about by heightened arterial tension. This theory turns rather on causes than processes; in its distinction between stimulation and irritation it has been considered in the review of Jores's theory, and in its reference to primary weakening of the media it comes under Thoma's theory of arterio-sclerosis. Lastly, the lesion in arterio-sclerosis has been compared to keloid, and though he does not make this comparison Ophüls¹⁷ approaches this hypothesis in his reference to the autochthonous development of arterio-sclerosis. If simpler pathological conceptions fail it may be necessary to have recourse to the complicated explanations offered by the terms "productive fibroses," "fibrous diathesis," and "autochthonous development," but in the meantime I am of the opinion that the simple process of inflammation is sufficient explanation of the production of the lesion in diffuse hyperplastic sclerosis, and in the next and last lecture its activity in other forms of arterio-sclerosis will be considered.

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TREATMENT OF PUERPERAL INFECTIONS.*

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In obstetrics probably more than in any other branch of medicine old methods of treatment persist long after their efficacy has been disproved by more recent scientific knowledge and experience. In recent years our conception of puerperal infections has undergone a great change, and yet the general body of the profession has not realized it, for we daily see and hear of procedures being carried out which we can only regard as harmful.

The great danger of specialization is that the specialist is apt to lose his perspective and to be so immersed in the details of his own subject as to lose sight of advances being made in other directions, many of which may be of the utmost importance to him. What we have to realize is that the general principles of pathology have a universal application, and that the details of treatment founded upon them should require only slight modification to meet the different anatomical and physiological conditions present in any region of the body.

I do not intend to go fully into the treatment of all the different varieties of puerperal infections. All I wish to do is to ask if that treatment is always in conformity with what we know of pathology and of infections in general, for on this must depend its likelihood of yielding the best results.

Much has been learned in recent years regarding the mode of invasion of infective organisms, and nothing is of more importance from the obstetrical point of view than a realization of the frequency with which infective organisms spread throughout the blood stream from what was at first a purely local focus. The organisms concerned principally in puerperal infections—the streptococci, staphylococci, colon bacilli, pneumococci, and gonococci—very readily gain the blood stream, so that probably a few escape into it from every local focus. In the majority of instances their numbers are so small and the reaction of the blood tissues so great that they do not long survive. Furthermore, a great many organisms hitherto regarded as purely saprophytic have been proved to be capable of living in the tissues and spreading by the circulating blood. In view of these facts we must discard altogether the old classification of puerperal infections into sapraemias and septicaemias. We must regard every case of bacterial invasion of the genital tract as a potential bacteraemia and must direct our treatment accordingly.

When organisms invade a raw surface the lesion is at first quite localized. There is inflammatory reaction with a certain amount of destruction of tissue. Whether the condition remains localized depends on the degree of the reaction, on the number and virulence of the organisms, and on the amount of rest that can be ensured. If spread occurs it may take place by continuity of tissue, sometimes along the surface, often along the lymph channels, or the larger lymph vessels may be invaded and the organisms disseminated in the tissues through which they run, there producing other lesions. Thrombosis of blood vessels may occur and the organisms invade the thrombus, so that it becomes more and more extensive, spreading up the veins towards the heart and to a lesser extent along the arteries. From such a thrombus the organisms may spread into the general blood stream, although this is not necessarily the case. Pieces of thrombi may become detached, and such emboli, laden as they are with the infecting organism, may set up lesions in distant parts without there being any general blood infection. Finally, without any degree of thrombosis and often with a very minute local lesion there may be a massive general dissemination throughout the blood stream—a true bacteraemia.

CAUSE AND SYMPTOMS.

Apply this general knowledge to the particular subject. We know that the majority of infections of the mucous surface of the puerperal uterus remain localized. Reaction is such that the organisms are destroyed. If any escape into the blood stream they are so few in number as not to survive. The patient has an elevation of temperature for a few days, the lochia may be profuse and purulent for a time, but soon everything settles down to normal.

Extension by continuity of tissue results in a spreading inflammation of the mucosa, in an infiltration of the muscular wall of the uterus, or an extension to the tubes, with or without pus formation. If the lymph stream is invaded, a general peritonitis may occur, but more usually there results an inflammatory reaction in the cellular tissue of the broad ligaments with, in my experience, nearly always an involvement of the tubes—the so-called pelvic cellulitis. This may or may not go on to abscess formation, but nearly always remains localized to the pelvis.

