CARDIAC DECOMPENSATION DURING PREGNANCY AND LABOR *

By K. L. SCHAUPP, M. D., San Francsco

The frequency with which cardiac disease has been diagnosed during pregnancy and the infrequency of serious decompensation at the time of labor were the factors stimulating this paper. It is purely a preliminary report based upon our work at the Women's Clinic of the Stanford Medical School during the past three years.

In obstetrical examinations, a thorough survey of the heart and circulation is just as important as pelvimetry. It is necessary not only to know whether or not there is cardiac enlargement or whether there is insufficiency or stenosis of any of the valves, but a very clear picture must be presented as to what may be expected of any individual heart if put through a period of stress.

Heart-murmurs are very common, as anyone knows who does many routine examinations. Especially common is a transient murmur which appears at the base over the pulmonic area, but from which we have never yet found symptoms. From this type on there are many kinds of murmurs and many degrees of each type.

It is fortunate that even when a diagnosis of a definite organic lesion has been made, we do not often find the heart showing signs of decompensation, but we must ever be on the alert to the knowledge that it may occur at any time, and we must not be taken by surprise.

The history of previous cardiac disease with decompensation during pregnancy and labor is naturally important, but must not be taken as positive evidence that it is going to occur again. Nor is the fact that the patient with a well-marked lesion but who has never had a break in compensation, any assurance that such a break may not appear at this time. We find that there is no regularity with which we can prognosticate the probable course of events without careful intensive study. Some patients have marked symptoms in one pregnancy and in several subsequent ones seem perfectly normal. In one case of this series the patient had had mild signs of decompensation ever since an attack of inflammatory rheumatism at ten years of age, and when seen early in her first pregnancy showed such definite signs of danger that termination of the pregnancy was considered. She improved, however, as the pregnancy progressed and at labor was perfectly normal and, except for the presence of a systolic murmur and slight enlargement of the heart, one would not have known that there had ever been a lesion.

Another patient had always been well until her first pregnancy, when she had a severe decompensation. Following this there were three normal pregnancies without symptoms. With the fifth she came under our care with a marked decompensation and active endocarditis. This woman delivered spontaneously, but sank rapidly and died on the fourth day.

The heart that is not compensating presents an individual problem during pregnancy and labor. Under normal conditions of health it is resilient and adapts itself quickly to varying demands. The types of lesions met with are the same as at any other time and the resultant symptoms are naturally also the same, but are accentuated by the added work that is thrown upon the circulatory system during this period. Nausea, poor nutrition, and the elimination of toxins or waste products of the embryo throw an added burden on the heart early in pregnancy. Later, the increased vascularization tortuosity of vessels and the mechanical embarrassment of the growing uterus increase the load. During labor the actual work performed by voluntary and involuntary effort, the increase in blood pressure and accelerated pulse rate cause the greatest strain. Lastly, the sudden emptying of the uterus at the end of the second and third stages may, by splanchnic dilatation, cause shock and dilatation even after several hours.

The necessity of close supervision to forecast the probable effect of pregnancy and labor upon the cardiac pathology is evident. All patients who have been found to have a heart lesion need to be closely watched. This means careful questioning for signs of early decompensation, frequent reading of the blood pressure, and careful examinations of the heart, as well as urine examinations.

Where signs of the break appear, medical advice should be asked as soon as possible and treatment begun. The treatment naturally is the same as for the same type of lesion uncomplicated by pregnancy. Where consultation is called there should be the utmost co-operation to determine the effect of each condition upon the other. Happily, where this co-operation exists we can feel reasonably safe, for the approach of the point of danger will have been recognized and the pregnancy terminated before the break.

Here we must make a careful survey of the apparent cardiac reserve and balance it against the remaining work that we know must inevitably be thrown upon the heart. Should there be no improvement after a reasonable period of intensive treatment, termination is indicated and the sooner it is done, the better the prognosis. If, however, the patient is in a grave condition when first seen, it is better to be conservative and try to gain a little ground before attempting any operative procedure. There are times when the decompensation is so grave that we are sure that even a small burden added to the already heavy load will cause fatal termination.

