CARDIAC DISEASE AS A COMPLICATION OF PREGNANCY.*

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THIS subject is of great interest, both to the laity and to the medical practitioner. To the former it is at times of vital importance. Shall a woman with a heart lesion marry? The physician is called upon to decide this—or rather, to give his opinion, for frequently his advice is not heeded—and if pregnancy occurs, his is the task of caring for the patient.

In discussing this subject our considerations naturally fall under three headings. The diagnosis of the condition comes first, for without a correct diagnosis we are surely upon uncertain ground. Secondly, the prognosis comes. Is the condition so serious? and under what circumstances and when? Are marriage and pregnancy advisable? If pregnancy exists, shall it continue, and if not, when shall it be interrupted? If it does continue, what are the dangers? These and many other questions depend on the prognosis, and must frequently be decided by every obstetrician. Closely connected with the prognosis is the treatment; for on this the prognosis largely depends; and, conversely, the treatment rests upon the prognosis. The treatment must, therefore, be our third subject of consideration.

To an audience such as this it is unnecessary to say that every murmur of the heart does not indicate endocarditis. And yet how many of you have not found a hemic murmur only in a patient who had been told that she was suffering from heart disease? Murmurs, systolic at the base of the heart, the pulmonic or second left interspace, we do not, as a rule, consider of importance. Systolic murmurs near the apex, with or without thrills, systolic or diastolic murmurs in the aortic area—these are the murmurs most frequently met with as indications of endocarditis. Marked change in the rate, rhythm or impulse of the heart-beats are important aids. Myocarditis, one of the most dangerous forms of heart disease from an obstetric stand-point, is very hard

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to make out and often is first suspected when the heart's action suddenly becomes impaired. Undoubtedly, it is often overlooked entirely.

Percussion of the heart, upon which many expert medical d agnosticians rely, is in the later months of pregnancy very misleading as an indication of cardiac disease. This brings up the much discussed subject of the physiological hypertrophy of the heart during pregnancy. It has been generally believed, and many still hold the view, that the heart is larger during pregnancy than at other times. If this is so, an increase in cardiac dullness on percussion would not mean endocarditis, but only the normal enlargement of the heart during pregnancy, assuming, for the moment, that this increased cardiac dullness shows enlargement of the heart at all.

Larcher claimed that the left ventricle was enlarged during pregnancy, as he found the average thickness of the wall of the left ventricle greater than 10 mm., the figures given by Bizot for the average thickness of the normal wall of the left ventricle. Ducrest supported him in this belief. Buhl, however, found the average normal thickness 16 to 17 mm., and thus claimed that Larcher's figures did not show any increase in thickness beyond the average. Zambaco, in a prize essay at the French Institute of Medicine, gave it as his opinion that hearts of women dying in pregnancy were larger than those of women dying nonpregnant. Other authors have tried to settle this question by weighing the heart after death. Müller, after careful weighing of a number of cases, concluded that there was no increase. Lohlein was unable to find any increase of weight in a number of specimens. Dreysel claimed a very slight increase. The average weight of the female heart, taken from the findings of fifteen different authors, was found by Stengel and Stanton to be 263 gm., and by comparison with the average weight of a series of hearts taken from women dying in pregnancy it was shown that in pregnancy there not only was no *increase* in weight, but even a slight *decrease*.

Duroziez tried to settle the question by physical examination of the living woman. He finds an increase of cardiac dullness in the vertical and horizontal diameters. The day after confinement the area is that of normal dullness. Fellner confirmed this. Gerhardt claimed that these results were valueless, as the upward displacement of the diaphragm by the enlarged uterus caused this increase of cardiac dullness by displacement of the heart. The theory has been advanced that the increased arterial tension

during pregnancy necessarily causes enlargement of the heart by increasing the amount of work it must do. Various attempts have been made with the sphygmomanometer to show this increased tension.

