A Clinical Lecture

ON

HEART DISEASE IN RELATION TO PREGNANCY AND LABOUR.

DELIVERED AT UNIVERSITY COLLEGE HOSPITAL.

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I HAVE chosen as the subject of this lecture heart disease complicating pregnancy and labour: first, because it is an important matter, and of not infrequent occurrence; and, secondly, because the teaching in some of the current textbooks is, I venture to think, erroneous, in that it exaggerates the danger and the mortality arising from this complication of labour.

EFFECT OF PREGNANCY ON THE HEART.

Before we consider the changes which occur in the heart in cases of heart disease complicating pregnancy, we must pass in review briefly the changes which occur in pregnancy in the normal heart. It has been said that the heart undergoes hypertrophy during pregnancy, and this assertion is based on the supposed fact that there is thickening of the wall of the left ventricle, some increase in the weight of the heart, a displacement of the apex beat, an increase in the loudness of the heart sounds, and the production of murmurs over the cardiac area. And, further, it is assumed that the amount of work to be done by the heart during pregnancy is increased. These assertions have not been allowed to pass unchallenged, and it is still a matter of argument whether the heart really does hypertrophy during pregnancy. In the first place, it is necessary to remember that the observations as to the thickening of the wall of the left ventricle have been made on patients who have died of various diseases, and in many instances not with scientific accuracy, and no regard has been paid to the relation of the weight of the heart to the weight and size of the individual, which is, of course, an important factor. Moreover, in a number of cases no such thickening of the walls of the left ventricle has been found to be present on *post-mortem* examination. Any conclusion based on the occurrence of murmurs over the cardiac area in a case of normal pregnancy is untrustworthy as evidence of hypertrophy, because such murmurs may be produced by changes in the blood or by dilatation of the cavities of the heart. And, further than this, you must remember that such murmurs are not present in more than 4 per cent. of pregnant women. You must also bear in mind the fact that if the apex beat is displaced it is not in itself evidence of hypertrophy, because displacement of the apex beat during pregnancy is to a large extent dependent on the changes which occur in the shape of the thorax. It has been shown by *x-ray* photographs that while in the latter months of pregnancy the long axis of the heart is placed to a very large extent transversely in women with short squat figures, in tall women or women of normal height it is but slightly displaced. Further, in many of these cases the apex beat is produced not by the left ventricle but by the dilated right ventricle. Any attempt to ascertain the exact extent of the cardiac dullness or its increase during pregnancy by percussion is a difficult matter, because of the development of fat and of the mammae in pregnant women. The area of cardiac dullness is increased, but that may well be due to dilatation of the heart if it be not due to the displacement of the heart's axis, which undoubtedly occurs in ordinary pregnancy.

The view that increased work is thrown upon the heart during pregnancy, although probable, is not proved. It is supposed that the interposition of the placental circulation increases the amount of the work done by the heart, that the changes in the shape of the thorax tend to throw an increased strain on the right side of the heart and increase the amount of work done by the right side. Probably there is an increase in the total amount of blood in the woman's body, and an increase in the respiratory changes occurring in the placenta; further than this there is the necessity of getting rid of an increased amount of waste material,

produced partly by the mother and partly by the fetus, and this, it is said, shows that an increased amount of work is thrown on the heart even in a normal pregnancy. But much of the strain is thrown upon the right side of the heart as well as upon the left side, and therefore it cannot be taken as complete proof of the occurrence of hypertrophy of the left ventricle during pregnancy. On the other hand, many observers maintain that the heart is not hypertrophied at all in pregnancy, but that it undergoes dilatation, and that the dilatation affects mainly the right side of the heart. This view of the dilatation and weakening of the heart, is supposed to be supported by the fact that this organ, often quite early in pregnancy, tends to fail in an otherwise healthy woman, that is to say, that any extra demand made on the heart in the early months of pregnancy is responded to less readily than in a healthy non-pregnant woman. Further proof of dilatation is that the tracings of the apex beat demonstrate it to be due often to an over-distended right ventricle, and not to a hypertrophied left ventricle. The constant presence of overfullness of the jugular veins in the neck, the irregularity of the pulse, the occurrence of heart failure not infrequently during pregnancy, and, most important of all, the fact that dilatation of the heart cavities, and not hypertrophy of the left ventricle, have been found in a large number of cases *post mortem*, tend to confirm this view. So that the old idea that the heart normally hypertrophies during pregnancy, is not proved beyond any possibility of doubt. It is probable that in some cases hypertrophy of the heart is the chief change which occurs, while in some there is dilatation rather than hypertrophy, and in others there is hypertrophy of the left ventricle and dilatation of the right side of the heart. It also appears certain that in some healthy women, at any rate, neither dilatation nor hypertrophy of the heart occurs during pregnancy.