In 1395 pregnant patients seen during the last three years in the Stanford Women's Clinic and the Stanford Obstetrical service at the San Francisco Hospital, cardiac disease, other than functional murmurs, was diagnosed thirty-eight times. Mitral insufficiency was most common, occurring 18 times; mitral insufficiency complicated with

* Read before the Section on Obstetrics and Gynecology of the Medical Society of California at Yosemite National Park, May, 1922.

stenosis was observed 6 times; endocarditis, 5; mitral stenosis, 3; myocarditis, 2; aortic stenosis, 2; aortic insufficiency and aortic stenosis with insufficiency, each once. Myocarditis and endocarditis presented the most serious complication. Both patients suffering from myocarditis showed a marked break, and both were delivered operatively. Of the five patients with active endocarditis, all had symptoms and four were terminated operatively, while the only one allowed to go through spontaneous labor was the one who subsequently died. Of three patients with mitral stenosis, two had symptoms and were assisted at labor. In mitral insufficiency, the most common lesion, symptoms appeared in eleven cases, but they were in most part mild, only four coming to operation. Of the aortic lesions, none turned out to be serious.

Of the 38 patients with decompensation, 23 had albuminuria and 4 had casts, 19 had dyspnoea, 17 palpitation, 14 cough, 14 edema, 13 pain, and 4 had irregularity of pulse. While dyspnoea was the most common symptom, it was usually present in a moderate degree and with palpitation and slight edema was often the only sign of decompensation. In the more serious cases, however, cough and pre-cordial pain were the most constant symptoms and were often very difficult to control. It was in the cases of coughing and pain that we found the gravest decompensation, and here interference was more often necessary. Irregularity of the pulse, while not frequent, was almost always associated with a serious lesion. The time of appearance of symptoms varied, but in most of the twenty-four that occurred ante-partum they began after the sixth month, and of these the majority appeared during the last six weeks. In one, symptoms occurred almost with conception in three different pregnancies, and with each grew worse.

Five patients who were known to have cardiac lesions, but in whom there had been no signs of decompensation, decompensated after labor in varying degrees. One had acute dilatation. There was only one who had marked signs intra-partum, and this was the patient with endocarditis, who died on the fourth day. It is remarkable to note that with the number of severe cases treated ante-partum, all but this one stood the test of labor or some operative procedure unusually well.

An important point brought out in this investigation was the relation of the blood pressure to decompensation, and it may be an important factor in prognosis. In nearly all cases on returning compensation the blood pressure shows a rise, even in cases where it already was above normal. In one case it went from 98/60 to 132/70, in another from 95/50 to 114/70, and in a third from 130/85 to 145/88. Many such instances can be quoted. In one case of acute dilatation, the pressure dropped from 128/80 to 50/? and then came back to normal as compensation returned. In the fatal case, the pressure was 128/88 on admission two weeks before delivery, and it gradually fell. In another patient where the break was so bad that we felt that she would not survive delivery, the pressure with returning compensation came up to 156/108. At about this point, further treatment was refused and the patient went home, to return in about a week as bad as ever and with a pressure of 120/80. After a week of treatment the pressure read 142/90 and there had been so much improvement that a Voorhees' bag was introduced and the pregnancy terminated by version and extraction. This procedure was entirely successful and the patient went home markedly improved.

The stage at which interference should take place is dependent upon the time at which the symptoms occur, the severity of the symptoms and whether or not there is a tendency toward returning compensation. If symptoms occur early in pregnancy and show tendency toward gradual increase in severity, in spite of treatment, the pregnancy should be terminated at once. If, however, there is improvement a watching policy may be adopted, for in almost all patients there is sufficient warning of the impending break.

Where symptoms appear suddenly during the later months and are severe the problem becomes more complicated, for treatment attempted at the time of the initial break may be just as serious as the disease.

