus for it must be admitted that the voluntary efforts although not confined to the foetal second stage usually are so and it is hardly possible to conceive that reflex contractions of these muscles will take place before labour is well advanced. It seems to be natural now to try to estimate the amount of pressure from these sources. A study of table 384 shows

1st. The lowest reading when the OS is but slightly dilated say to the size of a Shilling.

2nd An increasing amount of pressure with an increasing size of Cervix.

Now it appears to me that this enables us fairly to estimate the reasonably amount of pressure which may fairly be credited to the first two named factors. When the OS remains about the size of a shilling the contractions

of the uterus will alter its shape and so bring about pressure in the way I have previously described which on the cervix gradually enlarges the second element viz the dragging up of the cervix by the bladder will be brought into play. A reference to Table iii is sufficient to demonstrate this. This table shows the relation between bladder pressure and cervical dilatation and shows that the pressure on the bladder is in direct ratio with the increasing size of the cervix. That there are exceptions to this is only what might be naturally expected. With readings of single points under such circumstances absolute uniformity can hardly be attained but in the main the points indicated is proved. As I mentioned in an earlier part of this paper unusual rises in the readings are to be found here and there occurring through some accidental voluntary effort on the part of the patient. They must, therefore, be eliminated

Table iii

It will be observed that these
such high readings are rendered more
readily with undilated cervix. In such
of these cases there was some unusual
and uncalled for effort on the part
of the patient. These high readings
in pleurisy at the chest till after
there voluntary effort came in.
From the table I show it may be
assumed that the pressure during the
1st stage of labour i.e, with an undilated
cervix varies from .1 to 16 in. [1 to 6 mm]
These low readings occur equally in
primiparae and multiparae and were
taken, with the exceptions noted, when the
patient was still and on the back.
The increase of pressure, therefore, can
only be accounted for by the altering
shape of the uterus pressing the bladder
against the abdominal wall, or as it
has been in very early labour against the
Symphysis pubes and [redacted] as the labour
advances by the bladder being drawn
and pressed on by the cervix.
The following are examples of the

readings refer to -

Multiparae

cervix	reading
Shilling	· 4
Shilling	" 4
Florin	· 5

Primiparae

Shilling	· 1
Crown Shilling	· 2
Crown	· 3
Florin	· 3
Wineglass	· 6

It is striking that these readings correspond so entirely in Primiparae and Multiparae. It would, I think, be, à priori, expected that the readings even at an early stage would be greater in primiparae than multiparae. This is not the case. They are apparently the same. Presumably the walls of the ~~uterus~~ abdomen being more tense and unyielding in primiparae the uterus would have a firmer body to press against as the uterus grows. The

66

comparatively low abdominal walls of the multiparae. ~~It~~ The tubes, however, do not support this. It becomes necessary to look for an explanation of this. Now the relative position in primiparae & multiparae throws some light on the question. For while in the multiparous woman the head in early labour remains comparatively high in the primiparous woman long before labour has set in the head with the lower uterine segment has sunk deep into the pelvis. Hence what the primipara gains by time walls she loses by the fact that the head has sunk beneath the fundus of the bladder whereas in the multipara the whole lower uterine segment and the contained foetal head remaining high at or near the time the whole influence of the force-pressure and cervical dilatation come to bear on the bladder. It must be further kept in view that in condition

of moderate distension the pressure will not be against the yielding irregular abdominal walls but but invariably against the symphysis. This being the case it is not matter for surprise that the readings in both multiparae & primiparae should be the same.

I have not yet performed experiments to show whether the readings in multiparae & primiparae are the same with distended bladders where, of course, the pressure will be between the uterine wall on the one hand and the abdominal parietes on the other.

As will be seen from my tables in all my experiments the bladder was but moderately distended.

All the tables have a urine column in which this is indicated.

It becomes desirable to define the term distension a little more minutely

There are four conditions under which the bladder may be met with

1st A condition of Total Emptiness in which the bladder walls are in close apposition. This apposition during parturition will be one of anterior and posterior wall never of upper and lower as it sometimes the case in the non-pregnated condition

2nd A condition of moderate distension, when the bladder walls have begun to separate and take a definite outline A very small quantity of urine is sufficient to do this.

Neither of these conditions are recognizable by any special clinical feature. ~~Xxxx~~ Each can only be designated negatively.

3d A condition of distension

This differs somewhat in parturition and in the non-pregnant condition

For while 3xx may be regarded as a moderately distended bladder

in the non-pregnant condition half. litre quantity will be sufficient to produce moderate distension in the parturient woman. Further while 3 xx gives no clinical feature in the non gravid multiparous woman little more than 3 x will give the characteristic tumour supra-pubically in parturition. The cause of this has already been drawn attention to by Hahn and I have sufficiently referred to it in Speaking of the anatomy of the bladder

4th. A condition of over distension

Between moderate distension and over distension no absolute clinical line can be drawn but a simple x. mano-metric experiment will illustrate the point.

Given a bladder containing a quantity of urine not sufficient to stretch the walls to their fullest extent and given a certain external pressure on the viscera no effect need be produced on the mercurial column provided that the walls have still

Sufficient room to accommodate the
altered shape of the fluid mass.
But supposing with the same amount
of pressure as the bladder walls are
tense or have no room to distend
then such pressure will, at once, be
indicated on the Column.

Such a condition is one of distension
It comes to this that so long as the
resistance of the bladder walls is less than
the resistance of the column of mercury
the manometric readings will be unaffected.

The pressure of water on the bladder
flattens it antero posteriorly and so
long as the bladder can extend
longitudinally or transversely with less
pressure than is necessary to affect
the mercurial column the readings
with large and small amounts
will be the same

Suppose for example that the point
of over distension is say 3 XXX and that
the viscera contain that amount the
results will be different for, in that
case a very small pressure will

cause a high reading because owing to the rigidity of the walls the column of mercury will be more easily displaced than the vesical parietes

Table V

Table V shews this graphically
The abscisa shews the amount of urine while the ordinate shews the corresponding pressure and it will be found that the highest readings obtained were with quantities of urine varying from 3i to 3iv while with 3xiv and 3x ounces respectively the readings were comparatively low.
The former gave an average of 3in: while the latter gave an average of 1inch. So that mercury and, for the reasons I have just shown, it makes no difference whether the bladder contain much or little urine provided always the point of overdistension be not reached before pressure is applied

Conclusion.

