might adopt without trouble, which will materially lessen the risk of septic poisoning. Among these may be indicated the use of antiseptic lotions, with which the practitioner and nurse should always wash their hands before attending any case or touching the genital organs; the use of carbolized vaseline, 1 : 8, for lubricating the fingers, catheter, forceps, etc.; syringing out the vagina night and morning with creolin and water; rigid attention to cleanliness in bedding, napkins, etc. Precautions such as these, although they may appear to some frivolous and useless, indicate a recognition of danger and an endeavor to remove it, and if they were generally inculcated on nurses (see note, p. 584) and others, might go far to prevent the occurrence of septic mischief.

Nature of the Septic Poison.—As to the precise character of the septic poison—although of late much has been said about it, and there is good reason to believe that further research may throw light on this obscure subject—too little is known to justify any positive statement. The researches of Heiberg, Von Recklinghausen, Steurer, and others have shown that in puerperal septicæmia, as in surgical fever, erysipelas, and other infectious diseases, micrococci in large numbers may be traced passing between the muscular and connective-tissue fibres, through the lymphatics, and thus into the general circulation, and that they may be found in various organs and pathological products. More recently Fränkel isolated from a number of cases a chain-forming micrococcus, which he at first regarded as specific, and named the streptococcus puerperalis. Subsequently he satisfied himself of its identity with a similar micro-organism in pus. Winckel also cultivated a streptococcus from a case of puerperal peritonitis. It produced an erysipelatous rash in the ear of a rabbit, and was similar in its characters, both morphologically and in artificial cultivations, to the streptococcus found in erysipelas. Cushing found streptococci in endometritis diphtheritica and in secondary puerperal inflammation, and Baumgarten, Bumm, Pfannestiel, and others have recorded similar observations. Pfannestiel investigated four cases of puerperal septicæmia with diphtheritic endometritis and purulent peritonitis, and he concluded that a specific micro-organism could not be differentiated in puerperal fever. In his opinion the streptococci from pus, from erysipelas, and diphtheritic affections of the pharynx had all the power of setting up puerperal septicæmia. Doléris never failed to find streptococci in the blood in puerperal septicæmia, and after death they are readily detected in great numbers. They do not multiply in the blood during life, but they cause changes in both the red and white corpuscles, which stick together and form minute capillary infarctions, in which the micrococci increase, and from which they invade the surrounding structures and produce various pathological changes. These observations are of much importance, as tending to confirm by scientific observation the intimate relation between these various forms of disease which has long been believed to exist. It may be taken as certain that streptococci bear an intimate and important relation to the disease; but whether they themselves form the septic matter or carry it, or whether they are mere accidental concomitants of the pyæmic processes, it is impossible, in the present state of our knowledge, to decide.

Channels of Diffusion.—Passing on to the channels of diffusion through which the septic matter may act, we have to consider its effects on the structures with which it is brought into contact, and the mode in which it may infect the system at large; and this will include a consideration of the pathological phenomena.

Local changes consequent on the absorption of the poison are pretty constant, and of these we may form an intelligent idea by thinking of them as similar in character and causation to those which we have the opportunity of studying when septic matter is applied to a wound open to observation, as, for example, in cases of blood-poisoning following a dissection wound. Distinct traces of local action are not of invariable occurrence, and in some of the worst class of cases, when the amount of septic matter is great and its absorption rapid, death may occur after an illness of short duration but great intensity, and before appreciable local changes, either at the site of absorption or in the system at large, have had time to develop themselves. The fact that puerperal fever may prove fatal, without leaving any tangible post-mortem signs, has often been pointed out, such cases most frequently occurring during the endemic prevalence of the disease in lying-in hospitals. There can be little doubt, however, that in such cases of intense septicæmia marked pathological changes exist in the form of alterations of the blood and degenerations of tissue, but not of a character which can be detected by an ordinary post-mortem examination. In the great majority of cases, indications of the disease exist at the site of absorption. These are described by pathologists as identical in their character with the inflammatory œdema which occurs in connection with phlegmonous erysipelas. If lacerations exist in the cervix or vagina, they take on unhealthy action, their edges swell, and their surfaces become covered with a yellowish coat, similar in appearance to diphtheritic membrane. The mucous membrane of the uterus is also generally found to be affected, and in a degree varying with the intensity of the local septic process. There is evidence of severe endometritis; and, very frequently, the whole lining of the uterus is profoundly altered, softened, covered with patches of diphtheritic deposit, and it may be in a state of general necrosis. In the severer cases these changes affect the muscular tissue of the uterus, which is found to be swollen, soft, imperfectly contracted, and even partially necrosed, a condition which is likened by Heiberg to hospital gangrene. The connective tissue surrounding the generative tract is also swollen and œdematous, and the inflammation may in this way reach the peritoneum, although peritonitis, so often observed in puerperal septicæmia does not necessarily depend on the direct transmission of inflammation from the pelvic connective tissue, but is more often a secondary phenomenon.

The channels through which general systemic infection may supervene are the lymphatics and the venous sinuses, the former being by far the most important. Recent researches have shown the great number and complexity of the lymphatics in connection with the pelvic viscera, and marked traces of the absorption of septic matter are almost always to be found, except in those very intense cases already

alluded to, in which no appreciable post-mortem signs are discoverable. The septic matter is probably absorbed from the lymph spaces abounding in the connective tissue, and carried along the lymphatic canals to the nearest glands. The result is inflammation of their coats, and thrombosis of their contents, which may be seen on section as a creamy, purulent substance. The absorption of septic material may, as Virchow has shown, be delayed by the local changes produced in the lymphatics and in the glands with which they communicate, which are, therefore, conservative in their action; and the further progress of the case may in this way be stopped and local inflammation alone result, such cases being believed by Heiberg to be examples of abortive pyæmia. On the other hand, the free septic material may be too abundant and intense to be so arrested, it may pass on through the lymph canals and glands, until it reaches the blood-current through the thoracic duct, and so produces a general blood-infection. This mode of absorption of septic matter, and the tendency of the glands to arrest its further progress, serve to explain the progressive character of many cases, in which fresh exacerbations seem to occur from time to time; since fresh quantities of poison, generated at its source of origin, may be absorbed as the case progresses. The uterine veins are supposed by D'Espine to be the channel of absorption in the intense form of disease which proves fatal very shortly after delivery, too soon for the more gradual process of lymphatic absorption to have become established. It is evident that the veins are not likely to act in this way, since they must, under ordinary circumstances, be completely occluded by thrombi, otherwise hemorrhage would occur. If, however, uterine contraction be incomplete, the occlusion of the venous sinuses may be imperfect, and absorption of septic material through them may then take place. Some writers have laid great stress on imperfect uterine contraction in predisposing to septicæmia, and its influence may thus be well explained. The veins may bear an important part in the production of septicæmia, independent of the direct absorption of septic matter through them, by means of the detachment of minute portions of their occluding thrombi, in the form of emboli. If phlegmonous inflammation occurs in the immediate vicinity of the veins, the thrombi they contain may become infected. When once blood-infection has occurred by any of these channels, general septicæmia, the so-called puerperal fever, is developed.