When the time for interference has arrived, the safest method of procedure must be chosen. This depends upon the time in the pregnancy, the stage of labor and the parity of the patient, as well as upon the type of heart lesion involved.

The means must be the one with the least attendant strain or shock in accomplishing its purpose, and greatest care is necessary in its selection. In active endocarditis, especially where there are lung signs, the anaesthesia necessary for Caesarean section may be more serious than the cardiac disease. In mitral stenosis, with insufficiency and muscle change, the long process of dilatation and expulsion is far more serious than a Caesarean section under nitrous oxide and oxygen. Where there is marked edema of cardiac origin and passive congestion, such a procedure as manual dilatation of the cervix with version and extraction, may increase the danger, for the traumatization to pelvic vessels in even a slight degree may be the origin of a pelvic thrombosis with embolism, made possible by the venous stasis. If delivery is by the vaginal route and the head presents, it seems best to deliver by forceps as soon as dilatation is complete. This is best accomplished under nitrous oxide and oxygen after episiotomy, where the perineum is resistant and has in its favor that it shortens the labor perceptibly, and if properly done gives a minimum of shock.

Procedures other than the use of forceps in this group, were used as follows: Caesarean section, four times, twice for mitral stenosis and insufficiency, and once each for myocarditis and mitral insufficiency; Voorhees' bags were used five times, three times in mitral insufficiency, and once each for myocarditis and endocarditis. Three abortions were done after consultation with the medical

staff, and three patients were sterilized. In only one instance was manual dilatation done.

CONCLUSIONS

1. Cardiac decompensation during pregnancy is not uncommon.

2. Serious decompensation at the time of labor is rare.

3. Persistent cough and precordial pain are the most constant symptoms in grave decompensation.

4. The frequent reading of blood pressure during pregnancy complicated by cardiac failure is a valuable aid in choosing a time for interference with the pregnancy.

5. Lesions involving muscle change, or active infection of heart-valves are the most serious at labor.

6. Patients whose symptoms do not improve under treatment should have the pregnancy terminated.

7. Interference to shorten the labor of all cardiac cases is justifiable after the first stage has been completed.

DISCUSSIONS

Armstrong Taylor, San Francisco.—Dr. Schaupp has read a paper on a subject in which we are all deeply interested; a subject that is recognized many times and I believe more often not recognized. Dr. Schaupp kindly allowed me to look his paper over a few days ago and rather than discuss his paper at random, I have made notes on it. In discussing the paper, I wish first to emphasize the great importance of regular routine examinations during pregnancy. It has always been a difficult problem to decide when a patient is fit to undergo pregnancy. Even with a mitral stenosis, which is considered a very serious complication, many have gone through several pregnancies and in a subsequent pregnancy the most serious symptoms of a decompensation have occurred. These decompensations usually occur late in pregnancy and prognosis in such a case as this is always extremely doubtful. The prognosis is usually good as long as compensation is regained. It is not advisable, however, for these mothers to undergo the severe strain coincident to pregnancy. The myocardium should be the determining factor in all these cases. A patient with fairly good compensation should be under close observation during the entire pregnancy and I believe that at the first sign of a break some operative procedure should take place. A valvular lesion, I believe, when there is no decompensation and a reasonable amount of exercise does not change the condition of the patient, she should be allowed to go through her pregnancy and the chances are that she will go to term without any break in compensation. On the other hand, when there is a marked decompensation and the patient is cyanotic with marked edema and pulmonary congestion there should be no hesitancy in emptying the uterus. The next point that I want to call your attention to embraces those abortions in patients having a mitral lesion and where there have been repeated hemorrhages. In that particular instance, had we examined the patient carefully we would have found a high blood pressure and if that patient had been watched very carefully, with prolonged rest, the proper elimination and the right diet, I am positive that many of our abortions that are classed merely as abortions, brought about probably as we say through accident or some other reason, but which are due possibly to these mitral lesions, might have been prevented. I do not agree entirely with Dr. Schaupp in the statement that he makes, that possibly Caesarean section is advisable in a large percentage of these cases. It may, and it possibly is, a procedure that many times we are compelled to take when the patient is in an alarming condition. It is possibly the only reason for it, but there are many of these cases when the parts of the birth canal are very soft and edematous, dilatation with the bag and delivery immediately with forceps will probably cause the patient less strain than a Caesarean section. I would like to call your attention to a case that occurred recently and was sent to the San Francisco County Hospital. The history of the case and what we found at autopsy will probably give us a better idea of the pathological conditions that may be found in these cases. The patient was a para five and was sent to the hospital with a diagnosis made on the outside, of active tuberculosis. When we saw her she was very cyanotic. There was edema of the lungs and she was in a very critical condition. Dyspnoea and all the symptoms that you naturally find in a lobar pneumonia were present. She was put upon the table and spinal anaesthetic was used and she was delivered very promptly. The delivery caused very little strain and I am sure that there was very little stress occasioned during the delivery. The patient was taken to a ward room and appeared to be in a better condition than when she went on the table. One hour after delivery her condition was alarming. She sank very rapidly and died in about two hours. The findings of the autopsy were very interesting. There was a chronic endocarditis with a marked stenosis and edema of lungs. There was no tuberculosis and the lung had exactly the appearance of what we found during the influenza period, with the exception that there was none of the sero-sanguinous fluid present. I think that with proper care if these cases are watched from the beginning of pregnancy, no matter whether the lesion may be functional, as we often find, or whether it is a mitral stenosis, a cardiac decompensation or a myocarditis, without a doubt 75 per cent of them could be carried through to full term.