Thrombus formation is always present at the placental site, and any organismal invasion of this area is peculiarly liable to cause an extension of it; hence the frequency of septic thrombo-phlebitis of the ovarian and other pelvic veins as a manifestation of puerperal sepsis. Bacterial invasion of the general blood stream I have already referred to.

These are the lesions our general knowledge of infections would lead us to expect, and these are the lesions which we find clinically and in the post-mortem room in cases of puerperal sepsis:

1. A localized surface infection of the mucosa.
2. Spreading infective lesion of the general surface of the mucosa, often with extension to the tubes.
3. Inflammatory infiltration of the uterine wall, sometimes with abscess formation.
4. Inflammatory effusion in the cellular tissue of the broad ligaments with or without pus, and usually accompanied by tubal inflammation with or without pus.
5. General peritonitis.
6. Septic thrombo-phlebitis of the pelvic veins with or without emboli, and with or without bacteraemia.
7. A general bacteraemia.

In any one case there may, of course, be a combination of these conditions. Knowing these to be the possibilities, how ought we to approach the investigation and treatment of the case of a woman confined two or three days previously and presenting febrile symptoms? The first thing to do obviously is to exclude the possibility of the fever being due to any other cause than puerperal sepsis. This involves a careful examination of the heart, lungs, kidneys, breasts, and other organs. Some time ago Dr. W. A. Scott and I made an analysis of all our cases of fever in the puerperium; in 2,096 cases confined in the Burnside Maternity Hospital, Toronto, 476 showed definite puerperal morbidity according to the standard laid down by the British Medical Association. In only 50 of these could we find any definite septic lesion in the pelvis. In 20 the cause of the temperature was extragenital from such conditions as pyelitis, cystitis, pneumonia, miliary tubercle, suppurating ear, etc. In the remaining 406 no definite lesion to account for the temperature could be detected by any of the ordinary methods of examination, including blood cultures. All of these patients made a

* Read at meeting of Edinburgh Obstetrical Society, February, 1923.

perfect recovery without any treatment. What the cause of the temperature was we could not definitely say, but doubtless in a good many of the cases there was some infective lesion of a mild character somewhere in the genital tract.

TREATMENT.

The first thing to do in any case is, therefore, to make a general examination of the patient and to abstain from any local treatment until the indications for it are quite definite. Finding nothing extragenitally we should investigate the pelvic organs. The perineum is inspected. If there is a wound and it looks inflamed, any stitches ought to be removed and free drainage allowed. The same applies to stitches in the cervix. A careful and very gentle bimanual examination may now be made. At this early stage probably nothing will be discovered, or at most a large tender uterus with profuse and perhaps fetid lochia, but in the absence of physical signs in the other systems, or in the perineum or cervix, we conclude that the uterus is the source of the infection. Now at this stage I most emphatically hold that exploration should cease. There is a great temptation to try to find out what the condition of the interior of the uterus is by introducing the finger into it. As a matter of fact we are seldom much the wiser even if we do get the finger in, and the possibilities of doing harm are great. We presume that there is a localized patch of inflammation on the uterine mucosa. What good is it going to do to feel it? None whatever; and it may be productive of much harm by creating fresh raw surfaces and disturbing thrombi. For some days after delivery the placental site is raised and irregular owing to the normal thrombus formation in the vessels. Any rough manipulation of this area may readily convert a local into a general blood infection. And if this is possible as a result of a digital exploration it is still more likely to occur if a curette is used. When we find the source of infection in the perineum we do not use a curette to scarify the infected tissue. We do not use a sharp spoon for a recent infective ulcer anywhere else in the body. Why, then, should we do it in the uterus? There is no good reason for it and several very good ones against it. In the first place we cannot hope to curette the infected patch only and leave the rest of the mucosa untouched. We are bound to create a large number of fresh raw surfaces and inoculate into them the infecting germ, thus favouring local spread. We are bound to disturb thrombi and open up blood vessels, leaving the door open for a general infection. We remove the reaction zone of tissue, open up the lymphatic channels, and produce such a disturbance in the relation of parts by our manipulations that extension to the blood stream, to the broad ligaments and peritoneum, is favoured. We know that all these things are liable to occur. Does curetting the uterus favour them or not? I say most emphatically that it does. And yet we know that it is frequently carried out.

