PUERPERAL INFECTION, ITS CLINICAL VARIETIES AND TREATMENT.*

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Opportunity has been afforded the writer in his hospital practice for clinical observation of a series of severely infected puerperal women, and in many instances when on duty to direct their treatment. In the past six years on the Third Indoor Division of the New York Lying-in Hospital there have been 825 cases of morbidity of genital origin, the index of morbidity recognized by the hospital being any rise to 100.4°

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or over during the lying-in period. This is excluding temperatures due to definite breast or lung conditions or to extragenital infections. In two ways the morbidity may be described as legitimately larger than that of the ordinary maternity service, first by the admission of cases in labor that have already undergone attempts at delivery, and secondly by the admission of infected post-partum women. The "septic" side of the service has thus become of value in presenting a wealth of material for study.

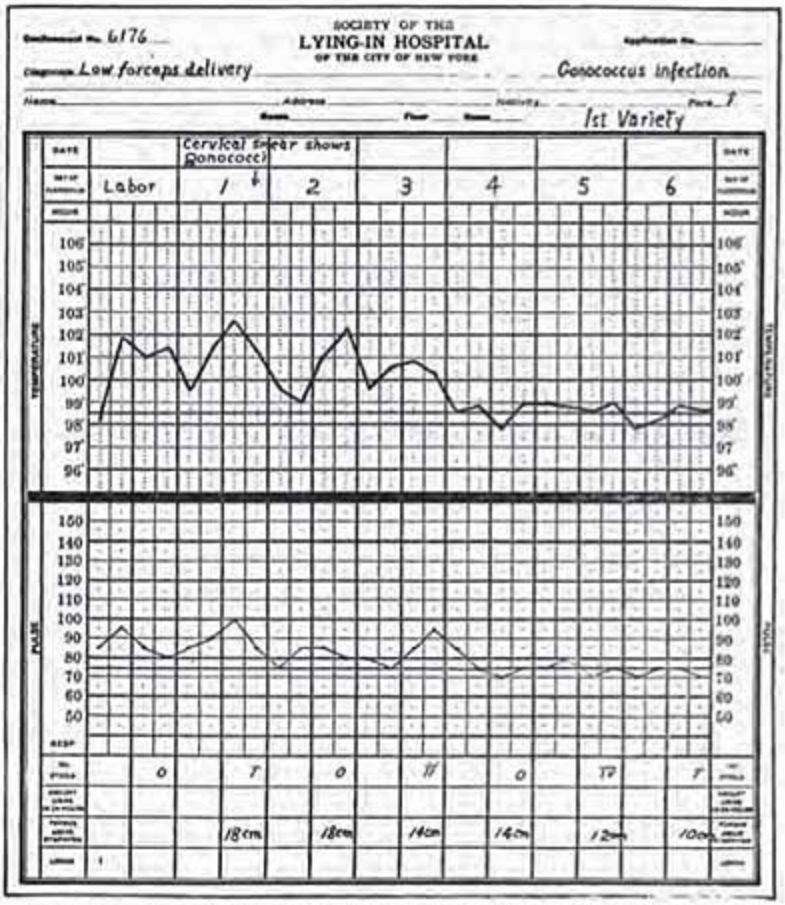

CHART I.—Temperature curve of gonorrheal infection of the early variety. Clearing up without sequelæ in the first week of the puerperium.

It has come to be recognized that early diagnosis of the cause of fever in the recent mother is difficult, and that many procedures widely employed in the treatment of puerperal infection are dangerous and of indefinite value. It is to aid in the appreciation of the variety and the extent of the infection present, as well as to discriminate in the method of treatment to be employed that this paper has been undertaken.

The only way in which we can make any progress with this complicated but all too common problem is to continue in our collaboration with the bacteriologist. We feel that great assistance has been given in the management of puerperal infection by the hospital laboratory in the details of culture and spread slide reports. It is true that the isolation of the offending bacterium is often of little apparent value. "Streptococci