The main points of this paper may be summed up as follows:—

1st That pressure is brought to bear on the bladder during labour

2nd That during the interval of pain bladder pressure amounts practically to 'nil'

3rd That in ordinary labour the maximum pressure is about 3·2 lbs on the Square inch.

4th That this pressure is obtained during the second stage of labour but that especially high readings may be got during the first stage when, by accident, any voluntary effort is interposed.

5th That in ordinary labour the minimum pressure amounts to ·1 lbs on the Square inch and that this is found during the

first Stage of Labour

6th That the average reading during the first Stage of labour amounts to :—

a, inclusive of accidental high readings
·92 lbs on Square inch

b, exclusive of accidental high readings
·42 lbs on Square inch

The latter may, therefore, be regarded as the correct estimate

7th That the average reading during the second Stage of labour amounts to
1·88 lbs on the Square inch

8th That when regard is had to the position of the bladder during parturition the Sources of the pressure are three :—

A. Change of Shape in the uterine ovoid

B. Stretching of the cervix

C. Pressure from the abdominal muscles

9th That of these three Sources that derived from the abdominal

walls is the result

10th That pressure exerts in no way to be influenced by the patient being primiparous or multiparous.

11th That the quantity of urine in the bladder does not influence pressure provided always the point of over distension is not reached.

The experiments from which the foregoing conclusions are drawn are presented in a tabular form in the accompanying volume and are arranged as follows:—

Table I

is a general statement of the experimental results showing

age, No of labours, commencement of labour, condition of OS and membranes, presentation & position, Situation of head, length of time during which the observations were conducted, No of Observations in each case, minimum rise, maximum rise, quantity of urine.

Table II

shows the experiments arranged in a descending series. The pressure being indicated in inches of mercury

Table iij

shows the experiments arranged according to the number and stage of labours

Table IV

shows specimens arranged according to the number of labours and the conditions of P & membranes.

Table V

shows specimens arranged according to quantity of urine in the bladder

Table VI

gives inches of mercury converted into pounds showing pressure per square inch of bladder area in undilated primiparae.

Table VII

Shows the same in dilated primiparae

Table VIII

Shows the same in dilated and undilated multiparae.

Note

It is well to point out that this maximum pressure viz 3·2 lbs represents the pressure brought to bear on the bladder by the powers of parturition through some part of the uterine contents not however on any of the points sustained by the girdle of Contact. If the girdle of Contact means, as I have always, by which is clear, the ring embraced by the largest Circumference of the foetal head I have at considerable length endeavored to prove that in ordinary labour, in the second stage, the bladder never presses any part of the girdle.

Note

It would seem at first sight an easy matter, given the pressure on one part of the pelvis to calculate the pressure on the rest. Such, if it were possible, would be a ready method of determining the resistance of passage and the force lost in

them. There are two difficulties

1st It is impossible to ascertain the amount of surface included in the girdle of contact

2nd The bracelet does not press parts of this girdle.

Note

It is a somewhat remarkable fact that the figure 3·2 lbs per square inch of bladder corresponds so nearly to Hamphton's 3·4 lbs per square inch as a result of the extreme force of the uterine contractions. It is necessary to point out that this is but a coincidence there being no relation either as to Cause or effect between the two pressures. The absence of relation between the two will become apparent when we consider

1st That Hamphtons figure represents the sum of uterine pressure brought to bear on the foetal head.

2nd The figure 3·2 as a result of my own experiment represents the maximum force brought to bear by the action of the voluntary muscle on the bladder

Funic Haemorhage during Labour.

Interference with foetal life through haemorhage from the placenta, whether it is praevia or in its normal position is of course well recognised and unfortunately of comparatively frequent occurrence.
Direct bleeding from the umbilical cord is, however, very rare and has received correspondingly little attention.
Such haemorhage may take place in cases where women are suddenly overtaken by labour and are delivered in a standing position.
In such cases the foetus falls to the ground and by its weight or the suddenness of its fall the umbilical cord is torn.
A result of this nature may take place at any part of the cord and sometimes even a portion of the placenta is torn out with it. The haemorhage is never great. The vessels retract. The edges of the wound are ragged.
How long would the bleeding is

always slight and in a case to term
there is often none at all. Umbilical
Haemorrhage of the newly born child has
long occupied a prominent place in
the medico-legal history of infanticide
as among those causes which destroy
the child by omission in contra-distinction
to its direct destruction by commission.

Haemorrhage of this kind is a
subject of interest for medical jurists
rather than for obstetricians.
As it can hardly be included under
Funic haemorrhage during labour
I propose in the Legal to discuss that
form of funic haemorrhage which is
apt to occur in case of faulty
insertion of the Cord into the placenta.

There are four insertions

1st Central

2nd Excentric

3d Marginal

4th Velamentous

of these insertions the excentric and
one central may be regarded
as the ordinary types while the marginal

and velamentous are abnormal and both concerned in producing the accidents of which this paper treats.

In a communication on the irregularities observed in the Cord Valentin gives the following data with regard to the relative frequency of the insertion of the cord of the cord.

Out 2471 labours in which the condition of the placenta was noted the cord was

Excentric	1950	times
Central	342	"
Marginal	158	"
Velamentous	21	"

The separation of the funic vessels previous to their entry into the placental substance — Insertio velamentosa — is a well recognised condition but its influence as a factor in the production of haemorrhage during labour has received comparatively little attention.

This is scarcely matter for surprise when the rarity of velamentous insertion of the cord is considered.

83

That it is but rarely met with may be gathered from the following facts

Sickel out of 502 deliveries

observed 3 cases

= 1 in 160

Cornelius found 1 per 1000

Chiari, Braun, Spaeth found

4 in 1835 deliveries

= 2 in 1000.

Chantreuil remarks on these figures that among them where specimens is most attended the proportion is even less

Valenta, as I have mentioned, gives

21 in 2471 cases

From the above figure I find that the average occurrence of this condition is nearly 5 per 1000.

Now if velamentous insertion in general is a condition so rarely met with in Obstetrics it follows that a disposition of the funic vessels on the membranes in such a way as to be a cause of haemorrhage must be a combination of the

hæmat. occurrence.

