

By G. OWEN C. MACKNESS, B.A. (Oxon.), M.D., Broughty Ferry.

THE subject of heart disease complicating pregnancy has lately on more than one occasion occupied the attention of our Society. In October 1887 Dr Berry Hart read a paper on mitral stenosis as a complication, giving at the same time the reports of two cases which had been under my own care; while on the same date Dr Ballantyne fully recorded another similar case. Three other cases were recorded by Dr Berry Hart in May 1889, and one by Dr Fraser Wright in last July. The subject is of such importance that I need hardly apologise for relating at some length the following case, which was treated in the Edinburgh Maternity Hospital during the time that I was Resident Physician. The case, which was under the care of Dr Halliday Croom, to whose kindness I am indebted for permission to lay these notes before you, was one of pregnancy complicated by aortic stenosis and incompetence, together with mitral stenosis and incompetence.

Jane C., aged 24, i.-para.

History.—Her mother is still alive and well; no history as to

father. When about 10 or 11 years old she had scarlet fever and measles, followed immediately by small-pox; from these she recovered well. She does not know that she has ever had rheumatic fever, but has suffered at times from pains in her wrists. She has always been fairly strong, but as a general servant she has done a great deal of hard work. About two or three years ago she noticed that her feet were swollen at nights; this condition, however, passed off without treatment. At the end of 1886 she began to be troubled with shortness of breath and palpitation on making any exertion. In the beginning of January 1887 she caught a cold which kept her in bed for a day; there were no special pains in the joints. She last menstruated on 9th January 1887. About this time she had severe pain in her left side, which soon improved; but in the beginning of April it returned, and she was admitted into Dr Affleck's ward, Royal Infirmary, Edinburgh, on 8th April, complaining of shortness of breath and pain in her left side, the pain being shooting in character and often passing up into both shoulders. At the time of her admission into the Infirmary she suffered a great deal from giddiness, with pains in her head. She never had any morning sickness.

I am indebted to Dr Affleck's kindness for the following notes of her condition while in his ward:—

Circulatory System.—Pain severe in left mamma; slighter pain on inner side of right mamma; slight palpitation; dyspnoea, especially at night; visible pulsation in episternal notch and beating of carotids; apex beat in fifth interspace, about 2 inches from sternum, feeble, and with no thrill; slight thrill between second and third interspaces; slight thrill in episternal notch. Heart not enlarged. Over mitral area the first sound is replaced by a soft blowing murmur, which is propagated round to the axilla. Over aortic area systolic and diastolic murmur heard, harsher and more prolonged than mitral; murmurs conducted up vessels and down sternum. Pulse 80, and regular. Respiratory system normal. At the end of April there was some œdema of the feet on standing. She was treated with digitalis, iron, and arsenic. On 1st May sickness after every meal commenced; on 10th May stirrage was first felt; on 13th May she had epistaxis; on 22nd July she had irregular pains over the abdomen, together with difficulty in micturition; on 24th July she was in bed with a painful swelling and ecchymosis in the upper part of the left thigh, and with severe vomiting. On 25th May there was some hæmatemesis. She was now put upon milk diet, the digitalis mixture stopped, and she was ordered bismuth and opium powders, with ζ ss. of brandy every four hours; warm opium fomentations were applied to the thigh. On 28th July the pain and ecchymosis were disappearing. From this time until 15th September, when she was sent to the Maternity Hospital, she had occasional hæmatemesis; extreme prostration and also sleeplessness at night; she vomited three or four times a

day for two or three days at a time, with intervals of a week or two, during which she was better. She at times had some slight hæmoptysis, and often required to sit up in bed in order to breathe at all. Her condition all this time was most critical.

After admission to the Maternity Hospital on 15th September her condition improved considerably; she was kept on milk diet, and treated with bismuth and opium; ℥ss. of brandy was given three times a day. She had no further sickness except once after taking castor-oil. She was rarely troubled with breathlessness except at nights now and again. The opium was gradually diminished in quantity, and the brandy was stopped for a time while she was also allowed a little solid food. Dr Byrom Bramwell examined the condition of her heart, which he found to be only slightly enlarged; the apex beat was displaced outwards (probably by the uterine tumour); over the mitral area was a distinct presystolic murmur, together with a slight systolic murmur which was conducted towards the axilla; over the aortic area were heard systolic and diastolic aortic murmurs, the systolic being very well marked. These were conducted up the vessels and down the sternum.