In 1904, Stengel and Stanton, of the University of Pennsylvania, in an article called "The Heart and Circulation in Pregnancy and the Puerperium," reviewed this whole subject, and from a series of very careful experiments came to the following conclusions:

The blood pressure is not increased before or after labor. During labor with the "pains," there may be an increase. The heart has no special increase in work during pregnancy, and there is no hypertrophy. The increased area of cardiac dullness is due to the upward and outward displacement of the heart by the diaphragm. This is less in multiparæ, where there is a separation of the recti muscles of the abdomen.

The methods of ascertaining the thickness of the heart muscle and of weighing the heart were inaccurate, and many of the hearts examined were diseased and therefore hypertrophied from causes other than pregnancy.

MacDonald (1878) agrees in the main with these views, though he inclines to the belief that there is a slight enlargement of the left ventricle in pregnancy. Williams thinks there is a slight enlargement, while Edgar and Hirst think there is *no* enlargement.

One must not be misled, then, by the increased area of cardiac dullness found on percussion, for this is probably due to a displacement and not to an enlargement of the heart. However, if it can be ascertained that there is no displacement of the heart by the diaphragm, as in marked diastasis of the recti, an apparent enlargement of the heart may be considered as abnormal and not as a physiological hypertrophy.

The diagnosis of heart disease in the pregnant woman is made in the same way as in the nonpregnant woman, except that percussion is more difficult (from the enlarged breasts) and not always to be relied upon. The importance of a careful auscultation of the heart in every case is apparent when we consider the frequency of heart lesions in pregnancy. Demelin gives it as 1.2 per cent., Vinay as 2 per cent., Fellner as 2.4 per cent. and Williams as 2 per cent.

The prognosis and treatment of heart disease in pregnancy vary within wide limits, from the mildest kind of complication, needing no treatment, to one most dangerous to mother and fetus

and calling for the most urgent treatment. Angus MacDonald, in 1878, published a monograph called "The Bearings of Chronic Diseases of the Heart upon Pregnancy, Parturition and Childbed," in which he quotes a series of twenty-eight cases of heart disease complicating pregnancy.* His findings and conclusions are very interesting. In fourteen of his cases the chief lesion was mitral stenosis. The mortality here was very high—nine maternal deaths (or 64.4 per cent., and five fetal deaths (36 — per cent.). In eight cases the chief lesion was mitral insufficiency, and here the maternal deaths were four (or 50 per cent.), while the fetal deaths were none. In six the chief lesion was aortic insufficiency, with three maternal deaths (or 50 per cent.) and two (or 33 per cent.) fetal. A marked tendency to abortion was noted, eight in the first series (29 + per cent.), one in the second (12½ per cent.) and five (or 83 per cent.) in the last (a total of 50 per cent.).

This is a frightful mortality, 54 per cent. maternal and 25 per cent. fetal. All of the maternal deaths took place during or shortly after labor.

MacDonald concludes that mitral stenosis is the most common and most fatal lesion; also that all forms of endocarditis predispose to abortions. Recent cases of endocarditis are more dangerous than old cases, for in the former the inflammation of the endocardium is more apt to continue, causing further damage, and compensatory hypertrophy is not established. The danger from embolism is always present, and a so from impairment of the heart muscle. Pulmonary troubles, such as bronchitis or phthisis, greatly increase the danger from endocarditis. This is also true of kidney trouble. When there is fai ing compensation the prognosis is always bad. MacDonald thinks that in premature labors the prognosis is worse, and he is therefore much opposed to artificial termination of pregnancy as a rule.

From his experience and with his conclusions MacDonald has some decided ideas on treatment. Marriage of women suffering from endocarditis he thinks ought to be discouraged in cases of mitral stenosis and aortic insufficiency, where his mortality was so high. In mitral insufficiency there is less danger. Where there is evidence of failing compensation marriage ought to be absolutely forbidden. Where pregnancy *exists* all causes of pulmonary and renal inflammation ought to be carefully guarded against. As has been mentioned, he does not approve of induc-

*I have not included his three irregular cases.

tion of premature labor (excepting only where the intraabdominal tension is great), as the strain of labor is often too much for the already failing heart. During labor every effort should be made toward shortening the second stage, with forceps or version if necessary. Chloroform he approves of, as it lessens the uterine contractions, thereby lowering the arterial tension and relieving the heart. In the puerperium the same general principles of treatment for the heart are to be observed as in the nonpregnant state.

