AN INVESTIGATION

into the

BACTERIOLOGY, SYMPTOMS, AND TREATMENT

of

PUERPERAL INFECTION.

by

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PREFACE.

I have been led to undertake the investigations, clinical and bacteriological, of which this thesis is the outcome, in the hope of being able to add something to the knowledge of the causation and treatment of Puerperal Infection.

I have for some considerable time been assistant Medical Officer at Monsall Fever Hospital, Manchester, and have, while there, been in charge of the wards set apart for the treatment of Puerperal Infection. Monsall Hospital is I believe, the only fever hospital in Great Britain where such cases are to any great extent admitted. I therefore felt that I had an opportunity which but few were privileged to possess.

At Monsall Hospital there is a very well equipped laboratory. It has therefore been possible for me to carry out the bacteriological investigations to be described in this thesis, without any loss of time.

In this way I have been able not only to exclude many of the possible sources of fallacy which might otherwise have arisen, but also to make use of the knowledge so obtained in the treatment and prognosis of the cases.

I have endeavoured in every case, to make a careful and complete bacteriological examination, both/

both of the uterine discharges, and of the blood of the patient.

For permission to carry out my investigations, and to use the material so obtained I am greatly indebted to Dr. Gordon the Medical Superintendent of Monsall Hospital.

I have endeavoured to find all references which seemed to have anything like a distinct bearing on the subject, and wherever the originals were accessible, I have consulted them. As the bibliography is a complete list of the authorities I have consulted, no reference is given in the text, unless it seems necessary to quote the authority for some statement.

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I.

INTRODUCTORY.

That the subject of Puerperal Infection is one worthy of the deepest interest will, I believe, be readily acknowledged when it is remembered that some 4,000 mothers of England and Wales fall a prey each year to the ravages of this terrible disease.

There is perhaps no subject in the whole realm of obstetrics which has been the cause of so much controversy as Puerperal Infection. The first question that naturally arises is, what is meant by the term Puerperal Infection. I have avoided the term Puerperal Fever for two reasons, firstly because it suggests that the condition is essentially zymotic in character, and secondly because it lays too much stress on what is merely one symptom of the disease namely the rise of temperature. The old view, so strongly urged by Fordyce Barker in the early seventies, that Puerperal Fever so called, is a specific zymotic disease like typhus and typhoid which, however, only attacks puerperal women, has now been almost entirely abandoned. There can however be no doubt that Puerperal Infection is of a highly infectious character. This fact receives abundant proof from the/

the records both of private practice, and of lying in hospitals. The term Puerperal Infection which I have preferred to that of Puerperal Fever, sufficiently emphasises the infectious character of the disease while at the same time it also points to the true nature of the condition, namely that it is a wound infection. I would define Puerperal Infection as any condition that results from the innoculation with Pathogenic organisms of a raw surface, anywhere in the genital tract due directly, or indirectly to parturition, either miscarriage, or labour at full time. It is, however, obvious from the diversity of the symptoms and lesions which occur that we have to deal, not with one disease but with many forms of disease differing widely both in their pathology and in their clinical features. Since this is the case it is necessary to have definite rules to guide one in asserting or denying the presence of Puerperal Infection in any particular case.

In accordance with Section III. of the Midwives Act of 1902, a Central Midwives Board is constituted with powers somewhat analagous to those of the General Council of Medical Education. The regulations of that Board have the force of law when approved of by the Privy Council. One of the rules framed by the/

the Central Midwives Board reads thus - "A medical "man must be sent for by the midwife on the occurrence "of a rigor, or of a temperature of 101.4 with "quickening of the pulse for more than 24 hours." Here then is a brief but terse statement of the grounds on which one should be, if not certain, at least suspicious, of the onset of Puerperal Infection. I may say in passing, that I believe this clause alone will be simply invaluable in the prevention of severe cases of Puerperal Infection when, in the course of time, it has to be obeyed by all midwives.

It is then, generally accepted at the present time that the nature of Puerperal Infection is one of true wound infection.

II.

The materials and methods employed in the bacteriological investigations.

My investigations into the bacteriology of Puerperal Infection have been conducted in two directions; (1) The examination of the blood by cultivation, for the purpose of discovering the presence of micro-organisms, and (2) A similar examination of the uterine contents and discharges.

(1). The examination of the blood.

In procuring the blood of the patient for cultivation, I have followed, more or less closely, the methods employed by Dr. Thomas Horder. I use a 10.c.c. syringe made entirely of glass; the piston, barrel, and nose piece into which the needle is fitted, being made in separate pieces. The needles are of moderate size and very sharp, so that they pierce the skin and vein wall with great ease. A flask containing a one per cent solution of citrate of sodium, and the various culture media are the only other requisites. In each case the following culture tubes are innoculated, peptone beef-broth four tubes, sloped agar peptone two tubes, and nutrient gelatine two tubes.

The methods of procedure is as follows. The blood/

blood is obtained from a vein in the anticubital fossa and the arm chosen is usually the left one, as that is found to be the more convenient, occasionally however the veins are more prominent in the right arm, in which case that is the one chosen. The skin over the anticubital fossa is well scrubbed with soap and water, and a one in twenty carbolic soak is applied for a short time. The arm is now ready for the puncture.

The syringe is now boiled, care being taken to put it on in cold water as it is made of glass, and is therefore liable to crack if put direct into hot water. After boiling it is left in the water in which it was boiled. While the syringe is boiling the solution of citrate of sodium should also be boiled. The arm is then allowed to hang down for a minute or two over the edge of the bed or operating table as the case may be, and two or three turns of bandage are passed round it, well above the elbow, tight enough to compress the veins but not tight enough to act as a tourniquet. In this way it is usually possible to make the veins stand out distinctly. The syringe and needle are now fitted together, the piston and nose piece being removed from the hot water first/

first, so that the contraction on cooling may affect them before it affects the barrel. In this way no time is lost in fitting them together. The solution of sodium citrate is now cooled to about blood heat, and sufficient is drawn up into the syringe to fill the needle and nose piece. The object of this is to exclude all air from the syringe, and also to prevent too rapid coagulation of the blood. The carbolic soak is now removed from the arm, and the vein to be punctured is fixed upon, if no vein is visible it is usually possible to feel one under the skin.

The needle is pushed sharply through the skin in a vertical direction, not immediately over the vein but slightly to one side of it, then being held parallel to the surface of the skin, it is gently pushed into the vein in a direction opposite to that of the blood stream. If the vein is successfully punctured, the blood immediately flows into the needle and nose piece of the syringe.

The piston is now gently withdrawn and the syringe fills. When sufficient blood has been obtained the needle is removed, and the arm is raised, while a compress is applied to the site of the puncture. In this way all bleeding is immediately arrested. The amount/

amount of discomfort caused to the patient by the whole proceeding is surprisingly small. Nevertheless, in those cases in which an anaesthetic is administered for the purpose of examination or curetting, I usually wihtdraw the blood while the patient is still under its influence. In such cases I cut down on the vein, not deep enough to cut it but merely to expose it, and then proceed as before. The possibility of skin contamination is thus rendered more remote, and the process is quicker and more reliable.

The requisite amount of blood having been obtained, it should be transferred without delay to the various culture tubes. In the case of one peptone agar, and one nutrient gelatine tube, sufficient blood is squirted in, to cover the medium when the tube is held in a horizontal position, and in the other peptone agar and nutrient gelatine tubes, more blood is placed and allowed to collect at the bottom of the tube. The beef-broth tubes are innoculated with blood varying in amount from a few drops to three or four cubic centimetres. The object of having different dilutions of blood is (1) to dilute any antibodies which may be present and prevent the growth of organisms and yet (2) to have a good bulk of blood in one or two tubes/

tubes so that if the organisms are very scanty they may still be cultivated. I entirely agree with Horder that these different dilutions are of purely theoretical value, for I have never found organisms growing in the tubes where the blood has been well diluted and not in those tubes containing much blood. If a growth occurred in one tube and not in the others I should be highly suspicious of contamination having occurred in some way or other.

After innoculation the broth tubes are rolled between the hands to insure mixing of the blood and the broth, and are, along with the other tubes, conveyed to the laboratory and placed in an upright position in the incubators. The broth tubes must be left absolutely undisturbed for a few hours, at the end of which time the blood has clotted, leaving a transparent clot suspended in the broth. In this clot colonies of any organism that may be present develope as isolated masses. The cultures are examined every twenty four hours for a week, and film preparations are made, stained with Carbol Fuchsine or Gram's stain, and examined microscopically.

(2) The examination of the uterine contents and discharges.

This/

This is carried out as follows :- The patient is placed in the lithotomy position, a speculum is introduced into the vagina and the cervix is seized with two pairs of volcella, and pulled well down. A sterile swab on a sponge holder is then passed into the uterus, the utmost care being taken to avoid contamination from the vulvae, vagina etc. The swab is moved well round the interior of the uterus until it is soaked with the uterine discharges, it is then carefully withdrawn and the culture tubes innoculated. This process is carried out while the patient is under the influence of the anaesthetics, when an anaesthetic is given for purposes of examination or treatment. The culture tubes employed are, peptone beef-broth two tubes, peptone agar two tubes, nutrient gelatine two tubes, blood serum agar one tube and MacConkey and Hill's medium one tube. The composition of the last named is as follows :- sodium taurocholate, glucose, peptone, and water with sufficient neutral litmus solution to give it a distinct colour, the medium is placed in Durham's fermentation tubes. I used this medium to aid in the identification of Bacillus Coli Communis which reddens the medium and ferments the glucose, so that gas collects/

collects in the fermentation tubes, in this latter respect B. Coli differs from B. Typhosus which it otherwise closely resembles. The change takes place rapidly and the result is therefore of great use in diagnosis and prognosis. One broth tube and one agar tube I use for anaerobic cultivation. All peptone beef-broth, peptone agar, and serum agar tubes, are cultivated at a temperature of 37°c, the gelatine tubes at 22°c, and the MacConkey and Hill at 42°c.

For purposes of anaerobic cultivation, the method I employ is to absorb the oxygen of the atmosphere by means of alkaline pyrogallic acid and in this way to cultivate the organisms in an atmosphere of nitrogen. Buchner's tubes are very convenient for this purpose. They consist of a large strong glass tube sealed at the bottom, large enough to take a test tube culture, and having a constriction about an inch and a half from the bottom. The test tube culture is placed in the Buchner's tube and is supported by the constriction, a strong solution of pyrogallic acid is now run into the bottom of the Buchner and by means of a thistle funnel an equal quantity of twenty per cent caustic potash solution is added to it. A tightly fitting rubber cork is then/

then applied to the mouth of the tube which is placed in an incubator kept at 37°c.

In all cases where doubtful or mixed cultures occur I make plate cultures for the purpose of isolating and identifying the organisms present. In preparing plate cultures, three tubes of nutrient gelatine are taken and the medium is melted by placing the tubes in a bicker of hot water. Tube No. I. is then innoculated with the merest trace of the culture to be examined, the tube is well shaken to insure thorough mixing of the culture with the medium. Tube No. II. is now innoculated with two or three loopfuls taken from tube No. I., and after mixing thoroughly two or three loopfuls from tube No. II. are added to tube No. III.. Thus a very dilute solution of the culture is obtained. This is poured into a sterilised Petri capsule and allowed to spread evenly over it. The capsule is then cultivated at 22°c. and the resulting growths examined under the low power of the microscope. In this way pure cultures can easily be obtained even in cases of mixed infection. Films can be made from these and the organisms can be submitted to further tests to aid identification.

In/

In some of the cases where I obtained streptococcus pyogenes in the cultures I endeavoured, as far as possible to differentiate them according to the tests suggested by M. H. Gordon of the research laboratory of St. Bartholomew's Hospital. The nine tests applied, consisted in innoculating certain media with the organism to be differentiated, and noting the reaction produced during its growth. They were as follows.

1. The question as to the clotting of litmus milk within three days when incubated at 37°c.
2. The reduction of neutral red broth during incubation anaerobically for two days at 37°c.
3. The production of an acid reaction in three days, aerobically at 37°c. when cultivated in slightly alkaline broth containing one per cent of saccharose.
4. The same but containg lactose.
5. The same but containing raffinose.
6. The same but containing inulin.
7. The same but containing salicin.
8. The same but containing coniferin.
9. The same but containing manite.

The results I have drawn up in a table similar to/

to those shown by Gordon. This table will be found on page 21.

In each case I re-examined the streptococcus, in the differential tests, after it had been in culture for varying periods. I have always found that such streptococci respond to the tests in exactly the same manner each time.

Unfortunately I have had no facilities for the innoculation of living animals, so that I cannot make any statement with regard to the degree of virulence possessed by any of the organisms that I have isolated. Before concluding the present chapter I want as briefly as possible to describe a few experiments that I carried out with antistreptococcic and anti Bacillus Coli serum. The serum used at Monsall Hospital is prepared by Messrs. Burroughs Wellcome & Co., and it is claimed by them that it is bactericidal in its action. I have endeavoured to put this to the test by the following experiments, the test being applied to three different strains of streptococci derived from three different patients, and to one strain of Bacillus Coli Communis ;- I took five tubes, each containing 10.c.c. of peptone beef-broth. To tube No. I. I added 1.c.c. of the antiserum, to tube No. II/

II. ½c.c., to tube No. III., four minims, to tube No. IV., two minims. while tube No. V. was used as a control tube, no serum being added to it. Each tube was next innoculated with the organisms against which the serum was to be tried, and incubated at 37°c. The tubes were examined and fresh tubes sub-cultured from them. This was done daily for a week, the results obtained at the end of that time being accepted.

In three cases two of streptococcus pyogenes and one of Bac. Coli Communis, no growth occurred in any of the tubes containing serum, while a copious growth was obtained in the control tubes to which no serum had been added. In the third streptococcal series, the organism grew freely in all the tubes except that to which 1.c.c. of the serum had been added.

The next step was to take the control tubes in which there was a copious growth add 4.c.c. serum to them and after leaving them for eight hours to subculture them, I found that no growth occurred in three of the subcultures while, the subculture from the third streptococcal case again showed an abundant growth. It is a fact worth noting that the patient/

patient from whom this third strain of streptococcus was obtained, died, while the three patients from whom the other organisms were obtained, all recovered.

It was suggested to me that possibly horse serum itself apart from its having been immunised to certain organisms, might have the power outside the body of preventing the growth of organisms, or that the preservative in the serum might be sufficiently strong to prevent growth. The fact that growth did occur in one case in which serum had been added is sufficient in itself to disprove this. But to place the question beyond doubt, I carried out the same series of experiments using normal horse serum which I procured from Messrs. Burroughs Wellcome & Co. I found that in no case was growth prevented except in that tube to which 1.c.c. of serum had been added. As regards the preservative, the serum contains not more than .6% of either carbolic acid, or Trikresol that is to say in 8.m of serum or about $\frac{1}{2}$c.c. there is not more than about $\frac{1}{20}$ m of the preservative. Now in my experiments the tube to which $\frac{1}{2}$c.c. of serum was added contained 10c.c. of broth that is about 160m, that is to say I was dealing with a solution of $\frac{1}{20}$ m of carbolic acid in 160m of broth, that is about 1 - 3,200.

I/

I made solutions in broth of both carbolic acid and Trikresol about 1 - 2,000, and found that the organisms grew quite freely in both.

The antistreptococcus serum I used in these experiments was one obtained from a horse that had been injected with twenty strains of streptococci, and the anti Bacillus Coli serum from a horse injected with six strains of B. Coli, all the organisms having been obtained from cases of Puerperal Infection.

These experiments seem to prove that the serum has the bacteridical properties claimed for it, when it is tried against organisms, of the same brand so to speak as those against which the horse was immunised. I do not however wish to lay too great stress on these results as they are dependant on two or three cases only. The fact that one strain of streptococcus was able to grow in spite of the serum seems to be an additional proof of the existence of different species of streptococci.

The following table shows clearly the results obtained in the above experiments.

TABLE I.

CASE	ORGANISM	SOURCE	Tube 1. 1 c.c. serum	Tube 2. ½ c.c. serum	Tube 3. 4m. serum	Tube 4 2m. serum	Tube 5 control serum.
rs F.H. No.3	Streptococcus	Blood	-	-	-	-	+
rs E.D. No.4	Streptococcus	Blood	-	-	-	-	+
rs M.H.H. No.12	Streptococcus	Blood	-	+	+	+	+
rs E.C. No.16	Bac. Coli.	Uterus	-	-	-	-	+

III.

The organisms causing Puerperal Infection.

Among the organisms more commonly described as giving rise to Puerperal Infection are the following:-

1. Streptococcus Pyogenes.

Practically all observers who have examined the contents of the uterus in cases of Puerperal Infection, are agreed that the streptococcus pyogenes is the most important organism concerned in the causation of that disease. This is true not only because the streptococcus is the organism most frequently found, but also because it produces the most severe forms of the disease.

"In the commoner and slighter forms of puerperal "pyrexia", says Galabin, "streptococci are not "uncommonly present. In the fatal forms of puerperal "septicaemia they are present with few exceptions "either alone or associated with other organisms."

Bumm found streptococci in the uterine secretion of 22 out of 166 or 13.3 per cent of lying in women who had a temperature over 38°c. Kronig published statistics in 1895 showing that streptococci were present in 52 out of 296 or 17.6 per cent of lying in women with a temperature over 38°c.

He/

He also showed however that in 179 cases of undoubted puerperal endometritis which he examined streptococci occurred 75 times that is 41.9%. Whitridge Williams found streptococci in 44 out of 150 or 29.4 per cent of cases in which the temperature rose to 101°F., or higher, during the first ten days of the puerperium. Foulerton and Bonney have recently published statistics of 54 cases in which fever followed either miscarriage or labour at full time, and was attributable to infection of the generative tract. They found streptococci present in 25 of these cases that is 46.2 per cent. My own results are almost identical with this as I found streptococci in 14 out of the 30 cases that I examined, that is in 46.6 per cent. I attribute the discrepancy in the figures obtained by various observers to the fact, that, where a high per centage of streptococcal cases has been found, the cases examined have for the most part been of greater severity than those in which a low per centage was obtained. I would take this opportunity of stating that the cases admitted to Monsall Hospital are almost without exception cases of a very severe nature. The less severe cases occurring in Manchester are either considered too slight for removal to hospital, or are never notified at/

at all as cases of Puerperal Infection. With this fact in view, I have been forced throughout this thesis to modify many statements which would otherwise have been much more emphatically insisted on.

In my experience the streptococcus pyogenes is the organism above all others which is concerned in producing true Puerperal septicaemia. It is the organism that can most frequently be cultivated from the blood of patients suffering from Puerperal Infection. I examined the blood of ten of the fourteen cases in which I obtained streptococci from the uterine discharges, and in eight of these ten the organism was found to be present in the blood.

Under the generic term of streptococcus are included many different strains of cocci which differ in the toxines which they produce and in their reaction to various media. These different strains require different anti-serums if they are to be effectually counteracted by such means. It is this fact that has made the treatment by anti-serums so much more difficult, and has caused serum-therapy to fall into disrepute among practitioners.

I have already described the tests which I applied in attempting to differentiate the strepto-cocci in the various cases that came under my notice. I now append a table showing the results obtained.

Table II.

CASE	SOURCE	Clot	Neutral Red	Sacch-arose	Lac-tose	Raff-inose	Inul-in	Sal-icin	Coni-ferin	Man-nite
rs. F.H. Case 3	Blood	-	-	+	+	-	-	+	-	-
	Uterus	-	-	+	+	-	-	+	-	-
rs E.D. Case 4	Blood	-	-	-	+	+	-	+	-	-
	Uterus	-	-	-	+	+	-	+	-	-
rs F.E.M. Case 5	Blood	-	-	+	+	-	-	+	-	-
	Uterus	-	-	+	+	-	-	+	-	-
rs M.H.H. Case 12	Blood	-	-	+	+	-	-	+	-	-
	Uterus	-	-	+	+	-	-	+	-	-
rs. R.H. Case 14	Blood	-	-	-	+	-	-	+	-	-
	Uterus	-	-	-	+	-	-	+	-	-

It is interesting to note that, though streptococci from different cases have given different results, yet in each case the organisms isolated from the uterus and from the blood have given identical results.

2. Staphylococcus.

It is stated by Whitridge Williams that staphylococcus pyogenes aureus is the particular form of this organism that is usually present, and that staphylococcus pyogenes albus, and citreus, appear to play but a very small part in the causation of Puerperal Infection. Foulerton and Bonney however found staphylococcus pyogenes aureus only once while albus they found in twelve out of 54 cases usually associated with other organisms, but once in pure culture/

culture. With regard to my own results, I found staphylococcus pyogenes aureus in pure culture in two cases, in one of these it was also present in the blood. In one case I found staphylococcus pyogenes albus associated with streptococcus pyogenes.

Fehling and Haegler maintain that the staphylococcus gives rise to a mild form of infection. Where the staphylococcus has not been associated with other organisms, this seems to be the case. Both my cases in which staphylococcus was obtained in pure culture, made a good recovery in spite of the fact that in one the organism had reached the blood. The case in which streptococcus was also present proved fatal.

3. The Gonococcus.

In 1893 Kronig reported nine cases of mild infection in which he was able to obtain pure cultures of the gonococcus from the uterine discharges. More recently he has stated that he was able to isolate the gonococcus from the lochia in 50 out of 179 patients who were feverish during the puerperium. This figure is much higher than that obtained by most observers, and Whitridge Williams places the figure as low as five per cent. Leopold, Neuman, and many other writers describe cases of Puerperal Infection/

Infection due to the gonococcus, while on the other hand Foulerton and Bonney failed to isolate it in a single one of their cases. I myself have in three cases been able to get pure cultures of gonococcus.

It is usually stated that the gonococcus gives rise to mild forms of infection. Of Krönig's 50 cases not one ended fatally. I cannot claim to have been so fortunate however, for in one of my cases death resulted. This appeared to be due however, to what may be looked upon as an accident, apart from the nature of the organism all together, for the patient developed general peritonitis due to sudden rupture of a pyosalpinx into the peritoneal cavity. The patient died within 24 hours of admission. This case was one of great interest because it is held by many authorities that peritonitis does not occur in gonorrhoeal cases; now in this case the gonococcus was the only organism that could be found. The other two cases in which I obtained gonococci made a good recovery.

4. Bacillus Coli Communis.

As is only to be expected when the close proximity of the rectum to the genital tract is remembered, this organism is comparatively frequently found. It is stated by Foulerton and Bonney and some other observers that/

that this organism gives rise to a mild form of infection, with this view I cannot agree. I believe the Bacillus Coli to be capable of producing very severe forms of Puerperal Infection, not infrequently involving death or a very prolonged convalescence. I have found this organism in seven cases, three times in pure culture and four times associated with other organisms. Of these seven cases, two died, two had pyaemia, one had a pelvic abscess with a prolonged convalescence, and two made a good and fairly rapid recovery. I have been greatly puzzled by the complete failure of my attempts to cultivate Bacillus Coli from the blood, while I have several times succeeded in cultivating it from the pus removed from pyaemic abcesses. It seems certain that the organism must be conveyed in the blood stream to various parts of the body and yet in none of my blood cultures have I ever succeeded in growing it.

5. Unidentified Bacillus.

That Puerperal Infection may sometimes be due to a bacillus with which we are not familiar, has been clearly proved by the researches of Whitridge Williams, Kronig , Doleris, and others. In one of my cases I got a pure culture of an aerobic bacillus which I was/

was quite unable to identify, but which certainly was not Bacillus Coli.

6. Pneumococcus.

Weichselbaum, Barr and Tissier, have recorded cases in which this organism occurred, and recently Foulerton and Bonney claim to have isolated it in six of the 54 cases which they investigated. I have never found this organism in the uterine discharges of any patient that has come under my charge.

7. Diphtheria Bacillus.

It is usually accepted that the so called "Diphtheritic membrane" seen on the cervix and vaginal wall in cases of Puerperal Infection, is due to the Streptococcus pyogenes and not to the Klebs-Loeffler bacillus. Nisot, Bumm, and some other observers have however succeeded in some cases in cultivating the latter organism from the diphtheritic membrane, thus proving that it may occasionally be truly diphtheritic in character. In those cases which I have examined in which membrane was present, I found streptococci only and I have never succeeded in cultivating the Klebs-Loeffler bacillus from such a case.