But I hear it asked, Suppose there is a piece of placenta or membrane left inside the uterus—may this not be the cause of the rise of temperature, and, if so, should we not get it out? There is no reason for thinking that a piece of membrane or of placenta retained in the uterus predisposes to bacterial invasion. A recent investigation of 149 cases of retained placenta showed that in 44 per cent. the puerperium was absolutely afebrile, in 50 per cent. there was very slight fever, and in only 6 per cent. was there severe fever, with one death, and in four of these severe cases there had been intra-uterine manipulation of various kinds. It has been my teaching for some time, in conformity with that of the great majority of obstetricians, that even at the time of confinement it is wrong to put the hand, finger, or instrument into the uterus to remove pieces of membrane or placenta which may have been left behind unless there is excessive haemorrhage. The risk of introducing septic organisms is far greater than that run by leaving things as they are. Such retained portions separate and come away of themselves in a few days. And if it is risky to remove such pieces from the presumably germ-free uterine wall, how much more so is it when we know organisms to be present! The infective process is more likely to be in the part of the uterine wall from which the placenta has been detached rather than on that to which a small piece of membrane or placenta still adheres. In forcibly detaching such a piece we are simply opening up fresh surfaces for infection. Therefore I hold that even when we know that there is a portion of placenta or membrane in the uterus it is wrong to curette or introduce the finger or other instrument.

Even the intrauterine douche I believe to be more productive of harm than of good. The intrauterine douche was introduced as a means of treatment in the early days of antiseptics, when it was thought that they did much more in the way of destroying organisms in the tissues than we now know to be the case. Any antiseptic we may use as an intra-uterine douche has nothing more than a surface cleansing effect, and very little of that. It gets rid of possible accumulation of decomposing matter and pus from the uterine cavity, but the uterus is a muscular organ, and we have drugs at our disposal—ergot, piluitrin, and quinine—which, when administered, prevent any such accumulation. I can well remember when I was a house-surgeon in the Edinburgh Royal Maternity Hospital twenty years ago, when it was practically a routine to give an intrauterine douche to every patient with a rise of temperature lasting for more than two days, that in a very large proportion the douche was followed by a rigor or chill and a further elevation of temperature. That was supposed to be a nervous phenomenon. But was it? Is it not far more likely that it was due to a flooding of the blood stream with organisms—a temporary bacteraemia?

Sampson has shown, by injecting the venous channels of the uterus with a substance which gives a shadow with the x rays, what a very complicated system the veins form, and how free their communication is with the surface vessels of the mucosa. The thinness of their walls and the power of contraction in the uterine muscle makes it exceedingly easy for any minute substance in the uterine cavity or on the surface of the mucosa to be sucked into them, provided a surface vessel is laid open. Frank has shown, by blood cultures taken before and after intrauterine douching and simple manipulation of the uterus, that bacteraemia is very frequent after such proceedings. It is usually only a temporary condition, the blood again being sterile after a few hours, but if the initial dose of organisms is massive enough they may continue to grow and the case develop into one of true septicaemia.

Recent experience in the treatment of septic wounds has shown that the essential thing is free drainage, and the fewer antiseptics and the less interference the better. Now in the infected uterus the cervical canal always remains patulous and drainage is assured. It may be helped by placing the patient in the Fowler position and by administering the drugs I have mentioned. An ice-bag may be applied to the abdomen. It relieves any pain that may be present and reduces fever. A free liquid diet is given, the bowels are kept open but not severely purged, and if possible the patient is kept in the open air. Meantime a blood culture ought to be taken and repeated at intervals. We have ceased to take swabs from the interior of the uterus in the initial stages of infection because the results obtained were not commensurate with the difficulty of the proceeding and the risk to the patient. If there is accumulation of fetid discharges in the vagina a gentle vaginal douche may be given.

To this line of treatment the great majority of puerperal infections will yield and the patient make a perfect recovery. If extension takes place, this will declare itself in the course of a day or two and a definite diagnosis can be made. Cellulitis should be evident to bimanual palpation in three or four days; a pus tube a little later. When these have declared themselves the patient must make up her mind to a long period of inaction. In the majority of cases cellulitis will resolve in the course of a few weeks. A few undergo suppuration, and pus must be evacuated through the vagina or extraperitoneally through the abdominal wall. In the case of a pus tube we wait, if possible, until the temperature has reached and remained normal for some time before attempting removal. If the temperature remains high and the patient's general condition is deteriorating, pus may be evacuated through an incision in the posterior fornix and, if necessary, the tube removed at a later date. If there is evidence of peritonitis an incision may be made in the posterior fornix and drainage established.