Four Principal Types of Pathological Change.—The variety of pathological phenomena found on post-mortem examination has had much to do with the prevalent confusion as to the nature of the disease. This has resulted in the description of many distinct forms of puerperal fever, the most marked pathological alteration having been taken to be the essential element of the disease. As a matter of fact, there is no doubt that various types of pathological change are met with. Heiberg describes four chief classes which are by no means distinctly separated, are often found simultaneously in the same subject, and are certainly not to be distinguished by the symptoms during life.

Of these the first is the class of cases in which no appreciable morbid phenomena are found after death. This formidable and fatal form of

the disease has long been well known, and is that described by some of our authors as adynamic or malignant puerperal fever. It is the variety which was so prevalent in our lying-in hospitals, and which Ramsbotham talks of as being second only to cholera in the severity and suddenness of its onset and in the rapidity with which it carried off its victims. It is quite erroneous to suppose that the existence of pathological changes in this form of disease has never been recognized. Even with the coarse methods of examination formerly used, the occurrence of a fluid and altered state of the blood, and ecchymoses in connection with various organs—especially the lungs, spleen, and kidneys—were noticed and specially described by Coupland in his *Dictionary of Medicine*. More recently it has been clearly proved by the microscope that there exist, in addition, the commencement of inflammation in most of the tissues, shown by cloudy swellings, and granular infiltration and disintegration of the cell elements; proving that the blood, heavily charged with septic matter, had set up morbid action wherever it circulated, the patient succumbing before this had time to develop.

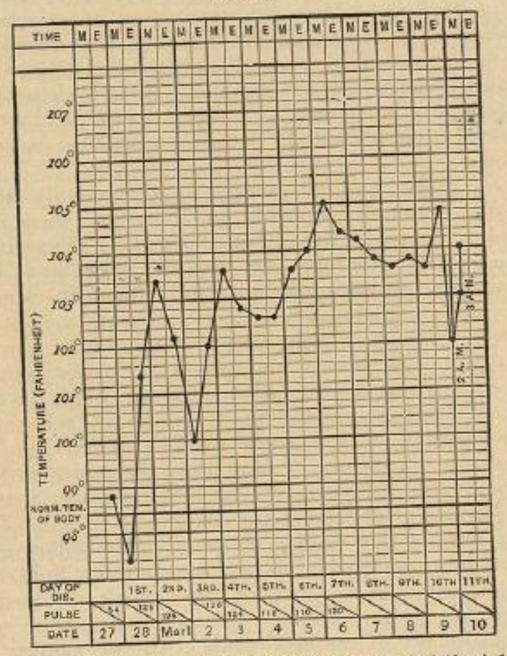
In the second type, and that perhaps most commonly met with, the morbid changes are more frequently found in the serous membranes, in the pleura, in the pericardium, but, above all, in the peritoneum, the alterations in which have long attracted notice and have been taken by many writers as proving peritonitis to be the main element of the disease. Evidences of more or less peritonitis are very general. In the more severe cases there is little or no exudation of plastic lymph, such as is found in peritonitis unassociated with septicæmia. There is a greater or less quantity of brownish serum only, the coils of intestine, distended with flatus and highly congested, being surrounded by it. More often there are patchy deposits of fibrinous exudation over many of the viscera, the fundus uteri, the under surface of the liver, and the distended intestines. There is then, also, a considerable quantity of sero-purulent fluid in the abdominal cavity. The pleural cavities may also exhibit similar traces of inflammatory action, containing imperfectly organized lymph and sero-purulent fluid. Schroeder states that pleurisy is more often the direct result of transmission of inflammation through the substance of the diaphragm or lung than a secondary consequence of the septicæmia. In like manner evidences of pericarditis may exist, the surface of the pericardium being highly injected and its cavity containing serous fluid. Inflammation of the synovial membranes of the larger joints, occasionally ending in suppuration, is not uncommon and may probably be best included under this class of cases.

In the third type the mucous membranes appear to bear the brunt of the disease. The pathological changes are most marked in the mucous membrane lining the intestines, which is highly congested and even ulcerated in patches, with numerous small spots of blood extravasated in the submucous tissue. Similar small apoplectic effusions have been observed in the substance of the kidneys and under the mucous membrane of the bladder. Pneumonia is of common occurrence. In most cases it is probably secondary to the impaction of

minute emboli in the smaller branches of the pulmonary artery; but it may doubtless arise from independent inflammation of the lung tissue, and will then be included in a class of cases now under consideration.

The fourth class of pathological phenomena are those which are produced chiefly by the impaction of minute infected emboli in small vessels in various parts of the body. These are the cases which most closely resemble surgical pyæmia, both in their symptoms and post-mortem signs, and which by many writers are described under the

FIG. 209.