8. Bacillus Aerogenes Capsulatus.

This/

This organism is said to occur occasionally, Stewart and Ernst among others have described it. In 1900 Welch wrote an exhaustive review of the literature of this subject and pointed out that the air bubbles sometimes found in the blodd vessels of women supposed to have died from air embollism are often the product of this organism. It is an organism of which I have no personal experience as it has not occurred in any of my cases.

9. Sapraemia.

There seems to be considerable confusion in the use of this term. In its literal sense it should include only those cases in which the disease is due, not to the invasion of the tissues by organisms which may grow and multiply and pass into the blood stream, but rather to the absorption of ~~tissues~~ toxines produced by saprophytic organisms growing usually in pieces of retained placenta or membrane. In such cases the organisms are anaerobic in character. Kronig reported having found anaerobic organisms in thirty-two out of the 179 cases that he examined. Most other writers however, are of the opinion that Puerperal Infection can only rarely be attributed to anaerobic organisms, and that a careful examination of the lochia in cases of so called sapraemia would in/

in most instances reveal the presence of some form of pathogenic organism. Bumm found streptococci in eight cases out of eleven that were supposed to be cases of sapraemia.

Foulerton and Bonney only succeeded in growing anaerobic organisms in one out of their 54 cases, and in that one it seemed certain that the bacillus was merely a secondary infection added to a primary streptococcal one. Unfortunately in some ten of my cases I omitted to carry out anaerobic cultivation, but in those cases in which I did employ anaerobic cultivation, I have never once succeeded in detecting true anaerobic organisms. It is possible that in some of those cases, in which I did not succeed in cultivating any organism whatever from the lochia there may have been anaerobes present, but if so I failed in my attempts to cultivate them. In several cases that I would class clinically as cases of sapraemia I have been able to cultivate streptococci from the retained products in the uterus.

In concluding this chapter I append a list showing clearly the relative frequency with which various organisms occurred in my investigations, which were conducted in thirty cases admitted to Monsall Hospital as cases of Puerperal Infection.

Streptococcus pyogenes	10
Streptococcus and Bacillus Coli.....	3
Streptococcus, Bacillus Coli, and staphylococcus pyogenes albus.....	1
Staphylococcus pyogenes aureus.....	2
Bacillus Coli Communis.....	3
Gonococcus.....	3
Unidentified aerobic bacillus.....	1
Absolutely sterile.....	7
Total No. of cases	30

My results agree with those of other observers in the large preponderance of cases in which streptococci have been found. They differ from those of Foulerton and Bonney mainly in two respects (a) the pneumococcus has never been isolated and (b) gonococcus has been isolated in three cases. In other respects they are very similar to the results obtained by Foulerton and Bonney.

IV.

The modes of infection.

"In every pyaemic process", says Burdon Sanderson. "You may trace a focus, a centre of origin, lines of diffusion or distribution, and secondary results from the distribution; in every case an initial process, from which infection commences, and from which the infection spreads, and secondary processes which come out of the primary one."

So in puerperal fever there is always a centre of origin from which the infection spreads, and secondary results arising from the spread, unless held in check by suitable treatment. The centre of origin in such cases is a raw surface somewhere in the genital tract. I first propose to discuss the question of how this raw surface is produced and how it becomes innoculated with organisms, and I shall then consider the complications arising from the spread of the infection so produced.

In most women who are giving birth to a child for the first time, and not infrequently in those who have born children already, there is during parturition some laceration of the perineum, vulvae or vagina, such tears may be the site for the entrance of organisms.

Frequently/

Frequently the cervix gets split during labour; this is more particularly the case when forceps have been used, especially if they have been applied too soon, before the cervical canal has fully dilated. The raw surfaces produced by the splitting of the cervix often become innoculated with organisms unless great care be taken to cleanse them thoroughly, and if possible to repair the laceration. In a large number of the cases that have come under my care at Monsall there has been considerable laceration of the cervix.

Lastly and most important, there is the interior of the uterus itself. When one considers the condition of the uterus immediately after delivery, with its raw surface, and large gaping and thrombosed placental sinuses, it is easily understood that any organism entering the cavity of the uterus during labour at once finds a suitable nidus for its growth.

It not infrequently happens that some portions of the placenta or membranes are retained in the uterus after labour, and they may form the soil in which organisms grow, and from which spread of infection to the uterus is an easy matter. Puerperal Infection is slightly commoner in primiparae than in multiparae; this/

this is but natural, for there is necessarily greater stretching of the parts in the former, and so greater risk of laceration occurring.

The next point to be considered is, how do the organisms reach the raw surface which they are to infect. It is generally accepted at the present time that the large majority, if not all, the cases of infection are caused by the introduction from without of pathogenic organisms into the genital canal. Semmelweiss as long ago as 1861 stated this fundamental truth, though of course the true nature of the infection by means of micro-organisms was quite unknown to him. "I consider", he says, "Puerperal fever, not a single case excepted, as a resorption fever caused by the resorption of a decomposed animal organic material. The first result of the absorption is a change in the blood, and the exudations are the result of this change. The decomposed animal organic material which when resorbed causes child bed fever, is brought to the individual from without in the great majority of cases, and this is infection from without. These are the cases which represent the epidemic child bed fever. These are the cases which can be

prevented. The bearer of the decomposed animal organic material is the examining finger, the operating hand, instruments, bedclothes, atmospheric air, sponges, the hands of midwives, or nurses which come in contact with the excrement of women sick with puerperalfever, and after that handle pregnant and parturient women. In other words the bearer of the decomposed animal organic material is anything which is soiled by a decomposed animal organic material and comes in contact with the genitalia of these patients."

These words of Semmelweiss practically contain in a nutshell, the various ways in which organisms are introduced into the genital canal. The examining hand of the doctor or midwife in attendance at the time of delivery must bear the blame of most of the cases of Puerperal Infection. Forceps or other instrument, if not properly sterilised, may be the means of introducing organisms, while in some cases it is obvious from the delay in onset of symptoms that the infection occurred, not at the time of delivery, but at a later date, and is due to vaginal douching so often practised by midwives during the puerperium, dirty bedclothes, etc.

The/

The importance of the atmospheric air as a possible source of infection is strongly urged by some authorities. Playfair quotes several cases in which he believed sewar gas to have been the cause of infection; he goes on however to say that in one case removal of the patient to better sanitary conditions produced immediate amelioration of the symptoms. This does not to my mind prove that sewar gas was the cause of infection as the disease when once started would not have been cured by the removal of the patient from the atmosphere contaminated by sewar gas. There seems to me to be no positive evidence that the air is ever the source of infection. I believe that the atmospheric air is of importance in so far that, if it is contaminated, it acts as a predisposing cause of infection by impairing the patient's general health, and so lowering her power of resistance to organisms that may get implanted in the generative tract.

The relation which Puerperal Infection bears to other fevers is a subject that has been the cause of much discussion. There is considerable evidence to show that puerperal fever often results when a lying in woman is attended by a doctor already in attendance/

attendance on a case of Erysipelas. This will occasion no surprise when it is remembered that most bacteriologists of the present day, believe that there is practically no difference between the streptococcus pyogenes and Fehleisen's streptococcus erysipelatis, which may easily be carried from the patient suffering from erysipelas to the genital canal of the lying in woman.

Concerning scarlet fever, it should be held in mind that it too, in all probability is caused by a streptococcus. ~~In scarlet fever the throat is usually the centre from which infection spreads.~~ It seems to me quite conceivable that the organism from a case of scarlet fever may, if it reaches the genital tract of a parturient woman, give rise to a true form of Puerperal Infection. On the other hand there is no doubt that women may, during the puerperium, contract scarlet fever which runs the ordinary course without any symptoms of Puerperal Infection whatever.

In the case of the other zymotic diseases, even where the specific organism, streptococcus or otherwise, is not conveyed to the genital canal, nevertheless the acquirement of a zymotic disease during the puerperium lowers the resistive power of the patient, and so renders her an easy prey to any organism/

organism that may reach the uterus.

It is still held by some authorities that in some cases the infection is due to organisms that were present in the genital tract before the onset of labour. Infection resulting from such organisms receives the name of Auto-infection. The question of the possibility of auto-infection can only be decided by careful bacteriological examination of the secretion from the genital tract in the pregnant and nonpregnant conditions. The results of such examination have been differently stated by different observers. It is now generally agreed that the interior of the uterus either pregnant or nonpregnant, is entirely devoid or organisms. The work of Gonner, Doderlein and Winternitz, seem to have placed this fact beyond doubt. In the case of the cervix there is more doubt; Walthard found that organisms were present only in the lower third of the cervix, and other observers have failed to find any at all. Foulerton and Bonney on the other hand, found organisms present in the cervix of 19 out of 39 patients whom they examined, but who were suffering from cervical catarrh. It may of course be claimed that these women were not in a state of perfect health and that therefore/

therefore the results obtained cannot be accepted. The vagina then is the only part of the canal left to be considered. Steffeck held that micrococci were present in the vagina of about half the number of pregnant women not previously examined digitally. On the other hand, the work of Krönig and Menge, and Bergholm, Williams seems to have proved conclusively that under normal conditions pathogenic organisms are not present in the vagina of pregnant women, but that there may be present certain organisms, aerobic or anaerobic, which while not actually pathogenic are yet capable of causing slighter forms of infection. In fact, so far from a healthy vagina containing pathogenic organisms, it is certain that the vaginal secretion has a bactericidal power, and the gonococcus appears to be the only organism that can live and thrive in it. To sum up then, if auto-infection is to occur in any but the mildest forms it must be due to organisms present in the cervical canal and while it is impossible to disprove that infection in this way may occur, it is usually regarded as being very rare. The only other possible form of auto-infection is that due to the presence of gonococcus.

From a practical point of view the cases that come into Monsall are divided into two groups.

(1) Those in which the infection has occurred at the/

the time of delivery, due to the introduction of organisms into the genital canal by the hand of the midwife or medical attendant or by means of the blades of forceps or other instruments used. In these cases the disease usually shows itself in from 2 - 6 days after delivery.

(2) Those cases in which the infection has occurred later due to the entrance of organisms at a later date. In these cases the medical attendant cannot be held to blame. I believe that Bacillus Coli Communis frequently finds entrance into the genital canal from clothing fouled by faeces.

It is a fact worthy of note, that by far the greater number of the cases admitted to Monsall, have been attended by a midwife and not by a doctor, and of those cases in which a doctor has been present at the time of delivery, nearly all have been cases in which forceps have been used, or some other active interference has been necessary on the part of the medical attendant. This large preponderance of midwives' cases is at first sight very striking, I do not however attach too much importance to it, for I feel that it is to a large extent due to the fact that many doctors will not notify cases of Puerperal Infection occurring/

Infection occurring in their practices, but prefer to treat them at home and, in the event of a fatal termination, to certify them as having died of pneumonia or some such disease.

V.

The symptoms and complications.

The symptoms of Puerperal Infection vary in severity according to the kind of case with which one is dealing. The old division of cases into sapraemia, septicaemia and pyaemia has many advantages, if the terms are not regarded too literally. As I have already pointed out, some observers deny the existence of sapraemia, if that term be confined to its literal meaning namely, a condition in which the organisms present are true saprophytes. In the same way the term septicaemia, if confined to those cases in which organisms are actually present in the blood must not be applied to many cases which clinically are indistinguishable from true cases of septicaemia. For, if these terms are to be used in their strict literal sense, it will be necessary to invent new names, (a) for those cases in which pathogenic organisms, while not present in the blood, have nevertheless invaded the actual tissues of the uterus, and (b) for those cases where pathogenic organisms are present in the retained decidual products but have not yet invaded the tissues of the uterus.

The/

The three terms sapraemia, septicaemia and pyaemia are undoubtedly useful for clinical purposes and therefore, while quite recognising their limitations, I have adopted them.

1. Sapraemia

In the first class of case the infection is due to the absorption of chemical products produced outside the tissues of the body, either by true saprophytes, or by pathogenic organisms which are facultatively saprophytic. There is a condition of septic intoxication as distinct from septic infection; to this type I apply the term sapraemia. The onset of symptoms occurs within forty-eight hours of delivery and is due to the retention within the uterus, of portions of placenta or membranes. The lochial discharges are abundant and foul smelling. The first symptom that causes alarm is a rigor and this is accompanied by a rise of temperature to 102° or 103°F. The pulse is quickened, the rate being 110 to 120 per minute or even more. The patient sweats considerably, and becomes more or less prostrated. On examination the uterus is found to be large, flabby, and tender, and to contain a considerable amount of retained products. On the removal of these the symptoms subside and the patient makes an uninterrupted recovery/.

recovery. I have never seen a single fatal case of this type.

2. Septicaemia.

In cases belonging to this class the disease is due to septic infection i.e. there is actual invasion of the tissues of the uterus, by pathogenic organisms which will, if not checked, spread and pass into the blood stream. In such cases the lochial discharges remain quite sweet; this fact only too often throws dust in the eyes, not only of midwives, but even of medical men, for many regard foul smelling discharges as a "sine qua non" of puerperal sepsis; so far from this being the case however, I regard foul smelling lochia as a rather favourable symptom since they point to a cause that is readily removable, namely retained products in the uterus. The onset of symptoms is usually later than in the first type, occurring about the second to fifth day, but as in the first type it is marked by a rigor accompanied by a sharp rise of temperature. The rise is often very high 105° to 106° and not infrequently it is maintained for some time. The pulse becomes very rapid, upwards of 120 and often as high as 150 per minute. There is also a sweetish odour in the breath/

breath a sign which I have come to regard as of considerable gravity. There is usually a marked degree of anaemia and the lips, gums and tongue are covered with sordes. Occasionally there is a yellowish tinge in the skin which must be regarded as an ominous sign, telling as it does of the actual destruction of the blood cells. Delirium is frequently present occasionally maniacal in character, but more frequently of the low muttering type so often seen in typhoid fever. In some very severe cases the patient has an extraordinary sense of wellbeing which, if associated with serious symptoms, should be regarded as a very bad sign. On examination the abdomen is found to be distended and the uterus unduly large and very tender. It is often found that there has been a good deal of laceration of the genital tract, the perineum being torn and the cervix split. On exploring the interior of the uterus, one finds its walls soft, flabby and rough, there is a distinct endometritis but little if any retained placenta is to be found. The milk is occasionally completely suppressed. The patient is generally constipated though in the more severe cases diarrhoea of a very persistent and uncontrollable character may intervene.

The/

The prognosis in such cases is much worse than in cases of the first type.

I regard cases that are due to the presence of Bacillus Coli Communis as really belonging to this type though the onset of symptoms is usually later, namely the sixth to the twelfth day after delivery. I believe such cases to be of a very serious nature often ending fatally or leading to pyaemia and a very long period of convalescence.

3. Pyaemia.

It is an open question whether pyaemia should be regarded as one of the types of Puerperal Infection or should be classed as a complication. It usually results from the infection of thrombi at the placental site and subsequent inflammatory changes in the vein. These thrombi break down and small pieces are carried into the circulation and may give rise to metastatic abscesses in any part of the body. The onset presents much the same features as the last type of case but is marked by the recurrence of the rigors once every twenty four or forty eight hours. During each recurring attack the temperature runs up very high, to 105F. or even higher; the rigor itself is followed by very profuse sweating during which the temperature falls rapidly. Undoubtedly however, the most striking feature/

feature of these cases is the formation of metastatic abscesses in various parts of the body. The commonest situations for such abscesses are (1) the cellular tissue especially in the limbs, (2) the joints, (3) the lungs and (4) the liver.

An abscess forms without giving rise to any pain or uneasiness, when occurring in the cellular tissue or joints its presence is recognised by a patch of reddening over the skin with a doughy feeling of the subjacent parts. The number of such abscesses that may form in one patient is very remarkable. In the case of Mrs. E.M. No. 15, which I have described, upwards of 20 abscesses had to be incised in various parts of the body, and a case previously in Monsall had upwards of 60 incisions made.

Before proceeding to discuss the complications of Puerperal Infection, I want to say a word or two about the condition of the blood in that disease. Examination of the blood may be bacteriological or cytological. I have already described the methods that I employed in the bacteriological examination so that I shall here content myself with giving the numerical results obtained. I examined the blood of 23 women suffering from Puerperal Infection, in nine organisms/

organisms were present, and in fourteen the blood was sterile. In eight of the nine cases in which a positive result was obtained, the organism present was the streptococcus pyogenes, and in the remaining one it was staphylococcus pyogenes aureus. In seven of the fourteen cases in which the blood was sterile, no growth was obtained in the cultures from the uterine discharges, in two infection was due to the gonococcus, in one to the Bacillus Coli, in one to the staphylococcus pyogenes aureus, and one to an undentified aerobic bacillus, and in only two was the streptococcus pyogenes the cause of infection. That is to say that in eight out of ten cases of streptococcal infection in which the blood was examined the organism was found to be present in the blood.

The cytological examination is of considerable help in determining the stage to which the disease has advanced and in estimating the progress which the patient is making. Unfortunately I have not had any opportunity of examining the blood of women during pregnancy, at full time, or during a normal puerperium. However it is, I believe, generally recognised that there is distinct physiological leucocytosis during pregnancy. Henderson stated the average number of leucocytes per cubic mm., that/

that he found after examining a large number of women at full time, to be 21,000. Most other observers place the average considerably lower. The increase in the number of leucocytes during pregnancy is greater in primiparae than in multiparae. Cabot reports a case in which the count was 36,000 though the patient was apparently in the enjoyment of perfect health. Hibbard and White give the averages as, primiparae 15,000, and multiparae 11,700 per cub. m.m. In a normal puerperium the number of leucocytes falls fairly rapidly and evenly during the first week, more slowly during the second week, while in the third week it should reach its normal level. It will easily be seen that it is impossible to draw correct conclusions from a single leucocyte count during puerperium. If the counts are repeated some guide may be obtained from the results. A steady rise in the leucocyte count from day to day frequently indicates the presence of septicaemia, while a sudden rise in the number of leucocytes denotes the formation of a localised abscess. The differential count is not of much value in this condition as the relative increase in the polymorpho-nuclear leucocytes which occurs in septicaemia and suppuration, also occurs in the normal increase in pregnancy/

pregnancy and in the puerperium.

Though one cannot learn a very great deal from the leucocyte count, the changes in the number of red cells and the amount of haemoglobin may be of great value in determining the condition and progress of the patient. No reduction in the number of red corpuscles and in the haemoglobin should take place during pregnancy if the general health of the woman is well maintained. There is however, in the large majority of women some slight reduction, the red cells falling to about 4,000,000 and the haemoglobin to 70 per cent. The amount of reduction during the puerperium naturally depends to some extent on the amount of bleeding that occurs at the time of delivery. The red cells do not as a rule fall below 3,500,000 or the haemoglobin below 60 per cent. At the end of the second day after delivery, the red cells and haemoglobin begin to increase and shouldreach the normal by the end of a fortnight. In cases where infection occurs this regeneration is arrested and there is a fairly rapid reduction. This goes on at the rate of about 50,000 red corpuscles and 5 per cent haemoglobin per day. In the case of Mrs. E. W. case No. I. the red cells fell to 1,700,000 and the haemoglobin to 22 per cent and several more of my cases/

cases showed a very marked reduction both of red cells and of haemoglobin. The general rule is that the haemoglobin falls more than the number of red cells, that is to say the anaemia produced is a simple secondary anaemia. Where counts are made daily the cessation in the fall of the red cells and haemoglobin marks the turning point in the case, and the patient at once begins to improve. In most of the cases that have come under my care the blood count has shown signs of improvement within a week of admission, or else the case has ended fatally.

The complications of Puerperal Infection.

Endometritis.

Although I mention this as a complication, so common is it, that I regard it rather as a symptom of the condition. It is unquestionably the lesion that occurs most frequently in Puerperal Infection.

General peritonitis.

In by far the greater majority of cases of Puerperal Infection which terminate fatally, death is due to general peritonitis. Streptococci and other organisms may spread rapidly from the interior of the uterus to the peritoneal surface and may there give rise to inflammatory changes. This is by many authorities regarded as the usual channel of infection, but/

but in many cases peritonitis may result from the escape of pus from a diseased fallopian tube or from the rupture of a paremetric or ovarian abscess. In my experience this has been the commoner cause. Of the seven deaths that have occurred in my series of thirty cases, five have been due to peritonitis in three of these cases (cases9, 14 and 21) there was a pyosalpinx with pus exuding from the end of the tube into the peritoneal cavity. In one case (Mrs. C.W. 30) a parametric abscess burst into the peritoneal cavity setting up general peritonitis which proved fatal within twelve hours. This occurred in a patient who on admission seemed to be rather a mild case and in whose uterus and blood no organism was found. In only one case (Mrs. J.W. case 7) did the peritonitis appear to be due to the spread of the organism from the interior of the uterus to the peritoneal surface.

The symptoms produced are simply those of general peritonitis resulting from any other cause. There is acute abdominal pain with marked tenderness, the patient lies with her knees drawn up and resents any handling of the abdomen. The pain which is very severe may be distinguished from the after pains of labour /

labour by the fact that it is continuous. The abdomen becomes distended and tympanitic and ceases to move in respiration. The patient has a pinched and worried expression of face, and the pulse which is at first hard, small, and wiry, soon becomes soft, feeble and very rapid. Vomiting is not uncommon and the vomited matter may in severe cases be blood stained or even faecal in character. As a rule the bowels are constipated, but in some bad cases there is marked diarrhoea. In some of the very worst cases pain and tenderness of the abdomen are absent and the patient feels pretty well. Abdominal distension and a rapid feeble pulse with possibly diarrhoea are in such cases the only manifestations of the condition. As death approaches the extremities get cold and the patient exhibits "floccitatio" and "subsultus tendinum". It is stated that if the peritonitis does not prove rapidly fatal, masses in some instances may be felt in the abdomen, due to the matting together of coils of intestine. In one of these masses an abscess may form which points, either externally in the abdominal wall leaving a sinus that long continuous to discharge, or into the intestine, vagina, or bladder. I have never had the good fortune to see a case of puerperal peritonitis that has/

has lived long enough to suffer from this complication.

Parametritis or Pelvic Cellulitis.

This is usually due to the spread of organisms from the uterus through the lymphatics to the connective tissue around the uterus. Lymph is effused and a mass forms that can be felt in one or other broad ligament. The patient is said to lie with the leg on the affected side drawn up and to be unable to straighten it without pain, I do not however consider that this sign is at all reliable in the diagnosis of the condition. On vaginal examination a mass can be felt just to one side of the uterus in the position of the broad ligament; this mass is usually very tender to the touch. There is often found to be a tear in the cervix on the same side as the mass in the broad ligament, and it seems probable that in some cases at any rate, pelvic cellulitis arises from the spread of infection from such a tear in the cervix. If suppuration does not occur the mass becomes harder and less tender and is gradually absorbed. In the case of Mrs. L. T. No. 26, I was able to follow the absorption of such a parametric mass from day to day. When suppuration occurs, the patient gets fever of the hectic type and loses her appetite, and her condition generally suggests the formation/

formation of pus somewhere. The fever may subside and the pus become encysted and absorbed, or on the other hand as occurred in the case No. 30 already mentioned the dividing wall may rupture and the pus be poured into the peritoneal cavity and there set up general peritonitis. In the case of Mrs. M. J. J. No. 2 the pus formed in a parametric abscess tracked through the great sacrosciatic notch and pointed over the sacrum.

Perimetritis or Pelvic Peritonitis.

This condition usually to some extent accompanies the last and is due to the spread of infection from the cellular tissues to the peritoneum covering it. The symptoms resemble those of general peritonitis but are not nearly so severe, the pain and tenderness being confined to the pelvic region. There is board like induration of the roof of the pelvis; the uterus is firmly fixed in the centre, and there may be local swelling in the neighbourhood of the uterus due to the matting together of coils of intestine, fallopian tubes and ovaries. On vaginal examination the uterus is felt to be fixed and there is found to be bulging in the lateral fornices and often in the posterior fornix. Suppuration may occur but is not

nearly/

nearly so common as in Parametritis, A certain amount of pelvic cellulitis and peritonitis occurred in a large number of my cases.