Williams finds mitral insufficiency the most common lesion, while mitral stenosis is the most often fatal. He recognizes myocarditis, though hard to diagnose, as a cause of sudden death in labor. Few heart lesions in pregnancy, however, give symptoms. Fellner, in his series of 94 cases, found only one-seventh giving cardiac manifestations. Demelin, in 41 cases, found two-thirds giving symptoms. Williams, in 3000 of his own cases, normal and abnormal, found only one giving alarming symptoms. But he says there is danger during labor of failing compensation and collapse, and after labor he thinks hemorrhage is apt to occur. He also says severe heart lesions are apt to produce abortions. Premature labor was noted in 20 per cent. of Fellner's cases. As regards the mortality, Fellner, with his ninety-four cases of heart lesions complicating pregnancy, gives a total of 6 per cent. Demelin, with his forty-one cases, has a mortality of 5 per cent. With failing compensation, however, the prognosis is worse and the mortality higher. Guerard gives a mortality of 28 per cent., Schlayer of 48 per cent., Leyden 54 per cent., and Lublinsky 100 per cent. Williams thinks that interdicting marriage for women with heart lesions is extreme, but when the lesion is severe or compensation poor the dangers of childbearing should be fully explained.

In pregnancy, if compensation is fair, rest with heart tonics should be given. If these fail and the patient's life is in danger from edema of the lungs, bloodletting should be resorted to, followed by prompt emptying of the uterus. During labor nervousness and increased arterial tension from uterine and abdominal contractions make an anesthetic of value. When the cervix is fully dilated and the head well engaged, forceps are indicated.

Hirst says that "mitral diseases are the most serious." He does not fear endocarditis in pregnancy when compensation is good, and adds that he "never lost a case." Abortion he finds

taking place in 25 per cent. of the cases. He recommends close watching of the urine, frequent recumbent positions, fresh air, avoidance of sudden chills and violent efforts, and, if there is failing compensation, termination of the pregnancy at the thirty-sixth week.

Edgar recognizes embolism as a great danger in heart diseases with pregnancy, also pulmonary inflammations in the later part of pregnancy from severe exertions or colds. M tral stenosis is especially dangerous. During labor the t me of greatest danger is immediately after the expulsion of the child or placenta. He strongly recommends the free use of strychnine during pregnancy as well as enforced rest with massage. During labor he uses ether, and shortens labor by manual stretching of the cervix, giving digitalis if necessary, with strychnine *always*.

He shortens the second stage with forceps, and thinks venesection would be useful, except for its unfavorable moral effect.

Costé says that very sudden death after labor is almost always due to myocarditis. If to this a puerperal fever is added, there is the greatest danger. The diagnosis is hard to make, but if in the course of a puerperal fever there is a sudden failing in the pulse, this becoming small, feeble, irregular or intermittent, with sudden faintness and precordial pain, the diagnosis is assured.

From these authorities and others we may briefly state the prevailing ideas on the prognosis and treatment.

Heart lesions are present in about 2 per cent. of all pregnancies. When compensation is good there are few symptoms. When compensation is failing the prognosis is bad, and the mortality ranges from 28 per cent. (Guerand) and 54 per cent. (MacDonald) to 100 per cent. (Lublinsky).* Abortions or premature labors are common, especially with failing compensation, where Hirst finds it 25 per cent. and MacDonald 50 per cent. Mitral lesions are agreed upon by all as the most frequent; Williams says mitral insufficiency and MacDonald mitral stenosis. All agree that mitral stenosis is the most dangerous lesion, while aortic insufficiency (MacDonald) and myocarditis (Williams, Hirst and Costé) are considered the next most dangerous.