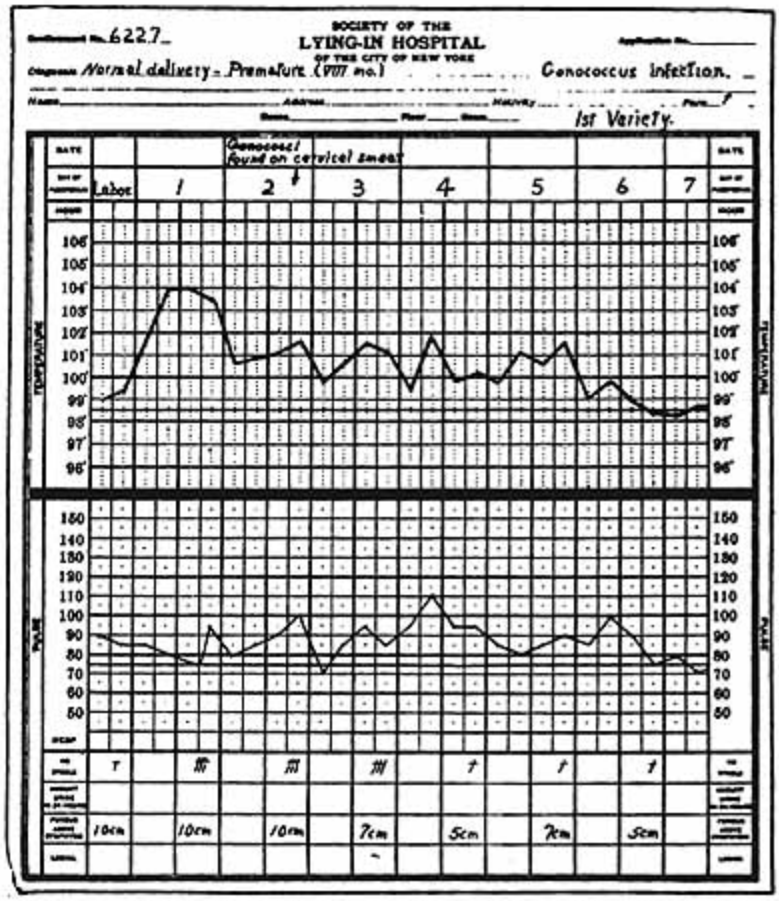

CHART II.—Temperature curve of gonorrheal infection of the early variety. Clearing up without sequelæ by the end of the first week of puerperium.

in uterus" cases get well and "sterile culture" cases die. Investigators argue that we are not justified in classing a case as streptococcic toxemia just because a few non-virulent streptococci are found on cervical smear or uterine culture. The quality and quantity of the particular woman's resistance, however, must be taken into account as well as the acquired virulence of the same non-virulent bacteria as they penetrate into wounded and devitalized tissues. When the attending physician knows what

organism is at work he always feels in better command of the situation. It helps him to judge when to be radical and when to be conservative in his attack if he is acquainted with the identity of the enemy. Certainly with our present knowledge of the subject the most exact index of the variety of the infection is the result of cervical and uterine smear and culture. On the other hand, the clinical picture of pulse, temperature and general condition is the correct index of the balance between the virulence of the particular strain of that organism and the resistance of the patient.

There were 225 women in whom either the streptococcus, the gonococcus, the staphylococcus or the colon bacillus were found, and the discussion will be confined chiefly to these and to a number of cases with distinct pathological lesions but in which no organism was isolated. It might be well in passing to mention fifty-two instances of reaction temperature occurring in labor or immediately thereafter and falling to normal within the first twenty-four hours with no further rise during their stay in the wards. The higher rises to 103° and 104° were usually associated with foul and yellow lochia and were a true transient toxemia. The milder reactions occurring in severe labor or after operative procedures may be viewed as the temperatures of exhaustion or of the absorption of fibrin ferment. There were, however, seventy-one additional patients with an apparent reaction rise which as the case progressed either continued high or after the initial fall reappeared. So that it must be borne in mind that a temperature beginning in labor or appearing within the first twelve hours cannot always be looked upon with equanimity as a reaction rise. It may be the first signal of a severe infection.

True bacterial toxemia including sapremia and without definite pathological lesions aside from birth injuries of the genital canal, occurred 317 times in the series. In 137 of these toxemias cultures of pathogenic bacteria were secured. In the remainder which were largely sapremic, either the cultures were negative for pathogenic bacteria or else no cultures were made.

Sapremias	180
Streptococcic toxemias	37
Staphylococcic toxemias	38
Mixed	18
Gonococcic toxemias	31
Colon bacillus toxemias	12
Staphylococcus and colon bacillus	1
Total toxemias	317

Probably the most interesting group of toxemias were those in which the gonococcus was found in the vagina or cervix.[1] There has been

[1]The cases cited do not include any of those reported from the wards of this hospital by Stone and Macdonald in 1905.

considerable discussion as to whether the gonococcus is such a frequent inhabitant of the genital canal of pregnant women as general statistics of the disease would indicate, also when present whether it is really of much importance as a pathological factor in the puerperium. Our experience is not conclusive on either point, but such figures as it is possible to present are suggestive.