G. Carl H. McPheeters, Fresno.—I would like to emphasize the point that Dr. Schaupp makes in regard to blood pressure estimations. I have found in my experience that what he cites is quite correct. The blood pressure estimations made with regularity are especially important in cases of pregnancy which apparently have heart lesions of any kind.

K. L. Schaupp, San Francisco (Closing).—I am sorry that I did not make myself clear because the impression that Dr. Taylor received from what I said is not what I meant to say. I do not believe that we should do a Caesarean Section unless there is no other way. Caesarean section seemed to be the least serious procedure in the cases cited. I do not believe that anyone can tell you at any time what should be done in any particular case and that is the reason I lay stress on the point of medical consultation to determine just how much the heart can stand. In the case of the patient who died, the medical men advised Caesarean section quickly under nitrous oxide and oxygen which we opposed, because, as she had rales in her chest and signs of fluid, edema and dyspnoea and she could not lie down, we felt that the quickest way to kill the patient would be to give her any kind of an enesthetic. We thought to put in bags or to hasten the last stages of labor for her. It was her fifth baby and premature labor set in; she called an interne only when she was having severe pains. The baby was born spontaneously with the minimum of shock and strain before anything could be done. She seemed very much better at once and then suddenly began to sink. She died on the fourth day. The post-mortem examination, I think, justified our opinion in not doing a Caesarean section. It showed that there had been an old valvular lesion of the heart. The vegetations were active and there were small infected emboli in the lungs. There was a thrombosis in the pelvic vessels. There was minimum shock, no damage done by natural force of labor and yet the cause of death was pulmonary

embolism. I think if we had done a Caesarean section at that time it certainly would have resulted in earlier mortality. I sum up, in concluding, that each individual case needs its own individual study and careful consideration and sometimes when you have marked edema of the abdominal wall, as Dr. Taylor said, a Caesarean section is not wise. It means simply to be watchful throughout the pregnancy to see what the heart is doing and try to know what it can do when a strain is put upon it. A murmur is nothing, but you should be on your guard. You should see the patient more often and inform yourself about her general condition with the cardiac point in view. When she begins to show signs of decompensation, put her in bed and try to get her heart into better shape before anything is done.

(Stanford Medical School, Sacramento and Webster streets, San Francisco, Calif.)