As to treatment, where compensation is good, little or none is needed except watchfulness and care. In failing compensation, active treatment is necessary, stimulation, termination of pregnancy (not advised by MacDonald, however); making

*The total mortality is between 5 per cent. and 6 per cent., Demelin and Fellner.

the labor short and easy, with forceps or version if needed; the use of chloroform without fear of bad results (though Edgar prefers ether); and after labor, stimulation, with bleeding if indicated.

At the Sloane Maternity Hospital in 4000 confinements occurring between September, 1904, and April, 1907, I have collected fifty-six cases of cardiac lesions. Each history was ooked at separately, in order that the number might be as accurate as possible. This, fifty-six in 4000, makes the frequency 1.4 per cent. In looking over the 5000 confinements immediately preceding this series, thirty-six cases of cardiac lesions are recorded. This does not give an accurate idea of the frequency of the lesion, as many of the mildest cases are not on record.

Taking these two series, we have a total of ninety-two cases- Mitral insufficiency is found to be the most frequent—forty-nine (53 per cent.); mitral stenosis next, fourteen (15 per cent.); double mitral, fifteen (16 per cent.); total mitral lesions, seventy-eight, or nearly 85 per cent. of the whole series; myocarditis, five (5.4 per cent.); aortic insufficiency, three (3.2 per cent.); aortic roughening, three (3.2 per cent.); malignant endocarditis with ulceration of tricuspid valve, one; marked tachycardia, two.

These cases of tachycardia were possibly not dependent on heart lesions and do not properly belong here, but I have mentioned them because they seem of spec al interest. Curtin, of Philadelphia, speaks particularly of tachycardia 'n pregnancy and says that most cases are due to a toxemia of pregnancy. This form of tachycardia is very common, and is often seen during or immediately after labor, frequently becoming alarming and even fatal. Other cases he has found to be the beginning of a later developing exophthalmic goitre.

One of the cases that I have mentioned was a private patient of Dr. Cragin. During her pregnancy and puerperium she had several attacks when the pulse became too rapid to be counted, with marked dyspnea and precordial pain, and yet, in spite of many apprehensions, she went through labor with absolutely no abnormal symptoms. The other was a ward patient. Her condition was so remarkable as to be almost amusing. After an easy normal labor with very little loss of blood, she was wheeled into the room adjoining the operating-room, apparently in the finest condition. Her pulse shortly after was reported as very bad, and on taking it I found it too rapid to be counted,

weak and thready, apparently the pulse of a dying woman. However, her fundus was hard. There was no bleeding and her face was ruddy and the picture of perfect content and well-being. In view of this, her pulse was disregarded, and in an hour or so was normal again. She had no albumin, no known heart lesion and no evidence of toxemia. Her puerperium was normal.

Recently I saw a case with Dr. Eli Long where, after an easy labor, it was necessary to manually extract the placenta. There was very little hemorrhage and the uterus contracted well, but the pulse jumped up to over 180 to the minute. The patient looked and felt perfectly well, however, and in a few hours the pulse was normal again. There was here no evidence of heart lesion or toxemia and the puerperium was normal.

The first of these three cases was probably one of angina pectoris and is mentioned here as of interest simply because the heart was not disturbed at all by labor. The other two, in the absence of any clinical signs, must be put down as examples of the neurotic tachycardia mentioned by Williams.

The total number of maternal deaths in this series of ninety-two cases was seven (7.6 per cent). three were with myocarditis, two were with mitral insufficiency, one was with double mitral and one with malignant endocarditis. Two deaths were due chiefly to eclampsia, so that out of the series, five deaths alone were due solely to the heart lesions. Myocarditis has the highest mortality,* three out of five (60 per cent.); mitral insufficiency, two deaths out of forty-nine (about 4 per cent.); double mitral, one out of fifteen (6 per cent.). The total mitral lesions were seventy-eight with three deaths (under 4 per cent.). Mitral stenosis alone gave no deaths, and no aortic lesions resulted in death. This is quite contrary to the results of other writers, especially MacDonald. All of the deaths occurred after labor and, with but one exception, within a few hours. There were twenty-eight abortions and premature labors (30 per cent.), but twenty-two of these were artifically induced, leaving six (or about 8.5 per cent.) occurring spontaneously. How many of the twenty-two would have occurred spontaneously we do not know. There were thirteen still-births and six infant deaths, a total infant mortality of nineteen (or a little over 20 per cent.).