On 5th October she got up for an hour, and continued to do so on most days after this. On 14th October she complained of pain in her back and left side; also a little sickness. On 15th October pains still continued; considerable dyspnoea during the night. These pains passed off, but recommenced at 11.30 P.M. on 18th October, when the breathing also became extremely troublesome. On 19th October she was much better; the bismuth and opium were stopped, and she was ordered ℥5 of tr. of strophanthus (1 to 20) every four hours. On 23rd October it was determined to try and bring on the labour, as she was already a week past her time, and was becoming extremely nervous lest the new quarter, bringing with it fresh doctors and nurses, should arrive before she was well on the road to recovery. Consequently, at 11.30 A.M. on that day under chloroform I separated the membranes for about 1 inch round the cervix with my finger and gave a hot douche. A large Barnes' bag was then placed in the vagina, and only removed in order to give a hot douche every four hours. No pains resulted from this. On 25th October, at 1 P.M., Dr Croom, with some difficulty without chloroform, passed a large-sized bougie for about 1½ inch between the posterior wall of the uterus and the membranes; a hot douche was then given every four hours. Early on 26th October the pains began, but were feeble and useless at first. During the evening and night of 26th October she had frequent pains, and became extremely hysterical. Chloroform was given during most of the pains. She complained of severe stabbing pain, especially during the labour pains, in the precordial region and passing up into the left arm.

During the pains the pulse became more rapid, and much

weaker and less regular; between the pains it was about 90, full and regular. She continued in this state all night and during the whole of the next day, the os dilating very slowly. She was given ℥5 of tr. of strophanthus every four hours, and ℥ss. of brandy every three hours, with beef-tea at frequent intervals.

At 5 P.M. on 27th October 25 minims of tr. of opium were given, but she vomited it at once. She was becoming extremely weak and exhausted, while the difficulty in breathing was so great at times that she had to sit up in bed in order to breathe at all. At 7.40 P.M., when the os was the size of a crown piece, the membranes spontaneously ruptured high up, and a certain amount of liquor amnii escaped. At 9.40 P.M. Dr Croom saw her, and advised that the labour should be ended at once. She was then put deeply under chloroform, and after dilating the os with the fingers I applied forceps, and delivered the child shortly after 10 P.M. The placenta was expressed ten minutes after, and she was then allowed to come out of the chloroform, during the administration of which she had been extremely sick. No ergot was given, as a certain amount of hæmorrhage was thought desirable; there was a good deal of bleeding, which had to be checked later by hot douches. After delivery the pulse was 118, and fairly full; half an hour later it was 96, full, and regular. She was very sick for some time, and complained of sore throat; the precordial pain had entirely gone, and never reappeared. The child was a healthy male, 23 inches long, and weighing 9 lbs. 10 oz., being the largest child born in the Maternity during the quarter. The puerperium was perfectly normal. She was not allowed to nurse her child; there was no trouble with the breasts, as she had very little milk. She was kept on the strophanthus until 29th October, when the dose was reduced to ℥4 every four hours; on 31st October it was further reduced to ℥2. Her breathing was perfectly easy now, and recovery was rapid and uninterrupted. On 7th November she was sent back to Dr Affleck's ward, where the report of her cardiac condition was given as follows: A distinct precordial thrill exists; over the mitral area the first sound is preceded and replaced by a murmur which is conducted into the axilla; the second sound is impure; over the aortic area both sounds are replaced by murmurs which are conducted up the vessels and down the sternum. After a short stay in this ward she was dismissed in fairly good health, but after undertaking the duties of a domestic servant she again broke down; a short rest, however, soon restored her to comparative health, and when I last saw her, about fifteen months ago, she was able to undertake light domestic duties.

(A series of pulse tracings were taken before, during, and after labour, and a few of the more typical of these were shown, in order to give some indication of the condition of her circulation.)

In all the cases which have been recently brought before the Society the cardiac lesion has been only at the mitral orifice; in

this one, however, the main lesion was probably at the aortic orifice, although the mitral valves were at the same time stenosed and incompetent, so that the case forms a fitting and interesting addition to the series. The case is a remarkable one, in that there were numerous and extensive cardiac lesions before the commencement of pregnancy; and it was interesting to mark the increase of existing symptoms and the development of new ones as pregnancy advanced and an extra strain was thrown upon the already overtaxed heart, which, however, rapidly regained its former condition as soon as the labour was completed. When in Dr Affleck's ward she was for a time in a most critical condition, and it seemed almost as if she were bound to die from exhaustion consequent upon the persistent vomiting; yet she recovered from this, and the interesting point is, that not only did premature labour not supervene, but that she even went beyond the ordinary period of pregnancy.