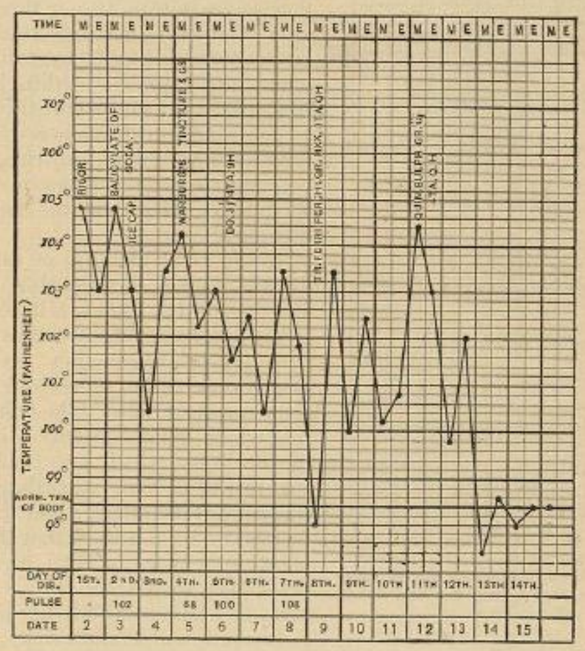


A. S., aged thirty years; confined February 27, 1879; died March 10th.

name of puerperal pyæmia. The dependence of puerperal fever no phlebitis of the uterine veins was a favorite theory, and in a large proportion of cases the coats of the veins show signs of inflammation, their canals being occupied with thrombi in a more or less advanced state of disintegration. The mode in which these thrombi may become infected has been shown by Babnoff, who has proved that leucocytes may penetrate the coats of the vein, and entering its contained coagulum may set up disintegration and suppuration. This observation brings these pyæmic forms of disease into close relation with septicæmia such as we have been studying, and justifies the conclusion of Verneuil that purulent infection is not a distinct disease, but only a termination

of septicæmia, with which it ought to be studied. We have, moreover, to differentiate these results of embolism from those considered in a subsequent chapter, the characteristic of these cases being the infected nature of the minute emboli. Localized inflammations and abscesses, from the impaction of minute capillary emboli, are found in many parts of the body; most frequently in the lungs, then in the kidneys, spleen, and liver, and also in the muscles and connective tissues. Pathologists are by no means agreed as to the invariable dependence of these on embolism, nor is it possible to prove their

FIG. 210.

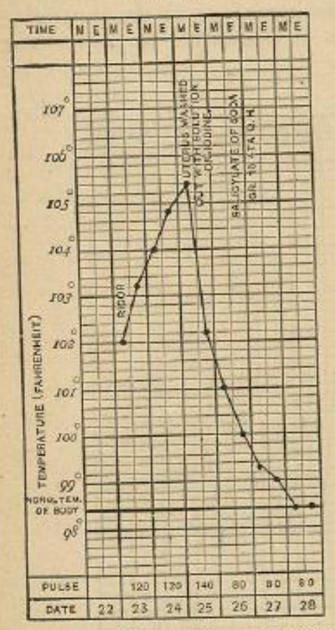


Mrs. D., aged twenty-five years; confined May 1, 1879. Puerperal septicæmia; recovery. An untrapped pipe, communicating with sewer, was found in bath close to this patient's bed.

origin from this source by post-mortem examination. Some attribute all such cases to embolism, others think that they may be the results of primary septicæmic inflammation. It has been proved by Weber that minute infected emboli may pass through the lung capillaries; and this disposes of one argument against the embolic theory, based on the supposed impossibility of their passage. It is probable that both causes may operate, and that localized inflammations occurring a short time after delivery are directly produced by the infected blood, while those occurring after the lapse of some time, as in the second or third week, depend upon embolism.

Description of the Disease.—From what has been said as to the mode of infection in puerperal septicæmia, and as to the very various pathological changes which accompany it, it will not be a matter of surprise to find that the symptoms are also very various in different cases. This can readily be explained by the amount and virulence of the poison absorbed, the channels of infection, and the organs which are chiefly implicated; but it renders it very difficult to describe the disease satisfactorily.

FIG. 211.



Mrs. P., aged twenty-four years; labor natural; confined May 22, 1880. A piece of decomposed membrane the size of hand washed out of her uterus at first intra-uterine injection; rapid recovery.

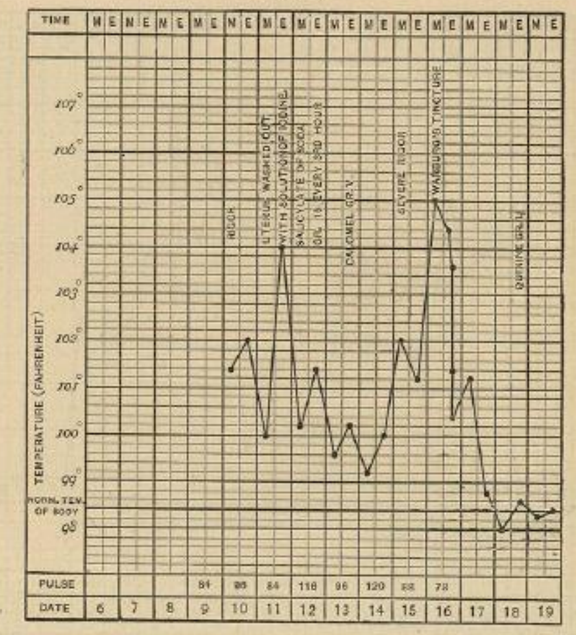
The symptoms generally show themselves within two or three days after delivery. As infection most often occurs during labor, or in cases which are sapræmic within a short time afterward, and before the lesions of continuity in the generative tract have commenced to cicatrize, it can be understood why septicæmia rarely commences later than the fourth or fifth day.

In the great majority of cases the disease begins insidiously. There are, generally, some chilliness and rigor, but by no means always, and even when present they frequently escape observation or are referred to some transient cause. The first symptom which excites attention is a rise in the pulse, which may vary from 100 to 140 or more, according to the severity of the attack; and the thermometer will also show that the temperature is raised to 102°, or, in bad cases, even to 104° or 106°. Still it must be borne in mind that both the pulse and temperature may be increased in the puerperal state from transient causes, and do not of themselves justify the diagnosis of septicæmia.

In the more intense class of cases, in which the whole system seems overwhelmed with the severity of the attack, the disease progresses with great rapidity, and often without any appreciable indication of local complication. The pulse is very rapid, small, and feeble, varying from 120 to 140, and there is generally a temperature of 103° to 104°. In the worst form of cases the temperature is steadily high without marked remissions (see Figs. 209, 214, and 215). There may be little or no pain, or there may be slight tenderness on pressure over the abdomen or uterus; and, as the disease progresses, the intestines get largely distended with flatus, so that intense tympanites often forms a most distressing symptom. The countenance is sallow, sunken, and

has a very anxious expression. As a rule, intelligence is unimpaired, and this may be the case even in the worst forms of the disease, and up to the period of death. At other times there is a good deal of low muttering delirium, which often occurs at night alone, and alternates with intervals of complete consciousness, but is occasionally intensified for a short time into a more acute form. Diarrhœa and vomiting are of very frequent occurrence; by the latter, dark, grumous, coffee-ground substances are ejected. The diarrhœa is occasionally very profuse and uncontrollable; in mild cases it seems to relieve the severity of the

FIG. 212.



