

Heart Disease and Pregnancy

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The combination of pregnancy and heart disease cases is one of the most fascinating and trying problems with which physicians have to contend.

Approximately two out of every hundred pregnant women have heart disease. Ninety to ninety-five per cent of these have rheumatic heart disease, about five percent have congenital heart lesions and the remainder consist of hypertension, syphilitic, thyrotoxic and kypho-scoliotic heart disease.

Up to the 20th century little attention was paid to the problem of heart disease complicating pregnancy and the mortality rate, both fetal and maternal in pregnancy with heart disease was quite high. Now the rate has been cut to a quarter of that at the beginning of the 20th century by such improvements as better therapy of heart failure, better understanding of the physiology of pregnancy, modern electro-cardiography, better diagnosis and treatment of congenital heart disease, treatment of sub-acute bacterial endocarditis and good prenatal care.

However, proper management of the pregnant cardiac patient still requires a knowledge of cardiac pathology and the normal cardio-pulmonary physiology of pregnancy as well as the use of modern techniques.

Cardiac pathology is fairly well established and I will briefly relate the current concepts of cardio-pulmonary physiology of normal pregnancy.

1. Plasma volume:

There is a gradual plasma volume increase from the twelfth to the twenty-fourth week of pregnancy with rapid increase to 45% above normal from the twenty-fourth to thirty-fourth week. This is thought to be associated with higher androgen and estrogen blood levels due to greater production and retention of these hormones. They cause retention of sodium and water in the body. There is some but not a proportionate increase in red and white blood cell production so that the P.C.V., Haemoglobin and blood viscosity decrease in pregnancy.

During the last month or so of pregnancy there is a decrease in plasma volume from 40 - 30% above normal at delivery. After delivery there is again a sudden rise in volume due to freeing into the circulation of pooled blood from the placenta and the now contracted, highly vascularized, uterus.

So it may be seen that there are two periods of peak strain on the heart due to increased circulatory volume—at the 34th to 36th weeks of pregnancy and shortly after delivery. It is at these points that most defective hearts will fail.

2. The pressure of the fetus and the increase in body weight of the mother requires greater muscular work and higher caloric and oxygen supply to the tissues.

3. After the first trimester there is a slow increase in cardiac output

to 25-50% above normal but oxygen consumption is disproportionately lower because of the increased circulatory rate noted in pregnancy.

4. Pulmonary ventilation is increased 50% by dyspnoea. Vital capacity rises slightly up to delivery due to widening of the sub-costal angle. There is a sudden increase in vital capacity after delivery and this again throws a sudden strain on the heart.

5. There is an increased pulse and respiratory rate with labor pains but these return to normal between pains.

6. The effect on the blood pressure is negligible, normally varying from a lower to higher than normal value.

7. Functional systolic murmurs, usually pulmonary in origin, may appear due to displacement of the heart by the growing fetus. These are of no significance except in differentiation from organic murmurs.

8. Electrocardiographic changes suggesting coronary insufficiency appear during pregnancy, only to disappear after delivery. Knowledge of this will help one to avoid misdiagnosis of coronary artery disease, which is rare in the child-bearing age but must be borne in mind.

9. There is some suggestion that arterioles are more sensitive to stimulation during pregnancy and this tends to cause a fluctuant blood pressure.

What are the effects of these changes on the heart? The heart enlarges as seen by x-ray, but it has not yet been established whether this is due to actual hypertrophy, dilatation, upward displacement of the heart by the diaphragm or a combination of these. Be that as it may, heart size, as we shall mention later,

is an important prognostic sign in predicting the possibility of failure in the defective heart.

Cardiac reserve is encroached upon, but to what extent and result is an individual matter and still awaits measurement. Such measurement would be invaluable in prognosis with heart disease.

Is there residual damage after pregnancy in the normal heart or in the defective heart which has not failed? The concensus of opinion seems to be that there is not. The appearance of functional cardiac murmurs in pregnancy has already been mentioned.

With these basic facts in mind, suppose now the physician is presented with a woman with cardiac disease who wishes to know if it is advisable for her to become pregnant or one who is already pregnant. In view of the fact that maternal mortality is 500% higher in pregnancies complicated by heart disease than in non-cardiac pregnancies, the physician needs some system in order to evaluate the advisability of pregnancy or continuation of pregnancy for this woman with cardiac disease. Since most of the cardiac defects found are rheumatic, I will deal with this type from here on, except as otherwise specified. With this condition we must consider the possibility of congestive failure as the chief complication of pregnancy.