It is generally said that mitral stenosis is the most dangerous heart lesion which can occur as a complication of pregnancy, and that the other lesions are dangerous to a much less degree. The explanations of this are far from satisfactory, and have been fully discussed by Dr Angus Macdonald in his work on *Heart Disease in Pregnancy, etc.*, so that it is unnecessary to refer to them further here. The purpose of this paper is to try and show that the great cause of danger is venous congestion, systemic and pulmonary, and that, since this is produced in the early stages of mitral disease, especially mitral stenosis, therefore this is the most dangerous lesion; but that, since it also appears in the later stages of aortic disease, therefore these become equally dangerous in the later stages, although they are less so when the disease is not so far advanced; in other words, the danger of heart disease as a complication of pregnancy and labour depends more upon the *extent* of the lesion than upon its *nature*.

In order to establish the truth of this proposition it will be necessary shortly to consider,—1, the effects of pregnancy and labour on the normal circulation; 2, the effects of the various heart lesions on the normal circulation; and, 3, how these effects interact on one another.

1. During pregnancy there is increased peripheral resistance, due to the circulation of the blood in the placenta, but this is met normally by a slight hypertrophy of the left ventricle of the heart. During the first stage of labour the pains probably cause an increased strain upon the heart, while its action will be weakened to some extent by the exhaustion which follows from the acute physical suffering. During the second stage of labour, however, the bearing-down pains come into play, and the patient, shutting her mouth, presses with all her abdominal muscles, so that there is considerably increased strain upon the heart and some embarrassment of the pulmonary circulation, while the venous portion of the systemic circulation be-

comes more or less engorged, so that the right side of the heart tends also to become engorged with blood; this must be obvious to any one who gives the question any consideration, and needs no further explanation. During the third stage of labour, as soon as the placenta is separated and expelled, the uterus contracts firmly, and drives the blood suddenly from the uterine sinuses into the abdominal veins, which expand to receive it until the heart can adapt itself to the altered condition of the circulation.

2. We must now shortly consider the main effects of the various heart lesions on the circulation. Mitral stenosis, by preventing the ready passage of the blood from the left auricle into the ventricle, causes engorgement and dilatation of the former; this raises the pressure in the pulmonary veins, and so causes œdema and congestion of the lungs; the backward pressure reacts further on the right side of the heart, and causes dilatation of the auricle and ventricle, so that the systemic veins which open into the right auricle become over-distended and engorged. At the same time the left ventricle receives less than its proper quantity of blood, and in consequence atrophies to some extent. Here, then, the most important results are engorgement and over-distension of the systemic and pulmonary veins, and this condition of affairs coming on very early in the disease, becomes more marked as it progresses.

Mitral regurgitation produces the same sequence of events, due in this case to the blood being forced back on the lungs by the incompetence of the mitral valves; the results, however, do not appear so early in the disease as in the former case, but eventually become equally marked. The left ventricle, however, tends rather to hypertrophy than to atrophy.

Aortic lesions, on the other hand, produce diminished forward rather than increased backward pressure, but sooner or later they come to produce this latter effect also; here, too, the left ventricle hypertrophies.

We see, therefore, that all heart lesions come eventually to cause venous engorgement, but that, while mitral stenosis produces it at once, mitral incompetence does not produce it until the disease has been in existence for a rather longer period, and aortic lesions do not produce it until they have been in existence for a considerable time, and have come to produce increased backward rather than diminished forward pressure, which is their primary effect.

3. We have now to show how it is that pulmonary and systemic venous engorgement produce such dire results in pregnancy and labour. We have seen that pregnancy throws an extra strain upon the heart; if, however, this organ is already weakened by disease, it is unable to withstand this strain, and its action becomes more embarrassed, hence all forms of heart disease are dangerous; but if the disease is not far advanced the heart may, by suitable treatment, be brought to perform the work required of it. In mitral stenosis,

however, we have seen that the left ventricle tends to atrophy, while its muscular fibres also degenerate, and hence this disease is especially dangerous, more especially as it is now a well-recognised fact that in this lesion, owing probably to the above-mentioned degeneration, the heart does not react at all readily to cardiac tonics, such as strophanthus, digitalis, etc. In mitral incompetence and aortic diseases there is already more or less hypertrophy of the left ventricle, according to the extent to which the disease has advanced, and hence the question as to whether the heart can undertake the extra strain thrown upon it by the increased peripheral resistance depends entirely upon the extent to which the disease has advanced.