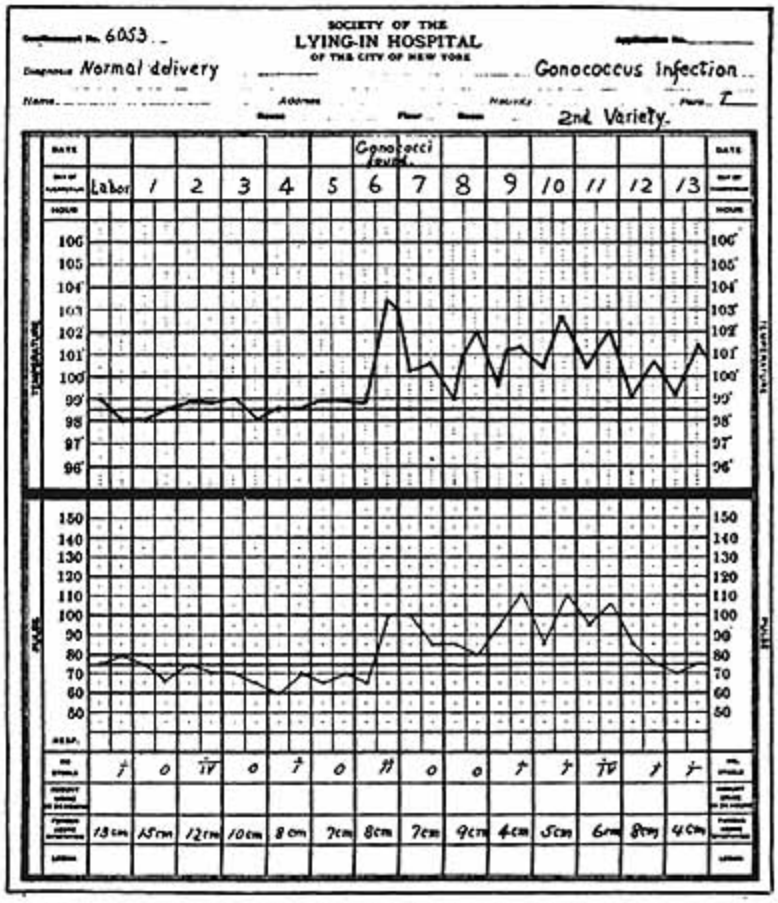

CHART III.—Puerperal gonorrheal infection of the second variety, symptoms not appearing until late in first week. Gonorrheal tubes were removed from this case eight months later.

Several years ago we took smear spreads from the cervix and vagina of every parturient on admission. The gonococcus was found approximately in 6 per cent of all pregnant women. This is in close agreement with Williams's figures of 5½ per cent. The experience of foreign observers seems to be much larger, (Leopold 20 per cent, Kronig 28 per cent). At the time of this investigation about 40 per cent of the women infected

with gonorrhea exhibited a febrile course during their puerperium. In the six years we have had thirty-nine cases of fever in the puerperium with a gonorrheal infection. While it is scarcely possible to individualize this infection as a clinical type, it is quite noticeable that there are two varieties of the gonorrheal invasion to be clinically distinguished from each other. The first variety is the more common. The temperature rises during labor on the first day and runs a course of six or seven days duration, approaching normal in the A.M. and reaching 101° to 103° or 104° in the P.M. The lochia is foul, of a musty, fetid odor; the pulse ranges a little lower than in streptococcic or colon bacillus infection, and there is the general picture of a bacterial toxemia. Further trouble may be expected in 12 per cent of such cases, usually in the form of pelvic abscesses with associated streptococcus infection and requiring posterior vaginal section and drainage. Rarely there may be an immediate tubal involvement following this type, but such extension is usually later and five of these women have had salpingectomies performed within eight months after their confinement.

The gonococcus may be found on cervical spread slides from the second to the fifth day. We found it most frequently as early as the third day. A pure infection of the gonococcus exhibiting this early clinical type will often resolve as a simple toxemia and leave the woman in good physical condition.

The second variety of the gonorrheal infection, not so common as the first, shows no rise in temperature or other disturbances during labor or for the first five or six days, and the woman seems to be running a normal course. At the end of the first week, however, from the fifth to the seventh day, the temperature suddenly shoots to 102° or more and there is severe pain and tenderness across the lower abdomen. It is this class that includes the greater number of adnexal complications. The gonococcus seems to have penetrated deeper before conception occurred and lying quiescent attains new vigor during the puerperal involution.

In 28 per cent of such cases the infection is not limited to the uterus. Even more remote lesions may occur such as arthritis. One of our cases developed a typical gonorrheal arthritis of one elbow and the opposite wrist, delaying the convalescence for many weeks though finally subsiding without operative interference.

The most conservative treatment has proved to be the best when the gonococcus is present. Intrauterine douches are bad and a curettage of any variety is most dangerous. In several cases there was a most suspicious connection between an intrauterine douche and a spread of the infection to the tubes a day or two later. The advisability of even vaginal irrigating with permanganate solution is questionable. The time for such treatment was before parturition. Cartharsis, elevation of the head of the bed and the ice-bag when pain or tenderness is present is the more appropriate management of gonorrheal toxemia.