THE PHYSIOLOGIC BASIS FOR THE EMPLOYMENT OF CALCIUM IN THE TREATMENT OF ASTHMATIC PAROXYSMS *

By F. M. POTTENGER, M. D., Monrovia, Calif.

Asthma has always been one of the enigmas of medicine, but with increased knowledge a solution of some of its problems has already been found and others are on the way to solution.

The greatest advance in etiology is the proof that asthmatic attacks may be superinduced by substances to which the patient has become sensitized. This fact, however, must not be considered as a complete solution of the problem of etiology, but must be taken for the suggestions which it offers for further study and research.

Analysis of phenomena which are recognized as being due to hypersensitiveness, particularly such clinical entities as urticaria, eczema, hay fever, and asthma, show that individuals subject to these conditions often belong to families in whom other members have the same tendency, and, further, that the tendency often manifests itself during the early period of life. Again, patients who suffer from one of these affections often suffer from more than one, and show such other symptoms as exaggerated oculo-cardiac reflex, bradycardia, hyperchlorhydria, and spastic constipation.

Of the older remedies for relieving asthma, antispasmodics were most generally used in such form that they could be burned and the fumes inhaled, or, if the attacks were too severe, hypodermics of atropin or morphin were resorted to. Adrenin has been used quite generally during recent years, and in most instances affords prompt relief from the paroxysm.

More recently clinicians, believing that most asthmas are due to a hypersensitiveness to some protein, have used great patience and wonderful ingenuity in working out the particular protein at fault in each case and then desensitizing the patient. When a failure to find a protein to which the patient reacts occurs, there is probably too much of a tendency to conclude that it is because the particular protein has not yet been tried. There is gradually developing, however, as a result of these studies and observations, a belief that these hypersensitive reactions are not all specific, and a strengthening of an opinion formerly quite generally held that there is probably a group of asthmas which is due to causes other than specific sensitization to protein, such as reflexes from the nose, sinuses, intestinal and genitourinary tract, and from the lung itself, as we sometimes see follow healing in tuberculosis. The fact that asthmatic paroxysms are precipitated by changes in weather and by the inhalation of irritants calls attention to the reacting capacity of the patient as a factor of importance.

It seems to me that our advances in the understanding of asthma can be furthered most at this time by a better analysis of the patient who suffers from the affection. This conclusion is based on the data recited above.

The first important fact in studying the patient is that the anaphylactic reaction is one which expresses itself as a parasympathetic syndrome; and the second, that the essential condition present in asthmatic paroxysms is the bronchial spasm and the increased bronchial secretion, both of which are due to a hyperstimulation of the pulmonary branches of the vagus, which is the most important nerve of the parasympathetic system. Other symptoms such as dyspnoea, emphysema, and rapid pulse follow the bronchial spasm caused by increased vagus action.

Further evidence of the parasympathetic (vagotonic) nature of asthma is furnished by the methods which have proved effective in relieving it, either general sedatives which take the tension off the nervous system as a whole, atropin which inhibits the vagus directly, adrenin which produces the same effect as though the sympathetics were stimulated and thus opposes the action of the vagus, or desensitization of the patient which relieves the extra stimulation of the hyperactive vagus (parasympathetic) system.

After arriving at the concept that asthma is a condition of hyperirritability of the pulmonary branches of the vagus, we are obliged to analyze further. The parasympathetic mechanism is not wholly an affair of the vegetative nervous system. What is going to happen when the nerves belonging to this or any system are stimulated will be determined not alone by their own state, but by the condition of the tissues upon which they act. Therefore, it is too narrow to view asthma as a parasympathetic syndrome in a strict neurologic interpretation of that term. We must conceive of it as being a disturbance in the whole neuromotor mechanism (including in this the secretory mechanism as well as the muscular).

Biochemical studies have established the important fact which clinicians are not sufficiently appreciating, that the cell itself determines largely its own action. Cells are made up of colloidal substances of which the phases differ greatly in different tissues and under different circumstances. These cells take up and give off various electro-

---

* Read before the Los Angeles Clinical and Pathological Society, February 22, 1923.