CHANGES IN BLOOD AND BLOOD PRESSURE.

There are no characteristic or important changes to be met with in the pulse of pregnant women. The question as to whether the blood pressure is raised is one about which there is a great deal of difference of opinion; but, on the whole, the evidence is in favour of the view that the blood pressure is raised above the normal. Most observers are agreed that in the first half of pregnancy there is no rise of the blood pressure. In the second half there is a gradual rise, and this rise reaches its maximum towards the end of pregnancy. During the second stage of labour there is a further marked rise, which reaches its maximum just before the birth of the child. Immediately after delivery there is a very marked fall of the blood pressure to below the normal. This fall continues until the expulsion of the placenta has been accomplished, when the pressure tends to rise a little. As a rule, however, it remains subnormal until about the fifth day of the puerperium, after which it attains the normal mean again. This fall of blood pressure immediately after the second stage of labour is very important, and although there is, as I have mentioned, a good deal of difference of opinion, yet I think we may regard the above description as an accurate account of the alterations which occur in the blood pressure of an otherwise healthy woman during pregnancy, labour, and the puerperium.

With regard to the changes in the blood itself during pregnancy, the total amount of the blood has been found by experiment to be increased in pregnant animals; this, however, has not been directly demonstrated in pregnant women. There is no other change in the blood in pregnant women of much importance except the presence of a physiological leucocytosis, the so-called leucocytosis of pregnancy. The red corpuscles are normal in number and size. The specific gravity and the freezing point of the blood are normal. The alkalinity of the blood is a little diminished, and, as I have said, there is a definite leucocytosis in every woman towards the end of pregnancy.

We may conclude, then, that there is no marked change in the pulse; there is sometimes hypertrophy of the heart, sometimes dilatation and hypertrophy, and in a certain number of cases there is no change in the heart at all; and that during normal pregnancy there is an increased strain thrown upon the heart muscle and increased demands upon the functions of the heart. As a result of this you will find in many cases, quite early in pregnancy, long before the uterus can exert pressure on the

diaphragm, or before there can be any increased amount of work thrown on the heart owing to the development of the fetus, that the heart tends to fail in otherwise healthy women. The increased amount of work performed by the heart during pregnancy affects chiefly the right side of the heart, and this is due to the changes which occur in the thorax and lungs during pregnancy. The capacity of the thorax and the vital capacity of the lungs is not diminished in any way, but there is a definite alteration in the shape of the thorax; the circumference at the base is considerably increased, and there is an alteration in the height of the diaphragm compared with the normal. There is also marked limitation in the movements of the bony walls of the thorax. The natural result of this is a tendency to congestion and oedema of the bases of the lungs. And this in its turn throws an increased strain on the pulmonary circulation. You will find in the majority of pregnant women, on examining the chest in the latter weeks of their pregnancy, especially in those who are accustomed to spend much time lying down, physical signs of a slight degree of oedema at the bases of the lungs. In the same way increased work is probably done by the liver and the kidneys of the woman during pregnancy in order to deal with the increased amount of excretory products produced by the increased tissue metabolism of the mother and the fetus. It is also probable that if there is any failure in the functions of the liver or of the kidneys or of either, an accumulation of toxic materials occurs in the blood of the mother, and these poisonous bodies may exert an injurious effect on the heart, and play some part in producing the fatty degeneration of the heart which occurs not uncommonly in pregnancy.