Salpingitis and pyosalpinx.

are usually due to the spread of infection from the uterus along the fallopian tubes causing inflammatory changes in them, followed sometimes by suppuration. Occasionally the inflammation may result from the spread of infection to the tubes through the lymphatics. The enlarged tubes can be made out on Bimanual examination.

Phlegmasia Alba Dolens.

This condition is due to two causes (1) Extension of infection from the pelvis through the lymphatics to the cellular tissue around the great vessels of the thigh and (2) to thrombosis of the veins of the thigh extending from thrombosis of the pelvic veins. Probably both elements exist in most cases. The condition is characterised by swelling of one or both legs, which are tender and brawny, and do not pit on pressure. If a vaginal examination is made there is usually found to be some degree of pelvic cellulitis. Rigors are frequent and there is great irregularity of the temperature./

temperature. Recovery may take place without abscess formation or the condition may become one of pyaemia which I have already described. Mrs. E.M. B. case 23 illustrates the condition of phlegmasia alba dolens very well. In the case of Mrs. E.D. case 4 there was well marked thrombosis of the veins of the leg but no lymphatic changes were observed.

Abscess of the uterine wall.

This is an extremely rare complication but as it occurred in one of my cases I have felt obliged to mention it.

In 1904 Lea described a case in which a large abscess formed in the wall of the uterus. Laparotomy was performed and the abscess was opened and the patient recovered. Infection in this case was due to the gonococcus. In the case of Mrs. M. J. H. No. 21, laparotomy was performed and general peritonitis found. The uterine wall was seen to be the seat of several abscesses, these were not opened as the general condition of the patient was so very bad that the case was hopeless. At the post mortem examination the whole uterine wall was found to be riddled with small abscesses, and it was clear that nothing short of hysterectomy would have been/

been the slightest use, and that operation would have almost certainly killed the patient immediately and on the table. Infection was in this case also, due to the gonococcus and the pus in the various abscesses was found to be crowded with gonococci.

VI.

The treatment of Puerperal Infection.

I propose to consider treatment under two heads (1) prophylactic and (2) curative. The treatment of Puerperal Infection is but too often the shutting of the stable door after the steed has been stolen, and there is probably no condition in the whole realm of medicine in which the old adage, "prevention is better than cure", is truer or more worthy to be constantly borne in mind. There can be no doubt I think, that Puerperal Infection is to a very large extent a preventable disease. I have already pointed out that except in an almost negligible minority of cases, the infection comes from without and is due to lack of care on the part either of the medical attendant, the midwife or the patient herself. My work recently however, has been conducted, not in a lying in hospital, but in a hospital for infectious diseases, where part of my duty has been the treatment of puerperal infection. I feel therefore that in this paper I am more concerned with the curative treatment of a serious condition than with the prophylactic measures necessary to prevent its occurrence. Nevertheless I feel so deeply the extreme/

extreme importance of careful attention to asepsis on the part of those who are in attendance on lying in women that I feel constrained to refer briefly to those measures which, if carefully carried out, would I believe render Puerperal Infection a very rare occurrence even if it failed to stamp it out altogether.

That the untrained midwife is one of the most potent causes of Puerperal Infection, and as such, should be abolished there can I think, be little doubt. There are at the present time in the British Isles thousands of midwives whose knowledge of sanitation, antiseptics and infection is absolutely nil. This class of woman must be abolished and in its stead must be placed a class of well trained nurses. Infection is frequently carried by the midwife from one patient to another. Two of my cases form a striking example of this fact. Mrs. E. A. case 19 was admitted to Monsall Hospital a few days after M. L. case 18; both these cases in infection was found to be due to the staphylococcus pyogenes aureus, and on inquiry it was found that Mrs. E. A. was attended by the midwife who but four days previously had been in attendance on M. L. These were the only cases in my series in which staphylococcus pyogenes aureus

was/

was found.

It would be well were it possible to adopt the plan adopted during the epidemic of 1892 - 93, on the recommendation of Dr. Williams the Medical Officer of Health for Glamorgan County, namely that each midwife, after attendance on a case of Puerperal Infection, should not be allowed to attend another confinement for two months. Some such plan is necessary not because it is impossible for a midwife to disinfect herself properly, but because with the present class of midwives it is impossible to teach her how to disinfect, and to impress on her the importance of such disinfection.

All practitioners who have much midwifery in their practices readily admit the difficulty of taking proper precautions especially among the poorer classes. Nevertheless it is well that all should have an ideal which it should be their object to come as near to as circumstances will allow of. The woman about to be confined should be placed in the best hygienic condition that her station in life will permit of. Her diet, exercise, and daily life should be regulated so as to maintain her general health and increase her power of resisting infection

to/

to the highest possible pitch. Care should be taken to see that the parturient woman is not to be confined in a bed already infected in any way. It is recorded in Public Health for 1893 that one man lost three wives from Puerperal Infection, and on investigation it was found that all three had been confined in the same bed which had not been disinfected. The only way to prevent infection occurring in this way among the lower classes, is to see to it that the bedding and clothing of every puerperal case shall be thoroughly disinfected and the room also carefully cleaned. Cases are also recorded of Puerperal Infection occurring in women lying in, in a bed previously used by a patient with scarlet fever or some other infectious disease.

With regard to the conduct of the labour itself, Berry Hart says, "When summoned to an obstetric case the medical attendant begins his struggle with infection on laying hold of his obstetric bag." It is not my purpose here to enter into any elaborate method for the sterilisation of the hands, but rather to indicate generally, the measures necessary to prevent the introduction of organisms into the genital tract. The external genitals should be carefully cleansed/

cleansed before any examination is made, and obviously great care must be taken to insure the thorough disinfection of the examining finger. While avoiding as far as possible, hurting the feelings of the woman, it is advisable to expose the parts in making examination, as in this way there is much less risk of carrying in organisms from the bedclothes and external genitals. The examination made should be as thorough as possible and subsequent examinations should be avoided. Many obstetricians now are advocating the use of rubber gloves. These certainly render the risk of hand contamination much less but it is urged by some authorities that the sense of touch is considerably impaired by their use. That gloves do at first interfere somewhat with the sense of touch I readily admit, but after a little practice I believe one learns to feel sufficiently accurately for the purpose, I myself have become quite accustomed to them and always wear them in making vaginal examinations.

The use of forceps plays no small part in the causation of Puerperal Infection. I have found that in many of the cases admitted to Monsall, where the doctor was present at the time of delivery, forceps have been used and almost always considerable laceration/

laceration of the vagina and cervix has occurred. When forceps are to be used the utmost care should be taken to render them perfectly sterile and almost as important, application before the cervix has fully dilated, and undue haste in delivery, should be avoided. In this way risk of laceration of the cervix and innoculation of the raw surface so produced, is considerably diminished. Premature manipulation of the uterus to expell the placenta should be avoided, since it tends to favour retention within the uterus of some portion of the placenta or membranes. When expelled, the placenta and membranes should be carefully examined to ascertain that no part of them is left behind. All lacerations of the genital tract should when possible be immediately repaired.

After completion of labour the external genitals should be covered with an antiseptic pad, care being taken in every way to prevent contamination from faeces. Antiseptic pads should be continued for at least a week after all discharge has stopped.

With regard to vaginal douching, I believe it should be avoided either before, during or after labour, unless there be some special indication for/

for its use. In ordinary cases I believe it to be, not only unnecessary, but actually harmful, since it has been proved that the vaginal secretion has distinct bactericidal properties and if it is removed the resistive power of the patient is decreased. Vaginal douching especially when done by a midwife is often the means of carrying in organisms instead of washing them out.

In every case admitted to Monsall, almost without exception, vaginal douching has been carried out once or twice daily either by a midwife or by the medical attendant, from the time of delivery to the time of admission to hospital. No good appears to have resulted from it in a single case.

The curative treatment.

Such a serious condition as Puerperal Infection calls for prompt action on the part of any medical man who may be called upon to treat it. When brought face to face with a case of Puerperal Infection there are four definite objects to be kept in view, (1) to discover the site of the infection, (2) to deal with the site, and endeavour to remove the cause, (3) to keep up the strength of the patient by suitable diet etc., and by the administration of serum or other therapeutic agents to increase the patient's power of resisting and overcoming the infecting organisms and their products; (4) to be prepared to deal to the best of one's ability with any complication that may arise.

(1) To discover the site of infection.

A careful and complete examination of the genital tract must be made. Doleris has in a recent paper laid stress on this. "It is necessary", he says, "at the first sign of infection, at the first quickening of the pulse, to make an examination of the genital tract, not the very insufficient and incomplete examination by means of palpation, or even of/

of vaginal examination with the finger, but a detailed gynaecological examination, with the speculum, with the eyes, and with an exploratory curette. yet

That the examination may be complete without inconvenience to the patient I would recommend the administration of a general anaesthetic, more especially as the treatment to follow often calls for such an anaesthetic. All laceration of the perineum, vagina, and cervix should be noted and the uterus itself should, in every case where involution has been interrupted, be explored with the finger. Lastly, the condition of the uterine appendages should be ascertained by means of bimanual examination.

2. To deal with the site and endeavour to remove the cause.

All lacerations of the genital tract must be thoroughly cleansed, and where such lacerations have been repaired and the stitches show signs of suppuration, it is advisable to remove the stitches that thorough cleansing of the parts may be accomplished. I am now confronted with a very vexed question, namely, the proper method to adopt in dealing with the puerperal uterus. A great many eminent men in this country among whom is Galabin advise the use of/

of uterine and vaginal douches if no retained products can be felt in the uterus; if, on the other hand, there are retained products in the uterus they would recommend the use of the finger for the removal of such products. Again many American and almost all the French writers are enthusiatic in their recommendation of curettage in all cases, whether retained products are present or whether, as frequently happens, nothing is to be felt within the uterus, but a condition of endometritis is present. Not only do various authorities differ with regard to the advisability of curetting, but there are grounds of difference among those who recommend and practice curetting in Puerperal Infection. Some recommend the use of a blunt curette, others of a flushing curette, and others are strongly in favour of using a sharp curette, among the latter is Sinclair.

"Curettage", says Whitridge Williams, "as a routine measure in all cases of Puerperal endometritis is by no means to be recommended for the reason that in the most severe cases there is absolutely nothing in the uterus which can be removed, and its employment can only do harm by breaking down the leucocyte wall which serves to prevent the invasion of the deeper layers of the uterus by the offending bacteria.

On/

On the other hand, when the uterus contains much debris its removal is more readily effected by means of the finger than by a curette. Doléris in his recent paper already referred to, says, "The best thing to be done is to carry out a series of operations in which the curette plays its part but is not the only thing necessary. Briefly the series of operations that I conduct are as follows. (1) Very complete dilatation of the cervix with Hegar's dilators. (2) Methodical clearance of the infected debris of the mucus membrane, with a very large blunt cubette with a broad rounded top. (3) écouvillonage of the cavity. (4) Prolonged antiseptic injections followed by an injection of absolute alcohol. (5) Packing the uterus with iodoform gauze steeped in glycerine creosote. (6) Introduction of a drainage tube if necessary. (7) Antiseptic care in the after treatment of the uterine cavity and of all wounds in the genital tract." Judging from the results that I myself have seen at Monsall, I would strongly recommend, and would certainly practice curetting. The form of curette which I consider best for the purpose is a light, sharp instrument. The statement of Williams that where debris is present in the uterus, its/

its removal is more readily effected by the finger than by a curette, seem possibly true if a blunt curette is meant, but absolutely absurd if a sharp curette be thought of.

With respect to the fact that in many cases no retained placenta is present in the uterus, I regard it as just as necessary to remove the whole of the endometrium down to the muscle, as to remove retained products. This can only be done safely with a sharp curette. If curetting formed the whole of the treatment I should regard the causing of a large raw surface in an already infected uterus as extremely dangerous; but as Doléris points out curetting is but a part of the treatment and the careful swabbing of the raw surface with antiseptics is every bit as important as the curetting itself. I differ from Doléris in that I recommend a sharp curette and do not believe that there is any advantage to be derived from écouvillonage or brushing out the uterus with a wire brush.

It is sometimes urged that there is great risk of perforating the thin wall of the puerperal uterus with a sharp curette. I believe that there is much less risk of penetrating the uterus with a light sharp curette than with a clumsy blunt curette or flushing curette with which a considerable amount of force/

force is required, if it is to be of any use. Dr. Gordon of Monsall Hospital has had some very light, well balanced, sharp curettes, specially made for use in puerperal cases, these have broad tops with a sharp cutting edge. This is the instrument always used in Monsall, where curetting is regarded almost as part of the routine treatment of puerperal cases. In spite of this I have never myself perforated the uterus, nor have I ever seen it perforated, and the good results obtained from this method have led me to advocate curetting with a sharp curette in cases of Puerperal Infection. The only class of case in which I believe that curetting is unnecessary and even harmful is that in which gonorrhoea has been the cause of infection. In such cases the uterus should in my opinion be left severely alone.

If the bleeding after curetting is at all profuse, I would recommend a douche at the temperature of 120°F. This not only checks the haemorrhage, but clears away all blood clot or loose particles of debris left after the curetting. After this the uterus should be dried out with swabs, and then every part of it mopped out with pure izal, care being taken to reach every corner of the uterus. The reason for employing izal in/

in this connection, is that Dr. Gordon found that when applied to the ulcerated fauces in severe cases of scarlet fever it seemed to have a selective action on the necrotic tissue, while the healthy mucus membrane was not affected by it. As in the interior of the uterus one cannot see what one is doing, it is necessary to use an antiseptic which is not an escharotic to healthy tissue, moreover izal is not toxic. The uterus is then packed with packed izal gauze, the packing is left in 12 - 24 hours and then removed. Vaginal and intrauterine douches are not employed.

There is one point with regard to curetting, that I should like to mention before going on to discuss the dieting and general treatment of the patient. I have heard it stated that complete removal of the endometrium with a curette prevents the possibility of future pregnancies. With regard to this I am not in a position to make any dogmatic statement, I can only say that after enquiry by the sister of the puerperal ward, it was found that in no case had the function of menstruation been interfered with. It therefore seems likely that in the course of time some of the patients curetted in Mondall may again conceive/

conceive and bear children.

3. To maintain the strength of the patient.

Diet. It is absolutely necessary to support the strength of the patient by giving plenty of nourishment. Milk naturally forms a large bulk of the nourishment given in the acute stage. I would recommend giving two to three ounces of milk somewhat diluted, every hour or at most every two hours. Benger's food, Brand's essence, eggs beaten up in milk, custards and jellies, should also be given frequently. If milk causes the patient to vomit, it is advisable to mix it with barley water, if vomiting still persists and is very troublesome nutrient enemata must be resorted to, the enema I recommend consists of beef tea 4 ounces, cream half an ounce, with an egg beaten up in it. I do not as a rule give stimulants unless the patient is in such a low condition as to render their use absolutely necessary. As soon as the temperature begins to drop and the pulse to improve the diet should be increased. Milk pudding, bread and milk, Bovril, beef tea, and such like articles should be added to the diet, care always being taken to try and find things that the patient relishes and will therefore consume. I believe that at this stage some form of alcohol is often advantageous. Some of our cases have had champagne, but this of course/

course is expensive, and I believe that Raggett stout is just as beneficial while it has the advantage of being considerably cheaper. If the patient continues to make good progress for a day or two such things as fish and chicken may be given. I firmly believe that Puerperal Infection is one of the conditions in which it is advisable to feed the patient to the utmost limits of her digestive powers.

Drugs. I do not think that much good is derived from the exhibition of drugs in Puerperal Infection. Indeed in most cases I give no drugs at all except, calomel grains V, on admission, and repeated if necessary, even this should be used somewhat cautiously as some of the bad cases have a tendency to severe diarrhoea which is very difficult to check. In such cases good sometimes results from the administration of iron in the the form of tinct. ferri perchlor m. 10 - 15 three times a day. It seems to act as an intestinal antiseptic and styptic. Quinine has been largely used as an antiseptic and pyretic in Puerperal Infection, I do not recommend it however, for I have found that in many of the patients to whom it has been given it has caused vomiting, or at least a feeling of nausea, which has interfered with their relish for food and has in this way done more harm than good. In cases where the temperature is/

is high, cold sponging and even cold packs are, in my experience, much more beneficial than any antipyretic drug.

Hypodermic injections of strychnine and other stimulants are indicated when the pulse becomes very rapid and feeble.

Hipnotics are sometimes necessary especially where low muttering delirium is present, 20 grains of chloral hydrate with 20 grains of sodium bromide is what I usually give, but I make it a rule to combine these with 5 minims of liquor strychninae to counteract the depressing effect on the heart.

Operation. Considerable discussion has in recent years centred round the question of hysterectomy. This operation has had a fairly wide trial both in America and on the Continent and has not yet proved itself worthy of universal adoption. Bumm wrote a paper in 1901 in which he carefully considered the question and he came to a similar conclusion. It is obvious that the earlier the uterus is removed the better is the condition of the patient and the less chance is there of the disease having spread beyond the uterus. It is equally obvious that if in all cases the uterus were removed at a sufficiently early date/

date to prevent the spread of the disease to other organs, many a woman would be rendered sterile who would otherwise have made a perfectly good recovery, and been perfectly fit to undergo the ordeal of further pregnancies. The operation itself unless performed in the very earliest stages of Puerperal Infection is fraught with very great danger to the life of the patient. Jewett collected 112 cases including operation after abortions, and in these he found that the mortality was 48 per cent. This series of cases included not only those cases where operation was undertaken as a last resort but also 25 cases in which the disease was found to be localised in the uterus, of these latter 24 per cent proved fatal.

In two of the cases in my series hysterectomy was performed, both with a fatal result. In one of these cases Mrs. M. B. case 10 the operation was done as a last resort after examination of the blood had given a negative result. She did not rally after the operation but died within a couple of hours. In the other case Mrs. M. H. H. case 12, the operation was done on the third day after the onset of symptoms, shortly after admission of the patiemt to Monsall. It/

It was hoped that in this case spread of the disease might be stopped, but the subsequent examination of the blood revealed the presence of streptococci and though the patient lived for two days after the operation she finally succumbed to septicaemia. On two previous occasions hysterectomy has been performed at Monsall Hospital, but both times a fatal result was obtained. Such results not only prove that operation must be done early in the disease but also illustrate the danger to the patient involved in the operation itself. It has been suggested by Lusk that hysterectomy should be performed in cases of pyaemia as in this way the source of the infected thrombi would be removed, but it seems certain that before pyaemic abscesses appear, thrombosis has spread beyond the uterus.

If hysterectomy is to be performed I would recommend the vaginal method with the use of clamps.

As it is my intention to discuss serum- therapy at some length I propose before doing so to refer to the fourth heading with which I commenced the consideration of the treatment of Puerperal Infection namely.

4. The methods of dealing with complications that may arise.

When pelvic cellulitis or peritonitis suppurates, the abscess formed should be opened immediately, to prevent the risk of its bursting into the peritoneum and setting up peritonitis. Such abscesses can usually be very well drained through the vagina, and laparotomy is not necessary.

When a pyosalpinx is diagnosed operation becomes necessary. The pus may be removed either by puncture through the vagina or by laparotomy. The latter is preferable if the tube is fairly freely movable, where as the former method is quite satisfactory if there are a lot of adhesions, as there is in that case, once the abscess is opened into, very little risk of being unable to drain efficiently through the vagina. In those cases where the pyosalpinx is the result of gonorrhoeal infection, the prognosis is much better than when the streptococcus is the cause.

Laparotomy in cases of general peritonitis is practically hopeless so much so that it is very doubtful whether it should be undertaken. I think on the whole it is advisable to make the attempt if the prognosis is otherwise quite hopeless. I have seen laparotomy three times for general peritonitis, (Mrs. B. W. case 9. Mrs. R. H. 14 and Mrs. M. J. H. 21) but/

but in none of these cases could the life of the patient be saved.

In 1902 Trendelenberg reported having successfully prevented the formation of further septicembolli by removing the uterine and avarian veins in a case of pyaemia. It is not however an operation that bears much hope of success nor has it been practised to any great extent.

I shall conclude the present chapter by referring to the use of antistreptococcus and anti Bacillus Coli serum as a therapeutic agent in the treatment of Puerperal Infection.

The first antistreptococcus serum prepared was that of Marmorek. It was derived from a horse injected with a single strain of the streptococcus pyogenes and that isolated from the lower animals. Marmorek found that it was impossible to produce an effective serum by injecting the toxines of the cocci alone, and that living cultures were more efficacious in producing a potent serum than the dead bodies of the cocci. In the preparation, very small doses were at first injected, but the dose was gradually increased as the animal became more and more immune. Each successive dose however, was large enough to produce a distinct reaction. This process was a very long/

long one and extended over a year.

It soon became evident that streptococci were of many different strains which acted somewhat differently in cultures, morphologically, and as regards serum. Van de Velde undertook an interesting series of experiments which helped to throw light on this part of the subject. He first showed that if two horses are each injected with a different strain of streptococcus the serum removed from each is actively pretective against its own particular streptococcus but not against the other. He next showed that if a third horse is immunised by injecting into it two strains of streptococci, the resulting serum is protective against both strains. This work led to the preparation of a polyvalent serum and shortly afterwards Prof. Denys of Louvaine produced such a serum for practical use.

In the early part of 1905 cases of Puerperal Infection began to come into Monsall Hospital in much greater numbers; this led Dr. Gordon to collaborate with Messrs. Burroughs and Wellcome in the preparation of a polyvalent anti streptococcus and Anti Bacillus Coli serum. When a severe case of Puerperal Infection was admitted to Monsall a swab was taken from the uterus and sent to the Wellcome research/

research laboratory, and organisms were there cultivated from it, in the event of a fatal termination part of the uterus was also sent. The organisms grown from several such cases were injected into a horse, and the resulting serum was dispatched to Monsall for trial in other cases of Puerperal Infection. Each batch of serum sent to Monsall was numbered and when it was used the number was marked down on the bed chart and careful observations were made on its effects. In this way various brands of serum were prepared and used in Monsall, for example the serum in series E. 108 is obtained from a single horse into which have been injected streptococci obtained from five cases of Puerperal Infection treated in Monsall. In the same way E. 128 contains a serum from a single horse into which have been injected Bacillus Coli obtained from six cases of Puerperal Infection treated in this hospital. I could go on multiplying the examples, but I have said enough to show the kind of serum that I have been using in the treatment of the cases in my series. The polyvalent serum is like a blunderbus, if you do not hit the mark with one particular strain, you may do so with another. The serum prepared as I have described has now been placed on the market by Messrs. Burroughs/

Burroughs and Wellcome.

Careful observations have been made in Monsall with regard to the best method of administering the serum and the conclusions arrived at are that small doses are quite ineffectual and that if a large dose is given, repetition of the dose is unnecessary and does not increase the beneficial results obtained. I always administer 100 cubic centimetres of serum. This is usually injected into the abdominal wall and the whole is absorbed by the end of six to eight hours. On several occasions, in severe cases, I have injected it along with normal saline solution into a vein or into the cellular tissue of the axilla, thighs or breasts. In several cases streptococci have been easily demonstrated in a film preparation made from the uterine discharges but even when this has not been possible, it is not my custom, except in the mildest cases, to wait for the result of the bacteriological examination before administering the serum.