This is universally admitted to be the cause for while our English writers scarcely make any reference to the subject the latest writers of foreign text books viz Spiegelberg, Kleinwachter & Zweifel touch on the question very briefly in a sentence or two and all agree in remarking on its rarity

As bearing on the subject of fœtal hæmorrhage it becomes necessary to consider the arrangement of the vessels in Velamentous insertion.

The distance at which the vessels enter the membranes from the placenta is very variable

Hüter gives the following.

18 times 3 centimetres

2 " 3 "

1 " 4 "

Wrisberg mentions a remarkable case where the cord was fixed into the membranes exactly opposite the placenta.

Again it has been

observed that the vessels bifurcate
a very considerable distance before they
reach the membranes. The arrangement
of the vessels is of interest.

The umbilical vein after its separation
from the foetus and before it reaches
the membranes divides into two branches.
From these there are given off one
or two large veins.

When the principal branch reaches the
membranes it again divides into many small
branches. The largest of these is about
the size of a crow quill.

It is worthy of remark as bearing
on the subject of the present paper
that at the points where the branches
from the principal trunk is dilated
into a sort of sinus and further
that to the veinous and arterial trunks
are attached throughout of the same calibre
but at one point contract into small
tube and at another expand into
larger one. Such a condition favours
rupture.

When the umbilical arteries

reach the membrane they break up into numerous branches of varying calibre. This net work of vessels lies usually between two of the largest branches of the vein. It must further be observed that these vessels do not run straight on to the nearest point of the placenta but pursue a circuitous course traversing a large area of the uterine. This circumstance bears on the present subject increasing as it does, very considerably the risks of laceration and further increasing the chances of the development of this foetus being interfered with by pressure on the vessels from the passing ovum.

It is also a fact that the veins are more often than the arteries to pursue a devious course a circumstance favorable to the production of haemorrhage owing to the comparative thinness of the venous walls, their dilated and varicose condition, and their consequent greater liability to rupture

87

The actual insertion of a velamentous cord varies.

1st. It may be marginal i.e. the vessels may run off the membranes into the substance of the placenta at the rim

2nd. It may be eccentric i.e. the vessels may run over the placenta a considerable distance before they dip into its substance.

3d. It may occasionally be both marginal and eccentric i.e. One part of the funic root may run in at the rim while another may run some distance over the placenta before it finally dips into its substance

Hutin in his essay makes a suggestion as to the cause of development of the velamentous insertion. He points out that those who would account for the insertion of the cord into the placenta by the theory that the allantois is carried into the chorion only to the decidua serotina are in error. It is a fact

that is early over the whole chorion is surrounded by the vessels of the allantois. Hunter says that before the atrophy of the villi set in so as to differentiate the chorion frondosum from the chorion laeve there is one spot of the chorion richer in vessels than the rest. Here the vessels unite to form the umbilical cord. Obviously when this vascular spot is formed at the point where the chorion is united to the decidua serotina the cord will have its insertion into the placenta but on the other hand when the vascular spot is formed opposite decidua reflexa then the cord will be attached to a part of the chorion which at a later period will be bare. Hence the insertion will be velamentous.

Another explanation has been offered by Schultze in which he suggests that a defective rotation takes on the part of the foetus during the formation of the umbilical amniotic sheath may

account for this. In this way arises to adhesion between the endometary coat and cotton of the foetal membranes a depression sheath in the vessels and the vessels permitted to diverge are distributed to point more or less remote from the placenta

Such being the disposition of the umbilical vessels in relation to insertion of the foetus the enquiry next arises Is the condition accompanied by any special danger to the foetus?

Two sets of dangers have been described:—

1st during pregnancy

2nd during labour

It is with the latter that we are at present specially concerned.

A short reference, however, to the first set will not be altogether foreign to the subject.

It has been alleged by some authors that this condition interferes with the development of the child.

Chantreuil alludes to this and states that while in some cases he has observed the foetus to be ill-developed, in other cases it does not seem to suffer and is born. He draws a distinction, as far as regards this question between those cases where the separation is near the placenta and those where the distance between the separation and insertion is great. In the latter case the condition of the foetus is interfered with owing to the long and devious course which the vessels pursue: but especially because, in case of distant insertion, the vessels have to pass over a great portion of the circumference of the membranes they are pressed on proportionately by the growing size of the ovum. Whether this is the case or not I am not in position to say. Such a question can only be solved by the observation and record of cases.

In adding some slight support to the theory advanced I have seen two cases

of premature labour during my connection with the Maternity Hospital in both of which the insertion of the cord was velamentous and that for a considerable distance beyond the membranes placental. In both the foetus died and in one very much shrunken & shrivelled.

I have observed this also in a case of twins which occurred in the out practice of the Maternity during my term in 1880. Into a double placenta the second foetus was enveloped, and only survived a few while the first was vigorous and healthy. In the former the cord was velamentous and inserted marginally into the placenta. It is right to say that Crede repudiates the idea altogether and distinctly says that he has never observed that the encampment of the cord has any effect on the foetus whatever.

I now turn to the danger accompanying this condition of the cord

during labour

The main danger is haemorrhage

The relation between velamentous insertion and haemorrhage was recognised by Breisky. to whom belongs the credit of having first described Insertio velamentosa -

Solstein pointed out the relation between velamentous insertion of the funis and haemorrhage involving the death of the foetus

Benckiser in a thesis discusses velamentous insertion of the cord and specially refers to the relation between this condition and certain haemorrhages

Ahlfeld Web describes several cases of battledore placenta in which the funis was inserted into the membranes and where it divided into its vessels some distance from the edge and refers to tearing of these vessels with a torn placenta.

Hofer describes in his unpublished thesis velamentous insertion

of the cord the circulation ceases which such insertion may be a source of danger to the child. He points out that the insertion of the cord is seldom more than four or five inches removed from the border of the placenta. He draws attention to three points:—

I That when the cord is inserted into the edge of the placenta prolapse is apt to take place

II That if the vessels which are inserted into the membrane have their course at a distance from the Os uteri, the rent of the membrane will be out of reach of these vessels and the labour will in no way be endangered.

III If the vessels run in the lower segment they are apt to be torn.

Chaussier in an elaborate essay on the umbilical cord discusses inflammations among other disposition of the fœtus which interfere with pregnancy & labour and is the only

authors with whom I am acquainted who fully discuss haemorrhage produced in this way.