We may say, then, that a pregnant woman, in view of the increased demands made upon her heart by her condition, is on the borderline of a possible breakdown. And if that is the case in otherwise healthy pregnant women, the heart is still more likely to fail in a woman who is suffering from some form of heart disease, whether it be a valvular lesion or a degenerative change in the heart muscle. It is, however, certain that the majority of cases of valvular disease of the heart complicated by pregnancy do perfectly well, and pass through their labour and puerperium with no symptoms. But severe cases of heart disease in pregnant women undoubtedly present dangerous symptoms from time to time, and there can be no question but that pregnancy constitutes an increased danger to a woman who has a severe valvular lesion of the heart. Slight degrees of valvular affection very frequently accompany pregnancy, but severe cases are not met with very commonly. I have collected from the literature 131 cases of severe heart disease occurring in 55,000 cases of labour, or a proportion of about 1 case in every 400 cases of labour. Probably slight cases of heart disease with pregnancy occur more frequently than this. Cases of mitral disease form the majority, for while it is easy to collect the records of a number of such cases, aortic disease complicating pregnancy seldom occurs. Dr. A. Gray examined for me the casebooks for the past six years of the medical wards, and was only able to find 27 cases of aortic disease. Seventeen of these were in young unmarried women, and only 10 occurred in married women. In some of these cases the women were sterile, whilst in those in which an obstetrical history was given it was not sufficiently detailed to afford information of any value as regards the course of the pregnancies and labours.

SPECIAL DANGERS OF HEART DISEASE AND PREGNANCY.

Now, supposing a patient becomes pregnant who has a valvular lesion of the heart, what are the special dangers which are likely to occur during pregnancy, during labour, and during the puerperium? During the course of the pregnancy the two main dangers will be failure of compensation and the occurrence of degenerative changes in the heart muscle with consequent cardiac failure. Failure of compensation does not occur in the majority of cases of valvular disease complicated by pregnancy, because as a rule the compensation is sufficient to meet the increased demands thrown on the heart by the pregnancy and the patient consequently has no symptoms. If symptoms do arise, they are those which are met with in ordinary cases of uncompensated heart disease. The symptoms may begin quite early in the pregnancy, even in the first three

months, and the patient may complain of pain at the heart, palpitations, shortness of breath, and swelling of the extremities. In more severe cases there is likely to be marked dyspnoea, albuminuria, oedema of the lungs, with cough and perhaps haemoptysis and sleeplessness.

A good example of the ordinary course of a case of double mitral disease complicated by pregnancy is afforded by the history of a patient who was under treatment in Ward III not long ago. She was a woman aged 32, who had had six children, three of them having been born prematurely. She had suffered from rheumatic fever at the age of 10, and again at the age of 18. She was eight months pregnant when admitted, and on examination she was found to have a double mitral murmur, with oedema of the legs, marked dyspnoea, the respiratory rate being 30 to 40 per minute, and slight albuminuria. Under ordinary medicinal treatment, and rest in bed, she rapidly improved, and lost all her symptoms. That is what usually happens in the majority of cases of valvular disease complicated by pregnancy, where the failure of compensation is but slight.

This patient was a very poor woman, with a poor home; and as we were anxious that she should be delivered before her discharge from the hospital, for fear the symptoms might recur if she was allowed to return home, we induced labour at the thirty-eighth week by the introduction of bougies into the uterus. The child unfortunately was born dead, and presented the appearance of having been dead some little time. The mother did well, and on her discharge the systolic murmur had disappeared, but the presystolic murmur was still present.

This is a typical example of double mitral disease complicating pregnancy but yielding to ordinary treatment. You must, however, bear in mind that in this case labour was induced not on account of the patient's symptoms but to avoid the danger of a relapse after she had left the hospital during the time she was waiting for her confinement. If a patient develops failure of compensation she is likely to present, besides the symptoms due to her heart disease, special symptoms referable to the pelvic organs. For instance, in cases in which the failure affects mainly the left side of the heart, abortion is very likely to occur. I have here an interesting specimen of a frozen section of the uterus at the tenth week of pregnancy, from the case of a girl who died of mitral disease. You will notice that haemorrhages have occurred into the placenta, the decidua vera and the decidua reflexa. As the result of the failure of the systemic circulation the nutrition of the walls of the small arterioles suffers, and small haemorrhages occur, especially in the soft decidua of the uterus, with a tendency to resulting abortion. This accident is probably more frequent in pregnant women with heart disease than it is in healthy women. Some observers assert that abortion does not occur more frequently in these cases, but on the whole I think it does. Out of 80 recorded cases of pregnancy complicated by heart disease with symptoms, 35, or 44 per cent. of the patients, aborted. The frequency of the occurrence of abortions in general is about 20 per cent., so that in this series of 80 cases the percentage was twice as great.