There were also several cases admitted post partum suffering with gonorrheal infection that may be mentioned here to complete the group. One of these died with a complication septic pneumonia having had a mixed genital infection of gonococci and staphylococci. This was the only death in this group. One had multiple abscesses of the uterus and recovered after a complete hysterectomy, the abscesses showing strepto-

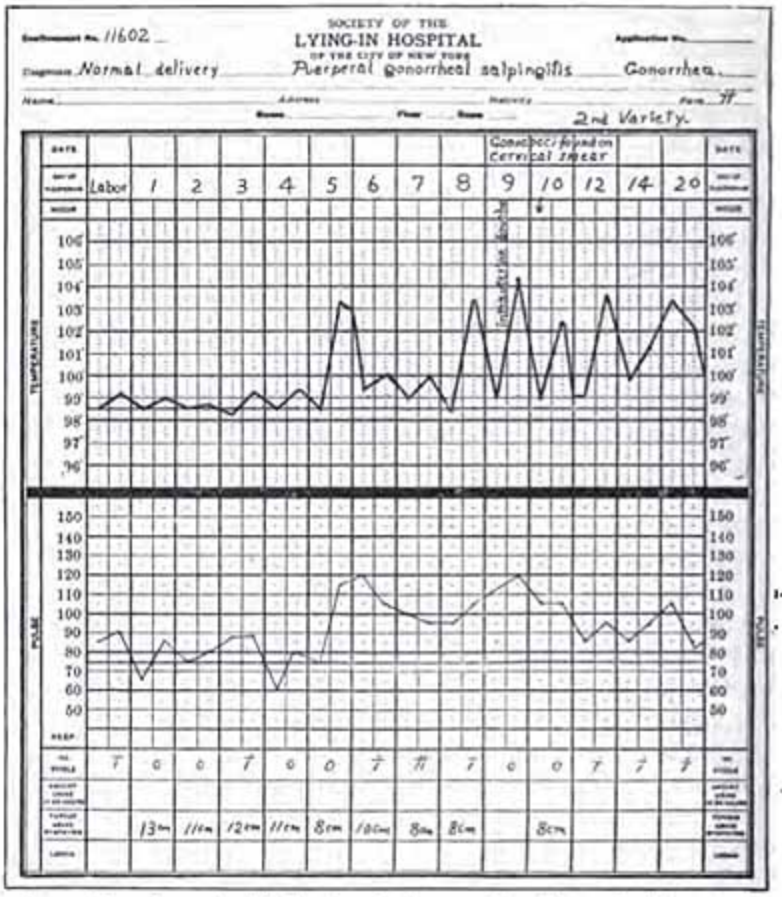

CHART IV.—Gonorrheal infection of the second variety. An intra-uterine douche on the ninth day, before the identification of the infection, was apparently followed by extension to the tubes.

cocci on culture. Two had posterior vaginal sections done for pelvic abscess.

Our experience with the gonococcus thus agrees with those who maintain that this infection is often a serious one in the puerperium. Though a fatal issue is not common, the damage done is more permanent than that of the other infections and there is likely to be further trouble at

a later date. The majority of puerpera who on their discharge examination showed thickening or tenderness in the vaginal fornices were those in which the gonococcus had been the destructive agent.

The common clinical picture produced by the colon bacillus is a severe toxemia beginning on the second to fifth day with a sharp rise of temperature, considerable prostration, and frequently with one or more chills. It is not especially distinguishable from the other toxemias except by the extreme foulness of the lochia, the odor being like that of colon bacillus pus from a bad appendiceal abscess. It is in this variety of infection that the intrauterine douche gently given has proven of greatest value. Twelve cases of colon bacillus toxemia were treated with intrauterine douches and responded well to one or more irrigations with normal saline solution. The change in the general condition within twenty-four hours after the administration of such a douche was most convincing of the effectiveness of local treatment in this infection.

In the toxemia produced by the streptococcus the treatment with intrauterine douching or manual cleansing of the uterus has not met with success. In thirty-seven cases of pure streptococcic toxemia not one responded favorably to such local procedures. The cases of streptococcic toxemia that cleared up rapidly did so without any local treatment whatsoever, and in reviewing the other pathological conditions such as streptococcic pelvic exudate, peritonitis and bacteremia, the record of intrauterine douching or curettage is usually found antedating the later serious developments. In streptococcic toxemia without complications there is usually no chill, the rise in temperature begins before the fifth day, the pulse rise is high in proportion and the lochia is not foul unless there is an accompanying mixed infection or retention of sapremic secundines. The general treatment of toxemia without local specialization is the one to follow, *i.e.*, institute drainage by elevating the head of the bed and apply the ice-bag to the lower abdomen for the toning of the uterus and the relief of pain.

Staphylococcic toxemia without complicating lesions is rare and when present is mild in character. The let alone treatment is here again all that is necessary. The staphylococcus is more frequently found in combination with the streptococcus in producing a toxemia which is of a more severe type.