Mrs. N., aged twenty-two years; confined Thursday, May 6, 1880. Forceps. Lochia from the first offensive; a small piece of membrane was probably left *in utero*.

symptoms. The tongue is moist and loaded with sordes; but sometimes it gets dark and dry, especially toward the termination of the disease. The lochia are generally suppressed or altered in character, and sometimes they have a highly offensive odor, especially when the disease is of the so-called autogenetic type. The breathing is hurried and panting, and the breath itself has a characteristic, heavy, sweetish odor. The secretion of milk is often, but not always, arrested.

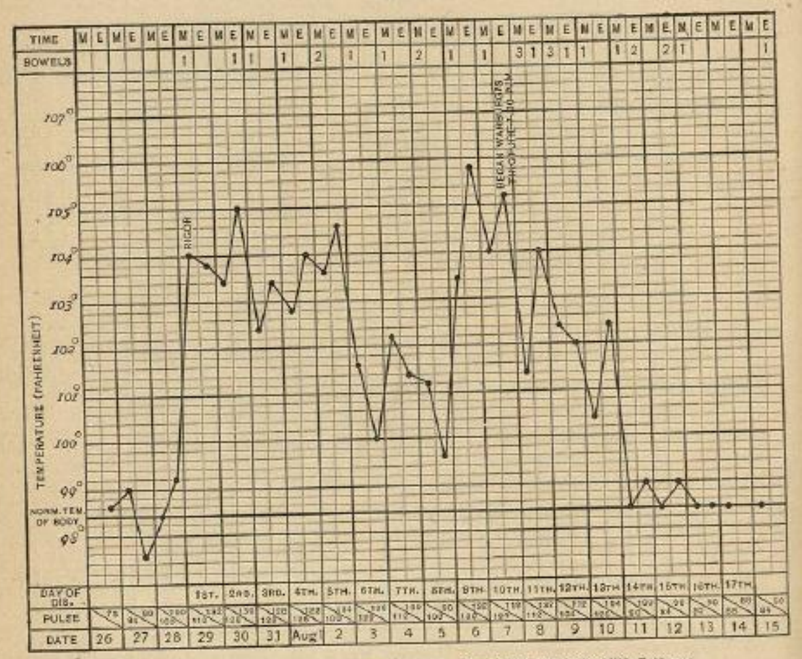
Duration.—With more or less of these symptoms the case goes on; and when it ends fatally it generally does so within a week, the fatal termination being indicated by more weakness, rapid, thread-like, or intermittent pulse, marked delirium, great tympanites, and sometimes

a sudden fall of temperature, until at last the patient sinks with all the symptoms of profound exhaustion.

In milder cases similar symptoms, variously modified and combined, are present. It is seldom that two precisely similar cases are met with; in some the rapid, weak pulse is most marked: in others abdominal distention, vomiting, diarrhœa, or delirium.

Local complications variously modify the symptoms and course of the disease. The most common is peritonitis, so much so that with some authors puerperal fever and puerperal peritonitis are synonymous

Fig. 213.

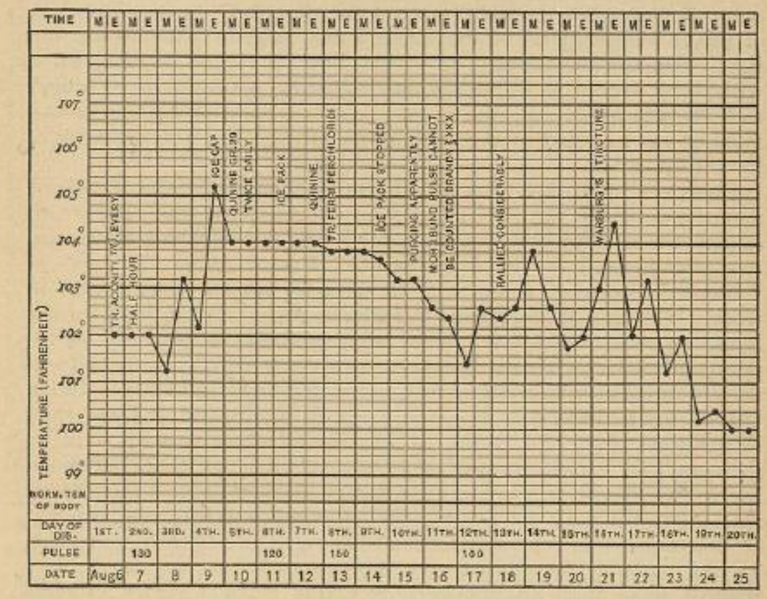


Mrs. ——, aged twenty-five years; recovery. Confined July 26, 1879, 7.40 P.M.

terms. Here the first symptom is severe abdominal pain, commencing at the lower part of the abdomen, where the uterus is felt enlarged and tender. As the abdominal pain and tenderness spread, the sufferings of the patient greatly increase, the intestines become enormously distended with flatus, and the breathing is entirely thoracic, in consequence of the upward displacement of the diaphragm and the fact that the abdominal muscles are instinctively kept as much in repose as possible. The patient lies on her back with her knees drawn up and sometimes cannot bear the slightest pressure of the bedclothes. There is generally much vomiting, and often severe diarrhœa. The temperature generally ranges from 102° to 104°, or even 106°, and is subject to

occasional exacerbations and remissions, possibly depending on fresh absorption of septic matter (see Figs. 210, 212, and 213). The case generally lasts for a week or more, the symptoms going on from bad to worse, and the patient dying exhausted. D'Espine points out that rigors, with exacerbations of the general symptoms, not unfrequently occur about the sixth or seventh day, which he attributes to fresh systemic infection from fetid pus in the peritoneal cavity. It must not be supposed that all these symptoms are necessarily present when the peritonitic complication exists. Pain is especially often entirely absent, and I have seen cases in which post-mortem examination

Fig. 214.



Mrs. M. K., aged twenty-one years; infection believed to be due to scarlatina. Confined August 5, 1878; recovery.

proved the existence of peritonitis in a very marked degree, in which pain was entirely absent. Sometimes the pain is only slight and amounts to little more than tenderness over the uterus.