Doubleday refers to the subject shortly

Schroeder devotes a paragraph to the subject in which he shortly and succinctly describes the forms of haemorrhage

Ruge mentions several cases of abnormal disposition of the umbilical vessels and describes velamentous insertion as being a source of danger to the foetus

Spiegelberg, Kleinwachter, Zweifel each make a short reference to the subject.

The record of individual cases of velamentous insertion is frequent, but of those associated with haemorrhage I have been able to collect only the following

Poullet of Lyons records two cases, one in the fifth and the other in the sixth months of pregnancy, in both of which, without any previous

pains or the slightest indications of labour, the membranes suddenly ruptured. In both cases marked velamentous insertion of the cord was found. He argues that this condition is a cause of very early rupture, and may for this reason give rise to premature labour.

Plustal describes a case of interest. The umbilical end of a foetus, dead previous to delivery, was divided 15 centimetres from its insertion into the placenta. At the apex of the angle there was a varicose pouch as big as a hens egg. The walls were thin and torn. The haemorrhage had lasted three hours. The foetus was exsanguine.

Lamaestre records a case of normal labour except that there was a small quantity of blood lost during the labour. The child was born dead. Surprised at this, Lamaestre examined the placenta and found that the vessels of the cord were inserted into the membranes over whose surface they

crossed for a considerable distance
On making close enquiry of the patient
he found that just before the result of
labour she had an abundant haemorrhage
followed at once by active labour.
Denman refers to a case of Rupture
of the umbilical vein
Bailly showed a placenta to the
anatomical Society of Paris and said,
the cord separated in the Chorion
10 or 12 centimetres from the placental border
from this point the vessels spread
out and radiated over the membranes,
he distinctly added apparently in contrary
to his expectations, this disposition was
not fatal to the Child which was born
alive
Valenta relates a case of a woman
who was delivered of a child at full
term. The woman stated that the waters
escaped before labours pains set in, and
from that time till the completion
of labour there was continuous haemorrhage.
On examining the placenta it
was found to be six inches in Diameter,

and situated high in utero. The vessels were given off from its lower margin. Before uniting to form the cord they ramified on the surface of the chorion for about 4/2 inches. The cord measured 16/2 inches long. There were four veins running from the placenta, which formed two venous trunks. At their junction to form the main trunk there were two rents. There was also a slight rent in a small arterial ring there. The vessels were situated over the OS uteri and the foetus born dead.

Two cases have come under my own observation. The one in connection with the Maternity Hospital and the other some years ago in Private practice. The placenta from the first case was retained once a drawing made of it at the time. This drawing I reproduced as a chromo-lithograph.

Case I Mrs. H. a multipara fell into labour on Sunday 26th October Dr. Meachatie my then resident at the

Maternity Hospital sent for me as the presentation seemed to be somewhat abnormal. On examination I found the Os well dilated, the membranes unruptured and there distinct pulsating cords passing through between them. Beyond and within the membranes several coils of the umbilical cord could be felt floating free in the Liquor Amnii. The head was high up beyond reach. The woman had a pendulous abdomen. On careful examination we observed that the vessels were well apart, and that the Edge of the placenta could be felt low down on the left side of the Os uteri. The diagnosis was a velamentous insertion of the funis with one or two prolapsed coils and a slight placenta praevia. As the Os dilated there was some slight haemorrhage from the Edge of the placenta. We waited till the Os was fully dilated and then, as the woman was a multipara and no obstruction in the pelvis and as the head was high up beyond

easy reach of the forceps, we resolved to turn. I ruptured the membranes, during the interval of a pain, at a point between the vessels, and turned and delivered easily. The child was alive. The point of interest lay in the fact that the insertion of the cord was velamentous. The vessels coursed for some distance over the membrane before their final insertion into the placenta at its margin. As will be seen from the chromo-litho-graph the veins are the more tortuous. At the point where the first two trunks of the umbilical vein joined there was a rent caused either through my hand while turning or through the delivery of the foetus. It may have occurred at the time of rupture of the membrane. There was no escape of blood, however, when I introduced my hand into the uterus. The cord was 24 inches long and was marginal

Case II, of which I have but a brief note, occurred in private practice

A patient aged 40 sent for me as labour had been going on for some time and she was having very considerable haemorrhage. When I saw her the membranes were ruptured the head low down and haemorrhage ceased. Shortly after my arrival the child was born dead, pale and anaemic. The placenta was delivered easily with some clots in 10 minutes. I put the case down as one of accidental haemorrhage. On enquiry after I found that the membranes ruptured an hour before my arrival, and from their rupture until the time of birth the discharge of blood with or without liquor amnii was continuous. On examining the placenta I found a velamentous insertion of the cord. The vessels before reaching the placenta with the membranes from which they were attached separated and ran for three inches over the membranes. The vessels trunks were multilocular

as well as long and tortuous.
Two of them at their union were
torn apparently at the site of the
rupture of the membranes

Method of its production

It is only under exceptional
circumstances that relaxations
insertion of the foetal is associated
with haemorrhage. It may arise, firstly,
when the vessels forming the knot
as they expand forcibly and coming
over the membranes come to lie over
that segment which corresponds to the
OS uteri - such as Vasa Praevia.

Under such circumstances haemor-
rhage is not unavoidable, and long
enough if have the membrane rent
between them the child may pass
through the rent so formed and
the fluid continue injuring the foetal
vessels at all. The main demand of safety
will consist in the vessel running
a long course, for if the bifurcation
of the vessels take place within the
lumen of the cervix the rent will

involve the bifurcation where as I have pointed out the vessel is expanded and weak. Again, if the vessels are small and are well compressed by the foetal head as it passes, no bleeding takes place and no harm results. On the other hand, if the vessels are closely situate or short and if the membranes rupture near the side of the vessel one of them may be involved in the rent and the child die from haemorrhage. Under such circumstances the child is born blanched & anaemic probably dead with all the signs of loss of blood. In the alternative already mentioned where the vessels are compressed and haemorrhage in this way controlled the safety of the child is not secured. The foetus is further exposed to fresh risks for this very pressure may render the foetus asphyctic and so destroy it. Such a result may take place without rupture of a vessel at all,

and must be regarded as one of the risks attendant on the disposition of the funic vessels. It is indeed perfectly conceivable that such a result might take place without rupture of the membranes at all.