There were 180 cases which may be classed as sapremias. These all had foul lochia, and include those in which either no cultures were made owing to the mild degree of the infection or where the culture was reported negative for pathogenic organisms. Many times there was evidence of retention of secundines, and improvement seemed more rapid in the cases in which a manual cleansing of the uterus was done. Aside from hemorrhage the indication for entering the uterus for the removal of foul retained lochia or secundines must be the patient's general condition. Providing no organisms are found on smear or culture, if the temperature

is high with or without chills, and the prostration is marked, it is proper to remove manually or with the intrauterine douche the contents of the uterus.

Such intrauterine manipulation will be precluded in the case of single day rises by the necessity of waiting for the twenty-four report from the bacteriological laboratory.

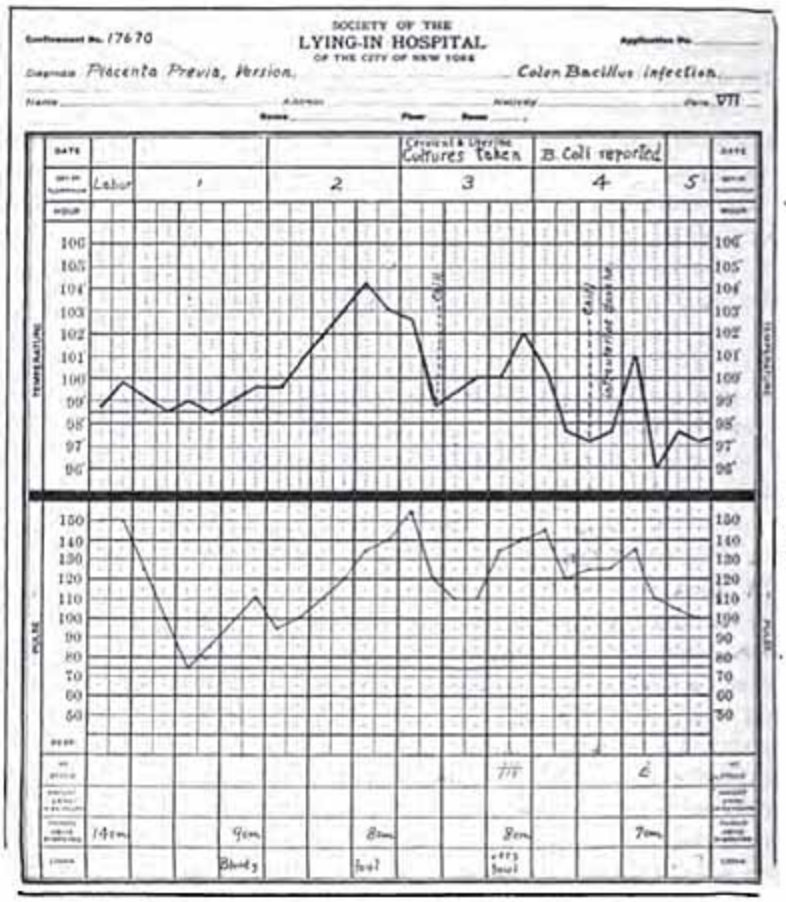

CHART V.—Showing the excellent results of the intra-uterine douche in colon bacillus infection of the uterus.

In making a diagnosis of pelvic exudate we will include two distinct pathological conditions. The first is strictly extraperitoneal and begins as a cellulitis between the layers of the broad ligaments.

It may extend anteriorly or posteriorly forming retroperitoneal infiltration. Pelvic cellulitis may thus become very massive without breaking down into pus formation. When extraperitoneal abscesses have formed either between the layers of the broad ligament or retro-

peritoneally, even sometimes within the sheath of the psoas muscle, we have usually opened them as soon as diagnosed. Fluctuation is rarely elicited, the pus being as a rule under considerable tension, and the diagnosis is made on the continued elevation of temperature and increasing pain and tenderness in the mass. The other form of pelvic exudate to be described is more likely to be found after abortion than term labor and is a true pelvic peritonitis. There is matting together of the pelvic organs together with loops of intestine and omentum with plastic lymph. When abscess occurs it is tubo-ovarian in character or in Douglas' culdesac, and although intraperitoneal is usually well walled off. Operation should be deferred unless the patient is growing worse or there is very distinct softened bulging in the posterior vaginal fornix.

Well marked pelvic exudate, many times filling up the entire pelvis, occurred fifty-seven times. Cultures and smears from the cervix, uterus or evacuated pus showed the following results:

No cultures secured in	13
Streptococci in	16
Staphylococci in	7
The above mixed in	9
Gonococci in	8
Colon bacilli in	4
Total	57

There seemed to be little difference in the course of resolution as far as the variety of the infecting organisms was concerned. It was noticeable that the streptococcus was most frequently found in the typical broad ligament extraperitoneal abscess, and that the pelvic complications of the gonorrheal infection were always tubal and intraperitoneal in location.