Thrombo-phlebitis is evidenced by wide excursions of temperature, by repeated chills, and by the palpation of some thickening on one or on both sides of the uterus. Such cases may be dealt with by ligation of the ovarian or common iliac veins. This somewhat heroic treatment has been carried out by many operators, often with surprisingly good results. If there is evidence of local abscess formation in the uterine wall, hysterectomy can be performed.

If the temperature remains high and there are not present in the pelvis physical signs to account for it the probability

is that there is a blood infection. This can only be shown by blood culture, frequently repeated if necessary. Dr. W. S. Cosbie, a member of my staff in Toronto General Hospital, took cultures from all puerperal patients running a temperature. His investigations are not completed, but we were surprised to find that so many of them had positive cultures at one time or other. Most of these made a complete recovery without special treatment.

In the treatment of true cases of bacteraemia we have used various kinds of intravenous medication such as magnesium sulphate, eusol, and salvarsan. We have also used serums. With all of them we have had recoveries, and at first attributed these to the drug used, until we found that, with no intravenous medication and with no serum, just as many patients got well. The great difficulty in assessing the value of these forms of treatment is that spontaneous recovery so often does take place.

What I have said regarding the treatment of puerperal infections occurring after a full-time delivery applies equally to those arising after abortion, either complete or incomplete. I make it a rule never to curette the uterus or carry out any intrauterine manipulation in a case of abortion if the patient has a rise of temperature, unless there is severe haemorrhage. If the abortion is incomplete and a mass is felt projecting through and blocking the cervical canal, this may be very gently removed, but more interference than that I think unwise. After the temperature has been normal for some days, if there is still evidence that the abortion is incomplete by the persistence of bleeding and the patulous condition of the cervix, gentle curetting may be carried out. Even after waiting this time it is almost invariably found that the patient's temperature rises after the operation, and she not infrequently has a rigor, showing almost certainly that there has been a blood invasion. Fortunately, in most cases, this is only temporary.

I have only touched very briefly on the whole subject of puerperal sepsis, but my purpose is served if I initiate some discussion on the inadvisability or otherwise of active interference with the interior of the uterus in the presence of fever. From all the evidence of the literature and from my own experience I hold that it is inadvisable.

THE USE OF QUINIDINE IN AURICULAR FIBRILLATION.*

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THERE have now been recorded several hundreds of cases of auricular fibrillation in which normal rhythm has been restored, and it can be accepted as demonstrated that quinidine can bring about this change of mechanism in a large proportion of all cases.

Like all powerful drugs, quinidine can produce effects that are unpleasant, or even dangerous, and so it is necessary to learn in what cases the conversion can be effected without producing such results. The advantages to be gained might conceivably be so great that the risk of unpleasant symptoms would not be a serious deterrent to giving the drug, but in digitalis we have a method of treating the effects of auricular fibrillation that is so successful that it must be seriously considered in what cases a successful quinidine result surpasses in therapeutic value the effect of digitalis treatment.

Answers to the two following questions must be obtained before quinidine is to find a place in practical therapeutics:

- (a) In what cases can the conversion be brought about without risk of producing dangerous symptoms?
- (b) In what cases does the therapeutic effect of this conversion surpass the effect of digitalis treatment?

Discussion may well help to answer two further questions:

- (c) What is the best method of administration in regard to dosage?
- (d) For how long after the conversion should the quinidine treatment be continued?

Many other questions must arise, but preliminary answers to these four are desirable before the necessary amount of

evidence will be collected on which sound therapeutics can be based.

Among the earlier cases in which I tried quinidine was a woman, aged 54, with a greatly enlarged heart, severe mitral regurgitation, and stenosis of rheumatic origin, and auricular fibrillation. Quinidine sulphate (5 grains night and morning) caused auricular flutter to develop, and after eight days, during which the auricular rate was about 200 and the ventricular rate 80 to 90, the pulse rate rose suddenly to 200, probably as the result of a 1:1 response. On stopping the quinidine and commencing digitalis fibrillation returned.