On the other hand, French and Hicks, in a series of 36 cases of mitral disease with pregnancy admitted into Guy's Hospital, found only 5.5 per cent. of abortions. I think, however, we may certainly conclude that there is an increased tendency for women to abort when their pregnancy is complicated by valvular disease of the heart with failure of the left ventricle. If the failure affects the right side of the heart, the patient is likely to develop congestion and venous stasis in the pelvis as in other parts of the body, and is liable to the occurrence of menorrhagia and of premature labour.

The second danger, which occurs occasionally during pregnancy, is sudden cardiac failure due to degenerative changes in the heart muscle. There can be no doubt, as it has been shown by *post-mortem* examination, that in a certain number of instances during pregnancy fatty degeneration of the heart muscle occurs. And occasionally you may meet with a case in which a woman during pregnancy dies of cardiac failure due to degenerative changes in the heart muscle, with or without any valvular lesion. If such degenerative changes in the heart muscle are present in a patient during pregnancy, then any undue strain, whether it be physical or mental, is likely to bring about heart failure. Death during pregnancy from such

a cause is uncommon. Porak, however, has recorded 5 cases ending fatally during pregnancy, of 88 cases of heart disease and pregnancy, and Baranger has shown that fatty degeneration and small haemorrhages may be found in the myocardium, and especially in the papillary muscles, in these cases.

CARDIAC FAILURE DURING LABOUR.

Death from cardiac failure during labour is very uncommon. It may be the result of apoplexy, embolism, or heart failure, and it is no doubt favoured by the rise in the blood pressure which occurs during the straining efforts of the second stage of labour and by the mental anxiety which may accompany the process of delivery. But such cases are very infrequent. Quite recently, however, I have had a case of this kind in which cardiac failure commenced during labour, and in which the patient died immediately after labour was accomplished. She was a woman 26 years of age, who had had one child. The pelvis was contracted, and in the first pregnancy delivery had to be effected by craniotomy. She took the anaesthetic (chloroform) badly on this occasion, and after delivery there was marked collapse. In the second pregnancy labour was induced at the thirty-fourth week of gestation. The presentation was a breech, and an attempt at cephalic version was made under chloroform, which proved unsuccessful even with the patient in the inverted position. As during the inversion marked cyanosis developed I desisted from the attempt to turn the child, and contented myself with passing bougies into the uterus. This was done at 10 a.m. without any difficulty and without any haemorrhage. The patient soon came round from the anaesthetic, and at 2 p.m. had a good pulse and was cheerful and well. About 2.30 p.m. labour pains commenced, and some *ante-partum* haemorrhage occurred. This continued to a slight degree until about 5 p.m. At this time the patient became rather collapsed and the pulse became rapid and feeble.

At 6 p.m., when I saw her, the pulse was very rapid and small, she was very pale, and complained of pain in the epigastrium. The second stage of labour was well advanced, and the haemorrhage had entirely ceased. The breech was presenting, and there was no sign of haemorrhage into the uterus or into the abdomen. The patient's condition gradually became worse, and the cardiac failure more pronounced, with dyspnoea and finally some air hunger. The pulse never recovered, although hypodermic injections of ether and strychnine were given, and saline fluid with brandy was transfused into a vein. I have never seen a case of severe haemorrhage in which saline transfusion did not produce temporary improvement and some change in the pulse; but in this case it had no effect whatever, and there was no doubt the heart's action was extremely feeble. As the condition of the patient did not improve, and we thought there might be some intra-uterine haemorrhage, it was decided, as a last resort, to empty the uterus. A leg was brought down, the body delivered by traction, and the after-coming head perforated, as there was some delay at the brim of the pelvis, the delivery being accomplished within a few minutes. The condition of the heart, however, did not improve, and the patient died half an hour after the birth of the child, before the delivery of the placenta. Unfortunately a *post-mortem* examination was not allowed. There can, I think, be no doubt that the patient died from heart failure, predisposed to by the *ante-partum* haemorrhage which occurred during the first stage of labour, and due probably to degenerative changes in the heart muscle. The patient was a nervous delicate woman, and, as I have mentioned, suffered from an excessive degree of shock after her first confinement. There were no symptoms or signs of any abdominal trouble, beyond the pain in the epigastrium, which might have been cardiac, and no sign of haemorrhage into the abdomen or into the uterus.

THE RISK OF HEART FAILURE AFTER DELIVERY.