It is very interesting to note that in thirty-two of the series

*Malignant endocarditis is of course fatal; MacDonald mentions two cases both of which died.

there were absolutely no symptoms. In twenty-four there were slight symptoms, but no treatment was necessary. In eight treatment was needed, but only for complications. Therefore, in sixty-four (or nearly 70 per cent. of the cases) no treatment for the heart lesions was needed. In twenty-eight (or about 30 per cent.) there was failing compensation and treatment was needed and given. All the maternal deaths occurred in this number, seven in twenty-eight (or exactly 25 per cent.). In this number also (twenty-eight with failing compensation) there were thirteen fetal deaths (or 46 per cent.) and twenty-two premature endings of pregnancy, but all artificial.

Albumin was present in sixty out of the ninety-two cases. In many of the severer cases it was difficult to tell how much of the distress—cyanosis, dyspnea, edema, etc.—was due to the heart lesion and how much to the albumin and toxemia present. Indeed, only one of the fatal cases did not have albumin. Ten cases had retained membranes, necessitating manual removal (one in nine). Only two cases of the ninety-two had postpartum hemorrhages. This is contrary to the experience of Williams, who finds postpartum hemorrhage common.

Briefly, from a study of these cases we find that the frequency of heart lesions in pregnancy was 1.4 per cent. The mitral lesions were by far the most common—nearly 85 per cent. of the whole number. Myocarditis was the most fatal—three out of five; and mitral stenosis uncomplicated and the aortic lesions gave no deaths.

Premature labor or abortion was common (about one in twelve when there was no interference), but nearly all of the bad cases were induced.

In over two-thirds of the cases the heart lesion was of practically no significance, giving little or no symptoms and needing no treatment. In the remainder, less than one-third, treatment was needed for failing compensation, and the mortality was high (one in four or 25 per cent.).

The total mortality was about 7 per cent. maternal and 20 per cent. fetal; with *failing compensation*, 25 per cent. maternal and 46 per cent. fetal. None of the deaths occurred during labor, but all afterward, probably partly because labor was hurried in every possible way. Albumin was present in about two-thirds of the cases. Postpartum hemorrhages were very rare.

Conclusions.—Cardiac disease in the parturient state is a complication of such frequency that anyone doing a fair amount

of obstetrics is sure to meet with it. The crucial point to be considered is whether or not the heart is well compensated. If it is, no danger need be expected from the heart lesion. The patient will in all probability go through pregnancy without inconvenience, will stand an ordinary labor well and in the puerperium will have no trouble. Marriage need not be especially feared if the cardiac compensation is good and the lesion is not a recent one. No special treatment is needed except added watchfullness, throughout the whole parturient state.

During pregnancy the patient should be especially guarded against sudden chilling, as this is apt to cause congestion of the lungs or kidneys and thus throw extra work upon the heart. For the same reason, sudden or prolonged exertions should be avoided. The urine should be carefully watched and the patient should have plenty of fresh air and wholesome food. If any signs of failing compensation appear, the patient should be treated for this at once.

During labor great care should be used not to let the patient overexert herself. The first stage should be made shorter, if necessary, by bags or bougie or by correction of bad presentations. Especially in the second stage should care be used to hasten delivery by forceps or other appropriate means. At the same time, I personally believe it is better that the patient should use a reasonable amount of her own strength than that resort should be made to a difficult artificial delivery, necessitating prolonged anesthesia. As to chloroform, these patients stand a moderate amount well and are benefited by it. Prolonged use of chloroform seems harmful. Ether, suggested by Edgar, I have seldom seen used in obstetrics. With any tendency to pulmonary congestion, I should think it contraindicated.