The colon bacillus was an especially treacherous organism when invading areas already infected with a different species of bacteria. Many of those later insidious types of retroperitoneal cellulitis are augmented and a fatal peritonitis superimposed by a penetration of this organism possibly through the adjacent intestinal walls. This was the course in two of the general peritonitis cases mentioned below, where a previous posterior vaginal section into a pelvic mass revealed nothing but a cellulitis. Cultures made at the time of operation from the exuding serum showed streptococci. The later laparotomy for a general peritonitis disclosed the superimposed infection of the colon bacillus in the abdominal fluid.

Posterior vaginal section for the evacuation of pelvic pus formation was made twenty-one times. Exploratory laparotomy combined with posterior vaginal section or with incision over Poupart's ligament was done nine times. When the abscess is far out in the broad ligament its

approach to the anterior abdominal wall can be outlined by an exploratory abdominal incision. The original wound can then be closed and a second incision made into the abscess far out above Poupart's ligament where it has been determined that such incision would enter directly into the abscess cavity without opening the peritoneum. When the broad ligament abscess is found close to the uterus, however, it must be drained

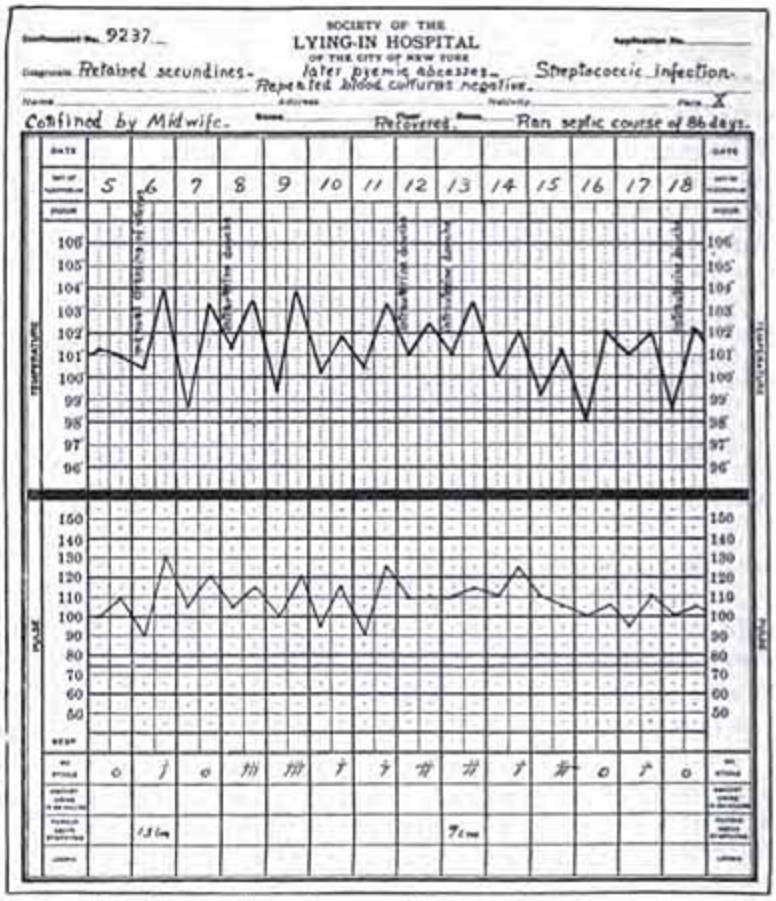

CHART VI.—Showing the uselessness of the intra-uterine douche in a virulent streptococcus infection of the uterus, prolonging the course, and furthering the later pyemia by breaking down nature's barriers.

transperitoneally the same as in a high tubo-ovarian abscess. In all cases of pelvic exudate where pus is found and liberated the convalescence is hastened, but it is doubtful if any advantage is secured by incising cellulitic masses when no pus is present. Resolution is the rule even in the extensive cases, and is hastened by daily hot vaginal douches, the ice-bag externally, and prolonged rest in bed preferably in the open air

and sunshine. The Lying-in Hospital with its well equipped solarium on the roof is admirably fitted for this outdoor treatment.

Femoral and saphenous phlebitis occurred fifteen times, usually beginning seven to twelve days postpartum. In two instances it started as an antepartum complication. In ten it was the only lesion present.