A woman, aged 31, with mitral stenosis of rheumatic origin and severe heart failure, at rest in bed had a ventricular rate of only 50 to 65. After five days of quinidine sulphate (5 grains three times a day) auricular flutter resulted, and after six days more on 7½ grains three times a day she had a Stokes-Adams attack with ventricular standstill.

A woman, aged 54, with a greatly enlarged heart, mitral regurgitation, and auricular fibrillation, evidence of arterial and renal disease, and a ventricular rate of 180, responded moderately to digitalis. At a ventricular rate of 90 numerous ventricular extra-systoles occurred. With quinidine sulphate (15 grains at intervals of six hours) normal rhythm resulted after four doses, but was accompanied by precordial distress and nausea. On stopping the quinidine auricular fibrillation returned a day later with relief from the subjective distress.

Another limitation to the administration was seen in a woman, aged 48, with mitral stenosis of unknown origin and auricular fibrillation of probably only a few weeks' duration. The response to digitalis was good, but after nine days of quinidine sulphate, during which she received 175 grains in all, a severe toxic erythema developed with headache, nausea, and fever.

After the experience with these cases careful selection was made, avoiding all cases with evidence of much damage to the cardiac structures such as great enlargement, heart-block, or severe valvular disease.

A man, aged 39, with syphilitic aortitis and severe heart failure but no evidence of valvular disease, responded well to digitalis and received antisyphilitic treatment. Three months later normal rhythm was restored after ten days, during which 180 grains of quinidine sulphate was given. The treatment was continued for three months on diminishing doses, and nearly two years later the rhythm is still normal except for ventricular extra-systoles, and he feels fit to return to his work as a stevedore.

In the case of a man, aged 26, with no clear evidence of cardiac enlargement or of valvular disease and no evidence of infection other than malaria, a successful quinidine effect has continued for twenty months, and he is now working as a labourer. The auricular fibrillation had been present for six weeks before admission, and the digitalis response was good.

A similar successful result was seen in a man aged 40 with exophthalmic goitre, without evidence of valvular disease, in whom auricular fibrillation had been present probably for five years, and was still present three weeks after partial thyroidectomy by Mr. Dunhill. Normal rhythm resulted after four doses of quinidine sulphate (5 grains three times a day), and has persisted with gradually increasing efficiency for five months.

A woman, aged 45, with exophthalmic goitre of a mild degree had probably had auricular fibrillation for some years. Severe heart failure responded well to digitalis, and normal rhythm resulted after six doses of quinidine sulphate (7½ grains three times a day). The dosage was gradually reduced and treatment discontinued four weeks later. An increase in the thyrotoxic symptoms was accompanied by a return of fibrillation. Partial thyroidectomy was performed by Mr. Dunhill, and as fibrillation was still present a week later quinidine was given, and normal rhythm returned after four doses of 5 grains three times a day.

Another case of this nature shows similar features.

A girl, aged 26, with mitral stenosis of rheumatic origin, responded well to digitalis objectively but continued to have severe dyspnoea and palpitations. Quinidine sulphate (5 grains three times a day) restored normal rhythm after seven doses, with relief from the palpitations. This dosage has been continued for nearly a year now, and a severe relapse occurred during a return of the rheumatic infection. Relapses of a few days' duration have occurred on three other occasions; on one she had a bad cold, on another much worry in connexion with the death of her mother, and on the third she tried to do some heavier work than usual.

There are cases of thyrotoxic auricular fibrillation in which normal rhythm was restored a few days after partial thyroidectomy without other interference, and cases in which auricular fibrillation occurred only for a few hours after operation during the stage of increased excitement. They suggest that the auricular fibrillation is due to an active toxic action, and that normal rhythm may result simply from the cessation of this action. The difficulty in obtaining a stable normal rhythm with quinidine in active toxic cases, and the stability obtained after thyroidectomy, indicate that in this type of case to obtain a stable normal rhythm the thyrotoxic factor must be treated.

In the other types of cases the indications of a similar active agent are not so complete, but the accumulation of more evidence may decide in favour of a similar state of

* Abstract of remarks made in opening a discussion at a meeting of the Therapeutic Section of the Royal Society of Medicine, March 13th, 1923.