In 1899 a committee was appointed in America to consider the value of antistreptococcic serum in case of Puerperal Infection. Their report which appeared in the American Journal of Obstetric was not encouraging/

encouraging. They collected 352 cases treated with serum, and among those they found the mortality was 20.74 per cent, whereas the mortality in cases not so treated was only 5 per cent. This result seems quite inexplicable at first sight, as it would appear that so far from doing good, the serum had increased the mortality, now no one would be bold enough to suggest that the effects of the serum(even the toxic effects described later), are deleterious even if it is useless. The solution of the mystery appears to be, that those cases in which the serum was given were all very serious cases in which the mortality would have been still higher without serum.
It does not seem possible to dogmatise on the use= fulness of serum, as in a very large number of the cases published in which it has been used no bacteriological examination of the lochia has been made and there is therefore no positive evidence that, either the cases in which it is supposed to have failed or those in which it is thought to have done good, were really streptococcal cases. I am however a firm believer in the beneficial effects of both antistreptococcus and Anti Bacillus Coli serum in suitable cases. I have seen several astonishing reactions/

reactions to serum, in cases in which the bacteriological examination of the lochia has placed the causation of the condition beyond doubt, and in which therefore it is reasonable to suppose that the marked and rapid improvement that followed its injection was due to the serum. Mrs. M. J. J. case 2 and Mrs. F. E. M. case 5 are the most striking examples to my mind of the benefit of serum, Mrs. E. C. case 16 is to my mind even more interesting from the fact that she failed entirely to respond to the anti streptococcus serum, but that, a pure culture of Bacillus Coli having been obtained from her lochial discharges, she reacted in the most marked manner to the anti Bacillus Coli serum which was then injected. This case was reported in the Lancet by Dr. Gordon. I do not mean to suggest that these cases are the only ones in my series in which I believe serum to have done good but simply that these are the cases in which the benefit was most marked and unmistakable.

I have had excellent opportunity of studying what one might call the toxic effects of serum. The toxic effects are as I have already stated not deleterious, though they may cause the patient some discomfort/

discomfort. The toxic effects produced by two or more small doses of serum are much more marked than those produced by one large dose.

The blood serum in any two species of animal is not identical, and that there are variations even in members of the same species, is proved by the varying degrees of immunity to certain diseases possessed by them. Eel's serum is found to produce a breaking up of the red corpuscles when injected into mammalian animals, and there can be no doubt that the serum of other animals possesses a certain degree of toxicity. It has been found that the injection of normal horse serum into man may be the cause of certain toxic symptoms. Moreover it has been found that certain horses possess those qualities to a much greater degree than others. This point was strikingly illustrated by one series of serum that was sent to Monsall. I found that in every case in which series E. 126 was used the toxic effects were very severe, so much was this the case, that this series had to be discarded, and the horse from which it was obtained was no longer used for the preparation of serum. The effects to be described, then, are due to the horse serum itself and have absolutely nothing to do with the immunisation of the serum to

any/

any special organism or toxine. It is obvious therefore, that the effects produced by antistreptococcus and anti Bacillus Coli serum are practically the same as those produced by antidiphtheritic serum, a capital account of which was published by Rolleston in the Practitioner last year.

The most frequent ill effects brought about by the injection of serum, are cutanious eruptions of various kinds. Park observed eruptions in 3 per cent of cases of diphtheria after antitoxine, Stanley in over 25 per cent and Villy in 35.2 per cent. I have observed them in a even larger percentage of puerperal cases after antistreptococcus or anti Bacillus Coli serum, partly I believe on account of the larger quantity of actual serum injected. The rashes are of three main types (1) scarlatiniform (2) urticarial (3) circinate erythema or morbiliform.

(1) The scarlatiniform rash is usually localised commencing round the site of injection of the serum, occasionally however it is more general and may be mistaken for scarlet fever. There is not however any increase in the temperature though at this stage of puerperal disease the temperature may be very high. It appears as a rule within three days and may be confused with the rash produced by the administration of /

of an enema.

(2) An urticarial rash is the most important of the rashes produced by serum. It may appear at any time after the injection but is commonest about the eighth or ninth day. Its appearances is in my experience frequently attended by a slight rise of temperature, and the itching produced is sometimes very severe. Joint pains may make their appearance at this stage though as a rule they do not come till later. The urticaria may be quite transient or may last several days.

(3) Circinate erythema or morbiliform rash.

This type usually makes its appearance about the fourteenth or fifteenth day after the injection, and is not infrequently accompanied by the onset of joint pains. It shows first about the elbows, knees and inner side of the thigh. It may remain localised to these spots but often becomes general. The appearance of this rash is frequently immediately preceded by or accompanied by a sharp rise of temperature.

Pains in the joints already several times mentioned are another inconvenience which may arise. As already stated this symptom often appears along with/

with the third type of rash about the end of the first fortnight. In one or two cases however I have found the pains come on at the end of a week. The pains closely resemble those of rheumatism and occur chiefly in the shoulders, elbows, knees and ankles, though I have once or twice seen patients suffer acutely in the joints of the fingers. The muscles about the affected joints are often tender and stiff. As a rule the pain is not very severe though in some cases especially after series E. 126 already referred to, the pains were extremely acute and the patient could not bear to be moved. The pain does not seem to yield to salicylate of soda aspirin and other antirheumatic agencies. Painting the affected joints with menthol pigment and wrapping them up in thermogenic wool sometimes gives considerable relief, and I am in the habit of giving antikamnia grains V. every four hours while the pain is severe.

Abscesses at the site of injection, I have seen described but as far as my experience goes I am happy to say they have been of extremely rare occurrence after antistreptococcus, antidiphtheritic, or any other kind of serum. I consider they are almost entirely due to carelessness with regard to asepsis in/

in the administration of the serum.

Serum has in some cases an undoubted depressing effect on the heart's action. Dr. Arnold of Monsall Hospital has shown by means of experiments on the frog's heart that this is due almost entirely to the presence of the preservative employed in the preparation of the serum. The preservatives in common use are Trikresol and carbolic acid and they form from .4 to .6 per cent of the total quantity of serum. That is to say that in injecting 100 c.c. of serum one is injecting from 8 to 9 minims of carbolic acid or Trikresol, this obviously is sufficient to produce a depressing effect. Dr. Arnold found that chinosol did not produce this depression, and we have since used some serum prepared with chinosol as the preserative, and this has not appeared to produce any depression whatever.

VII.

Description of the cases.

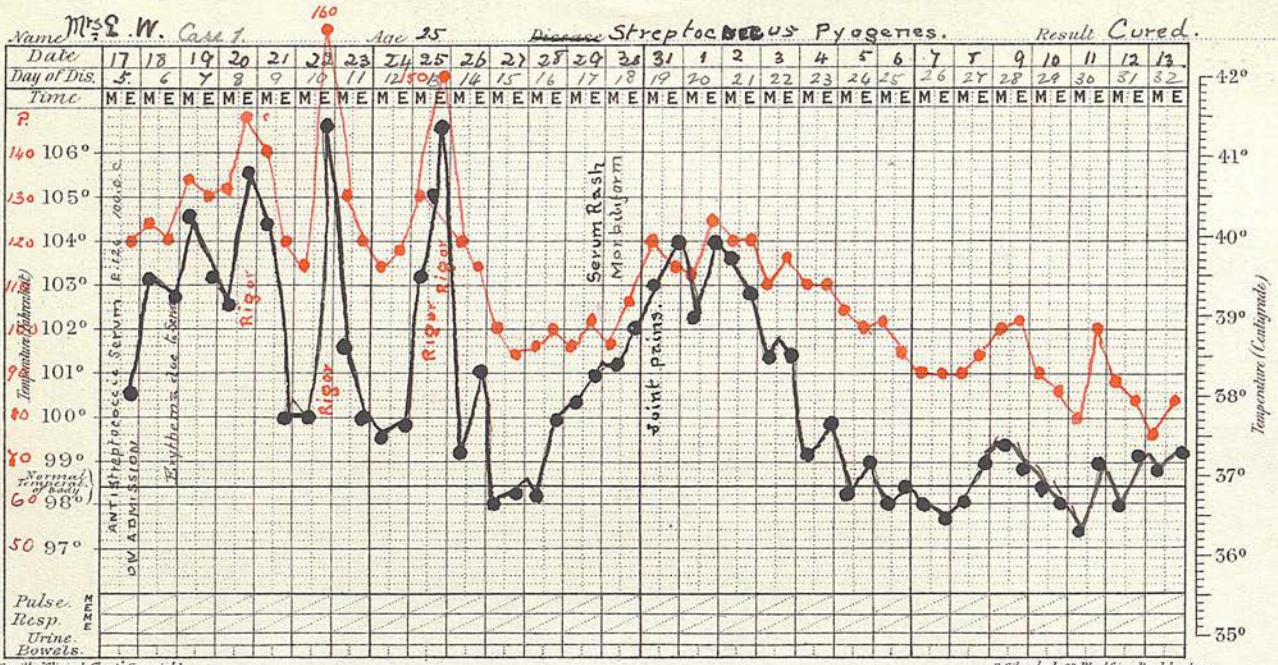
The cases I am about to describe are thirty in number, of these twenty-five are cases of Puerperal Infection occurring after full time labour, and five are cases of sepsis following abortion. It is obvious that a very full description of these cases with minute details of the treatment in each case would occupy a large sized volume, I have therefore endeavoured while noting all the important points to make the description as brief as possible. I have not for example in each case where curettage was performed stated that it was followed by izal swabbing etc., but in the chapter on treatment I have described the routine practice both as regards operative interference and diet etc. and except where definitely stated to the contrary, that has been carried out. I have attached to each case a temperature chart on which, in addition to the pulse rate and temperature, I have noted such things as rigors, serum rashes, joint pains etc. I have appended a table showing the result of the bacteriological examination in each case and giving the result of treatment. It will be seen that of the thirty cases, twenty-three recovered and/

and seven proved fatal that is to say the mortality was 23.3 per cent. These results are, considering the extreme gravity of most of the cases, very gratifying, and seem a strong argument in favour of curettage which was performed in all except seven of the cases.

Results of the bacteriological examination of the uterine contents and the blood of thirty cases.

NAME	CASE No.	Uterine discharges. Streptococcus pyogenes	Staphylococcus pyogenes aureus	Staphylococcus pyogenes albus	Bacillus Coli Communis	Gonococcus	Unidentified aerobic bacillus	Blood. Streptococcus pyogenes	Staphylococcus pyogenes Aureus	RESULT.
Mrs E. W.	1	+	-	-	-	-	-	+	-	Recovery.
Mrs M.J.J.	2	+	-	-	-	-	-	not	examined	Recovery.
Mrs F. H.	3	+	-	-	-	-	-	+	-	Recovery.
Mrs E. D.	4	+	-	-	-	-	-	+	-	Recovery.
Mrs E.E.M.	5	+	-	-	-	-	-	+	-	Recovery.
Mrs E. B.	6	+	-	-	-	-	-	-	-	Recovery.
Mrs J. W.	7	+	-	-	-	-	-	not	examined	Death.
Mrs. M. G.	8	+	-	-	-	-	-	+	-	Recovery.
Mrs B. W.	9	+	-	-	-	-	-	+	-	Death.
Mrs. M. B.	10	+	-	-	-	-	-	-	-	Death.
Mrs A.M.M.	11	+	-	-	+	-	-	not	examined	Recovery.
Mrs M.H.H.	12	+	-	-	+	-	-	+	-	Death.
Mrs A. F.	13	+	-	-	+	-	-	not	examined	Recovery.
Mrs R. H.	14	+	-	+	+	-	-	+	-	Death.
Mrs E. M.	15	-	-	-	+	-	-	-	-	Recovery.
Mrs E. C.	16	-	-	-	+	-	-	-	-	Recovery.
Mrs. L. B.	17	-	-	-	+	-	-	-	-	Recovery.
M. J. L.	18	-	+	-	-	-	-	-	-	Recovery.

NAME	CASE No.	Uterine discharges.						Blood.		RESULT.
		Streptococcus pyogenes	Staphylococcus pyogenes aureus	Staphylococcus pyogenes albus	Bacillus Coli Communis	Gonococcus	Unidentified aerobic Bacillus	Streptococcus pyogenes	Staphylococcus pyogenes aureus.	
Mrs E.A.	19	-	+	-	-	-	-	+	-	Recovery.
Mrs F. B.	20	-	-	-	-	+	-	-	-	Recovery.
Mrs M.J.H.	21	-	-	-	-	+	-	-	-	Death.
B. B.	22	-	-	-	-	+	-	-	-	Recovery.
Mrs E. B.	23	-	-	-	-	-	+	-	-	Recovery.
Mrs.S.A.C.	24	-	-	-	-	-	-	-	-	Recovery.
A. P.	25	-	-	-	-	-	-	-	-	Recovery.
Mrs L.T.	26	-	-	-	-	-	-	-	-	Recovery.
S. C.	27	-	-	-	-	-	-	-	-	Recovery.
Mrs M. A.	28	-	-	-	-	-	-	-	-	Recovery.
Mrs M. R.	29	-	-	-	-	-	-	-	-	Recovery.
Mrs C. W.	30	-	-	-	-	-	-	-	-	Death.



Dr Savill's 'Clinical Chart' Copyright. No 7.

H. Silverlock, 82 Blackfriars Road, London.

No. 1 Mrs. E. W. 25 years. Primipara, No miscarriage. Easy labour conducted by a midwife. Pyrexia and a rigor on the second day after delivery, accompanied by severe abdominal pain. Intra-uterine douches given without effect for five days, during which temperature remained 104°F. or upwards, patient then sent to Monsall.

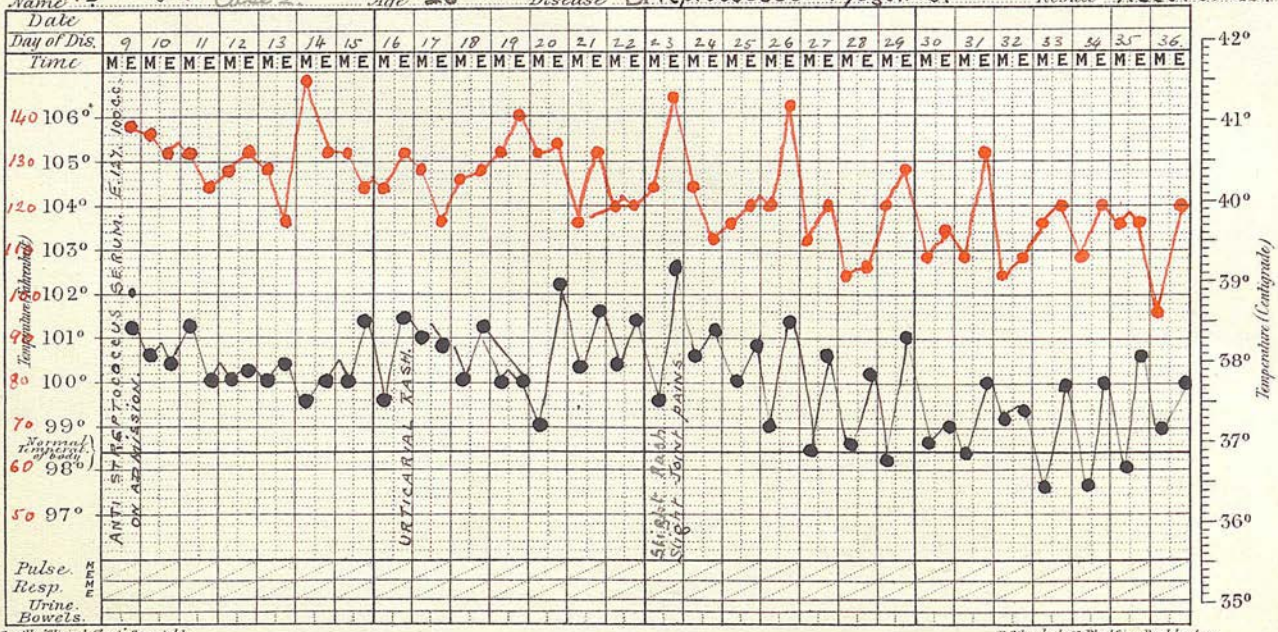
On admission:- Patient very ill indeed, tongue furred, yellowish tinge in the countenance, distinct septicaemic odour, rambling delirium, pulse 120 per minute very small and feeble, abdomen somewhat distended but soft and moving freely in respiration, uterus soft and flabby reaching to umbilicus, perineum badly torn and cervix lacerated, pelvic cellulitis present, both broad ligaments infiltrated, blood count red cells = 2,000,000 white cells = 18,000 Hb. = 30 per cent.

Uterus was curetted, a few pieces of decomposing placenta and whole of the endometrium being removed. The uterus did not contract well even after a douche at 120°F. antistreptococcic serum 100 c.c. E. 126 was administered. The following day cultures from the uterus and the blood were examined and found to contain streptococci. Temperature and pulse remained up, and/

and on the third day after admission patient had a rigor, after which she became almost comatose and was thought to be dying. Blood count showed R.B.C. = 1,800,000, W.B.C. = 20,000, H. = 25%. She remained very ill for many days during which time she had four rigors and was several times thought to be on the point of death. On the 16th day after admission the temperature fell to 99.2 and the pulse to 114 per minute. From that time she began to shew marked general improvement. The red blood corpuscles and haemoglobin began to increase and the leucocytes to diminish. The pelvic cellulitis subsided and no other complication arose, except very severe serum rash and joint pains. The serum given in this case was the series E.126 which as previously mentioned had afterwards to be discarded on account of the severe toxic effects which it invariably produced. Patient was discharged in excellent health after a stay of 57 days in hospital. Recovery in this case was little short of miraculous occurring as it did in spite of severe septicaemia.

No. 2 Mrs. M. J. J. 26 years primipara. No miscarriages. Labour lasted 24 hours and was conducted by a midwife. Pyrexia and a rigor on the third day. Vaginal/

Name Mrs M. J. J. Case 2. Age 26 Disease Streptococcus Pyogenes. Result Recovered.



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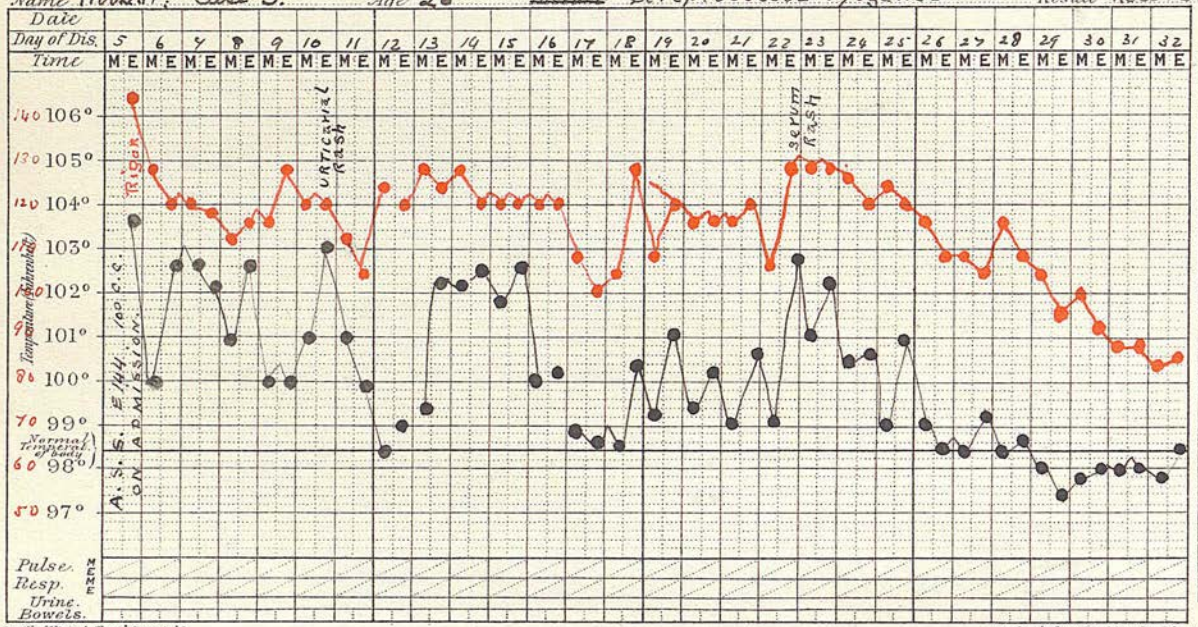
Vaginal douches administered by the midwife for six days at end of which patient was sent into Monsall. On admission:- General condition very bad, patient apparently moribund, face drawn, profound anaemia, tongue thickly coated, pulse138 per minute weak and intermittent, low muttering delirium, and ominous rattling in respiration, abdomen very much distended and extremely tender, uterus reaching to 1" above the umbilicus, perineum torn nearly into the rectum, cervix badly lacerated, raw surfaces covered with "diphtheritic membrane", some bulging in left fornix pelvic cellulitis, very scanty sweet smelling discharge from the uterus, blood count R.B.C. = 1,800,000, W.B.C. = 22,000, Hb. = 28 per cent.

Patient was curetted without an anaesthetic and antistreptococcus serum E. 127,100c.c. was administered. The cultures from the uterus revealed the presence of streptococci. The blood was unfortunately not examined, but was almost certainly septicaemic. Her condition improved very rapidly, in fact this is one of the most remarkable reactions to serum that I have ever seen. The pelvic cellulitis suppurated and the abscess formed, pointed in the back, the pus having travelled through the great sacrosciatic notch. The abscess/

Name Mrs. H. Case 3. Age 26 Disease Streptococcus Pyogenes. Result Recovery.



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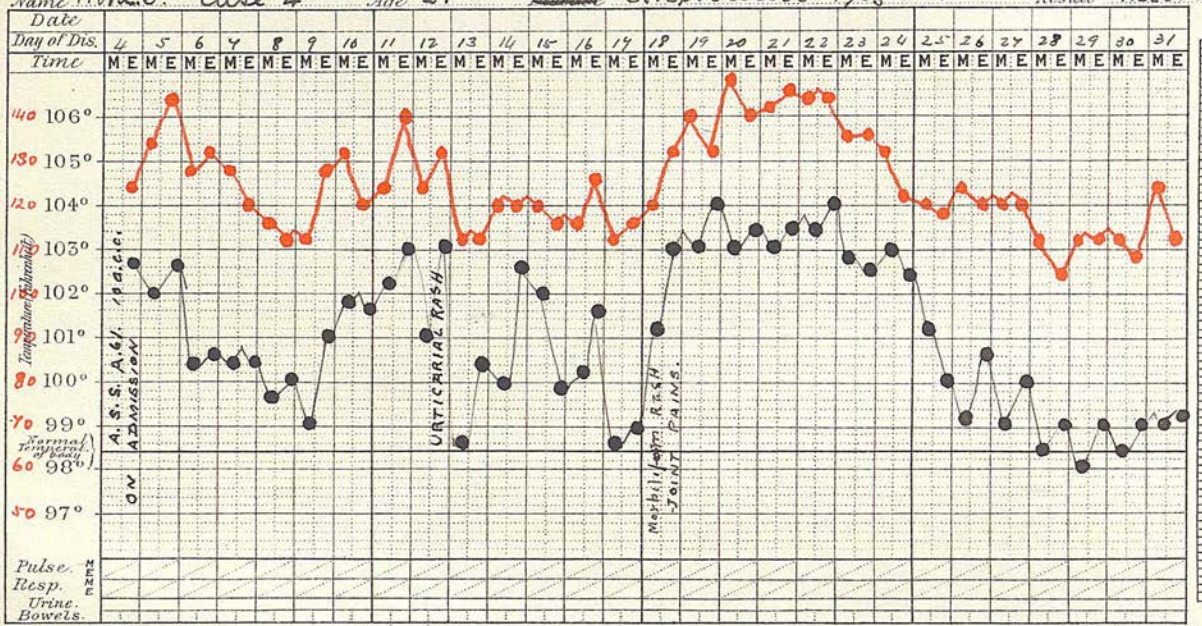
abscess was opened and thoroughly drained. Recovery in this case was also truly wonderful. A remarkable feature of this case was the lowness of the temperature which never rose above 102.6. The pulse however ranged between 120 and 150 for upward of three weeks.

No. 3. Mrs. F. H. 26 years. Primipara. No miscarriages.

Labour conducted by a doctor and terminated by the use of forceps. Pyrexia and a rigor on the second day. Vaginal douche for four days, patient then sent to Monsall.

On admission:- General condition poor, anaemia marked, tongue furred, abdomen freely moving, no distension, tenderness in the hypogastrium, uterus large and flabby reaching to the umbilicus, extensive bilateral tear in the cervix, vaginal wall badly lacerated, lochia very scanty not foul smelling, blood count R.B.C. = 2,800,000, W.B.C. = 18,756, Hb. = 30%.