Abortion is very likely to occur as a result probably of venous engorgement and consequent defective placental circulation, and hence it may occur in any of the heart lesions where this condition of affairs exists.

If labour comes on, during the first stage the heart is very apt to fail owing to the exhaustion of the patient, and its occurrence depends entirely upon the amount of reserve energy left in the organ, *i.e.*, on the extent to which the disease has advanced. The defective action of the heart, moreover, tends to increase the venous engorgement which already exists, and hence pulmonary embarrassment is very much increased.

During the second stage of labour, the bearing-down pains tend naturally to cause the venous engorgement and to embarrass the heart's action. These effects are normally of trifling importance, but when they already exist as a result of heart disease they become a great element of danger, and the heart often fails from engorgement of its right side and inability to drive the blood through the pulmonary circulation. Here, then, the great source of danger is the venous engorgement which is superadded to that normally produced by the bearing-down pains.

When the placenta is born, we have seen that the blood from the uterine sinuses is suddenly thrown into the abdominal veins, which expand, and so prevent the right side of the heart from becoming overdistended. If, however, the abdominal veins are already overdistended, they can no longer expand further, and hence the extra blood is thrown into the right auricle, which becomes still further distended and paralyzed.

We see, therefore, that the great danger in heart disease during pregnancy and labour is due to venous engorgement, and since this engorgement occurs in all heart lesions, therefore the danger is present in them all. We have seen, however, that mitral stenosis, when slight, produces this condition, while mitral incompetence must be more marked, and aortic disease even more so than mitral incompetence before it appears; in other words, while all the various heart lesions produce the condition, its appearance depends on the extent to which each one has advanced, so that we

may say that the danger in heart disease depends rather on the *extent* of the lesion than on its *nature*.

No mention has been made of certain other accidents which may occur during pregnancy in heart disease, viz., the growth of fresh vegetations or the supervention of ulcerative endocarditis, since these may occur equally in all the lesions, and do not concern the point which I wish to bring out to-night; neither have I considered those cases where death occurs later on during the puerperium from pulmonary complications, since these belong to an entirely different category.

A few words may be said as to the treatment of these cases, and in the first place as to the use of cardiac tonics. These should be avoided as long as possible, and never be used until there are evident signs of failure of compensation; before this appears careful diet, moderate exercise, and the use of iron and arsenic are all that are required. As soon as compensation threatens to fail cardiac tonics act well as a rule (except in certain cases of mitral stenosis, where they often have no effect); the best of them is, perhaps, strophanthus in small doses (*e.g.*, ℥2½ of the tincture every four hours). It must be remembered, however, that prolonged use of these drugs after compensation has been restored tends to do serious harm, since the hypertrophy of the heart which they produce is followed by degeneration of its muscular fibres. The dose may be increased if necessary, and then gradually diminished again until eventually it may, perhaps, be discontinued altogether for a time. Strophanthus is especially useful where there is continued vomiting due to gastric congestion; and its own tendency to produce sickness may be counteracted by giving it with tr. cardamon. co. If the venous congestion become very marked during pregnancy or labour, bleeding may in some cases give relief, at any rate for a sufficient time to enable the labour to be completed, and so allow the heart to again regain its power. Nitrite of amyl might, perhaps, be of use here just as it was found useful by Dr Fraser Wright during the third stage of labour. Since the bearing-down pains tend to increase the venous engorgement, chloroform should be given as soon as ever they appear, and the second stage of labour should be reduced to the shortest possible time; the administration of chloroform should be continued until after the placenta has been delivered.

When Dr Wright brought under the notice of the Society the case where he used nitrite of amyl in the syncope which followed the delivery of the placenta, some difficulty was found in understanding how it could relieve the engorgement of the heart. The following explanation seems to me, however, to be a reasonable one: the sudden delivery of the placenta causes, as we have seen, an extra amount of blood to be thrown into the right side of the heart, since the abdominal veins are already overdilated; nitrite of amyl dilates the arterioles and lowers the blood-pressure, so that more blood would

tend to pass into the systemic veins, and thus engorge the right side of the heart still further. The veins, however, are already overdistended, so that no more blood can enter them, and hence no harm can be done thus by the drug; but at the same time the nitrite of amyl dilates the *pulmonary* arterioles as well as those of the systemic circulation, and hence the flow of blood through the pulmonary vessels is made easier, and the right side of the heart can empty itself, and gets relief. Hence we see that the important action of the nitrite of amyl in these cases is upon the pulmonary, and not upon the systemic arterioles.