In advising the patient, individual factors such as religion, personal feelings, socio-economic factors, and so on, must be taken into consideration, but from the medical standpoint the physician's duty is to prognosticate the possibilities for the patient and leave the final decision up to her.

Whatever her decision is, it is up to the physician to do his best for her.

The following criteria are set forth as of value in prognosticating the possibilities for a given patient.

1. **The function classification** set down by the New York Health Association.

Class I. Patient with cardiac disease with no limitation of physical activity.

Class II. Patient with cardiac disease with slight limitation of physical activity.

Class III. Patients with cardiac disease with marked limitation of physical activity.

Class IV. Patients with cardiac disease who are unable to carry on any physical activity without discomfort.

Ninety to ninety-five percent of patients in Classes I and II in the above, in the absence of other complicating factors, rarely present any difficulties other than those of normal pregnancy.

Classes III and IV, comprising fortunately the smallest number, present the big problem in management and require careful consideration. It must be borne in mind that Classes I and II may pass to Class III or IV during pregnancy.

2. **What is the stage** in the natural history of rheumatic heart disease? If the disease has been present less than ten years, it is found that about 4% have congestive failure. If present more than fifteen years, 18% have congestive failure with pregnancy. So it is necessary to extract a careful history of the disease, and, if possible, obtain information concerning past cardiac status from her previous doctor.

3. **Age of the patient** is important. In a large series Gorenberg found that in pregnant rheumatic heart patients over 35 years of age, 42.6% had congestive failure at some stage of pregnancy, while 16.1% of the under 35 years of age group failed. This latter is less than one-half the former rate and certainly points to the importance of age in prognosis.

4. **Has congestive failure** occurred previously? If so, one expects recurrence of failure in 75% of such cases with pregnancy, accompanied by a three-fold increase in maternal mortality. This is especially true if any failure signs occur early in pregnancy. On the other hand, if the multipara with heart failure has had no previous congestive failure and no present decompensation the prognosis is much better.

5. **The presence of auricular fibrillation** is a grave warning sign with rheumatic heart disease and proposticates 331 $\frac{1}{3}$ % maternal mortality with pregnancy in such patients.

6. **Heart size by x-ray.** If the heart is 10% larger than normal the incidence of cardiac failure is much greater.

7. **Valvular disease** with murmurs seems of little prognostic value generally, since it is the state of the myocardium which is significant. One exception, mitral stenosis with diastolic murmur seems to have unpredictable prognostic value in that failure may or may not occur because of it.

8. **The Stage of Pregnancy** should be considered. The 7-8th lunar months show the highest incidence of failure and if the patient gets over this period with no great difficulty the prognosis is much improved.

9. **The Presence of active rheumatic infection** in the child-bearing age is a definite contra-indication to pregnancy. However, if no reactivation occurs after the process is quiescent for one to two years, it is usually safe to advise future pregnancies, everything else being favourable.

10. **The Presence of Serious concomitant disease**, e.g. tuberculosis, diabetes, or acute respiratory infection, demands the greatest of care and consideration in control of these diseases.

11. **The Presence of Hypertension** with or without rheumatic heart disease seems to predispose to toxemia in the pregnant patient.

Each of these factors are of variable prognostic value in the individual patient of course, but do provide a very definite set of values in evaluating any patient for pregnancy in the presence of heart disease.

Considering the foregoing then, there seems, with certain reservations in the individual patient, to be certain factors which we may consider as contra-indicting taking on, or carrying on of pregnancy. If there is a previous history of congestive failure, failure in the first trimester, evidence of auricular fibrillation indicating advanced cardiac pathology, acute rheumatic carditis, or advanced age, pregnancy should, generally speaking, be advised against or terminated.

If at all possible pregnancy should not be terminated in the third trimester for reasons given later when this is considered.