Symptoms of other local complications are characterized by their own special symptoms: thus, pneumonia by dyspnœa, cough, dulness, etc.; pericarditis by the characteristic rub; pleurisy by dulness on percussion; kidney affection by albuminuria and the presence of casts; liver complication by jaundice; and so on.

Pyæmic Forms of the Disease.—The course of the disease is not always so intense and rapid, being in some cases of a more chronic character and lasting many weeks. The symptoms in the early stage

are often indistinguishable from those already described, and it is generally only after the second week that indications of purulent infection develop themselves. Then we often have recurrent and very severe rigors, with marked elevations and remissions of temperature. At the same time there is generally an exacerbation of the general symptoms, peculiar yellowish discoloration of the skin, and occasionally well-developed jaundice. Transient patches of erythema are not uncommonly observed on various parts of the skin, and such eruptions have often been mistaken for those of scarlet fever or other zymotic disease. Localized inflammations and suppuration may rapidly follow. Amongst the most common are inflammation or even suppuration of the joints—the knees, shoulders, or hips—which is preceded by difficulty of movement, swelling, and very acute pain. Large collections of pus in various parts of the muscles and connective tissues are not rare. Suppurative inflammation may also be found in connection with many organs, as in the eye, in the pleura, pericardium, or lungs; each of which will, of course, give rise to characteristic symptoms, more or less modified by the type of the disease and the intensity of the inflammation.

Puerperal Malarial Fever.—There is a peculiar form of febrile disturbance which sometimes occurs in the puerperal state, and which is apt to be confounded with septicæmia, to which attention was specially directed by the late Fordyce Barker,[1] under the name of "puerperal malarial fever." It is specially apt to be met with in women who have been exposed to malarial poison during their former lives, the recurrence of the fever being probably determined by the puerperal state. Of this I have seen several very well-marked examples in ladies who had formerly contracted fever and ague in India. One of my patients who has been long in India, and suffered from intermittent fever for years, is invariably attacked with it after delivery, and herself warned me of the fact the first time I attended her. The diagnosis is not always easy. Barker insisted on the fact that puerperal malarial fever generally commences after the fifth day of delivery, while septicæmia almost always does so before that time. In the malarial fever, moreover, the intermissions are much more marked, while there are frequently recurring chills or rigors, which is not the case in septicæmia.

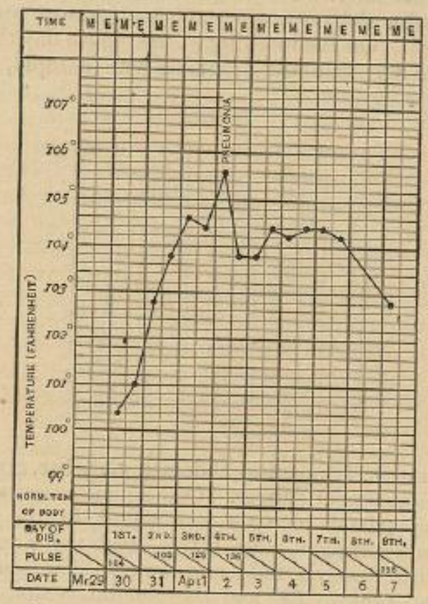
Treatment.—In considering the all-important subject of treatment, the views of the practitioner are naturally biased by the theory he has adopted of the nature of the disease. If that here inculcated be correct, the indications we have to bear in mind are: first, to discover, if possible, the source of the poison, in the hope of arresting further septic absorption; secondly, to keep the patient alive until the effects of the poison are worn off; and thirdly, to treat any local complication that may arise.

The first is likely to be of great importance in cases of sapræmia, as fresh quantities of septic matter may be from time to time absorbed. We, fortunately, are in possession of a powerful means of preventing

[1] "Puerperal Malarial Fever," Amer. Journ. of Obstet., 1880, vol. xiii. p. 271.

further absorption by the application of antiseptics to the interior of the uterus and to the canal of the vagina. This is especially valuable when the existence of decomposing coagula or other sources of septic matter is suspected in the uterine cavity, or when offensive discharges

FIG. 215.

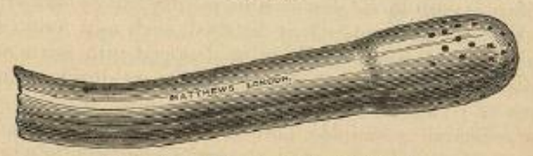


Mrs. B., aged twenty-nine years; confined March 29; died April 7, 1879.

are present. Disinfection is readily accomplished by washing out the uterine cavity, at least twice daily, by means of a Higginson syringe with a long vaginal pipe attached.[1] The results are sometimes very remarkable, the threatening symptoms rapidly disappearing and the temperature and pulse falling so soon after the use of the antiseptic

[1] My colleague, Dr. Hayes, has invented a silver tube for the purpose of administering such intra-uterine injections (Fig. 216), which answers its purpose admirably. The numerous apertures at its

FIG. 216.

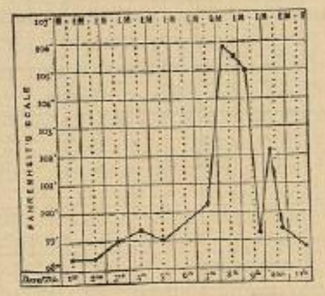


Hayes's tube for intra-uterine injections.

extremity allow of a number of minute streams of fluid being thrown out in the form of a spray over the interior of the uterus, the complete bathing of its surface and washing out of its cavity being thus insured. It is, moreover, introduced more easily than the ordinary vaginal pipe, and can be attached to a Higginson syringe.

injections as to leave no doubt of the beneficial effects of the treatment. I cannot better illustrate the advantages of this treatment than by the temperature chart (Fig. 217), which is from a case which came under my observation in the outdoor practice of King's College Hospital. It was that of a healthy woman, thirty-six years of age, who had an easy and natural labor. Nothing remarkable was observed until the third day after delivery, when the temperature was found to be slightly increased. On the morning of the eighth day the temperature had risen to 105.8°. She was delirious, with a rapid, thready pulse,

FIG. 217.



clammy perspiration, tympanitic abdomen, and her general condition indicated the most urgent danger. On vaginal examination a piece of compressed and putrid placenta was found in the os. This was removed by my colleague, Dr. Hayes, and the uterus thoroughly washed out with Condy's fluid and water. The same evening the temperature had sunk to 99° and the general symptoms were much improved. The next day there was a slight return of offensive discharge, and an aggravation of the symptoms. After again washing out the uterus the temperature fell, and from that date the patient convalesced without a single bad symptom. (See Fig. 211.)