Dr Underhill was much interested in the case so well recorded by *Dr Mackness*. It was important that all the cases should be observed and recorded, so that eventually we might get a more thorough understanding of the relations between heart disease and pregnancy and labour. The most important lesion in *Dr Mackness's* case seemed to be the mitral stenosis. He agreed in the main with *Dr Mackness* in his management of such cases, but he was of opinion that even in cases of this particular lesion the uses of heart tonics, particularly *strophanthus*, were of the utmost importance, particularly during the course of pregnancy. His experience led most certainly to that conclusion. He thought there was a simpler explanation of the action of nitrite of amyl than that given in the paper. It appeared to him that the dilatation of the arterioles all over the body provided a large space for the reception of the surplus blood which was overdistending the pulmonary vessels.

Professor Simpson was heartily in accord with *Dr Underhill* as to the value of *Dr Mackness's* communication. It not only presented a careful record of a very interesting case, but also a useful summary of the various cardiac lesions and their effects on pregnancy and labour. He (*Prof. Simpson*) thought with *Dr Underhill* that there was no risk in the more or less continuous use of cardiac tonics, and especially of *strophanthus*, during the pregnancy. He had never seen anything but good result from their administration continued throughout the gestation. He was glad that in the case recorded by *Dr Mackness* the result had been so satisfactory, and hoped that *Dr Mackness* would have further opportunities of observing some of those cases which he had shown so much capacity to analyze and record, so that he might further be able to enrich their *Transactions*.

Dr Wood said the thanks of the Society were due to *Dr Mackness* for the able and highly interesting paper which he had brought before it. *Dr Wood* had a case of mitral stenosis in his own practice about three weeks ago. The patient, aged 28, primipara, had an attack of rheumatic fever twelve years ago, and had suffered from the heart lesion ever since. Cardiac compensation was evidently completely established, and only

broke down on her becoming pregnant. She was treated continuously with digitalis for several months before the birth of her child, larger or smaller doses being given according as it was found necessary, and this continuous administration, he had no hesitation in saying, did her a great deal of good. On his visit to her after labour had begun, he found the first stage pretty well advanced, the breathing very much embarrassed, the pulse irregular and very rapid. During a pain, the embarrassed breathing became greatly exaggerated; the pulse, although the vessel could be felt, could not be counted, there being only an irregular quiver; the face became completely cyanosed from the venous engorgement of vessels. He had her at once placed under chloroform, but very soon changed to ether, and found that the pulse was sustained better. He terminated the labour, which was a breech, as rapidly as possible. In the second stage, the patient's condition was considerably worse than the first,—so much so, that he expected she would succumb from cardiac failure. During the labour, he gave her twice two min. of tinct. strophanth. hypodermically, and one of Natville's granules of digitalin. For several days after her confinement she suffered from œdema of the lungs and pleural cavities, owing, no doubt, to the backward blood-pressure.

Dr Fraser Wright said that *Dr Mackness's* suggestion as to the action of nitrite of amyl was one which had also occurred to himself at the time of recording his case in July last. The difficulty, however, in accepting this explanation lies in the fact that any dilatation of the pulmonary arterioles will be followed by increased pulmonary venous congestion and increased dyspnoea; yet in the case recorded the dyspnoea was instantly relieved. On the whole, he was still inclined to think that the relief obtained by using this drug is due to dilatation of peripheral systemic arterioles. The fact that bronchitis is often relieved by it offers no explanation, as here the fact that the peripheral bronchioles are also dilated has also manifestly much to do with the result.

Dr Berry Hart thought *Dr Owen Mackness's* paper a very valuable one, not only from the careful record of the case, but also from his *résumé* on the action of pregnancy on the diseased heart. He hoped *Dr Mackness* would still continue his observations on a subject he was so well qualified to deal with.

Dr Mackness thanked the Society for their kind reception of his paper. As to the use of cardiac tonics during pregnancy, he pointed out that they tended to produce hypertrophy of the heart, which would be followed by subsequent degeneration of the muscular fibres, and hence they increased the harm done to the heart by pregnancy. It was, therefore, advisable to use them only when absolutely necessary, and to discontinue their use as soon as possible. The failure of cardiac tonics was only observed in certain cases of mitral stenosis, and not in all.