Supposing that a patient with heart disease escapes the dangers of pregnancy and the smaller danger of labour, what are the risks of her condition after delivery has taken place? The heart may give out in one of three ways after parturition. Immediately after the birth of the child cardiac failure may occur, and this may be brought about by over-distension of the right side of the heart, with resulting paralysis, or by the blood accumulating in the

large abdominal veins in consequence of the rapid fall in the blood pressure. No doubt in the majority of cases the failure is due to over-distension of the right side of the heart and cardiac paralysis occurs with cyanosis and urgent dyspnoea. In other cases it is due to the accumulation of blood in the abdominal veins, very little blood finding its way to the heart, and the hypertrophied and dilated heart failing because of the small amount of blood which is returned to it. Berry Hart has observed seven cases of death from mitral stenosis, all with symptoms of over-distension of the right side, and in one case *post-mortem* examination showed the right side of the heart over-distended and filled with blood, and the left side contracted and empty. The patient died of cardiac paralysis, the result of over-distension of the right side. The third way in which cardiac failure may occur is some days after delivery, no doubt from degenerative changes in the heart muscle and from a failure on the part of the diseased heart to recover from the strain of labour. So that after her confinement a woman may die from heart failure brought about in one or other of these three ways.

Recently I have had a case of death after delivery from cardiac failure, in consequence probably of blood accumulating in the abdominal veins. The patient was 38 years of age, and she had had six children and one miscarriage. She had a severe attack of influenza with some cardiac weakness five weeks before her confinement, and had only recovered from this a week before her delivery took place. The labour was precipitate, a very large child being delivered in two or three pieces, after the membranes ruptured. Immediately after the delivery of the child the patient became markedly collapsed, and the pulse began to fail. There was no haemorrhage, external or internal, and the uterus contracted well. Injection of strychnine and ether, and the administration of oxygen produced but very temporary improvement. The pulse became weaker and weaker, the patient became extremely blanched, and developed faintness, marked dyspnoea, air hunger, and precordial pain, dying two and a half hours after the delivery of the child. I think the death in this case may rightly be attributed to the failure of a heart weakened by a recent severe attack of influenza, and brought about by the sudden fall in the blood pressure accompanying a precipitate labour, and the consequent accumulation of the blood in the large veins of the abdomen. The extreme pallor of these patients seems to indicate that they are bleeding, as has been said, into their own veins. On the other hand, the patients who die from failure of the heart from over-distension of the right side become cyanosed and have dyspnoea. The third way, as I have mentioned, in which patients may die is from gradual heart failure developing some days after delivery.

Some years ago I had a case in which the patient died on the tenth day after her confinement with cerebral symptoms the result of extreme cardiac weakness following delivery. She was a woman of 41 years of age, who had had five children and one miscarriage. She was a very fat and rather unhealthy patient. I only saw her for the first time in the second stage of labour, and found a shoulder presentation with a prolapsed cord. Chloroform was administered, internal version was performed, and a large child 10 lb. in weight, was delivered as quickly as possible. The child was born alive and lived, but immediately after delivery the mother became very markedly collapsed, the pulse failed altogether, and the heart sounds could hardly be heard. There was no *post-partum* haemorrhage, the uterus contracting down well, and there had been no *ante-partum* haemorrhage. The patient's condition was so grave—she was practically moribund—that it was deemed advisable not to attempt to express the placenta. A few hours after delivery Sir John Williams saw the case, and recommended, in view of the patient's very grave condition, that the placenta should be left *in situ* for the present, as the uterus was well contracted and there was no haemorrhage. The patient remained in an extremely critical condition for three days, but under the repeated administration of strychnine and brandy hypodermically she gradually recovered, and the heart condition slowly improved. The temperature on the fourth day rose to 103°, and the discharge from the vagina—the placenta being still in the uterus—became a little smelly. Ether and oxygen

was accordingly administered, the placenta removed with the hand, and the uterus washed out with 1 per cent. lysol solution. A careful examination of the interior of the uterus failed to discover any signs of a tear in the cervix or in the body. The pulse gradually improved and the temperature returned to normal. On the tenth day, when convalescence was thought to be established, the patient was suddenly seized with very severe pain in the head and right side of the neck, so acute that morphine had to be administered. She became comatose, had stertorous breathing, with pin-point pupils, and died a few hours after the first onset of the pain. Unfortunately no *post-mortem* examination was allowed, and whether the patient died of a cerebral embolus or of cerebral thrombosis remains undetermined. At any rate, whatever the actual cause of death, it was no doubt secondary to the extreme cardiac weakness which was present during the ten days that she lived after her confinement.