This is a very well marked example of the value of local antiseptic treatment, and I have seen many cases of the same kind. It should, therefore, never be omitted in all cases in which the presence of decomposing structures within the uterus is suspected; and, indeed, even when there is no reason to suspect the presence of a local focus of infection, the use of antiseptic lotions is advisable as a matter of precaution, since it can do no harm and is generally comforting to the patient. Various antiseptics may be used, such as a weak solution of carbolic acid, 1 : 50, tincture of iodine dropped into warm water until it has a pale sherry color, or a solution of perchloride of mercury of the strength of 1 : 2000. Of these, the perchloride of mercury solution is the most effective germicide, and Koch's experiments have conclusively proved that it is the only recognized antiseptic which can be relied upon for destroying the spores of micro-organisms after a single application. As, however, there is a possibility that a too free and incautious use of the corrosive sublimate might prove poisonous, it

would be well that such intra-uterine injections should not be stronger than 1 : 2000, and that they should be practised by the medical man himself, the quantity for such irrigation not exceeding two quarts.[1] One or other of these may be advantageously used alternately—one in the morning, the other in the evening. Occasionally I have employed a 1 : 50 solution of carbolic acid, with about 5 grains to the ounce of iodoform suspended in it. This has the advantage of not only being a powerful antiseptic, but of acting more continuously in consequence of the powdered iodoform remaining partially attached to the uterine walls; or, as some have advised, an iodoform bougie[2] may be placed in the uterine cavity, or powdered iodoform insufflated through the cervix. The nozzle of the syringe should be guided well through the cervix, and the cavity of the uterus thoroughly washed out until the fluid that issues from the vagina is no longer discolored. As the os is always patulous, there is no risk of producing the troublesome symptoms of uterine colic, which occasionally follow the use of intra-uterine injections in the unimpregnated state. It is quite useless to intrust the injection to the nurse, and it should be performed at least twice daily by the practitioner himself, in all cases in which the discharges are offensive. It is not advisable, however, that such injections should be used indiscriminately, since they are not entirely free from risk and may even be the means of introducing fresh septic matter into the uterine cavity. It has been pointed out[3] that sometimes the intra-uterine injection itself produces rigors and other nervous troubles. I am certain that this observation is correct, and I have myself more than once seen a severe rigor rapidly follow its administration. In any case it is useless to continue the use of intra-uterine injections for more than one or two days; they may be serviceable in the earlier stages of the disease, but when systemic infection has occurred they cease to be of use. The vulva should in all cases be carefully inspected with the view of ascertaining if the source of infection be not some local slough or necrotic ulcer about the perineum or orifice of the vagina, in which case its surface should be freely covered with iodoform. I have seen more than one instance in which this simple procedure has sufficed to cut short symptoms of a very threatening character.

Curetting the Uterine Cavity.—Curetting[4] the interior of the uterus has been strongly recommended and largely practised, especially in Vienna. It may obviously be valuable in cases in which retention of portions of the placenta or membranes is suspected, or in which a highly offensive discharge leads us to think that a necrosed condition of the decidua may exist. The patient is placed in the semi-prone position, the vagina irrigated with a sublimate solution and the anterior lip of the cervix drawn down with a volsella, and the endometrium thoroughly scraped with a blunt curette. The cavity of the uterus is

[1] Herff: "Ueber Ursachen und Verhütung der Sublimat-Vergiftung," etc., Arch. f. Gynäk., 1885, Bd. xxv. S. 487.

[2] These may be made of gum arabic and glycerin, about two and a half inches in length, each containing 90 grains of iodoform.

[3] Mangin: "Quelques accidents provoqués par les injections intra-utérines," Nouv. Arch. d'Obstét. et de Gyn., 1888, p. 33.

[4] See Weiss on "Curettement in Puerperal Septicæmia," Amer. Journ. of Obstet., August, 1892.

subsequently well swabbed out with tincture of iodine. It can be readily understood that such a procedure is more thorough and complete than intra-uterine injection, and there can be no objection to a careful use of it in hands tolerably expert in obstetric manipulations. It must, however, be only practised in exceptional cases, and with great caution, since any roughness might seriously injure the uterine structures.

Administration of Food and Stimulants.—In a disease characterized by so marked a tendency to prostration, the importance of sustaining the vital powers by an abundance of easily assimilated nourishment cannot be overrated. Strong beef-tea or other forms of animal soup, milk, alone or mixed either with lime- or soda-water, and the yelk of eggs, beat up with milk and brandy, should be given at short intervals and in as large quantities as the patient can be induced to take; and the value of thoroughly efficient nursing will be especially apparent in the management of this important part of the treatment. As there is frequently a tendency to nausea the patient may resist the administration of food, and the resources of the practitioner will be taxed in administering it in such form and variety as will prove least distasteful. Generally speaking, not more than one or two hours should be allowed to elapse without some nutriment being given. The amount of stimulant required will vary with the intensity of the symptoms and the indications of debility. Generally, stimulants are well borne, prove decidedly beneficial, and require to be given pretty freely. In cases of moderate severity a tablespoonful of good old brandy or whiskey every four hours may suffice; but when the pulse is very rapid and thready, when there is much low delirium, tympanites, or sweating (indicating profound exhaustion), it may be advisable to give them in much larger quantities and at shorter intervals. The careful practitioner will closely watch the effects produced, and regulate the amount by the state of the patient rather than by any fixed rule; but in severe cases eight or twelve ounces of brandy, or even more, in the twenty-four hours may be given with decided benefit.

Venesection, both general and local, was long considered a sheet-anchor in this disease. Modern views are, however, entirely opposed to its use; and in a disease characterized by so profound an alteration of the blood and so much prostration, it is too dangerous a remedy to employ, although it is possible that it might alleviate temporarily the severity of some of the symptoms, especially in cases in which peritonitis is well marked and much local pain and tenderness are present.

Medicinal Treatment.—The rational indications in medical treatment are to lessen the force of the circulation as much as is possible without favoring exhaustion, and to diminish the temperature.