The treatment with rest, elevation, protection and the ice-bag for the relief of pain has been invariably successful. It is important to

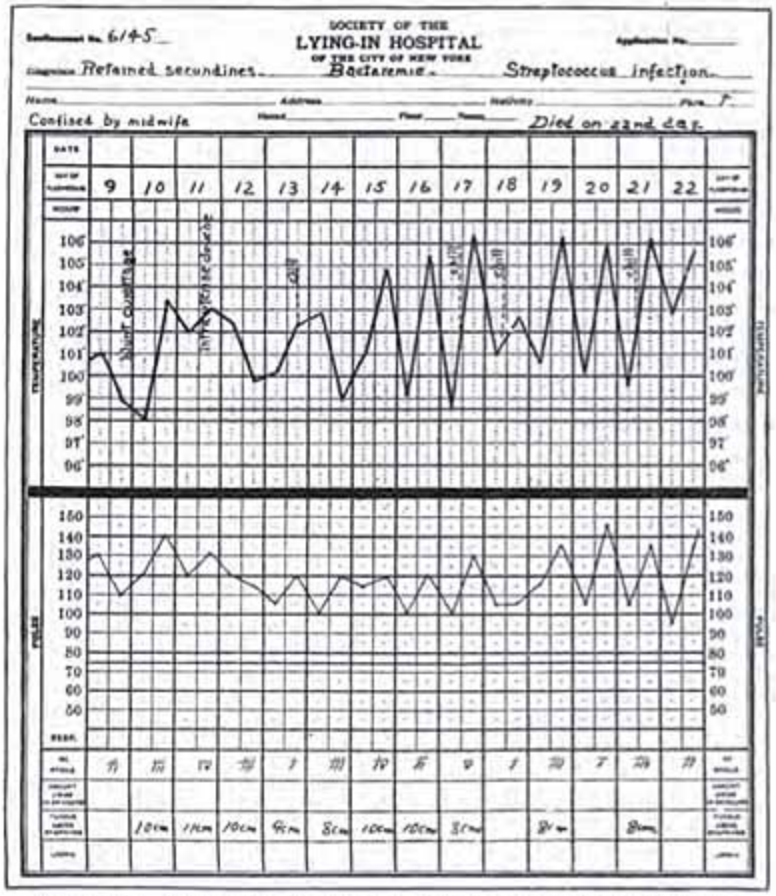

CHART VII.—Showing the bad results of curettage and the intra-uterine douche in streptococcus infection of the puerperal uterus.

avoid massage for reduction of the swelling until the temperature is flat and the tenderness in the leg has entirely disappeared. We have seen further extension of the process and prolongation of the convalescence for several weeks by rough massage that was instituted too early. Pelvic thrombophlebitis was diagnosticated clinically many times. These are all included in the pelvic cellulitis group, except two in which the diagnosis was confirmed by laparotomy.

The results in general puerperal peritonitis have been most unsatisfactory. There were nineteen cases diagnosed either by very definite physical signs, by operation or at autopsy. Cultures made from the peritoneal pus showed the following results:

Streptococci in	4
Staphylococci in	2
Above mixed in	2
Colon bacillus in	2
Colon bacillus and streptococcus in	1
No growth or no cultures	8
Total	19

Ten were subjected to laparotomy. In three a median incision was made with additional drainage incisions in the flanks, in five an abdominal incision combined with posterior vaginal section, and in two instances a hysterectomy was performed with general peritonitis following uterine rupture as the indication. Of the ten operated upon, nine died. The single recovery was a staphylococcus infection with many adhesions and pus pockets between the intestines. Nine died in which no operation was made. Their condition on admission seemed too desperate to warrant the attempt.

Bacteremia was a frequent finding in these peritonitis cases, so that it is evident that we will not be successful in opening the abdomen for drainage in general puerperal peritonitis until we are able to combat the associated infection in the blood.

The mortality among our straight cases of bacteremia until recently has been almost as great as in general peritonitis. Bacteremia with fifty or more colonies per cubic centimeter of blood was present in twenty-eight instances. Twenty of these women had been confined by private physicians and midwives and were sent into the hospital severely septic. Many were moribund on admission. The varieties of bacteria found were:

Streptococci in	22
Staphylococci in	1
Above mixed in	2
Colon bacillus in	2
Colon bacillus and streptococci in	1
Total	28

That bacteria in the blood are more frequently suspected clinically than they are demonstrated by our present culture methods has been pointed out by Dr. J. E. Welch, the hospital bacteriologist. In 175 septic women in which blood cultures were requested by the attending physician positive findings were made in but forty-six. In the twenty-eight cases

listed above the streptococcus was found twenty-two times in pure culture, once associated with the colon bacillus and twice with the staphylococcus. The staphylococcus occurred once in pure culture and the colon bacillus twice. The colon bacillus was only identified from post-mortem blood culture where the body had been kept over night on ice. It was found in the heart's blood and in the spinal fluid. Of the twenty-eight puerpera with bacteria free in the blood stream but three recovered. The first had an associated pyemia. When pyemic abscesses develop in the course of a bacteremia recoveries are frequently noted. In the list reported by Welch the only recoveries had abscess formation somewhere in addition to the bacteria in the blood. The two recent cases that have recovered are both of great interest to us, and the treatment employed in each will be the subject of further investigation. These were both cases of straight streptococcemia and without other demonstrable lesion. One already reported by Welch, responded to the subcutaneous injection of large doses of normal human blood serum after an evident failure with the leukocytic extract serum of His. The other was given two intravenous injections of thirty grains of magnesium sulphate in solution. Her temperature then fell to normal for four days when a slight phlebitis of the external saphenous occurred. This cleared up rapidly and she has passed on to a smooth convalescence. The injections were given very slowly. A chill followed each injection but there was no depression of the respiration which is the special danger warned against by Meltzer.