In the puerperium, when compensation has been complete through labor, little apprehension need be felt and no special treatment need be given, except, of course, added watchfulness. When the labor has been especially difficult, however, the heart may give us concern by being irregular, intermittent or suddenly rapid. In these cases, morphine, digitalis and strychnine are useful, especially the first. This irregularity usually lasts only twelve hours or so.

With *failure* of compensation we are confronted at once with a most serious complication. Under the most favorable conditions and the best treatment, the maternal mortality is one in four and the fetal mortality nearly twice this. Treatment should

not be delayed. The patient should be put to bed on a light diet—milk, if albumin be present—and suitable heart stimulation should be given (morphine, digitalis or strychnine). If albumin is found, care must be taken to ascertain what part of the symptoms are due to the kidneys. In many cases practically all of the symptoms are due to the kidneys, with toxemia of pregnancy, and treatment must be directed to this—colon irrigations, arterial dilators, warm baths, etc. Usually, where toxemia of pregnancy is present, the pulse is apt to be tense, though this is not always so.

If, in spite of treatment, failure of compensation is more marked (as shown by increasing edema, dyspnea, poorer heart action and cyanosis), termination of pregnancy should be considered.

MacDonald does not believe in induction of labor, as this still further upsets the heart's action, and Hirst advises inducing labor at the thirty-sixth week. I should rather favor terminating pregnancy as soon as it is seen that the heart action is steadily growing worse. Labor will still further embarrass the heart action, but as this must come sooner or later, I think the longer it is delayed, the worse the condition will be. I *do* think, however, that labor should seldom be induced until the above treatment has been thoroughly tried. Hasty termination of pregnancy before the heart has been given every chance by rest, diet and stimulation to regain its tone is, I believe, one cause of death. MacDonald's high mortality—these are not all his own cases—is largely due, I think, to the fact that pregnancy was not terminated soon enough. In only two of his cases was labor induced, and then only as a last resort. In nearly all of his fatal cases failing compensation had been present for weeks or months before labor actually occurred. An early induction would have brought on labor under more favorable circumstances.

When possible, of course, induction should be delayed until the fetus is viable. This is, however, a matter of judgment. The child's life should not be weighed against the mother's, as the infant mortality is practically twice as high as the maternal. The means of terminating pregnancy I shall not discuss. (Personally, I believe the bags, with at times the bougie, give the best results.)

During labor everything must be done to strengthen and support the heart, to quiet the patient and to shorten and

simplify the labor. Heart stimulants must of course be used; morphine in small repeated doses is especially useful, as it lessens the pain, quiets the patient and steadies the heart. Bags to hasten the dilatation of the cervix are useful. Forceps, as soon as they can be safely used, are of great value. Easy version and breech delivery are to be recommended. But here, again, prolonged difficult deliveries, necessitating much chloroform and tending to cause shock, are dangerous. With failing compensation, chloroform, in my experience, is poorly borne, and as little as possible should be given. In many cases it can be dispensed with altogether.

The third stage can often be shortened with advantage. In bad cases it is better to extract the placenta manually at once, making sure that the uterus is empty; following this with a hot intrauterine douche. This saves time and effort for the patient.

After labor, within a few hours, is the time when most of the fatalities occur. The patient should be placed in bed as soon as possible. It is a great mistake to delay, keeping the patient on the operating-table while the baby is being attended to or some comparatively unimportant treatment is being given. In bed the patient can be made warm and comfortable and is much less apt to suffer from shock. Heart stimulants should be used freely, as indicated. Morphine is of the greatest value. A full dose immediately after labor does more good, I think, than almost any other drug. After the exertion of labor is over, the care of the heart does not differ materially from that of endocarditis at any time. In bad cases, the mother should not nurse, as this causes added excitement and nervousness, and thus affects the heart badly.

Heart lesions in the parturient state with *failing compensation* are most serious for mother and fetus, having a frightful mortality and needing most urgent treatment. Where compensation is good, they are little to be feared and little treatment is necessary.

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