There is another possible sequel of cardiac failure following delivery, and that is a tendency to the retention in the body of various toxic materials as a result of the enfeebled circulation and a failure of the excretory functions of the liver and kidneys. This may lead to other complications, such as albuminuria, may predispose the patient to develop septic intoxication or septic infection, and, as I have already mentioned, may be a cause of degenerative changes in the heart muscle.

PROGNOSIS OF THESE CASES.

Now we pass on to discuss the prophylactic treatment of these cases. How can we avoid these special dangers, or if they do occur how shall they be treated? Let us consider the mortality of cases of heart disease complicated by pregnancy and the prognosis in any given case. As I have told you, there is a tendency at the present time to exaggerate the badness of the prognosis, or, in other words, to overstate the mortality from this condition, and that is due to the fact that Angus Macdonald, who first called attention to the dangers produced by heart disease complicating pregnancy, had an altogether exceptional mortality in the cases he described. Out of 14 cases which he had either observed or collected he had a mortality of 9, or 64 per cent. Much of the teaching current at the present time is based upon these figures, and it is not uncommon to find in textbooks the statement that the mortality of heart disease complicating pregnancy is 40 to 50 per cent. There can, I think, be no doubt but that this is an entirely erroneous estimate. Drs. Hicks and French, to clear up this point, have analysed the obstetric histories of 300 consecutive cases of mitral disease admitted into Guy's Hospital during the last twenty years. As a result of their investigations they came to the following definite conclusions: First, that comparatively few of these women are sterile; secondly, that these women are not particularly liable to abort. But, as we have said, this is probably not a correct conclusion, and it must be remembered that in many of the cases the histories upon this point were inconclusive. The third conclusion is that the majority of such patients bear children quite well. In other words, the majority of patients with valvular disease of the heart pass through their pregnancy, labour, and puerperium with few or no symptoms, and make a good recovery. Their conclusions were based upon 300 consecutive cases, and they found that the mortality, either immediate or within three months—and it is obvious that not only the immediate mortality must be considered but also that for the following two or three months, since the women may die later on as a result of their labour—was 13.9 per cent. I have collected 453 cases from the literature, of whom 53, or 12 per cent, died, including Macdonald's and Berry Hart's cases, the latter having lost 7 out of 8 patients, so that we may estimate the average death-rate of cases of valvular disease complicating pregnancy as about 12 per cent. The mortality-rate naturally depends on the variety of the heart disease to some extent, but mainly on the condition of the heart muscle. The nature of the valvular lesion is not of much importance; it is the condition of the heart muscle which must be taken into account. If the valvular lesion is well compensated, the heart muscle healthy, and the blood pressure normal, the danger to the patient is very small indeed. If the heart muscle is degenerated, or there is insufficient compensation, the danger is great.

Treub has recorded the results of 24 cases of heart disease complicating pregnancy under his care; of 6 cases of valvular disease of the heart with no symptoms all recovered; of 14 cases of uncompensated valvular disease 1 died, while of 4 cases of endocarditis and myocarditis complicating pregnancy all the patients died. These results afford a very good illustration of the important fact that the danger and the death-rate depends mainly on the condition of the heart muscle, and not so much on the nature of the valvular lesion. If the patient has endocarditis or marked degenerative changes in the heart muscle, the mortality may well be 100 per cent., and very probably will be over 50 per cent.

OBSTETRICAL TREATMENT.

What is the best treatment of these cases? Hicks and French maintain that the treatment of a case of pregnancy complicated by heart disease is to treat the heart disease, and that you need take no account of the pregnancy. And that conclusion being in large part a correct one, we will not waste time by considering in detail the treatment of the heart disease, but will discuss the obstetrical treatment, and mainly the question whether it is desirable to carry out any treatment of the pregnancy besides that directed to the condition of the heart.