In conclusion I might outline the treatment that we now follow when the temperature rises after labor. Breast, lung and throat conditions are ruled out. We exclude pyelitis, malaria, and typhoid by appropriate tests. A cathartic is given and attention is paid to emptying the bladder. A full condition of either bladder or rectum interferes with proper contraction and drainage of the uterus. When there has been a recent perineorrhaphy the wound is inspected and stitches removed if there is much tenderness or edema. The abdomen is examined, noting height of the fundus, areas of tenderness or resistance and whether there is tympanites or rigidity present. If there is a high rise of the pulse rate accompanying the temperature, cultures are taken from the cervix and uterus whether the lochia is foul or not. At this procedure inspection can be made of the vagina and cervix, especially noting if the latter is distinctly patulous and gaping. Such a condition of the cervix points to retained portions of membrane or placenta. If the pulse rise is slight in comparison with the temperature rise no vaginal inspection or cultures are made. After this preliminary information has been obtained, the bed is elevated sharply at the head and an ice-bag applied to the lower abdomen. The position of the bed facilitates drainage and the ice-bag induces a better tone in the uterus, possibly somewhat inhibits bacterial growth, and certainly gives great relief to the patient if there is any pain. On

the second day if the temperature is down our troubles are over and we have done no damage. If the temperature remains high or recurs we are justified in going ahead on the strength of the report from the bacteriologist which by this time will be available. Should the gonococcus or the streptococcus be reported the former treatment is simply continued.

If the colon bacillus is found or " no growth " reported and the lochia is foul we give a gentle intrauterine douche. At this time with the continuance of temperature and in the absence of the gonococcus or streptococcus it is permissible to make a gentle digital exploration of the interior of the uterus and remove any fragments of secundines that are present or release possibly retained lochia. This is in no sense of the word a curettage. We never curette except in incomplete abortions at or before the third month. The further course of the treatment will depend on the development of the case and already has been suggested in the description of the various conditions that may arise in bacterial infection of puerperal women.

NOTE:—It seems probable that the magnesium sulphate solution may be given with equally good effect by hypodermoclysis as well as by the direct infusion into a vein. The following case recently so treated by the writer in the Out-door Service appears to illustrate the value of this simpler and safer method of administration of the salt, avoiding both the danger of depression of the respiration when given rapidly into the vein and also avoid any hemolysis of the patient's already sadly depleted supply of red blood cells.

C. N. 51915. Aet. 20. Para I. This woman was delivered April 25, 1911, of a premature infant by breech extraction. The placenta required manual removal, being retained by the unusual condition of hourglass contraction of the uterus. On the third day the temperature rose to 102° associated with a foul lochia. The fifth day she had several chills, the temperature rising to 106° and the pulse to 140. There was no abdominal distension or tenderness, nor were there any uterine or pelvic symptoms whatever; as we are accustomed to say, no " localization ". The throat and breasts were normal. Intrauterine cultures taken on the sixth day showed a diplo-streptococcus, probably to be identified as the " diplo-streptococcus puerperalis " of the Germans. She had fever till the tenth day. On the twelfth day it rose to 104° and on the fourteenth to 104.5° with a chill lasting two hours. On the fifteenth day there was considerable edema of the vulva. No perineorrhaphy had been done, but there was a dirty puerperal ulcer along the posterior wall of the lower vagina at the site of a superficial abrasion of the mucosa. The lochia was still moderately foul. The patient had become markedly anæmic from the long course of the infection. Although it was not possible, on account of her fears to obtain a blood culture, she was evidently, in the absence of any localization, suffering from a true bacteremia; and most probably with the same variety of infection as that found on uterine culture.

It was impossible to prevail upon her to permit an intravenous infusion. Following the suggestion of Dr. H. Humiston of Cleveland, who has used this method successfully on several cases of puerperal infection, we injected twelve ounces of a sterile one per cent solution of magnesium sulphate under the right breast. The temperature rose to 105° that night, afterwards falling rapidly, and was 99° in two days. The afternoon of the seventeenth day, two days after the first injection, the temperature rose again to 103°, and a second injection of fourteen ounces of magnesium sulphate solution was given under the other breast. The temperature fell and remained normal after the eighteenth day. It was then only necessary to treat the anæmia and general exhaustion of the patient. The lochia which had grown scant became markedly profuse and purulent and character as the temperature fell following the injections of magnesium sulphate.

She was discharged in good condition on the thirtieth day post partum.