For the former purpose Barker strongly advocated the use of veratrum viride, in doses of five drops of the tincture every hour, until the pulse falls to below 100, when its effects are subsequently kept up by two or three drops every second hour. Of this drug I have no personal experience; but I have extensively used minute doses of tincture of aconite for the same purpose, and, when carefully given, I believe it to be a most valuable remedy. The way I have administered it is to give a

single drop of the tincture, at first every half-hour, increasing the interval of administration according to the effect produced. Generally, after giving four or five doses at intervals of half an hour, the pulse begins to fall, and afterward a few doses at intervals of one or two hours will suffice to prevent the heart's action rising to its former rapidity. The advantage of thus modifying the cardiac action, with the view of preventing excessive waste of tissue, cannot be questioned. It is evident that so powerful a remedy must not be used without the most careful supervision, for, if continued too long, or given at too frequent intervals, it may unduly depress the circulation and do more harm than good. It is necessary, therefore, that the practitioner should constantly watch the effect of the drug, and stop it if the pulse become very weak, or if it intermit. It is most likely to be useful at an early stage of the disease before much exhaustion is present, and then only when the pulse is of a certain force and volume. Barker says of the veratrum viride, what is also true of aconite, that "it should not be given in those cases in which rapid prostration is manifested by a feeble, thread-like, irregular pulse, profuse sweats, and cold extremities."

The Reduction of Temperature must form an important part of our treatment, and for this purpose many agents are at our disposal.

Quinine in large doses, of from 10 to 30 grains, has been much used for this purpose, especially in Germany. After its exhibition the temperature frequently falls one or two degrees. It may be given morning and evening. Unpleasant head-symptoms, deafness, and ringing in the ears often render its continuance for a length of time impossible. These may, however, be much lessened by the addition of 10 to 15 minims of hydrobromic acid to each dose.

Antipyrine in doses of 20 grains every three or four hours sometimes proves very efficacious; but, as it is apt to depress, it should be combined with some stimulant, such as 30 minims of sal-volatile.

Salicylic acid, in doses of from 10 to 20 grains, or the salicylate of soda in the same doses, is a valuable antipyretic which I have found on the whole more manageable than quinine. Under its use the temperature often falls considerably in a short space of time. It is, however, apt to depress the circulation, and thus requires to be carefully watched while it is being administered; and should the pulse become very small and feeble, it should be discontinued.

In some cases, especially when the fever has assumed a remittent type, I have administered with marked benefit a drug which is of high repute in India in the worst class of malarious remittent fevers, and the almost marvellous effects of which in such cases I had myself witnessed in India many years ago. This is the so-called Warburg's tincture, the value of which has been testified to by many high authorities, among whom I may mention Dr. Maclean, of Netley, Dr. Broadbent, and Sir Alexander Armstrong, the Director-General of the Medical Department of the Navy, who informs me that it is now supplied to all Her Majesty's ships in the tropics, because it is found to be of the utmost value in cases in which quinine has little or no effect. Recently its composition has been made public by Dr. Maclean. The

basis is quinine, in combination with various aromatics and bitters, some of which probably intensify its action. Be this as it may, the testimony in favor of the antipyretic action of the remedy is very strong. I have found its exhibition followed by a profuse diaphoresis (this being its almost invariable effect), and sometimes a rapid amelioration of the symptoms. In other cases in which I have tried it, like everything else, it has proved of no avail. Of its use in ten malarial cases above alluded to, Dr. Fordyce Barker says: "For nearly two years past, in those cases where the stomach will tolerate it, I have found Warburg's tincture much more effective and speedy in producing the results desired than the largest doses of quinine."[1]

Application of Cold.—Cold may be advantageously tried in suitable cases. The simplest mode of using it is by Thornton's ice-cap, by which a current of cold water is kept continuously running round the head. This has been found of great value in pyrexia after ovariotomy, and I have also found it useful as a means of reducing temperature in puerperal cases. It is a comforting application and gives great relief to the throbbing headache, which often causes much suffering. Under its use the temperature often falls two or more degrees, and it is easily continued day and night.

In very serious cases, when the temperature reaches 105° or upward, the external application of cold to the rest of the body may be tried. I have elsewhere related[2] a case of puerperal septicæmia with hyperpyrexia, the temperature continuously ranging over 105°, in which I kept the patient for eleven days nearly constantly covered with cloths soaked in iced water, by which means only was the temperature kept within moderate bounds and life preserved. But this method of treatment is excessively troublesome, and is in no way curative. It is only of use in moderating the temperature when it has reached a point at which it could not continue long without destroying the patient. I should, therefore, never think of employing it unless the temperature was over 105°, and then only as a temporary expedient, requiring incessant watching, to be desisted from as soon as the temperature had reached a more moderate height. It is clearly impossible to place a puerperal patient in a bath, as is practised in hyperpyrexia associated with acute rheumatism or typhoid fever. The same effect may, however, be obtained by placing her on mackintosh sheeting, or still better on a water-bed, into which cold water is run from time to time, and covering the body with towels soaked in ice-water, which are frequently renewed by the attendant nurses. During the application the temperature should be constantly taken, and as soon as it has fallen to 101° the cold application should be discontinued.

Administration of Turpentine.—Amongst other remedies which have been used is turpentine, which was highly thought of by the Dublin school. In cases with much tympanitic distention, and a small weak pulse, it is sometimes of unquestionable value, and it probably acts as a strong nervine stimulant. Given in doses of 15 to 20 minims

[1] Op. cit., p. 278.
[2] "A Lecture on a Case of Puerperal Septicæmia with Hyperpyrexia, treated by the Continuous Application of Cold," Brit. Med. Journ., 1877, vol. ii. p. 687.

rubbed up with mucilage, it can generally be taken in spite of its nauseous taste.

Evacuant Remedies.—Purgatives, diaphoretics, or even emetics, have often been employed as eliminants of the poison. The former are strongly recommended by Schroeder and other German authorities, and in England they were formerly amongst the most favorite remedies, and there is a general concurrence of opinion amongst our older writers as to their value. In the first volume of the *Obstetrical Journal* there is a paper by Mr. Morton, in which this practice is strongly advocated, and some interesting cases are recorded in which it apparently acted well. He administers calomel in doses of 3 or 4 grains with compound extract of colocynth, so as to keep up a free action of the bowels. It seems quite reasonable, when there is constipation, to promote a gentle action of the bowels by some mild aperient; but, bearing in mind that severe and exhausting diarrhœa is a common accompaniment of the disease, I should myself hesitate to run the risk of inducing it artificially, especially as there is no proof whatever that septic matter can really be eliminated in this way. At the commencement of the disease, however, I have often given one or two aperient doses of calomel with decided benefit.