There is, however, a second condition as illustrated by case 2 where dangerous haemorrhage may take place from the cord more especially from the root. In such a case the placenta is situated low down at or near the margin of the os and the cord is inserted into the edge of the placenta.

Under such circumstances whether the insertion is velamentous or not the dilated end of a vessel may give way either from the effects of labour or from artificial interference with the labour. Here the presenting part is the funis, not, as in ordinary presentations of the cord a prolapsed loop but the root of the cord attached to a battledore and praevia placenta

Associated with this condition

the cord proper can be felt within the membranes and if not managed carefully may complicate the case by becoming prolapsed in front of the head and add to the risks of the child by being compressed.

This prolapse of the cord as an occasional complication of velamentous insertion of the cord has been pointed out by Scanzoni, Hunter and Credé and must be discounted in treating the case.

There is a third source of Fœtal haemorrhage to which little if any attention has been directed.

Such haemorrhage may arise from a set of vessels which Hyrtyl has depicted and described as Vasa Aberrantia.

The subject is deserving of some attention.

There varieties of these Vasa aberrantia are described by Hyrtyl

1st Real placental vessels.

2nd Subsidiary Vessels

3d Vasa Nutrientia Chorii

1st The Real placental vessels:—

They differ from the ordinary placental vessels to this extent that they do not run throughout their whole course along the concave surface of the placenta. They leave this surface and make excursion so to speak for a varying distance along the chorion beyond the margin of the placenta and return again to the placenta and pursue the course of ordinary placental vessels.

The veins seem only to end in this way with very marked eccentric insertion of the Cord. Hyrtl states that in Circumvallate and Bipartite placentae these vasa aberrantia are seldom if ever requiring. It is noticeable that the vas aberrans is always the first branch given off from the main trunk and that the more central the insertion the longer the vessel.

Although haemorrhage from rupture of such a vessel cannot be called strictly umbilical haemorrhage yet the effect on the foetus is the same and the source of the bleeding is foetal.

2.ly Subsidiary Vessels :—

These vessels represent the radiating vessels of the rest of the cord which run to a subsidiary placenta. It is striking that these vessels do not run to the nearest point in the rim of a subsidiary placenta. They run rather in the shape of a bow arching over to that side of the subsidiary placenta which is furthest removed from the main placenta. Such small subsidiary placentae are never separate from the main mass by any distances of chorion, but touch it in one or many indeed minute situations. Hystyl suggests a very ingenious explanation of the method by which this apparently remarkable arrange-

ment is effected. The subsidiary placenta was originally far removed from the chief placenta; a branch of the umbilical vein and artery was conducted to it. At this time the vessels went direct from the main placenta to the nearest point of the subsidiary gradually, however, by the growth of the placenta the chorionic villi became connected while at the same time the vessels are not shortened but bent in the form of a bow sidewise. Now if by the growth of the chief placenta the subsidiary comes in contact or is fused with it, and if the connecting vessels preserve their original length then the vasa aberrantia will run in this bow form through the chorion and appear as if connected with the further side of the subsidiary piece. Now such vessels if placed in convenient circumstances haemorrhage may take place. Here again the

haemorrhage is with difficulty from the umbilical cord but in so far as such vessels form a subsidiary and to a subsidiary placenta the haemorrhage is umbilical.

3. Vasa Nutricia Chorii :-
These vessels are very inconsiderable in size. They may be seen in early but are more numerous in mature placenta. They are obviously vasa aberrantia. They are fine thread like capillary tubes. In contradistinction to the vasa adda aberrantia already described they pursue a direct course. They are generally thirteen in number. Hystyl says that when these vasa nutricia are present in numbers they are associated with a thin rimmed placenta and in their absence the placental edge is thick.
I have only referred to them in order to complete the description of aberrant placental vessels but their small size and short course exclude them

as causes of any considerable haemorrhage.

The diagnosis will be easy, difficult or impossible according to the direction which the dissociated vessels pursue. If the placenta is in its normal position and if the vessels diverge and spread out high up in the uterus then any diagnosis of the condition must be an impossibility. In such a case there are no symptoms and no haemorrhage and the velamentous cord will only be required postpartum.

If, however, the vasa praevia or vas aberrans in their course over the membranes pass over the segment situate ab the os uteri. they will then be easily accessible to the finger and the vessels can be felt moderately thick and firm. Their number will vary. They may be spread out fan-shaped over the os: there may be one or two or perhaps but a single vessel.

They are apt to be and have been mistaken for the prolapsed and knotted cord. Specially it will be observed that the vessels cannot be pushed back into the ligneus annuli.

Haemorrhage, however, is the most important and serious symptom and may take place under any of the circumstances which I have already described. Still in the absence of the actual feeling of the vessels accurate diagnosis of the cause of the haemorrhage will be difficult if not impossible.

The time when the haemorrhage takes place varies very much for in some of the cases recorded it took place many hours before delivery and of course the longer before delivery the greater the danger to the foetus. Usually, however, the vessels tear just when the membranes rupture and the ligneus annuli escapes mixed to a greater or less extent with blood if the labour does not and shortly the result is the birth of a dead

attempting forceps.

The risks attending on this dissociated condition of the funic cord would be incomplete were no reference stated made to the occurrence of an accident during delivery which is fortunately rare.

It is scarcely likely to occur in the hands of a properly taught practitioner. It means rupture of the vessels during delivery of the placenta. If traction is made on the cord when the vessels are to dispersed from their size & relation and tenderness they are apt to give way.

Such an accident is likely to occur only in the hands of improperly taught midwives, so delivery of the placenta by means of traction on the cord is abandoned as contrary to the mechanism of labour. It is an accident of comparatively little importance. Its occasional occurrence with a vehement cord is an additional reason for impressing upon midwives the necessity for leaving the cord alone. Much doubt and awkward embarrassment might arise to the accoucheur when a

happened in a case recorded by Rhe-
dale where a velamentous cord and a
battledore placenta occurred with one of the
funes of a twin placenta through its
accidental tearing away from its attach-
ment.