If you have a patient suffering from heart disease complicating pregnancy, you will place the patient at rest in bed, treating the heart condition by such rest or by the administration of heart or general tonics. Above all things, you will insist upon absolute rest in bed in the worst cases. Is it, however, ever advisable or justifiable to treat these cases by the induction of abortion or by the induction of premature labour? Is the contention of Hicks and French wholly correct that you need treat the heart, and the heart only, or is it necessary sometimes to cut short the pregnancy? I believe it is, and that in many cases the correct treatment is not only to treat the cardiac symptoms, but to relieve the patient of the strain produced on the heart by the pregnancy by the induction of abortion in some cases, or by the induction of premature labour in others. And I am of opinion that there are more cases in which the induction of abortion or of premature labour is good treatment than is generally supposed. It may be said that the immediate danger is increased by the induction of abortion or of premature labour, because, as I have pointed out, the danger after delivery is greater than that during pregnancy and labour. Therefore, you may from time to time, as in other severe diseases complicating pregnancy, such as albuminuria, meet with cases in which the result of inducing premature labour is markedly to increase the danger to the patient for the time being. But, in the majority of cases, if such interference is really necessary, you will by its adoption improve the patient's condition, and not make it worse.

The following case is a good illustration of the class of case in which abortion should be induced. The patient, a woman aged 32, had had two children and three miscarriages. She was suffering from double mitral disease, with marked dyspnoea, oedema of the lungs, cough, and haemoptysis, and was markedly anaemic. Considerable improvement took place with complete rest in bed and medicinal treatment, but the cough continued to be very troublesome. The oedema of the lungs did not clear up entirely, and after a time her general condition remained stationary. As she did not continue to improve, and as she was five months pregnant, so that she had a prospect of another four months before her confinement could be expected, in which the strain on the heart would continue to increase, I decided to induce abortion by the rapid method under anaesthesia. The cervix was accordingly dilated under ether to No. 26 Hegar's dilator, and then to a diameter of three and one-fifth inches by Bossi's dilator, and the uterus emptied. A considerable degree of hydramnios was present. After delivery the symptoms rapidly improved, the cough ceased, the physical signs of congestion and oedema of the lungs disappeared, and the general condition improved very markedly. In such a case as this the induction of abortion is justifiable and occasionally necessary. If I may recapitulate the reasons why in this case we induced abortion they were: first, that the patient had marked symptoms of failure of compensation as early as the fifth month, and, secondly, that these symptoms, although they were improved by rest in bed and medicine, did not entirely disappear. We

thought further that the strain of another four months of pregnancy, increasing, as inevitably it must, during the latter part of the term, would be too much for the weakened heart, and that, therefore, it was justifiable to terminate the pregnancy. If you decide to induce abortion in one of these cases, then the best method is to give an anaesthetic, to dilate the cervix, and to empty the uterus at one sitting. The class of case, then, in which abortion should be induced, is that in which ordinary medicinal treatment has produced no or only very little improvement in the general symptoms, and in which no further improvement in the cardiac condition is likely, so that it is essential that the strain of a long pregnancy should be avoided if possible. The following case is an illustration of the class in which premature labour may be induced. The patient was 25 years of age, a primipara with double aortic disease. She had some oedema of the legs, was markedly anaemic, and had severe syncopal attacks from time to time. With treatment by rest in bed and medicine she improved considerably, but when she got out of bed and about she had further syncopal attacks, so that her condition was not quite satisfactory. We tided her over her difficulties as long as possible, but at the thirty-eighth week I determined to induce labour because the syncopal attacks were still rather frequent, and it was therefore thought best to put an end to the pregnancy. A Champetier de Ribes's bag was introduced under an anaesthetic, and when the first stage was completed the patient was delivered under ether with forceps. The child is alive; the mother did well, and at the present time has lost all her cardiac symptoms. Some authors hold that the induction of premature labour increases the danger to the patient; but I do not think that this is so, because if you induce premature labour you can make arrangements to carry out the delivery in the best conditions and with the advantage of skilled assistance. I think, then, that in the case of patients who do not improve under ordinary medicinal treatment, it is wiser to terminate the pregnancy rather than to let the patient go on to full term. This does not agree with the conclusions of Hicks and French based upon the obstetrical histories of their 300 cases. They contend that the induction of premature labour is not necessary, since the great majority of their patients bore a considerable number of children with little or no danger. No doubt that is true of the general run of cases; just as it is true that the majority of cases of valvular heart disease complicated by pregnancy do very well with ordinary medicinal treatment. But you will meet with exceptional cases from time to time which require not only medicinal treatment, but, in order to lessen the strain thrown upon the overburdened heart, require, further than this, the induction of abortion or of premature labour.