Internal Antiseptic Remedies.—It is possible that further research will give us some means of counteracting the septic state of the blood; and the sulphites and carbolates have been given for this purpose, but as yet with no reliable results.

The tincture of the perchloride of iron naturally suggests itself, from its well-known effects in surgical pyæmia. In the less intense forms of the disease, especially when local suppurations exist, it is certainly useful, and may be given in doses of 10 to 20 minims every three or four hours. In very acute cases other remedies are more reliable, and the iron has the disadvantage of not unfrequently causing nausea or vomiting.

When restlessness, irritation, and want of sleep are prominent symptoms, sedatives may be required. Under such circumstances opiates may be given at night, and Battley's solution, nepenthe, or the hypodermic injection of morphia is the form which answers best.

Treatment of Local Complications.—Pain, tenderness, and local complications must be treated on general principles. The distress from them is most experienced when peritonitis is well marked. Then, warm and moist applications, in the form of poultices or fomentations, are very useful. Relief is also sometimes obtained from turpentine stupes, and when the tympanites is distressing, turpentine enemata are very serviceable. I have found the free application over the abdomen of the flexible collodium of the Pharmacopœia decidedly useful in alleviating the suffering from peritonitis.

Cœliotomy in cases of puerperal peritonitis has been discussed and practised within the last few years.[1] The subject is too new, and, as yet, experience far too small, to justify any dogmatic opinion as to its

[1] See Maury, "The Indications for Cœliotomy in Puerperal Fever," and Hirst, "The Position of Abdominal Section in the Treatment of Septic Peritonitis after Childbirth," Trans. of the Amer. Gyn. Soc., 1891.

merits or demerits. So far as existing evidence seems to show, the successful cases have been examples of localized pus deposits, more in the nature of pelvic peritonitis, or, in a few cases, of general suppurative peritonitis. In the latter class the operation has been performed a considerable time after delivery, such as six weeks, but cases of this kind cannot with propriety be called true puerperal septicæmia. The few cases reported in which cœliotomy has been performed soon after the development of septic symptoms appear all to have ended fatally. This is exactly what one would have *à priori* expected. In acute septic infection, which is a general and not a local disease, there are, it is true, very often marked symptoms of peritoneal disease, such as tenderness, immense distention, and the like; but this is one only of many local phenomena. To open the abdomen in such cases would be rash in the extreme, and a most hopeless procedure; it might even be impossible to return the enormously inflated intestines. It has been said that cœliotomy to be of use in cases of this kind must be done early, but it is to be remembered that in the early stages of septicæmia the symptoms are not well marked. The hope of cutting them short has not been abandoned, and it would lead to deplorable results if advice of this kind should lead to opening the abdomen of puerperal patients as soon as suspicious symptoms arose. In the former class, however, it is certain that in well-selected cases cœliotomy, washing out of the abscess cavity or peritoneum, and drainage, offer by far the best prospects of recovery.

Such are the remedies most used in this disease. It is needless to say that it is quite impossible to lay down fixed rules for the management of any individual case; and it is obvious that, if puerperal septicæmia be not a special and distinct disease, its judicious treatment must depend on the general knowledge of the attendant and on a careful study of the symptoms each separate case presents.

CHAPTER VI.

PUERPERAL VENOUS THROMBOSIS AND EMBOLISM.

Puerperal Thrombosis and its Results.—Under the head of *thrombosis* we may class several important diseases connected with the puerperal state, which have received far less attention than they deserve. It is only of late years that some, we may probably safely say the majority, of those terribly sudden deaths which from time to time occur after delivery have been traced to their true cause, viz., obstruction of the right side of the heart and pulmonary arteries from a blood-clot, either carried from a distance or, as I shall hope to show, formed *in*

situ. Although the result and, to a great extent, the symptoms, are identical in both, still a careful consideration of the history of these two classes of cases tends to show that in their production they are distinct, and that they ought not to be confounded. In the former we have primarily a clotting of blood in some part of the peripheral venous system, and the separation of a portion of such a thrombus due to changes undergone during retrograde metamorphosis tending to its eventual absorption. In the latter we have a local depositing of fibrin, the result of blood changes consequent on pregnancy and the puerperal state. The formation of such a coagulum in vessels the complete obstruction of which is incompatible with life, explains the fatal results. When, however, a coagulum chances to be formed in more distant parts of the circulation, the vital functions are not immediately interfered with, and we have other phenomena occurring, due to the obstruction. The disease known as phlegmasia dolens, I shall presently attempt to show, is one result of blood-clot forming in peripheral vessels. But from the evident and tangible symptoms it produces, it has long been considered an essential and special disease, and the general blood dyscrasia which produces it, as well as other allied states, has not been studied separately. I shall hope to show that all these various conditions, dissimilar as they at first sight appear, are very closely connected, and that they are in fact due to a common cause; and thus, I think, we shall arrive at a clearer and more correct idea of their true nature than if we looked upon them as distinct and separate affections, as has been commonly done. I am aware that in phlegmasia dolens, the pathology of which has received perhaps more study than that of almost any other puerperal affection, something beyond simple obstruction of the venous system of the affected limb is probably required to account for the peculiar tense and shining swelling which is so characteristic. Whether this be an obstruction of the lymphatics, as Dr. Tilbury Fox and others have maintained with much show of reason, or whether it is some as yet undiscovered state, further investigation is required to show. But it is beyond any doubt that the important and essential part of the disease is the presence of a thrombus in the vessels; and I think it will not be difficult to prove that in its causation and history it is precisely similar to the more serious cases in which the pulmonary arteries are involved.

It will be well to commence the study of the subject by a consideration of the conditions which, in the puerperal state, render the blood so peculiarly liable to coagulation, and we may then proceed to discuss the symptoms and results of the formation of coagula in various parts of the circulatory system.

Conditions which Favor Thrombosis.—The researches of Virchow, Benjamin Ball, Humphry, Richardson, and others have rendered us tolerably familiar with the conditions which favor the coagulation of the blood in the vessels. These are chiefly: 1. A stagnant or arrested circulation; as, for example, when the blood coagulates in the veins which draw blood from the gluteal region in old and bedridden people, or, as in some forms of pulmonary thrombosis, in which the clots in the arteries are probably the result of obstruction in the circu-