Velamentous insertion of the Cord with twins
has been noted repeatedly

Chantreuil mentions two cases one
recorded by Sommer the other Perraud
M. Depaul presented to the Academie
de Medicin the placenta of Triplets
with Cord inserted into the centre;
second at the margin: third vela-
mentous

Treatment

In managing a case
where such a condition is present
the main point is to preserve the
membranes intact as long as possible
until the os is freely dilated so that
delivery may be effected with as
delay immediately after their Rupture

Paulli's case would seem to
show that early rupture in

is a likely accident to occur

To obviate the Scanzoni has suggested the introduction of an India rubber ball. This can scarcely be effected to as much good as prevention. Obviously if the membrane rupture while delivery is impracticable the child will bleed to death.

If a vessel is torn after rupture of the membrane immediate extraction by whichever method is practicable can be accomplished with much ease and rapidity is imperative in the interests of the foetal

After the case is once recognised frequent examination should be avoided, the patient kept quiet and dilatation of the os promoted by means of opium & Chloroform

Immediately on rupture of the membranes unless indeed the labour is very rapid delivery should be accomplished by forceps or turning according to the exigencies of the case.

Perhaps it may be well to add that in any case where death of the foetus has occurred the placenta & membranes should be carefully examined and it may be that fatal hæmorrhage will be found to account for some foetal deaths which, from want of examination have been referred to other causes.

Literature

1. V. Hüter "die velamentose insertion der Nabelstranges" mon. f. geb., 28., 1866. S. 330
2. Schultze quoted by Lusk Science and art of Midwifery p. 282.
3. Weisberg, Henri Auguste, "Commentab. de Secundinar. Humanar. varietate", Section 1, Obs 2., in Nov. commentab. Societ. Reg. Scient., Göttingen T 4, 1773, p. 63.
4. Lobstein "Notice sur une disposition des vaisseaux du cordon" arch. de l'art. des accouchements Strasbourg 1801 page 320
5. Buchner Robert de Pforzheim Thèse Heidelberg 1801
6. Hüter "Ueber die vorliegen der nabel schnur gefäss" neue Zeitschrift für geburt., 12, 1842 S 48.
7. Chambrelle Des dispositions des cordon ombilical.
8. Joulin Traité d'accouchements p. 986.
9. Shroeder English translation page 312.

10. Rüge "Einige Fälle von abnormen Verlaufen der placentar gefäße" Zeitschr. f. geburtsh. 28. 1866 S 330.

11. Spiegelberg Lehrbuch der geburtshülfe S. 571.

12 Kleinwächter Grundriß der geburtshulfe S. 434.

13 Zweifel Lehrbuch der operativen geburtshulfe S 324.

14. Poullet & Lyons Annales de gynecologie October 1879.

15 Pluskal "Haemorrhagie produite par la rupture d'une varice du cordon" Cas med 1844.

16 Lamaestre, Chantreuil op. cit.

17 Deneux memoire sur la rupture du cordon pendant le travail Paris 1870

18. Bailly Chantreuil op. cit.

19. Valenta Betz memorabilien B. 19 H. 5.

20 Scanzoni Lehrbuch B. 2. S 1867.

21. Hyrtyl "der Blutgefäße der menschlichen & nachgeburt in normalen und abnormen Verhältnissen"

On a complication of Occipito-posterior positions of the Vertex.

Though much has been written on the subject occipito posterior positions of the vertex offer a wide field for study.

The frequency of this deviation from the normal standard is sufficiently marked to stimulate us to trace out every complication which may accompany the position - without going into statistics beyond our own Hospitals I should like to draw attention to the fact that out of :-

414 births which have taken place in the Hospital since May 1879 up till the present time

59 occipito posterior positions have occurred

i.e. 1 in 7 or 14 per cent.

In the present study I wish to limit myself entirely into an enquiry into one of the complications

met with in this form of cranial position. It may be hereby stated that the complications of occipito posterior position resolve themselves into two sets:—

1st There met with in the first stage of labour

2nd There met with in the second stage of labour

During the first stage of labour occipito posterior position are unquestionably a common cause of delay. This Delay is no doubt, frequently wrongly incorrectly referred to simple rigidity of the cervix. In some cases there may be rigidity as a complication; but when the parts preserve their normal tone and elasticity, and when the head and pelvis are of normal size delay in dilatation of the cervix from the position of the head alone is by no means an uncommon occurrence. The explanation of this delay is not difficult

to discover. If a digital examination is made early in the first stage of labour, the finger will recognise, both the posterior fontanelle, and the anterior extremity of the sagittal suture. In other words, from the obliquity of the uterus and the resistance of the tissues in the back the occiput is carried against the ~~sacral~~ walls of the uterus and the sacral promontory and a certain degree of extension is the result.

Now, it seems that this degree of extension, this difficulty in completing flexion and of driving the flexed head into the pelvis and bringing it to impinge on the OS uteri — constitutes the main difficulty, in occipito posterior positions all through labour.

For the same reason the cervix suffers to a greater extent in occipito posterior than occipito-

12°

anterior position, the dilatation required in the one case being greater than in the other

Meigs says "when the vertex is to the front it enters the os uteri favorably, and hence through the orifice with a circumference of 10½ inches, or a circle of 3½ inches diameter; but when in a posterior direction, the latter rays acquire a circumference of 12½ or 13 inches

A further complication is met with in the second stage when the resistance of the pelvic floor is encountered and rotation takes place. Into any of these possibilities of rotation there is delay

1st If forward, there is double the distance to travel to that denounced in a 1st or 2nd position.

2nd If backward, the anterior force drives the head against the floor of the pelvis. The result is

instead of the head being pushed up from the floor of the pelvis and under the pubic arch, it rolls back into the hollow of the Sacrum under the Sacral promontory. Here again the essential thing to do is to obtain flexion. It is no part of my present object to discuss the important practical question which here arises, whether we can hope for a change spontaneously or by art. The main point is to secure flexion. But a third possibility may occur, again, as a result of want of flexion, that is, when the pelvic resistance behind prevents descent and flexion and when the head becomes jammed more or less transversely

It is to the result of the third possibility that the present Study has reference. Beyond the complications to which reference has been made the increased laceration of the perineum in these cases where the head is delivered persistently posterior whether spontaneously or

or by artificial aid must not fail to be mentioned.

The following cases are illustrative of the third variety of occipito-posterior positions viz those in which neither the anterior nor posterior rotations take place Spontaneously but where the head remains jammed between the lateral pelvic walls, and where, as a result, there is more or less extensive injury to the soft parts in the pelvis this injury being uniform in its location and nature

I. The first time the condition was brought under my notice was on beginning duty at the Maternity Hospital in August 1879.