CONDUCT OF THE LABOUR.

The treatment of the condition at the time of the patient's confinement is of some importance. You must guard against the risk of cardiac failure, and if there are signs after the delivery of the child that the right side of the heart is over-distended, you should encourage *post-partum* haemorrhage, or you should actually bleed the patient. Such a mode of treatment undoubtedly yields good results where there are symptoms of over-distension of the right side of the heart and consequently danger of paralysis. Where the patient is pallid and the pulse very small, with no signs of over-distension on the right side, and where it is probable, therefore, that the blood is accumulating in the abdominal veins, the intra-abdominal pressure should be maintained at the time of delivery by the use of a sandbag or a tight binder, and appropriate means must be taken to stimulate the heart's action.

THE PROHIBITION OF MARRIAGE.

There remains now for our consideration only one question, and that is the truth of the dictum laid down in many books, that a patient with heart disease should not marry, or if she does marry she should not have children, or if she does have children she should not suckle them. Such a dictum, you will agree, is too sweeping. The majority of women with heart disease pass through their pregnancy and confinement with perfect safety and have no symptoms, and therefore it is not right to say that a young woman who has heart disease should never

marry. If her heart disease is compensated and there are no symptoms, she may marry. Cardiac failure probably will occur sooner or later, as Hicks and French point out, whether she becomes pregnant or not. The bad effect produced on the heart by pregnancy is, on the whole, not sufficiently marked to justify you in advising a patient strongly that she should not marry. It is true that if she marries it will be better for her not to have children, and it is true that if she does have a child she should not suckle, but it is not right that a woman with heart disease should be forbidden to marry. Although the danger is undoubted, and the mortality is as high as 12 per cent., yet it has been exaggerated, and the majority of these patients do perfectly well, and run no very great extra risk. So that a young girl with heart disease which is compensated, and which is not complicated by any accompanying disease of the lungs or other viscera, may be permitted to marry. Her heart will probably fail sooner or later, whether she marries or not, but whether the time of the onset of such failure of the heart will be precipitated by child bearing is a matter which admits of argument. There probably will be some precipitation, but it is doubtful whether the risk of this is so marked as to justify you in denying her the right to marry.

EFFECTS OF DIET ON THE DEVELOPMENT AND STRUCTURE OF THE UTERUS.

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THE alarming and persistent decline in the birth-rate is a matter of national interest the importance of which can hardly be over-estimated. The purely medical aspect of this question is, however, exceedingly difficult of approach, since social factors and social selfishness have undoubtedly a material influence. During the last generation, however, there has undoubtedly been a marked change in the relative proportions of the constituents of the average man's diet. Can such a change of diet have any influence on the birth-rate?

The following investigation was undertaken to discover what changes, if any, were produced in the development and structure of the uterus by various diets.

The animals employed in the research were rats. The uteri of 86 animals were examined both macroscopically and microscopically. The tissue for microscopic examination was removed in all cases from, as nearly as possible, the same area, the junction of the distal and mid thirds of the uterus.

Eight wild rats, in various stages of development, from the immature to the adult animal, were examined in order to form an opinion as to the structure of the uterus in animals living, presumably, under natural conditions.

The remaining animals were divided into five series, namely:

- (a) A series of 13 animals fed, from weaning, for periods of from nine to fourteen weeks on an exclusively milk diet. In one section of this series plain milk was used; in another, Pasteurized milk; in the third, sterilized milk.
- (b) A series of 27 animals fed for periods of from twenty-one days to nine months on bread soaked in milk.
- (c) A series of 11 animals fed for periods of from four to fourteen weeks on a rice diet.
- (d) A series of 5 animals fed for varying periods on a diet of porridge or oats.
- (e) A series of 22 animals fed for periods of from twenty days to eight months on a raw meat diet.

In the cases of the raw meat and rice diets, some animals were put on the diet as soon as weaned, others after they had reached various stages of development.

The uterus of the adult wild rat is lined by columnar epithelium. There are glands lined by epithelium which varies from low cubical to columnar in type. The mucous coat is bounded externally by a muscular coat. In the mucous layer three varieties of cells are found:

1. A cell with a large round or oval, relatively faintly-staining nucleus. This appears to be a young connective tissue type of cell.