Uterus was curetted no retained products found. Antistreptococcus serum E. 144, 100 c.c. was administered. Uterine and blood cultures both showed streptococci. Patient began to improve almost/


Name Mr E.D. Case 4 Age 27 Disease Streptococcus Pyogenes Result Recovery.
Date
Day of Dis. 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Time M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E M E
140 106°
130 105°
120 104°
110 103°
100 102°
90 101°
80 100°
70 99°
60 98°
50 97°
Temperature (Fahrenheit)
Normal Temperature of Body
Pulse.
Resp.
Urine.
Bowels.
NINE
A.S.S. A.M. 10 d.c.c. ON ADMISSION
URTICARIAL RASH
Morbilliform RASH JOINT PAINS.
42°
41°
40°
39°
38°
37°
36°
35°
Temperature (Centigrade)
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almost immediately, though temperature and pulse both remained irregular for about three weeks. The blood count by the end of a fortnight was R.B.C. = 3,500,000 W.B.C. = 10000, Hb. = 50 per cent. Patient was able to leave hospital at the end of seven weeks.

No. 4 Mrs. E. D. 27 years. 4 children. No miscarriages.

Labour lasted eight hours, conducted by a doctor, whose hand was introduced into the uterus for the purpose of removing retained placenta, Pyrexia and a rigor with very profuse sweating on the third day, intra-uterine and vaginal douches given by the doctor for four days. Patient then sent to Monsall.

On admission:- General condition very bad, profound anaemia and prostration, tongue furred fairly severe diarrhoea, abdomen soft, no distension and moving freely in respiration, uterus one finger's breadth below the umbilicus, split in the cervix which had been repaired, some pelvic cellulitis, blood count R.B.C. = 3000,000, W.B.C. = 15,000, Hb. 40 per cent. Uterus was curetted and allarge quantity of placental tissue removed. Antistreptococcus serum A.61. 100c.c. was given. Cultures both from uterus and blood were found to contain streptococci. Patient appeared

to/

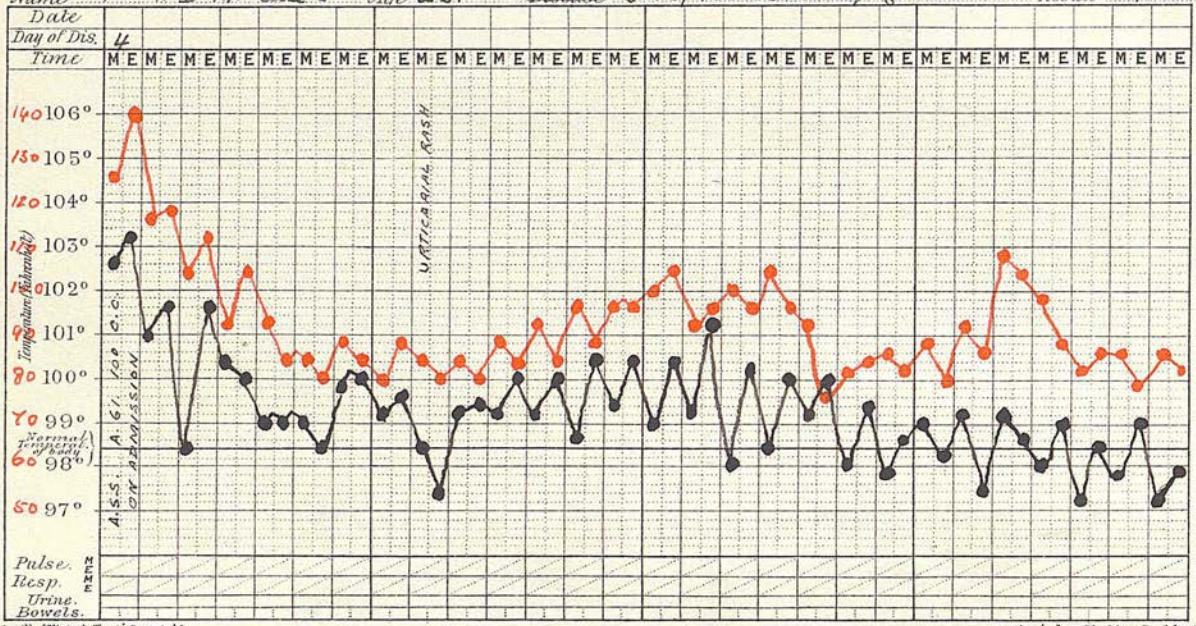
to improve very much for the first few days but at the end of the first week she began to complain of great pain in the right thigh, temperature and pulse which had been coming down, again rose. The right thigh down to the knee became swollen and very tender and it was evident that she had thrombosis of the femoral vein. This condition remained unchanged for three or four days and patient was getting more and more anaemic and on the tenth day after admission the blood count showed R.B.C. = 2,400,000, W.B.C. = 13,500, and Hb. 28 per cent. Throughtout the third week temperature remained 103° or upwards and the pulse was 130 - 150 per minute. It was feared that the thrombosis was spreading to the Vena Cava and patient's life was despaired of. Potassium citrate was given in doses of 40 grains three times a day and certainly seemed to do good. At the end of the third week temperature and pulse fell, blood began to improve and the condition generally became much better, after a long tedious convalescence patient was able to go home in fairly good health.

No. 5. Mrs. F. E. M. 23 years. Primipara.

No miscarriage.

Labour/

Name Mrs F. E. M. Case 5 Age 23. ~~Disease~~ Streptococcus Pyogenes Result Recovery.



Labour lasted fifteen hours and was conducted by a doctor. Pyrexia and a rigor on the third day, vaginal douche given by a neighbour, admitted to Monsall the next day.

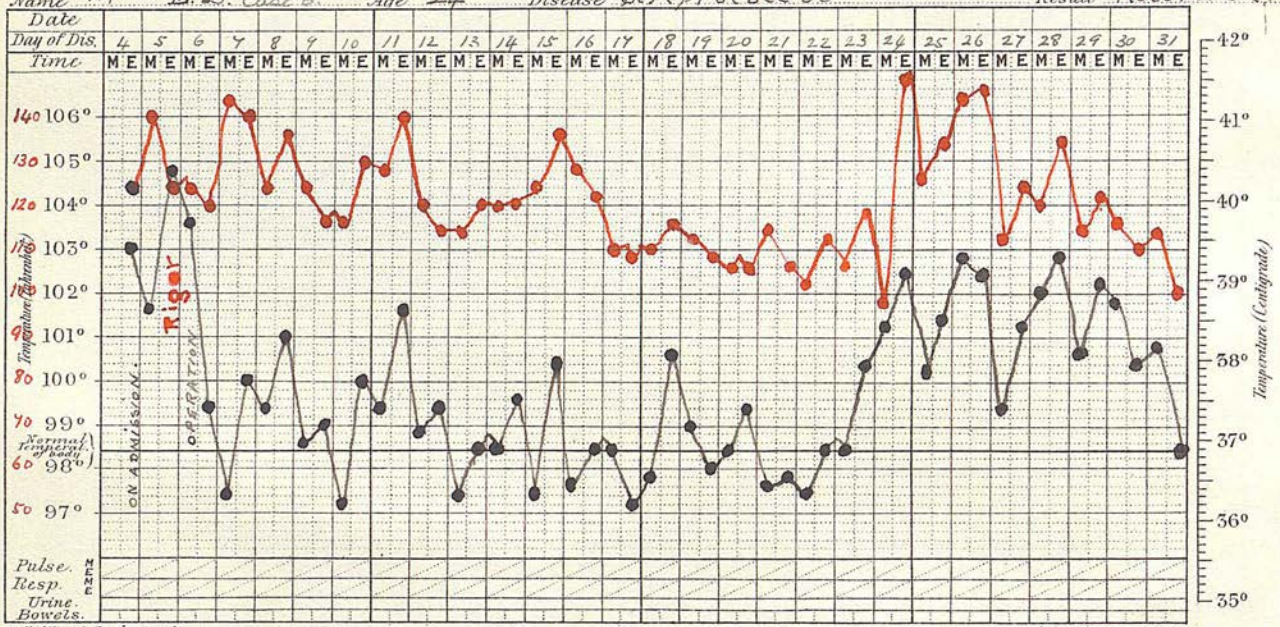
On admission:- General condition poor, tongue covered with dry brown fur, abdomen soft freely moving not distended, uterus a finger breadth above the umbilicus, perineum torn, cervix split, some thickening in the broad ligaments, pelvic cellulitis, blood count R.B.C. = 2,950,000, W.B.C. = 21,000, Hb. = 42 per cent.

The uterus was curetted and some pieces of placenta were removed, antistreptococcus serum A.61. 100 c.c. was injected. The cultures from both uterus and blood showed streptococci. Temperature and pulse began to come down almost directly and patient's condition improved rapidly, blood counts soon showed distinct improvement. Pelvic cellulitis did not clear up well at first, and it was feared that suppuration was going to set in, however this was not the case and patient made a good recovery.

No. 6 Mrs. E. B. 24 years. 4 children. No miscarriages.

Easy labour conducted by a midwife. A fortnight later there was a rise of temperature and a doctor was called/

Name Mrs. E. B. Case 6. Age 24 Disease Streptococcus Result Recovered.



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called in. The doctor diagnosed retained placenta and decided to curette. He proceeded to dilate the cervix with Hegar's dilators, but such profuse bleeding ensued that he stopped. Two days later the temperature was 103°F. and the patient had a rigor, she was immediately sent to Monsall.

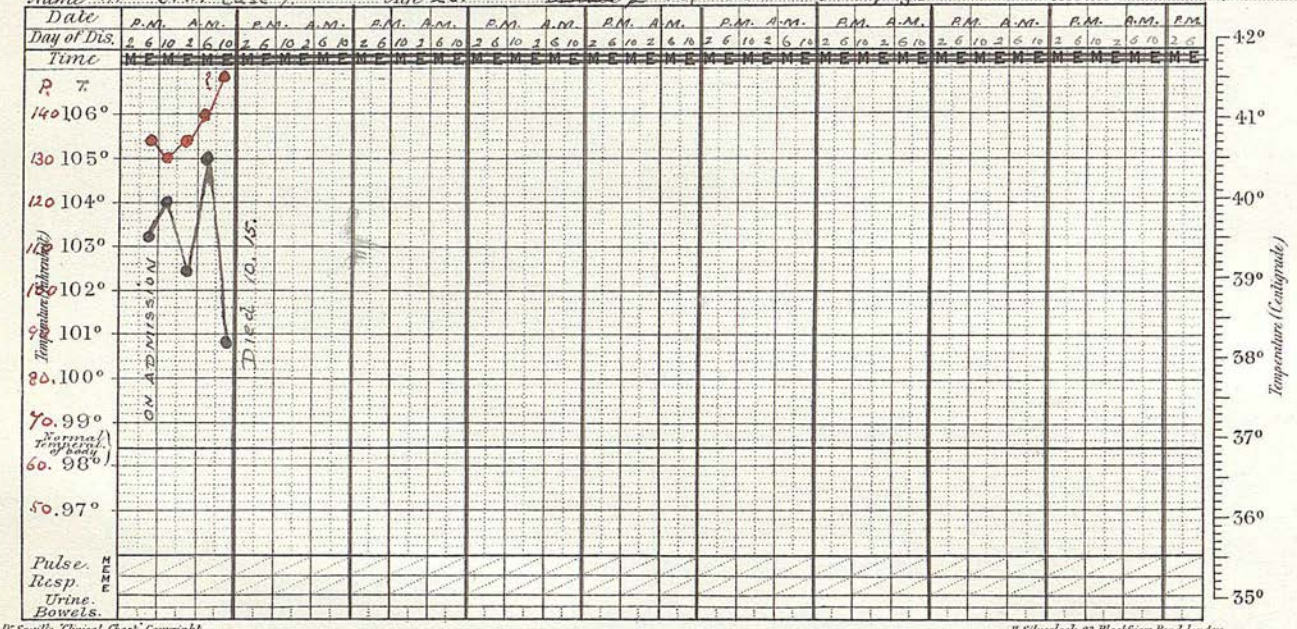
On admission:- Patient obviously very ill, abdomen very tender especially in the hypogastrium, uterus just felt above the symphysis pubis, on examination under chloroform cervix was found to be split laterally and posteriorly up to the level of the internal os, from the posterior tear blood stained serum was exuding but no pus, the body of the uterus measured 3" and the endometrium appeared smooth no retained pieces of placenta could be felt, the posterior tear in the cervix was continuous with an extensive laceration behind the uterus extending bilaterally into the broad ligament, the upper limit of the tear was not felt, but appeared to reach the peritoneal cavity. It was evident that the Hegar's dilator had been pushed through the cervix behind the uterus into or almost into the peritoneal cavity. There was some effusion into both broad ligaments, and in the Pouch of Douglas. Blood count showed R.B.C. = 5,150,000, W.B.C. = 19,300, Hb. = 46 per cent/

46 per cent. The tear in the cervix was cleaned up as well as possible and lightly packed with gauze. The cultures from the blood showed a negative result but the patient did not improve, the bulging in the posterior fornix became more marked, and pus was seen exuding from the tear in the cervix, on the third day after admission patient had a rigor and laparotomy was decided upon. On the abdomen being opened the uterus was found to be adherent to the surrounding structures, both fallopian tubes were intensely inflamed and contained pus, the right ovary was the seat of an abscess and there was a considerable amount of pus in the Pouch of Douglas. Some pelvic peritonitis was present. Both tubes and the right ovary were removed, and the abdomen was drained per vaginam and by a Keith's tube in the abdominal wound. The pus contained in the abdominal tubes was found to be crowded with streptococci. Patient remained for some days in an extremely critical condition, for several days the blood count got worse till it reached R.B.C. = 2,400,000, W. = 23,000 Hb. = 32 per cent.

At the end of a fortnight septic pneumonia was feared and patient was several times thought to be on/

4 HOURLY CHART.

Name Mrs J.W. Case 7. Age 26. ~~Disease~~ Streptococcus Pyogenes Result Death.



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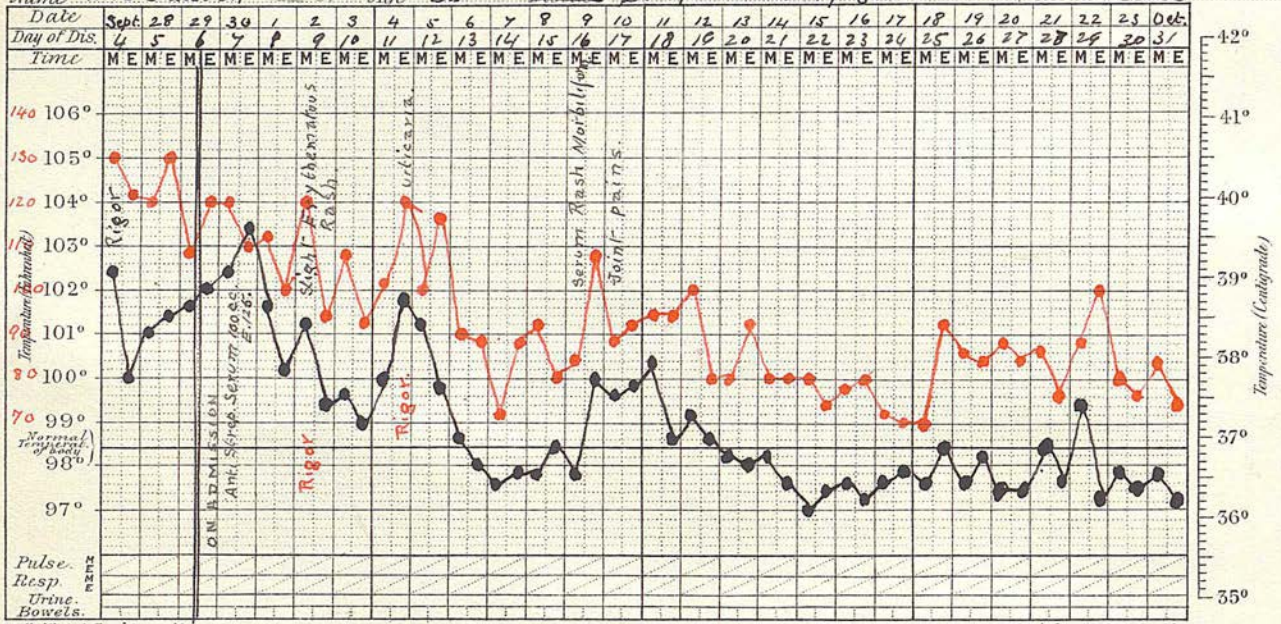
on the point of death. This is one of the few cases I have ever seen in which I believe oxygen to have been of the very greatest benefit. About a month after the operation the blood began to improve and the patient slowly recovered, at the end of 14 weeks patient was well enough to go home. This case was one of sepsis following the laceration produced by the Hegar's dilators.

No. 7. Mrs. J. W. 26 years. 1 child No miscarriages. Labour lasted 16 hours conducted by a doctor and terminated by the use of forceps. Pyrexia and rigor on the third day followed by sweating diarrhoea vomiting and abdominal pain, vaginal and intrauterine douches given by the doctor twice daily for ten days and patient then sent to Monsall.

On admission:- Patient sallow and comatose, tongue thickly coated, milk suppressed, abdomen markedly distended and boardlike, uterus not made out owing to great abdominal tenderness, perineum torn almost to the rectum, cervix badly lacerated and the surfaces covered with "diphtheritic membrane", slight discharge from uterine cavity not foul smelling, heart sounds scarcely audible, pulse rapid 134 per minute and very small. Blood count R.B.C. = 1,900,000 W.B.C. = 7,000/

Name Mrs Galston Case 8. Age 30 ~~Disease~~ Streptococcus Pyogenes Result Cured.



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W.B.C. = 7,000, Hb. = 20 per cent.

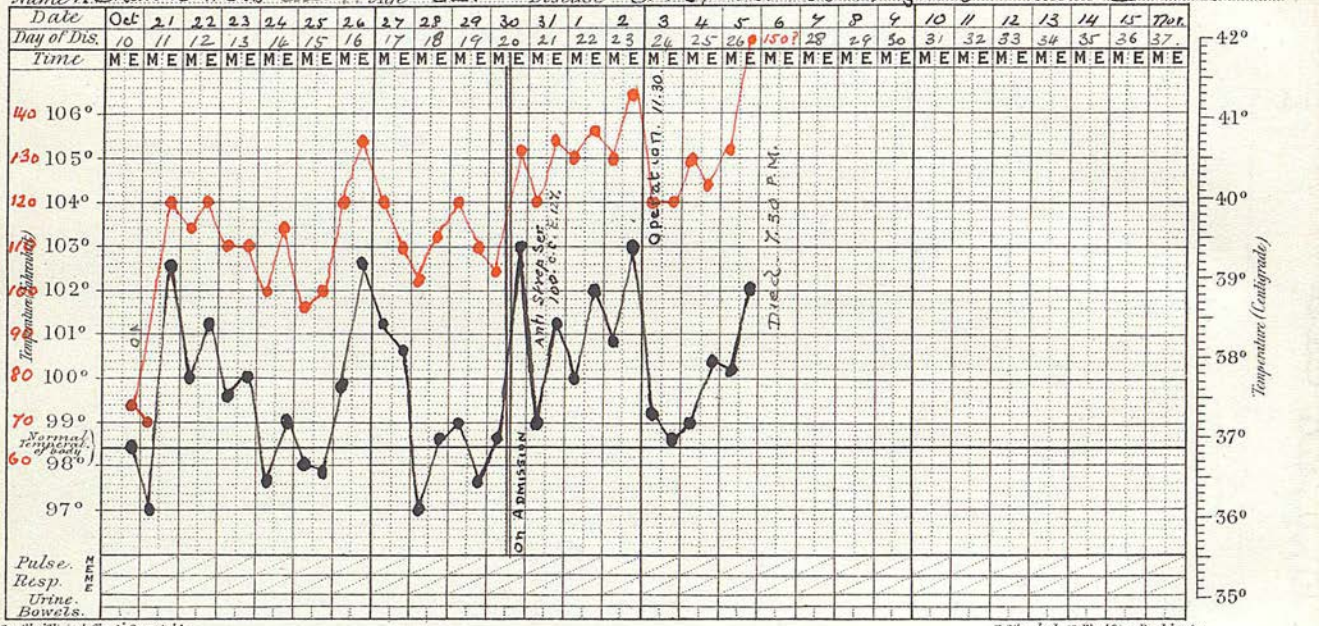
It was decided that operation would be useless as patient had obvious general peritonitis and was already moribund. She died within 18 hours of admission. Films from the uterine discharge showed crowds of streptococci.

At the post mortem examination the abdomen was found to be full of pus. The blood was not examined in this case.

No. 8. Mrs. M. G. 30 years. 5 children. One previous miscarriage.
Miscarriage at fifth month, no doctor or midwife present, pyrexia and a rigor on the fourth day, admitted to Monsall two days later.
On admission:- Tongue furred, abdomen distended, no pain or tenderness, uterus midway between symphysis pubis and umbilicus, cervix split, foul smelling discharge from uterus.

Uterus curetted and considerable amount of decomposing placental tissue removed. Antistreptococcic serum E.126, 100 c.c. injected. Cultures both from the blood and uterus showed streptococci. Patient remained very poorly for several days but after that made an uneventful recovery, except for very/

Name Mrs Blanche Webb Case 9. Age 32. Disease Streptococcus Pyogenes Result Death.



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very severe rashes and joint pains due to serum in series E.126 again. Patient was able to go home at the end of eight weeks. This case is the mildest that I had in which organisms were present in the blood.

No. 9. Mrs. B. W. 32 years. 4 children. one miscarriage.

The history of this case was an unusual one for a streptococcal case, the onset of symptoms not occurring until the tenth day after confinement. What the cause of infection was, it was impossible to ascertain.

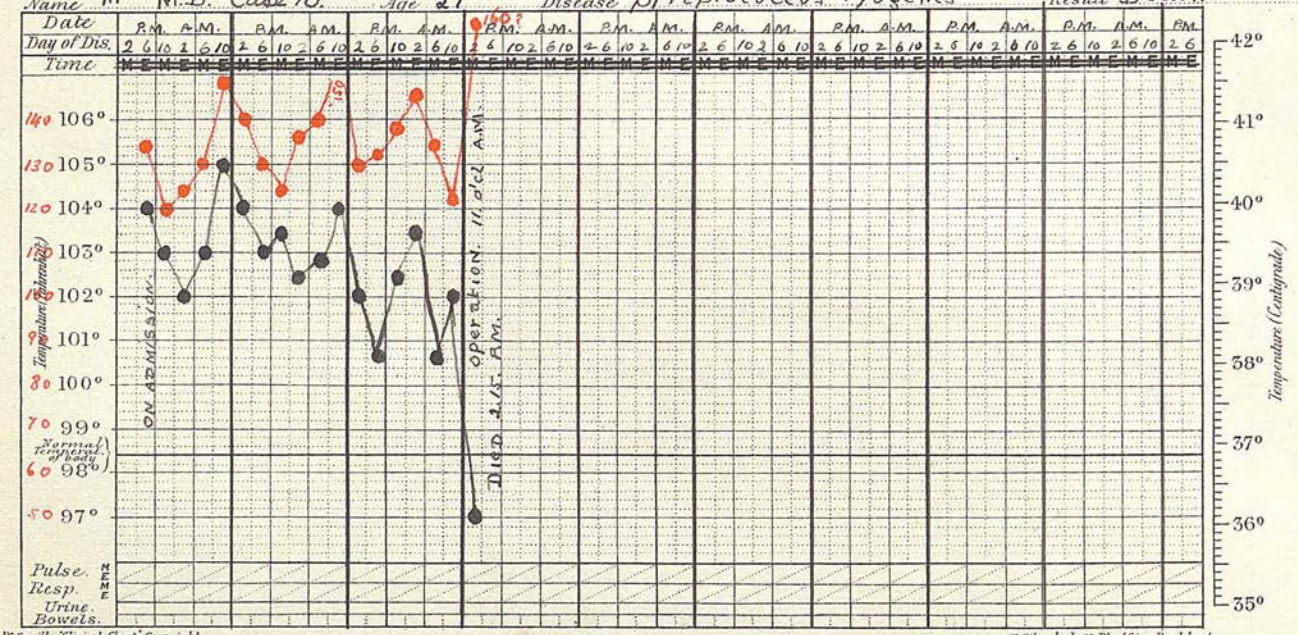
Pyrexia commencing on the tenth day continued intermittently until the 20th day when patient was admitted to Monsall.