I had been my habit ever since my appointment to the Maternity Hospital to examine each patient per vaginam on the 10th day post-partum.

I am aware that objections have been raised to such a procedure. That is not a fitting

opportunity to discuss them. I will only say that I have derived much valuable information from such examinations. In many cases I believe I have been able to give useful advice to the patient and certainly in no case am I aware of having caused the patient distress suffering or permanent injury.

Carried out with ordinary antiseptic care, with gentleness and with due regard to the patients feelings I am unable to appreciate the objections that have been raised. On the contrary I would strongly advocate a similar careful examination of pregnant such patients some weeks before delivery. Many complications might be foreseen and accidents avoided.

The first post partum examination I made on assuming duty in the Hospital in Bruges was on a patient who had been left over from the previous Incumbent.

The report by Drs Ramsay and Adams is as follows:—

August 6th Perineum torn down to within ½ inch of anus. On right side of pelvic wall, in the region of right ischial spine there is a distinct opening: its edges are smooth & incurved. It admits readily two fingers, is about one inch in length and its direction, as ascertained by a probe, is downwards & backwards. Through the opening the ischial spine can be felt

Left side normal.

Cervix forms but a slight projection: its edges are rapped and tender. It is bilaterally fissured, more deeply on the right side

Uterus normally situated

The examination causes no pain, except when the edges of the fissures are touched when the patient cries out.

The previous history.

The patient, a multipara in her 5th confinement, had a forceps case was delivered on the 28th July. The presentation was vertex, and the position R.O.P.

The 1st Stage was completed in 5 hours; 2nd Stage 3 hours. Owing to delay, forceps were applied and foetus delivered with backward rotation of the occiput.

On the patient's dismissal from Hospital, three weeks after delivery, the scars was still open and admitted a probe ab least 3/4 of an inch.

II. In private practice A primipara aged 21. Labour began at midnight. At 8. am I found the Os well dilated. Head R.O.P. Ag am membranes ruptured. At 9.30 the head had cleared the Os and was descending R.O.P, malposition marked. The pelvis was deep. At 1. Pm. as no progress was made a careful

examination was made by Dr Blackay and myself. the former the head extended, the occiput lying just over the right sacro iliac Synchondrosis in front of the oblique Diameter.

Forceps were applied and delivery easily effected.

However no attempt to rectify the position, but simple traction was made, resulting in the forehead coming under the arch of the pubes, and the occiput sweeping over the Sacrum and perinaeum

There was a considerable tear of the perinaeum,

The patient, it is to be observed, was in the 2nd stage from 10 till 1. a period of three hours

The perinaeum was stitched.

The patient required to have her urine drawn off for 3 days.

She completed her puerperium without any pelvic pain, but with a slight rise of temperature.

On 10th day stitches were taken

orbi, and a per vaginam examination made.

" Perinaeum healed

On right vaginal wall there is a deep sinus, edges smooth and bevelled. The wound easily admits the tip of the forefinger, and is sub-tender. On introducing a probe it is found to pass in one inch, direction downward & backwards. Through the wound the ischial Spine can be distinctly recognised. Muco purulent discharge present". At the end of six weeks:- "the wound is perfectly closed. There is still a deep furrow. I had occasion to make an examination a year afterwards and found the cicatrix well marked".

III An extern Hospital patient seen with Dr Macculloch, resident Physician Royal Maternity. The patient, a young Irish woman, a primipara had been in labour for 15 hours, 10 in 1st Stage, 5 in

the second.

The pains were strong and the head R.O.P. tending to transverse I applied forceps and delivered easily, not, however, without a considerable tear of the perinaeum.

There was backward rotation of the occiput.

The pelvis was a deep one.

The perinaeal tear was immediately stitched.

The puerperium was uncomplicated. On the tenth day I removed the stitches and found the following condition:—

Perinaeum healed

On the right pelvic wall there is a distinct laceration over the Sacro-Sciatic ligament and the ischial spine, admitting easily two fingers. The edges are smooth, but tender; a probe enters readily 2½ inches upwards. There is a considerable muco purulent discharge;

cervix deeply torn on the right side.
Uterus normal. With the further
history of the case I am unacquainted.

IV Private practice. A lady, who had
previously been delivered of her
first child by a friend in the
country, was recommended to me
by him for attendance during her
second confinement.

Her first delivery was aided by
forceps owing to backward position of the
occiput. I have no other particulars
concerning it: Her second labour
occurred on the 10th December 1879
when I saw her at 10. a.m. She having
been in labour since 10 the previous
night I found the head had passed
beyond the cervix and was R. O. P.
the posterior part of the head lying
over the right ischial Spine.
The outlet seemed small and the
pelvis deep.

At 12 noon I applied forceps and
delivered a persistent occipito posterior
head. The perinaeum, which had

been considerably torn in her first labour was not further injured.

On the third day she had difficulty in making water and on the fourth I had to draw it off with a Catheter this I had to do for several days.

As I was anxious to know the cause of the retention I made a vaginal examination and found:-

An old tear of the perinaeum on the right pelvic wall then is a deep laceration easily admitting two fingers: its direction is down and back: very tender: Left side normal. Cervix deeply torn on the right side

The edge of the cervical tear is flush with the vaginal roof.

There was no Constitutional disturbance worthy of note

The Vagina was well washed out twice daily with an antiseptic solution. At the end of six weeks the wound was rapidly closing but it was three months before it absolutely healed.

Her next confinement took place in December 1880. When I reached the patient the head was well down in the pelvis close to the vulva.

The patient who had always been averse to the attendance of a doctor only allowed the nurse to send for me after the (illegible) She had been in labour 10 hours, when she was very ill and desirous of having Chloroform administered.

I gave chloroform and as the head was small and well down on the perinaeum I allowed nature to finish the case.

The head was born occiput backwards half an hour after my arrival.

On the third day post partum she again complained of retention of urine. Before using the catheter I insisted on a vaginal examination which was permitted to with reluctance. I found the perinaeum without any fresh tear.

on the right pelvic wall I found a distinct depression of consistency sufficient to admit easily the tip of my forefinger. Its location was just over the side of the previous injury. The cervix was bilaterally lacerated, the right side being the deeper: otherwise the parts were normal

Before leaving the patient at this sitting I was allowed an examination when I found the tissues healing but not closed.

The records of these cases show a marked similarity. In each there is a special cranial position and a special pelvic lesion along with it.

Judging from the foregoing cases, given a right occipito-posterior position of the uterus, delayed in its rotation at a particular point in the pelvis, a more or less deep injury to the soft parts, resulting in a sinus is likely to occur.

Injuries and lacerations of the vagina are common enough in labour with a contracted pelvis

Schroeder has drawn attention thereto. Macdonald in a paper on occipito-posterior positions makes a short reference to lacerations of the soft parts. He writes as follows:—

"Of those which terminated face to pubes four of the mothers were primiparae and two multiparae" In these six cases which ended as face to pubes in one case only and that too a multipara did there occur anything other than the most trifling lacerations of the soft parts.

In this case the laceration which was not at all severe affected the back wall of the vagina without affecting the perineal tissues. It soon healed and gave no inconvenience.

Both Schroeder & Macdonald refer to these lacerations but give them no especial location in the

1361

pelvic cavity. They both further refer them to the use of the forceps.

Let us now proceed to examine the vaginal lesion as met with in the case recorded as well as its connection.

1. Its position. On the right side of the pelvis on a level with and including right ischial Spine

On passing the finger into the opening the Spine can be readily felt.

2. Its extent and direction

In the recorded case the lesion was pervious to three inches long and its direction in 3. downwards & backwards and in 1. upwards

3. Its formation

The head descends slowly, slightly extended in the left oblique diameter, until it reaches the floor of the pelvis. Here, arrested by the forward and downward inclination of the ischium and the elastic resilient posterior wall

of the pelvis attempts & throws the head forward. If the pelvis be normal and the head of average size, this is actually what takes place in the vast majority of occipito posterior positions. If, however, the ischial planes are nearly parallel, that is, if the normal slope is diminished, and if the ischial spines be prominent, as in the masculine or deep pelvis, then the advantage and cause of cavity rotation are lost. The head descends in the oblique diameter, the usual forward rotation is attempted, but the head becomes jammed over the ischial spine.

The head, somewhat flattened, becomes fixed, and the pressure so caused results in a sloughing which involves right ischial spine.

This mechanism somewhat resembles that met with in a rickety pelvis. In rickety mechanism consists in transverse

descent and retraction of the head, then to a certain modified effect that is what we mean with head; the depth and extent of the slough and sinus bearing a distinct reference to the length of time the head has remained fixed. It is clear, however, that but a short delay of the head in this particular position will cause a vaginal sinus of very considerable dimensions.

This is well brought out in Case II where, in a primipara, in whom 2nd stage was scarcely 3 hours, a sinus of 2 inches in length resulted. Now, these sinuses in this particular position are deeper and more marked than one would attach from the narrowness of the pelvis and the length of the presenting. This admits of explanation in the fact that the sharp prominence of the ischial spines afford a point and lever which the pectoral bulk of the

efficient force can be readily
effected. It can hardly be
matter for doubt that the majority,
if not all, of the cases of persistent
occipito-posterior occur in more or
less depressed pelves. The mere
fact of their repeated occurrence in
the same patient is, of itself, a
strong proof of this. The invariable
occurrence of the lesion on the
right ischium is a point to be
noted. In looking for an explanation
of this several points are to be
noted :—

I. Right occipito posterior positions
are more common than left.

II The occiput bearing on the
Right ischial Spine exerts a
greater pressure than the
biparietal bearing on the left

1st Because the occiput
is at first more promi-
nent than the biparietal

I say at first because the com-
pression which the head undergoes

in this position it seems that the head is pressed in in the antero-posterior diameter, and then the asymmetrical wedge shape of the head is obliterated, so that at the point of contact with the pelvis whether end of the head has an advantage over the other, both being equally steep.

2nd Because the pressure of the posterior pelvic wall will act more on the occiput than the sinciput, thus tending to drive the occiput forward.

3rd Because the occipital arm of the is the shorter of the cephalic lever and the pressure bears more directly on the force resisting it than on the force resisting the longer arm. Although, as the lever theory as accounting for flexion of the foetal head, has been ably combated by Professor Simpson, yet the lesion I have described would

seem to negative the condition assumed by Lahs in his conception of the mutual relations of the pelvic peritoneum and the foetal head.

Results. It must be admitted that in none of the cases I have recorded were the results to the patients serious, so far as the ultimate issue was concerned.

It is none the less true that such lesions may become of grave import.

1st. In two cases the patients suffered from retention of urine, requiring the use of the catheter.

This was, no doubt, due to the vaginal wound, in the same way that retention is observed resulting from perineal tears.

2d. The constitutional disturbance was small, and pelvic pain was in any way marked — so much so that, on such accounts, such injuries are very apt to be overlooked. This is what might be expected in a localized parametritis

3°= Such lesion greatly increase the risk of Septicaemia

4°= They may be the starting point of lesion and long continued parametritis

Two further points require notice:—

1st Did the forceps cause the injury?— I think not.

The history of case four at once conclusively proves that such an injury may occur without any instrumental interference: On the contrary, I believe,—

2nd that the prevention of this injury is to be looked for in early application of the forceps

If my explanation of the occurrence of this lesion is correct, then it is clearly bad practice to delay applying force to a partially rotated occipito-posterior head.

Why are these lesions not recognised?

a. Although, after a forceps case every careful practitioner will examine the vagina, yet he will probably fail to detect the lesion, as the opening, if there is one at all, will be very small, the injury being the result of pressure, and the slough not separating for some days

b. Because such injuries cause but little pelvic disturbance and the attention of the accoucheur is not attracted to the pelvis, and no vaginal examination being made, the injury remains undiscovered.

To Sum up:—

First. A partially rotated occipito posterior position is the most common of the various forms of occipito posterior position

Second Such an occipito-posterior position is usually associated with a degree

of minor disproportion of the pelvis

Third A very frequent, if not invariable result, is the formation of a more or less deep vaginal sinus.

Fourth The situation of this sinus is over the right ischial spine.

Fifth The extent and depth of the sinus depends on the length of time that the pressure has been exerted; though a very short period of pressure is sufficient to cause a sinus

Sixth These sinuses do not cause very much constitutional disturbance, and their existence is often overlooked because no vaginal examination is made.

Seventh The prevention of such injuries is to be

found in an early use of his forceps.