On admission:- Patient was wildly delirious, countenance yellowish, odour of breath septicaemic, tongue furred, abdomen very tender, uterus just felt above the symphysis, no laceration of the cervix, uterus well involuted and os closed, pelvic cellulitis, present, blood count R.B.C, = 2,320,000, W.B.C. = 22,000, Hb. = 28 per cent.

Uterus was not curetted, antistreptococcus serum E. 127 100 c.c. injected. Culture from the blood showed/

4 HOURLY CHART.

Name Mrs. M.B. Case 10. Age 24 Disease Streptococcus Pyogenes Result Death



showed streptococci. Condition became worse, the effusion into the broad ligaments increased, swelling in left broad ligament could be felt abdominally, and on the evening of the third day signs of general peritonitis set in. Median laparotomy was performed, general peritonitis was found, intestines were matted together and adherent to the broad ligaments which were enormously inflammed. Left fallopian tube was very much swollen and pus was exuding from the fimbriated end. Left ovary also inflamed. The left ovary and tube were removed and abdomen drained per vaginam and by a Keith's abdominal tube, though patient seemed a little better at first, she soon became worse and died two days later.

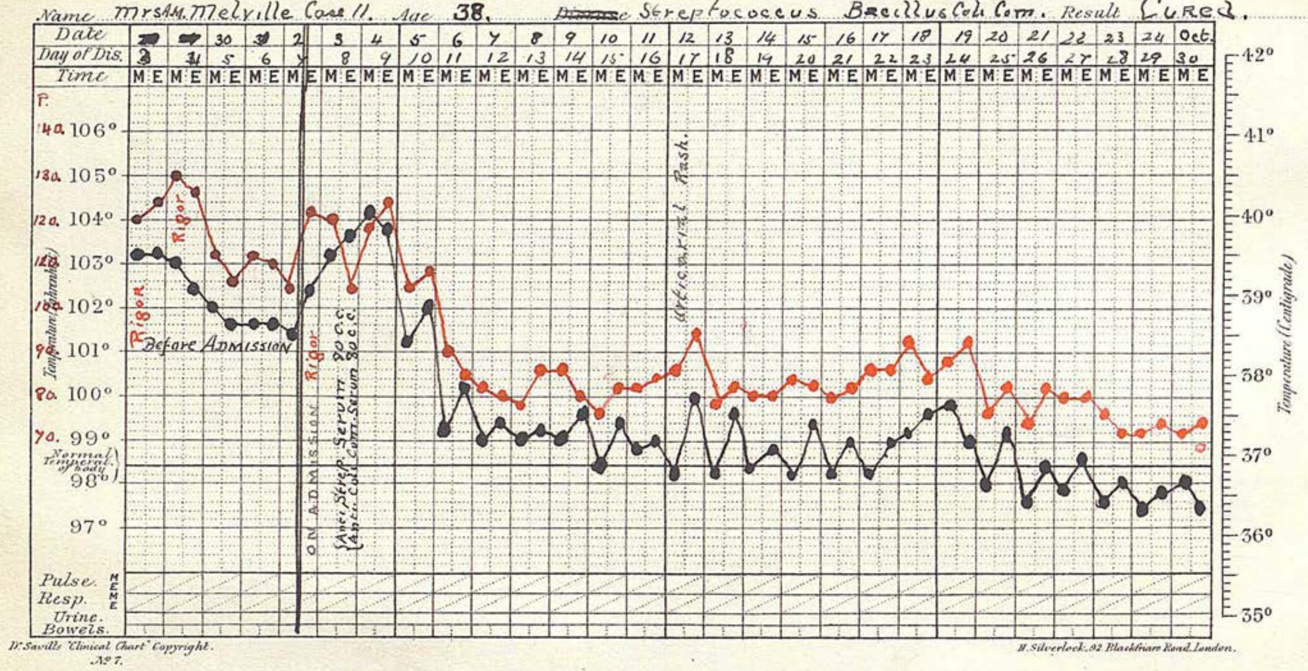
Streptococci were found in the pus contained in the left fallopian tube.

No. 10. Mrs. M.B. 27 years. Primipara.

No miscarriages.

Labour lasted twenty-four hours conducted by midwife. Rigor on third day, pyrexia on fourth day. Vaginal douches administered by midwife for five days. Patient then sent to Monsall.

On admission:- General condition extremely bad, Maniacal delirium, tongue furred, abdomen markedly distended/


Name Mrs A.M. Melville Case 11. Age 38. Streptococcus Bacillus Coli Com. Result Cured.
Date
Day of Dis.
Time
Temperature (Fahrenheit)
Temperature (Centigrade)
Normal Temperat. of body
Rigor
Before Admission
On Admission
Anti Strep. Serum 90 c.c.
Anti Coli Com. Serum 80 c.c.
Urticarial Rash.
Pulse.
Resp.
Urine.
Bowels.
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distended and tender, uterus large and flabby reaching to umbilicus, no laceration of cervix, some pelvic cellulitis. The uterus was curetted, no retained placenta was found.

Condition continued very bad, the uterine cultures showed streptococci, blood was sterile. On third day condition had not improved. Abdominal hysterectomy was performed but patient did not recover from the shock and died two hours later.

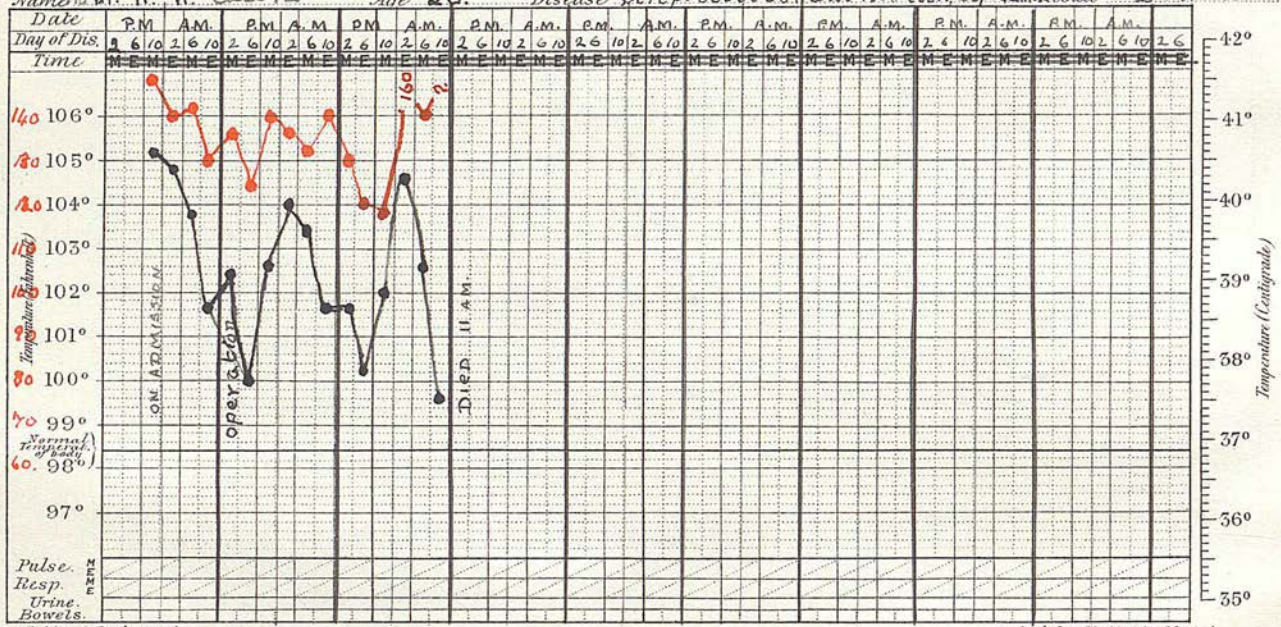
No. 11 Mrs. A. M. M. 38 years. 7 children. two miscarriages.

Miscarriage at sixth month, no doctor or midwife present. Doctor called five hours later to extract placenta. Hand introduced into uterus and placenta removed. Pyrexia 103° and rigor with profuse sweating on second day. Vaginal douches administered by a neighbour till seventh day when admitted to Monsall.

On admission :- abdomen distended, uterus large soft and flabby, cervix split, uterus 7" long, at placental site was a large mass of friable decomposing placental tissue, split in cervix continuous with laceration of posterior vaginal wall extending into tissues of left broad ligaments. No signs of peritonitis either general/

4 HOURLY

Name W.M. H. H. Case 12 Age 23. Disease Streptococcus., Bacillus Coli., Septaemia Result Death.



general or pelvic, some pelvic cellulitis, curettage was performed, slight rigor occurred shortly after. Streptococcus pyogenes and Bacillus Coli Communis isolated from uterine lochia. Blood not examined. antistreptococcus serum E. 125, 80 c.c. and Bac. Coli serum E. 123, 80 c.c. administered. Temperature remained up for four days and then patient began to improve rapidly. Wounds in vagina and cervix healed well and patient made an uneventful recovery.

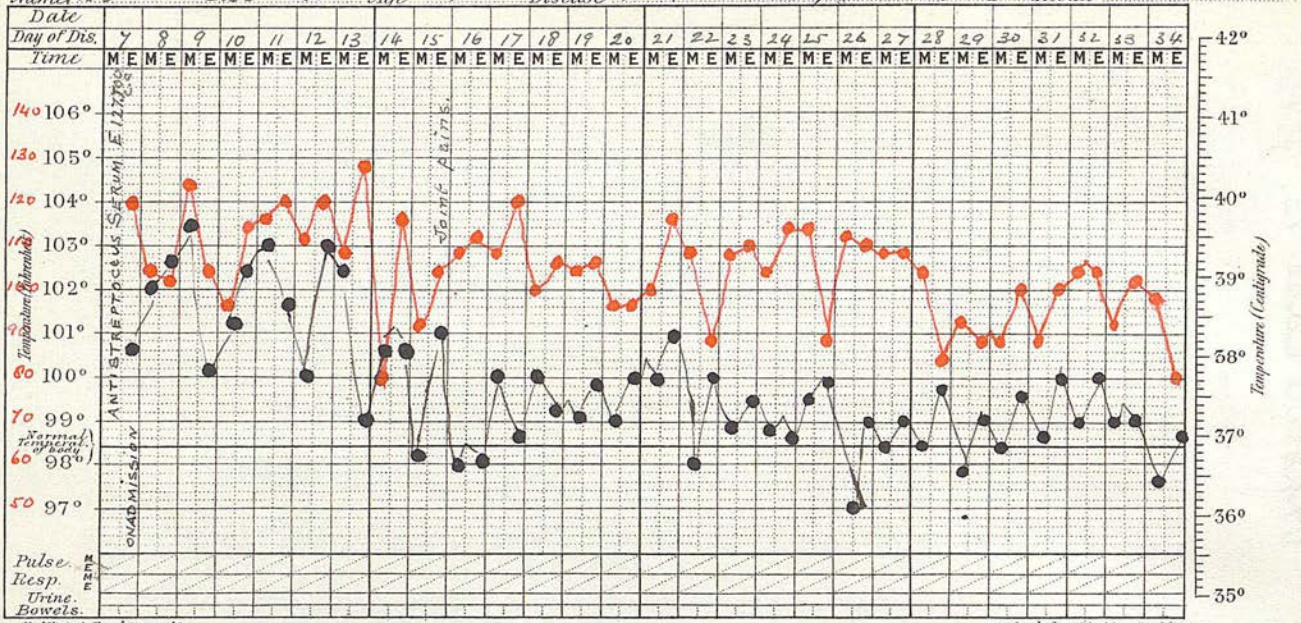
No. 12. Mrs. M. H. H. 23 years. 2 children. no miscarriage.

Easy labour conducted by midwife. Rigor on third day. Pyrexia 103° on fourth day. Admitted two days later.

On admission:- General condition very bad, marked anaemia, tongue coated, pulse 130 per minute, abdomen distended, uterus very large, soft and flabby, vaginal hysterectomy was performed, patient got over the operation well but died two days later of septicaemia, blood count showed R.B.C.=2,700,000, W.B.C. = 15,000 H. = 34 per cent. Streptococcus pyogenes and Bac. Coli Com. found in uterine discharges. Streptococcus also isolated from the blood.

No. 13/

Name Mrs A F. Case 13. Age 27 Disease Streptococcus Pyogenes Bac. Coli Com. Result Recovered.



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No. 13. Mrs. A. F. 27 years. Primipara.

No. Miscarriages.

Labour lasted 20 hours, conducted by midwife. Rigor pyrexia sweating and slight diarrhoea on sixth day. Vaginal douches throughout. Admitted on seventh day.

On admission:- Tongue raw and red, slight abdominal distension, uterus 2" below umbilicus, perineum torn, cervix split, foul smelling pus exuding from os. Blood count showed R.B.C. = 3,000,000, W.B.C. = 18,000, H. = 54 per cent. Curettage was performed no retained products found. Blood count remained about the same with variations in the leucocytes and temperature and pulse continued unsettled for some weeks. Abscesses formed, one in the right leg, two in the back, one in right forearm, and one in left little finger, these healed quickly after being opened. Streptococcus pyogenes and Bac. Coli Com. isolated from uterine discharges and also from pus in the abscesses. Blood not examined.

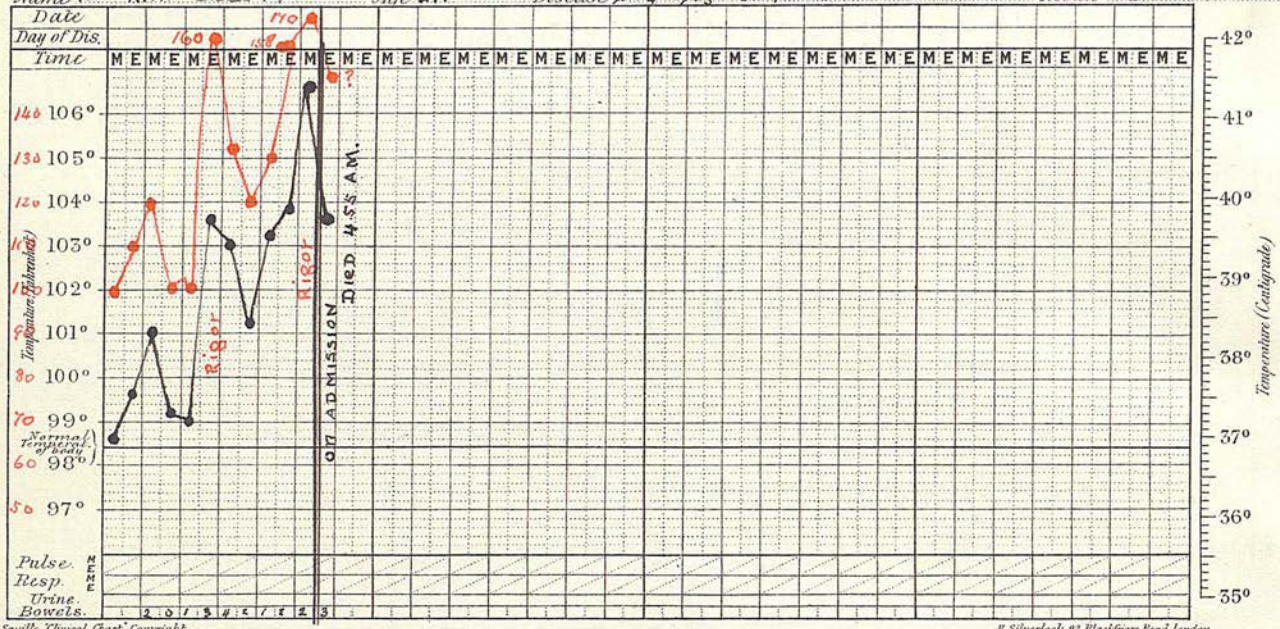
Patient made a good recovery and was able to leave hospital at the end of two months.

No. 14. Mrs. R. H. 27 years. Primipara.

No miscarriages.

Easy/

Name Mrs R.H. Case 14. Age 27. Disease Strep. Pyog. Staph. Albus. Bacillus Coli Com. Result Death.



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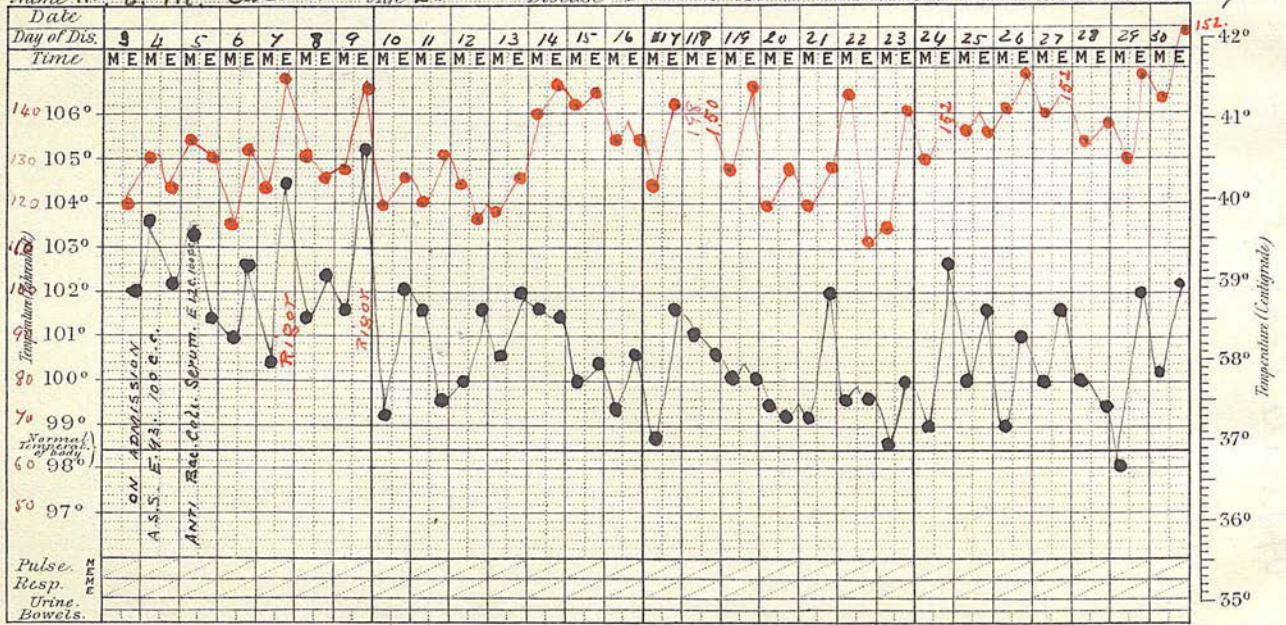
Easy labour conducted by a midwife. Pyrexia on sixth day followed by diarrhoea and abdominal pain. Admitted to Monsall on twelfth day.
On admission:- Tongue furred, dry and cracked, voice completely lost, profound anaemia, with slightly yellowish tinge of countenance, septicaemic odour of breath well marked, abdomen markedly distended, and board like, no movement in respiration, some laceration of the cervix, pelvic cellulitis and peritonitis present, fullness in Pouch of Douglas. Curettage was performed and considerable amount of purulant fluid and debris removed, laparotomy also performed . Left pyosalpinx, large abscess in Pouch of Douglas and general peritonitis found, drained by vagina and Keith's abdominal tube. Blood count showed R.B.C. = 1,800,000, W.B.C. = 19,670, Hb = 20 per cent. Patient died at 4 o'clock the following morning.
On examination of the cultures the uterine lochia were found to contain streptococcus pyogenes, staphylococcus albus, and Bac. Coli Com. while streptococcus pyogenes was also present in the blood.

No. 15. Mrs. E. M. 25 years. 3 children:
No miscarriages.
Placenta praevia, podalic version. Placenta removed by hand. Intra-uterine douche of normal saline given by/

Name Mrs E. M. Case 15 Age 25 Disease Bacillus Coli Communis. Result Recovery



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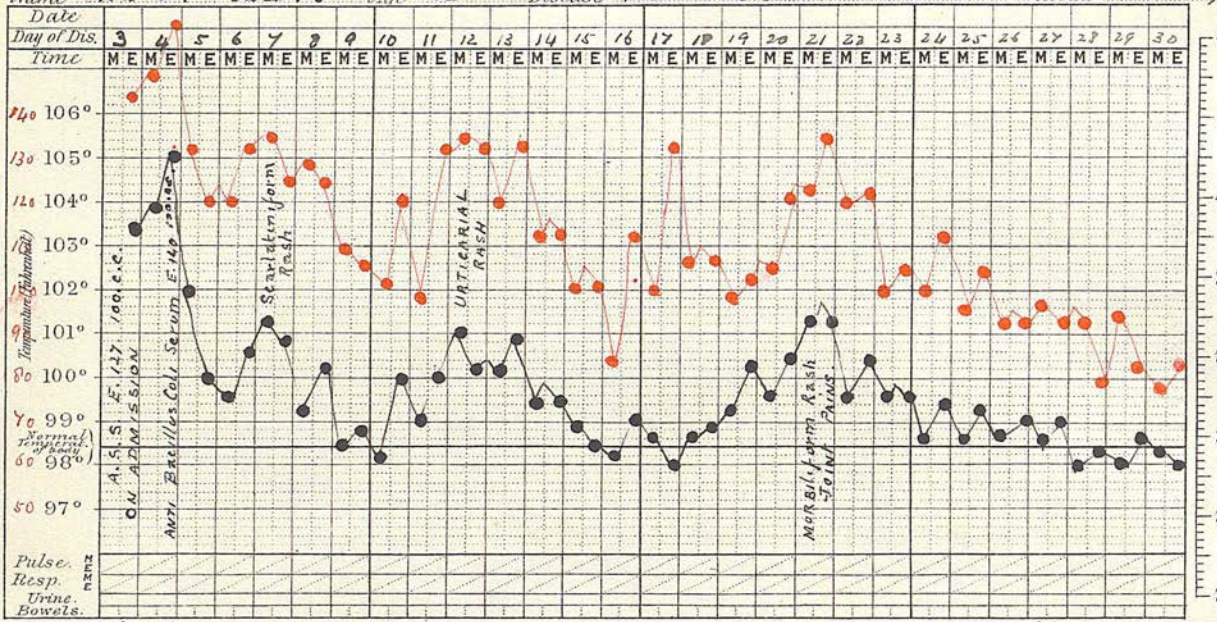
by doctor. Pyrexia and a rigor on seventh day, abdominal pain commenced. Patient admitted to Monsall on tenth day.

On admission:- marked anaemia, pulse small and rapid, profuse sweating. Tongue furred, abdomen distended but soft and moving freely in respiration. Aortic systolic murmur, patient delirious. Uterus 2" below umbilicus, discharge fetid, slight laceration of cervix, red area not tender or fluctuating, on outer side of right hip. Curettage performed, some retained placenta removed, antistreptococcus serum E. 93, 100c.c. was given. Bacillus Coli Communis isolated from uterine lochia, and anti Bac. Coli Com. serum E. 123 100 c.c. given.

Temperature remained up, and pulse continued very rapid. Rigors occurred from time to time. For a fortnight patient was delirious, with briefly lucid intervals, occasionally she was extremely violent. Abscesses of which that in right hip was the first, began to form in all parts of the body. Patient remained in bed for several months with occasional relapses, and abscess formation. All abscesses were opened immediately, in number they amounted to twenty-one. Patient was eventually discharged after a residence/

Name Mrs. Sl. Case 16 Age 22 Disease Bacillus Coli Communis Result Recovery



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residence in hospital of over seven months. This is a very remarkable case, patient's life was repeatedly despaired of, pulse rate often reaching 170 per minute, and for over ten weeks was never less than 120.

No. 16. Mrs. E. C. 22 years. Primipara. No miscarriages. Labour lasted ten hours conducted by a midwife. Vaginal douchings administered throughout puerperium until admission. Pyrexia and a rigor on the sixth day. Milk suppressed on eighth day, admitted to Monsall the following day.

On admission:- Extreme prostration and marked anaemia. Tongue furred, very slight abdominal distension. Uterus reaching to umbilicus. Perineum torn and cervix split. Curettage performed, some retained placenta removed. Uterine discharges not foul smelling. Antistreptococcus serm E. 127, 100c.c. administered. Blood count showed R.B.C. = 2,200,000, W.B.C. = 24,000, H. = 30 per cent.

The next day patient had a rigor. Temperature reached 105 and pulse 160, patient seemed very much worse. Cultures revealed the presence of Bacillus Coli Communis and no other organism in the uterine lochia, anti Bac. Coli serum E. 140, 100c.c. was administered. Within 12 hours patient showed marked signs of improvement, and from that time patient steadily/

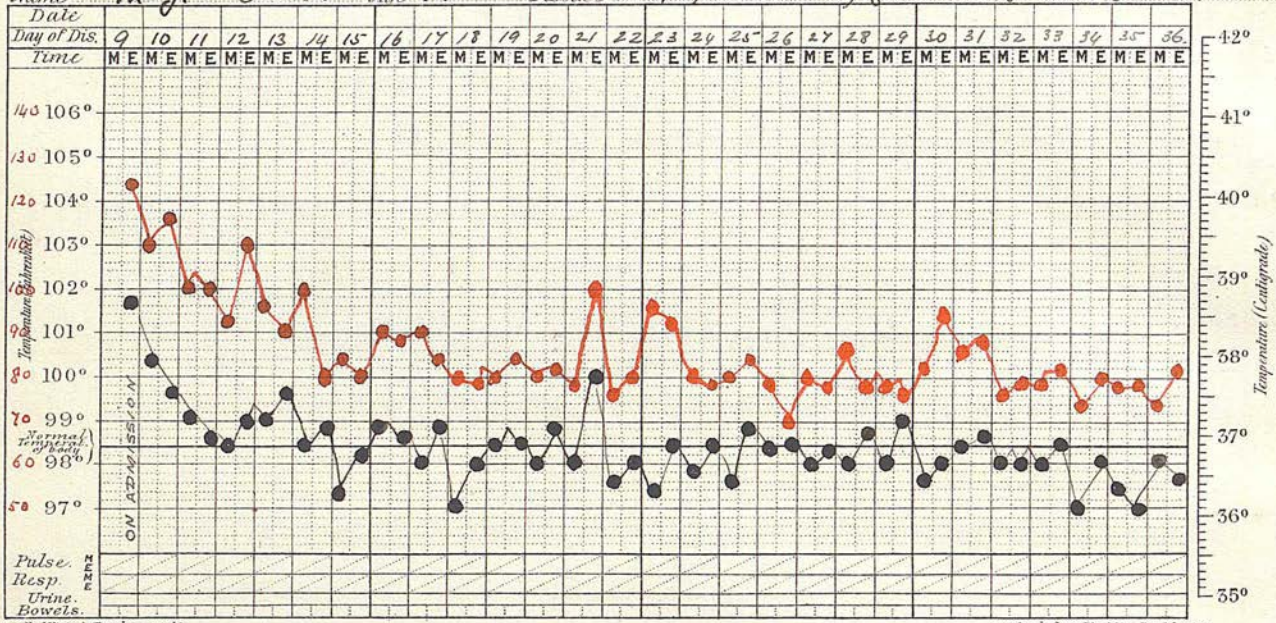
steadily gained ground. The blood improved and at end of a week the count showed R. B. C. = 2,650,000, W. = 14,000 and H. 38 per cent, by the end of a fortnight the leucocyte count was normal and red cells were over three million and haemoglobin 50 per cent. This patient showed well the toxic affects of serum, which were very evident without in the slightest retarding the comvalescence.

On the fourth day after admission, there was a slight erythema around the site of injection of serum, on the ninth day there was a general urticaria, and on the seventeenth day there was a general morbiliform rash accompanied by slight joint pains. Patient made an excellent recovery and left hospital at the end of six weeks. This is one of the most interesting cases in the series for the antistreptococcus serum given on admission, failed absolutely to have effect. While the anti Bac. Coli serum given on the discovery of the organisms in the lochia produced a very rapid and striking reaction, and patient made a speedy recovery retarded by no complication of any sort. The blood was absolutely sterile.

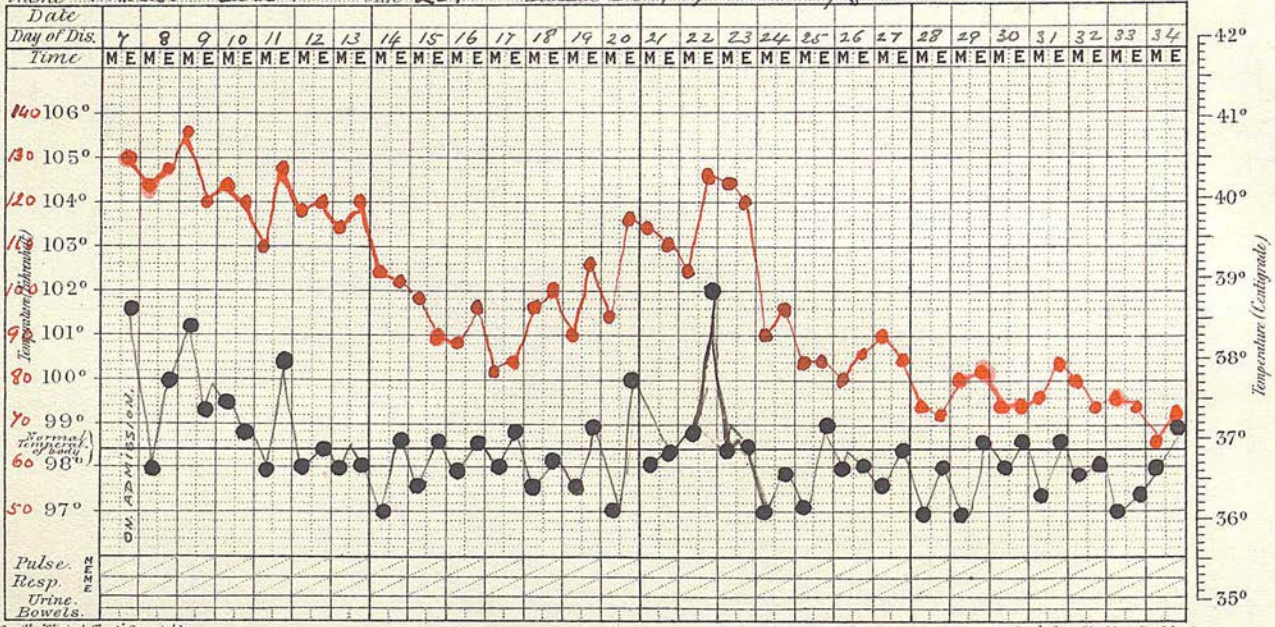
No. 17. Mrs. L. B. Primipara. No miscarriages.

Labour/

Name M. J. L. Case 18 Age 19. ~~Disease~~ Staphylococcus Pyogenes Aureus Result Cured



Name Mr E.A. Case 19. Age 25. ~~Disease~~ Staphylococcus Pyogenes Aureus Result Cured.



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not distended and moving freely, slight tear in perineum, bad split in cervix especially on left side, no cellulitis, sloughy foul smelling discharge from a patulous os.
The uterus was curetted and a few shreds of placenta removed. Blood count showed R.B.C. = 3,900,000, W.B.C. = 11,000 Hb. = 70 per cent.

Staphylococcus pyogenes aureus was the only organism isolated from the uterine lochia. Blood was sterile. Temperature and pulse dropped immmediately and patient made an uninterrupted recovery, and left hospital at the end of a month perfectly strong and well.

No. 19. Mrs. E. A. 25 years. 3 children.
No miscarriages.
Labour lasted about four hours conducted four days later by same midwife as Case 18. Pyrexia and a rigor on the fourth day. Admitted to Monsall three days later.
On admission:- Tongue slightly furred, some tenderness in the hypogastrium, uterus reaching nearly to umbilicus. No laceration of perineum or cervix. Some foul discharge from a patulous os, uterine cavity about 6" long.
Curettage/

Name Mrs. Blake No. 20 Age 21 yrs ~~Disease~~ Gonococcus. Result Cured.

Date	Oct	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5
Day of Dis.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Time	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E	M E

P

140 106° 130 105° 120 104° 110 103° 100 102° 90 101° 80 100° 70 99° 98° 97°

(Temperature Fahrenheit) (Normal Temperature of Body)

42° 41° 40° 39° 38° 37° 36° 35°

(Temperature (Centigrade))

ON ADMISSION

Pulse. M E M E
Resp.
Urine.
Bowels.

Curettage was performed, no retained products were found. Blood count showed R.B.C. = 3,150,000, W.B.C. = 18,000, Hb. = 50 per cent. Staphylococcus pyogenes aureus was the only organism that could be isolated from the uterine lochia, while examination of the blood revealed the presence of the same organism. The temperature and pulse remained irregular for some days, but patient made a very good recovery, in spite of the fact, that the organism was actually present in the blood.

No. 20. Mrs. F. B. 21 years. Primipara.

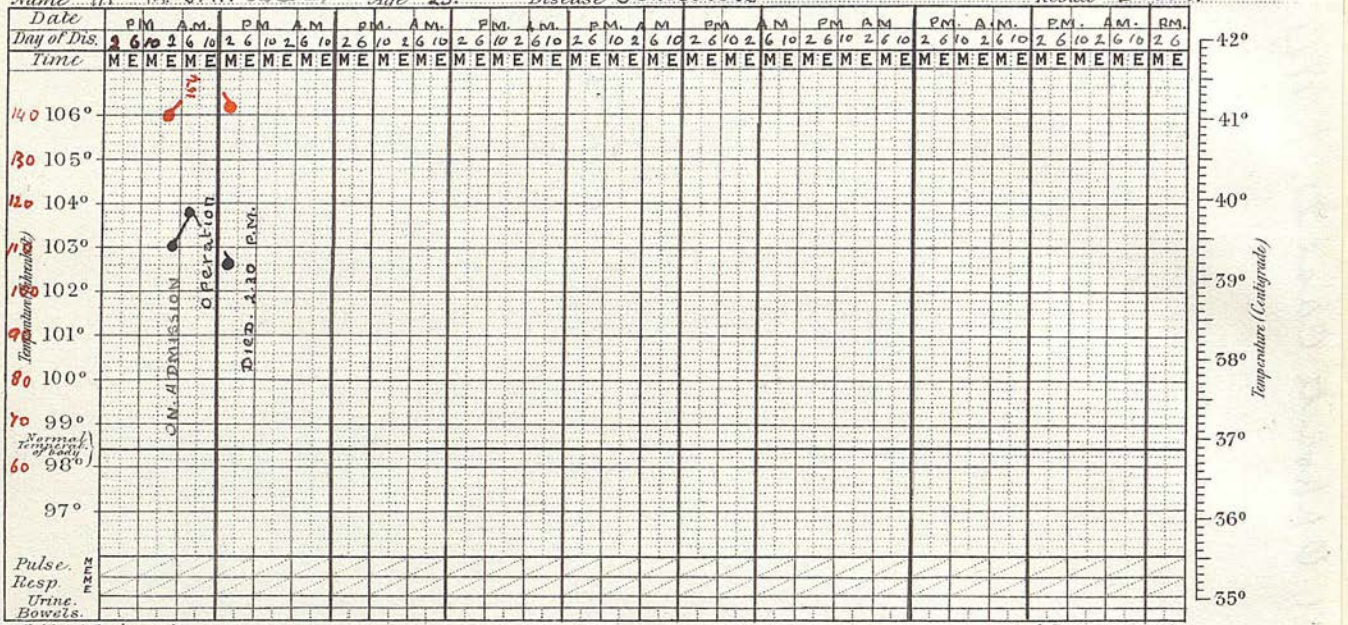
One miscarriage.

Short easy labour conducted by midwife. Pyrexia on fourth day, rigor on seventh day with profuse sweating. Pain in hypogastrium. Painful micturition, and retention of urine. Baby developed Ophthalmia neonatorum. Sent to Monsall on tenth day.

On admission:- Colour good, tongue slightly furred, no abdominal distension, uterus 3" below umbilicus, vaginal walls excoriated and covered with creamy looking pus, which was also seen exuding from the os. The vagina was douched out but uterus was left severely alone. Examination of the pus revealed the presence of a large number of gonococci. Discharge rapidly/

4 Hourly Chart.

Name Mrs M. S. H. Case 21 Age 23. Disease Gonococcus Result Death.



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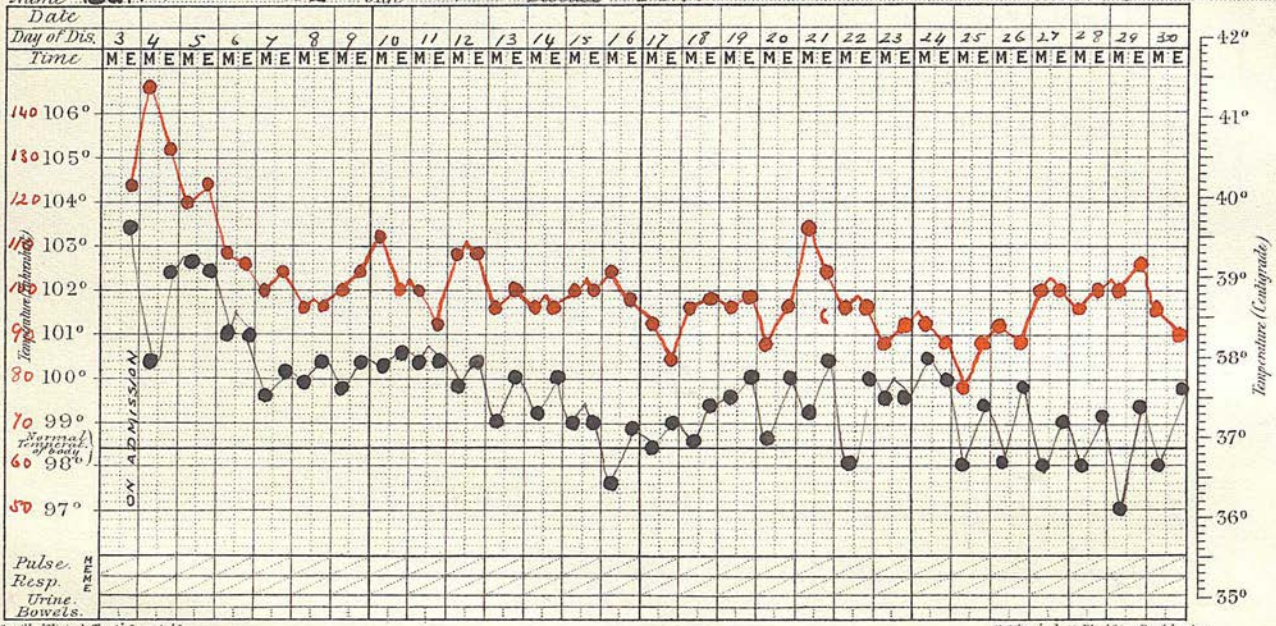
rapidly decreased and patient made a very good recovery.

No. 21. Mrs. M. J. H. 23 years. No children. One previous miscarriage.

Miscarriage at sixth month, no one present at the time, next day abdominal pain became very severe, and the following day patient began to vomit and have diarrhoea, abdominal pain became very acute, doctor was called in who sent her to Monsall at once. On admission at 4-30a.m. patient was evidently extremely ill, she was vomiting and abdomen was very tender there was obvious peritonitis. Blood count showed R.B.C. 3,500,000, W.B.C. = 28,000, H. = 88 per cent. She was operated on at 9 a.m. General peritonitis, right pyosalpinx which had burst and apparently an abscess in the uterine wall. The right tube was removed, and abdomen washed out and drained by vaginal and abdominal tubes. She died at 2-30p.m. The pus in the right tube was found crowded with gonococci but no other organism could be found. At the post mortem examination, the whole of the uterine wall was found to be riddled with small abscesses, the pus from which contained gonococci. This was a particularly interesting case, for/

Name B. B. Case 22 Age 37 ~~Disease~~ Gonococcus Result Cured



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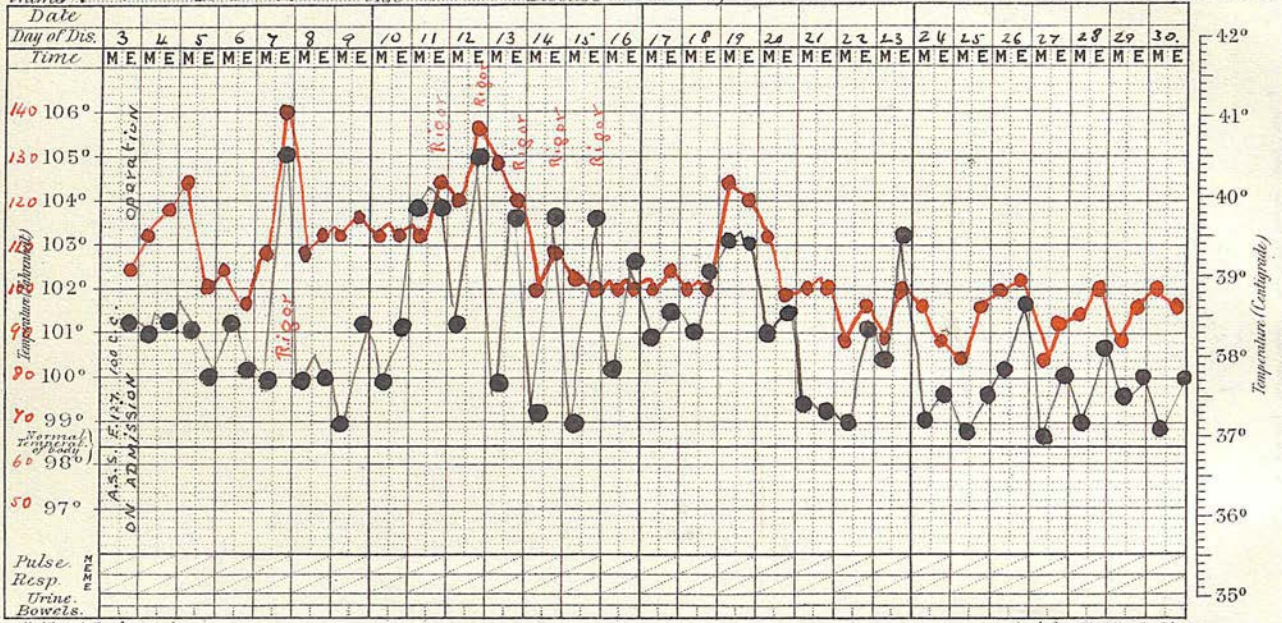
for no organism could be found except the gonococcus, and the blood was sterile. The abortion appeared to have been produced by gonorrhoea, though when the infection occurred is difficult to see. On inquiry it was found that the husband undoubtedly had gonorrhoea. The peritonitis appears to have been caused by the bursting of the pyosalpinx. The condition of multiple abscesses in the uterine wall is also very interesting.

No. 22. B. B. 37 years. A barmaid unmarried.
Two miscarriages.
Abortion at fourth month. Pyrexia with a rigor on sixth day followed by profuse sweating, vomiting and abdominal pain. Sent to Monsall three days later.
On admission:- Face anxious and pale, tongue furred, pulse 120 and somewhat thready, the lower part of the abdomen fixed and tender and some dullness in left flank, bulging felt in the Pouch of Douglas.
Laparotomy was performed. A double pyosalpinx was found with marked pelvic peritonitis and an abscess in the left Iliac region. Pus was exuding from the fimbriated ends of the fallopian tubes. There was an abscess in the left ovary. Both tubes and the left ovary were removed and the pelvis drained by vaginal/

Name W.F.B. Case 23. Age 40 ~~Diagnosis~~ Unidentified Aerobic Bacillus Result Recovered.



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vaginal and abdominal tubes. The pus from the tubes was examined and found to contain gonococci, but no other organisms. Temperature and pulse remained somewhat high for a month but patient slowly recovered her strength and was able to go home at the end of two months.

No. 23. Mrs. E. B. 40 years. Primipara.

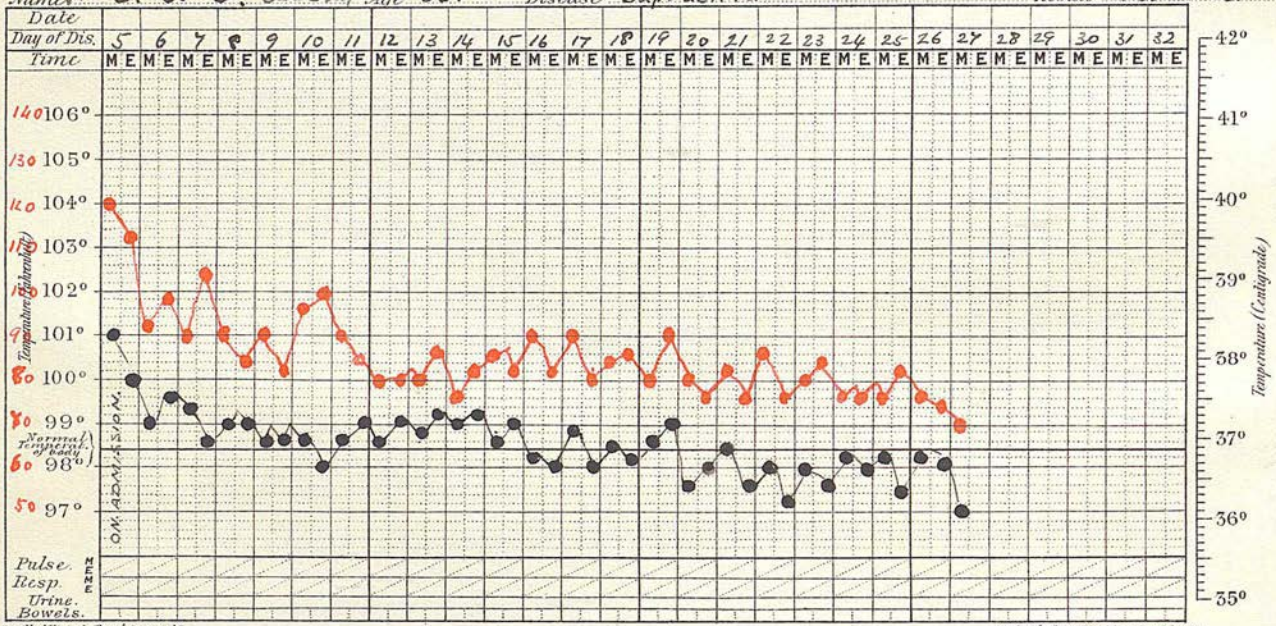
No miscarriages.

Long somewhat difficult labour conducted by midwife. Pyrexia on the third day. Rigor on the fourth day. Discharges became very fetid. Vaginal douches given by midwife. Sent to Monsall two days later.

On admission:- Patient seemed very poorly, tongue furred and dry, marked abdominal distension, coils of intestine standing out visibly from time to time. Uterus very large and lying over in the right Iliac fossa, marked constipation and some signs of intestinal obstruction. Cervix badly torn especially on the right side. Os patulous. Curettage performed and a considerable quantity of decaying placenta removed. Laparotomy performed and the intestinal obstruction relieved. Antistreptococcus serum E. 127, 100 c.c. administered. Blood count showed R.B.C. = 2,900,000 W.B.C. = 21,500, H. = 52 per cent.

Examination/

Name Mrs. S. a. C. Case 24 Age 36. Disease Sapræmia. Result Recovered.



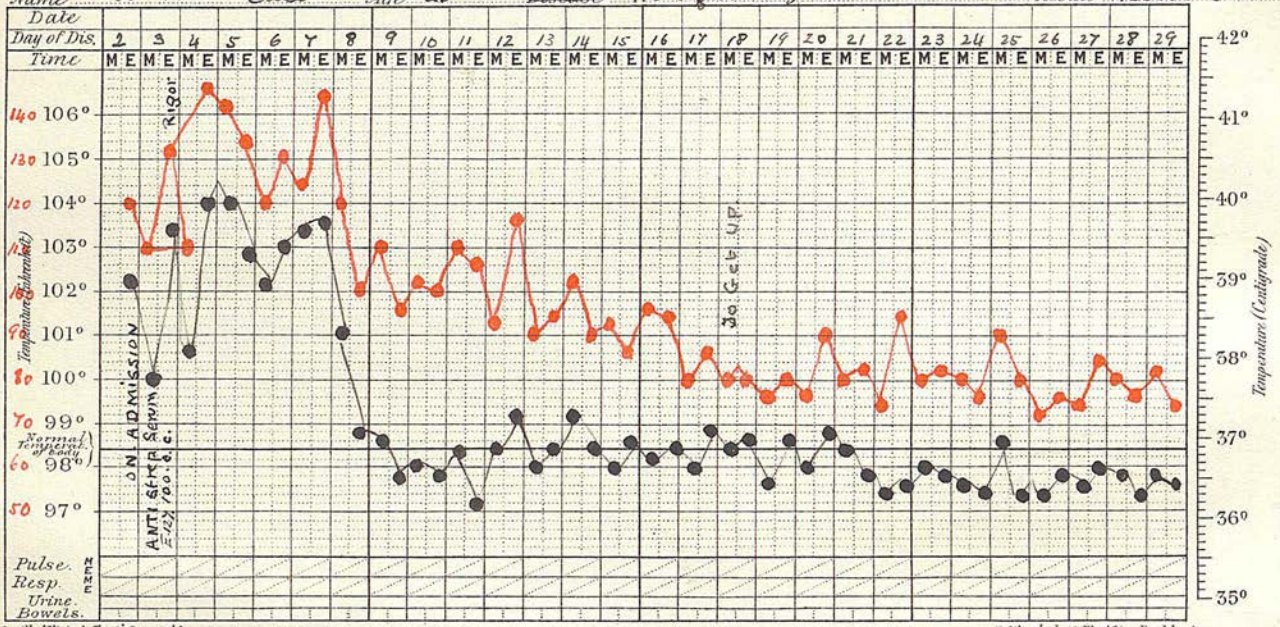
Examination of the uterine contents showed the presence of an aerobic Bacillus, not B. Coli, that could not be identified. The blood was sterile. On the fifth day after admission patient began to complain of tenderness in the right iliac region and the right thigh and she had a rigor, four days later the thigh became very swollen, brawny, not pitting on pressure, and very tender and she had another rigor, she had four more rigors during the next four days and the condition of phlegmasia alba dolens continued and pyaemia was feared. However very large doses of potassium citrate 40 grains three times a day were given and on the thirteenth day after admission she began to improve. Swelling of the leg gradually diminished and patient made a good though slow recovery.

No. 24. Mrs. S. A. C. 35 years. Seven children. One miscarriage.

Short easy labour conducted by midwife. Rigor and pyrexia 103° on third day accompanied by sweating vomiting and abdominal pain. Sent to Monsall two days later.

On admission:- Patient seemed in fairly good condition, no distension, some tenderness over lower segment of abdomen, uterus 1" below umbilicus, no laceration of perineum/

Name A P. Case 25. Age 25 ~~Disease~~ No Organism found Result Recovered.



perineum, os patulous with foul shreddy discharge exuding, no pelvic cellulitis or peritonitis.

Uterus was curetted and a considerable amount of foul smelling placenta removed. The cultures of both from the uterine discharge and the blood gave a negative result. This was the mildest case of the series, she made an uneventful recovery and left hospital at the end of three weeks. A case of pure sapraemia.

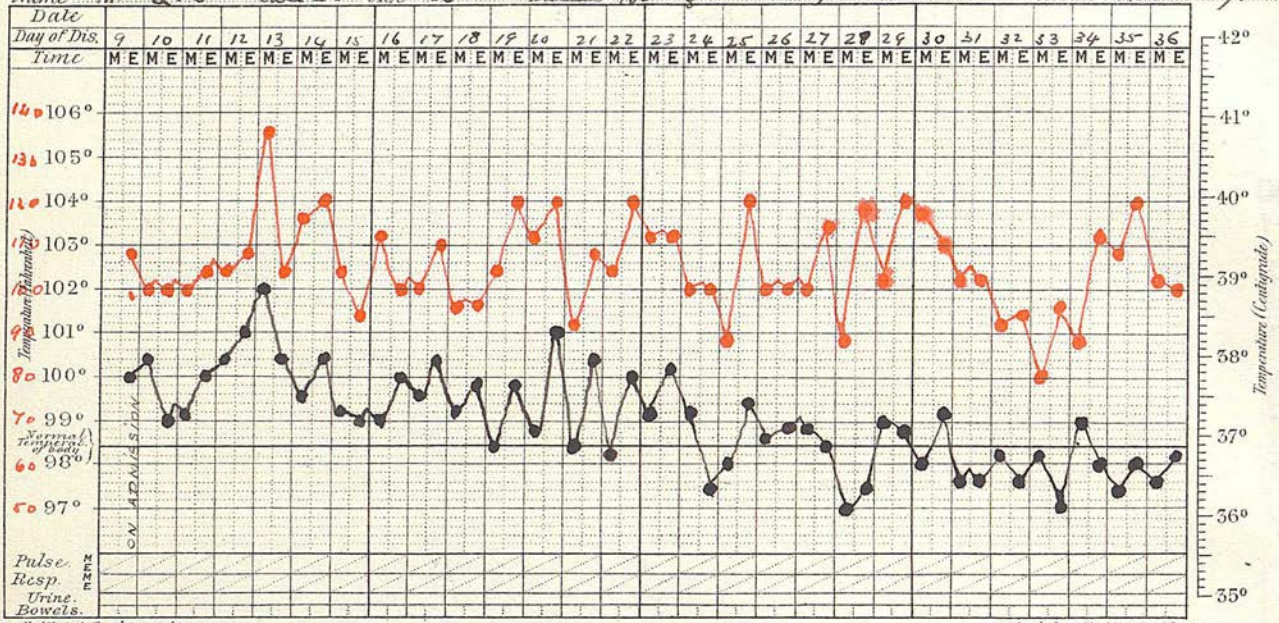
No. 25 A. P. 25 years. Primipara. No miscarriages. Criminal abortion at third month. Pyrexia and rigor on second day followed by abdominal pain. Sent to Monsall on second day.

On admission:- Patient seemed rather poorly, tongue furred, pulse 120, abdomen tender, uterus just palpable above symphysis Pubis, no laceration of genital tract, some foul discharge exuding from the os, no cellulitis.

Uterus was curetted and a considerable quantity of decidual tissue removed. Patient was rather poorly and pulse and temperature remained high for eight days, from that time patient rapidly improved and was able to leave hospital at the end of five weeks.

No/

Name Mrs. L. J. Case 26 Age 30 Disease No organisms found. Result Recovery.



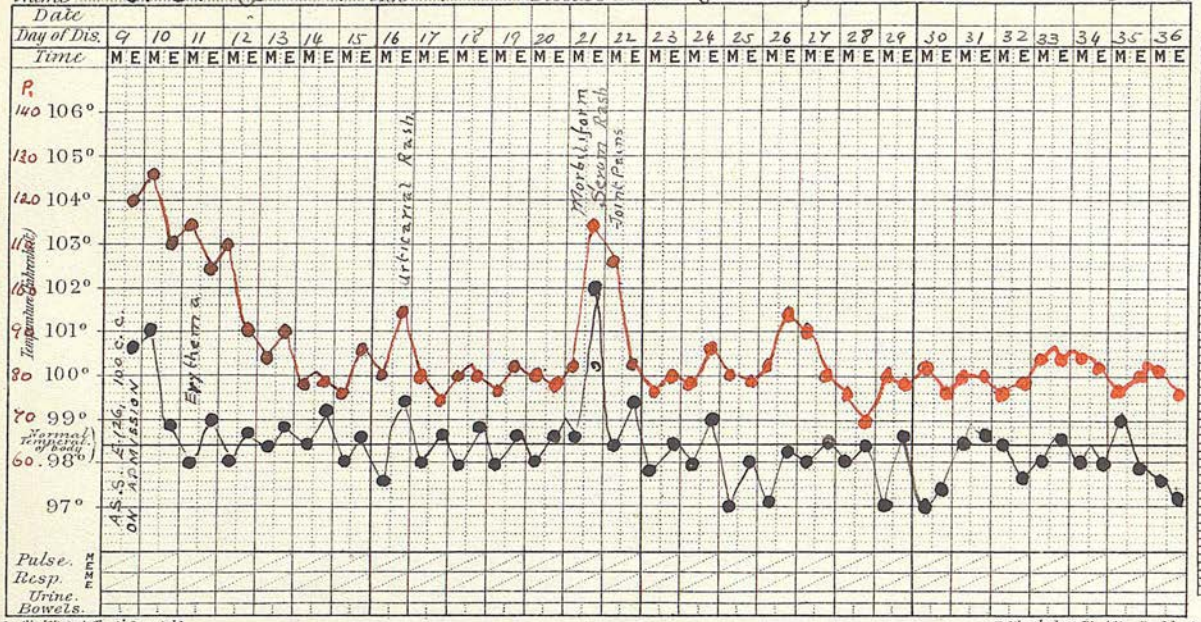
No growth was obtained either from the uterine discharges or the blood.

No. 26. Mrs. L. T. 30 years. Primipara. No previous miscarriages.
Abortion at the fourth month. Bleeding very severe. Pyrexia on sixth day no rigor but profuse sweating. Sent to Monsall three days later.
On admission:- Extreme anaemia, otherwise condition good. Tongue clean and moist. No abdominal pain, tenderness or distension, uterus just felt above the pubis, no laceration of the genital tract, os contracted, some pelvic cellulitis.

Curettage was performed after dilating cervix with Hegar's dilators. Blood count showed R.B.C. = 2,000,000, W.B.C. = 15,000, H. 30 per cent.
No organisms could be isolated either from uterine discharges or blood. Temperature and pulse were unsettled for some days, but patient improved rapidly, the blood making great strides day by day. The cellulitis cleared up nicely and patient made an excellent recovery and went home at the end of six weeks.

No. 27 S. C. 19 years. Primipara. No miscarriages.
Labour lasted/

Name S. C. Case 27 Age 19. ~~Disease~~ No organism found Result Cured



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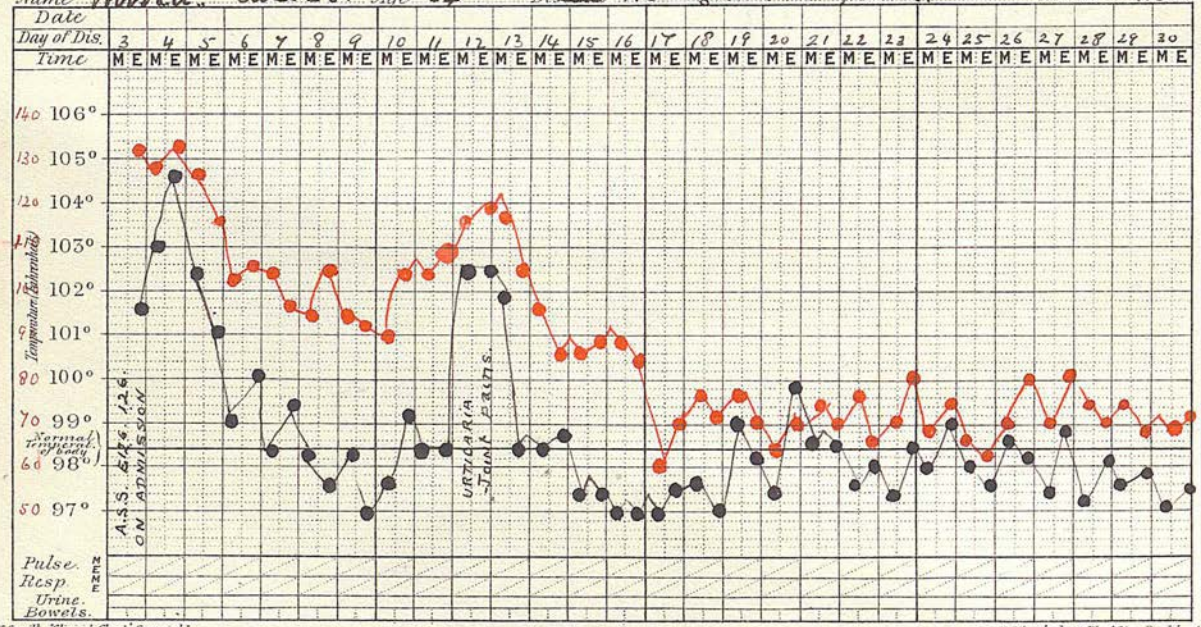

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Labour lasted twelve hours and was conducted by midwife. Pyrexia 102.4 on sixth day. No rigors. Sent to Monsall three days later.

On admission:- General condition good, tongue slightly furred, some tenderness in the hypogastrium, slight tear in perineum, no cellulitis.

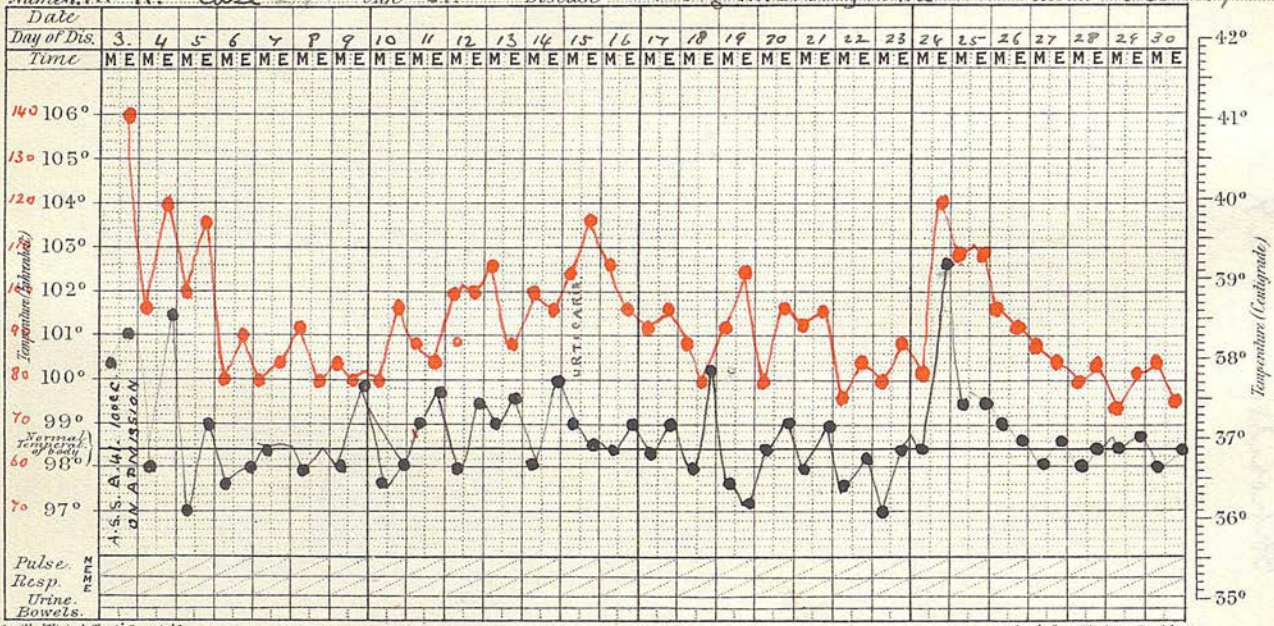
Uterus was curetted and a considerable amount of decaying placental tissue removed. Antistreptococcus serum given E. 126. 100 c.c. No growth resulted from the cultures taken either from the uterus or the blood. Temperature and pulse came down at once and patient made an uneventful recovery leaving hospital at the end of five weeks. The serum used was E. 126 and as usual caused severe toxic symptoms.

No. 28. Mrs. M. A. 34 years 10 children and 3 miscarriages.

Short easy labour, no midwife or doctor present. Pyrexia and a rigor followed by sweating on the fourth day. Very severe abdominal pain, lochia became chocolate coloured and foul, vaginal douching daily from delivery until admission on the sixth day.

On admission:- Tongue thickly coated, abdomen very tender but not distended, moving freely in respiration, uterus reaching to umbilicus, cervix badly split, very offensive/

Name Mrs. M. R. Case 29. Age 27. Disease No organisms found Result Recovery



offensive discharge from a patulous os. Some pelvic cellulitis, large mass of placenta removed with finger, and uterus then carefully curetted. Antistreptococcus serum E. 126 100 c.c. Cultures produced a negative result both in the case of the uterus and the blood. Temperature and pulse fell almost immediately and patient made a good recovery. Serum rashes and joint pains were extremely severe in this case, the serum given was series 126 which as described before always produced very marked toxic effects. Patient left hospital at the end of six weeks.

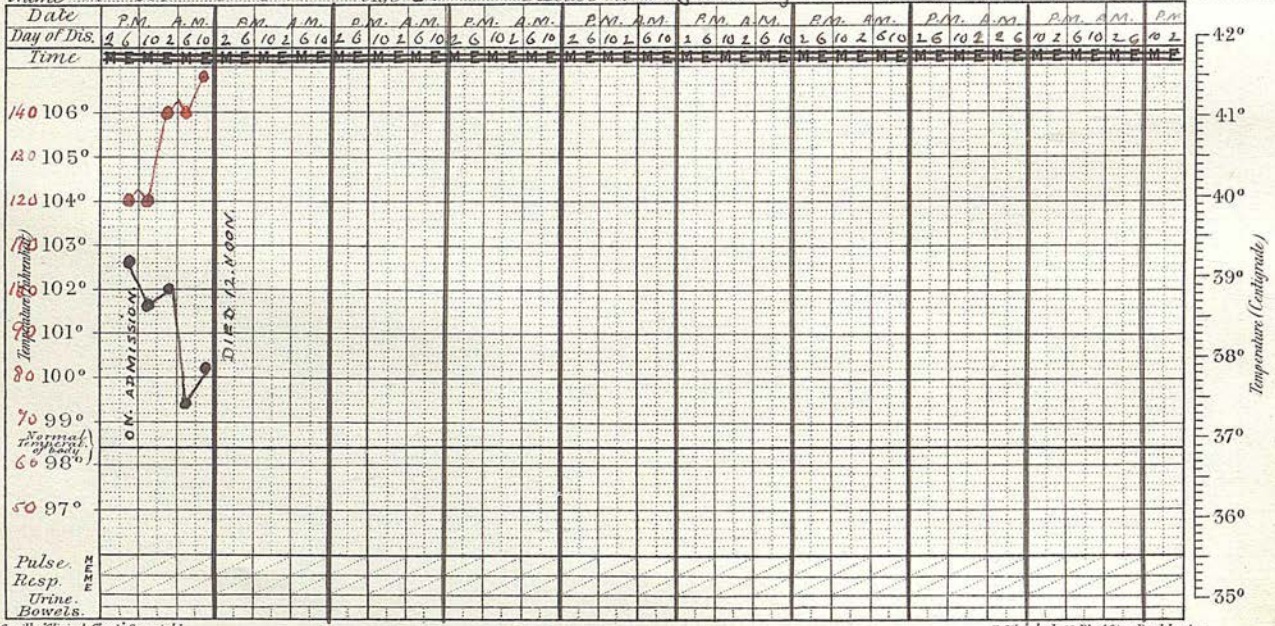
No. 29. Mrs. M. R. 27 years. One child. One miscarriage.

Partial placenta praevia, hand of doctor introduced into the uterus. Turning was performed. Pyrexia and a rigor on the second day, patient sent immediately to Monsall.

On admission:- Patient's condition was very bad. Tongue furred, great tenderness in hypogastrium, uterus fairly well contracted. Very extensive laceration of cervix, on the left side, the tear was almost into the peritoneum, the edges of the tear were sloughy and dirty. Pelvic cellulitis and peritonitis present, uterus not curetted. Blood count R.B.C. = 3,000,000,

4. HOURLY CHart.

Name Mrs C.W. Case 30. Age 30 ~~Disease~~ No organism found in Uterus Result Death



= 3,000,000, W.B.C. = 18,120, Hb. = 60 per cent. Edges of tear scraped with curette and swabbed with pure izal. Serum A.41, 100c.c. given.

Although this case presented the appearance of a streptococcal infection, efforts to cultivate that organism or indeed any other entirely failed, nor could any organism be seen in films prepared from the exudate from the tear in the cervix. The blood was also free from organisms. Temperature came down almost immediately and patient rapidly recovered. Pelvic condition cleared up nicely and the blood improved quickly, patient was able to go home at the end of six weeks.

No. 30. Mrs. C. W. 30 years. three children. No miscarriages.
Easy labour conducted by midwife. Pyrexia on fourth day. No rigor. Sent to Monsall next day.
On admission:- Patient seemed in fair condition, uterus felt in right iliac fossa, very tender, uterus curetted and some decaying placenta removed.
The next morning patient collapsed and died within an hour. The cultures both from the uterus and the blood gave a negative result. Blood count showed R.B.C. = 3,400,000, W.B.C. 20,179, H. 60 per cent.

At/

At the post mortem examination the abdomen was found to be full of pus which had apparently come from a pelvic abscess that had burst. Death is thought to have been due to general peritonitis caused in this way.

VIII.

Conclusions.

1. Puerperal Infection is a true wound infection.

2. The organisms that may cause Puerperal Infection are many, but the most important one, both in point of frequency and as regards the severity of the infection produced, is the streptococcus pyogenes. Next in importance is the Bacillus Coli Communis, while among the other organism that may occur are, staphylococcus pyogenes aureus and albus, gonococcus, pneumococcus, klebs-loeffler bacillus and possibly certain anaerobic organisms.

The streptococcus is the organism most frequently concerned in cases of true septicaemia, that is it is the one most often found in the blood.

3. Infection arises in, and spreads from, a raw surface somewhere in the genital tract, resulting from parturition. The organisms are usually derived from without and are conveyed to the genital tract, at the time of delivery by the midwife or doctor in attendance, or at a later date by vaginal douching, dirty clothing etc. In some instances however it is possible that the organisms are present in the genital tract before delivery, and that they give rise to/

to infection when a suitable soil is prepared for them.

4. The symptoms vary according to the type and severity of the case. A rigor, rise of temperature and quickening of the pulse almost invariably accompany the onset of the disease. In the slighter forms of infection the lochial discharges become abundant and very foul and considerable masses of retained placenta are present in the uterus. In the severer forms the lochia are scanty and have not as a rule a foul smell, endometritis is usually well marked but no decidual products are retained within the uterus. Prostration is profound and the general condition very bad. Not infrequently there is true septicaemia, organisms being actually present in the blood.

5. Of the complications, endometritis is the commonest, pelvic cellulitis and a certain degree of pelvic peritonitis are often found, while in the fatal cases death is almost always due to general peritonitis. Pyosalpinx and ovarian abscess may be found in a certain number of cases. Pyaemia is a very serious complication, while phlegmasia alba dolens and abscess of the uterine wall are amongst the rarer complications.

6./

6. Puerperal Infection is to a very large extent a preventable condition. Prophylactic measures are therefore of great importance. Care as to the general condition of the parturient woman is important, but particular attention should be paid by the accoucheur to asepsis in conducting the labour. When infection has occurred prompt and active interference by means of the curette followed by antiseptic swabbing is advisable. Antistreptococcus serum given in large doses is often very beneficial and is to be recommended in all cases where there is not definite evidence that another organism is the cause of the infection. Anti Bacillus Coli serum may do good in cases caused by that organism. In the after treatment the most important factor is the diet, good nourishing food should be given in large amounts.

Hysterectomy should not be regarded with favour, but all complications should be dealt with promptly and by operation if necessary.

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