Pregnancy having occurred and advanced, with its normal counterparts such as dyspnoea, ankle edema, cr-

thopnoea, palpitations and nervous distention having appeared, how can we draw the line between this and the early signs of congestive failure which exhibits these same signs? With insidious onset of congestive failure we usually find a few additional signs and symptoms. Dyspnoea is more marked than in normal pregnancy, a hacking recurrent cough is present, but should be differentiated from that of possible respiratory infection. Vital capacity is decreased instead of increased as with normal pregnancy. Persistent rather than transient pulmonary base râles appear. There is a greater than normal weight gain over a short period. The liver may be a little enlarged and tender to palpation. Bouts of paroxysmal dyspnoea with pulmonary edema may occur. At delivery a persistent tachycardia of greater than 110 per minute and tachypnoea of greater than 24 per minute suggest threatening congestive failure. All these factors should be looked for and evaluated carefully before deciding on future treatment.

How then shall the physician manage the pregnant cardiac patient who may develop congestive failure?

The important step is prevention and the following comprises a good routine:

1. **Rest:** The patient should have at least ten hours rest at night and one to two hours after lunch. If signs of failure occur, the patient should be put at complete rest, preferably in hospital until delivery.

2. **Frequency of Visits:** The patient should be seen every two weeks in the early stages of pregnancy and every week in the third trimester.

At these visits the cardiac as well as the obstetrical status should be checked.

3. All fatigue and other exercises, including excessive intake of fluid should be avoided.

4. Weight control: Over fifteen pounds weight gain is inadvisable, a high protein, moderate carbohydrate, low fat diet is advised with salt restricted after the sixth month of pregnancy.

In the presence of congestive failure or the previously listed contraindications to the carrying on of pregnancy, it is advised that the physician act as follows:

1. **First trimester:** Try to control the failure by usual methods of bed rest, 1.0 gm. sodium diet, digitalization, diuretics, oxygen when necessary and so on. However, abortion by curettage is advised by most.

2. **Second trimester:** Abdominal hysterectomy (with ligation of the tubes for sterilization where deemed advisable) should be carried out.

3. **Third trimester:** The patient should be carried to term, not only because here is a dangerous point to interrupt pregnancy in view of the great load on the heart at this point, but also because the baby and mother may often be successfully delivered. If the indications are present however the baby will have to be removed to save the mother's life.

Whether or not congestive failure occurs the following is advised for the pregnant cardiac patient:

1. Delivery:

It has been found that the per vaginam delivery is superior to caesarean section in the absence of obstetrical complications indicating the latter course. By the former

method there seems to be less strain on the heart and a more gradual accommodation of the circulation to the placental and uterine blood discharged into it by delivery. The patient should be placed in the orthopnoeic position, have adequate and appropriate relief of pain and anxiety by drugs and the delivery aided by low forceps in the second stage. The delivery should be done in hospital if at all possible.

2. Post - Partum:

Rest and observation for at least three to four weeks is advised.

Prophylactic penicillin is advised before delivery and in the post-partum period to prevent sub-acute bacterial endocarditis where the complication is a possibility.

Briefly now let us look at some other forms of heart disease.

Congenital septal defects tend to be complicated by sub-acute bacterial endocarditis, congestive failure, emboli and arterio-venous shunts immediately after delivery.

The arterio-venous shunt mechanism can perhaps be prevented by

- a. delivery per-vaginam
- b. binding of legs and abdomen immediately after the delivery to increase peripheral resistance.

Generally speaking, cyanosis with appreciable cardiomegaly and poor functional capacity give a poor prognosis for successful pregnancy.

Coarctation of the aorta is best corrected before pregnancy if possible, but pregnancy having occurred, they usually get along well and should be delivered by caesarian section to prevent aortic rupture due to the sudden strain of labor on the circulatory system.

Hypertension predisposes to toxemia. If the hypertension progresses during pregnancy one may have to advise interruption of the pregnancy in the interest of the patient.

In Syphilitic heart disease where aneurism is found or suspected to be present, the patient should be delivered by caesarian section to pre-

vent aneurismal rupture during the strain of labor.

In conclusion heart disease and pregnancy is a complex problem but one which can be handled successfully in most cases if basic principles are borne in mind and more careful consideration given to the treatment of each individual patient.

References:

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ANNUAL MEDICAL BALL

On the fifth evening of March, the Friday preceding Munro Day, there will be a big noise at the Nova Scotian Hotel, Medical students, their beloved mentors, G.P's., specialists, friends, Romans and countrymen, together with their wives, sweethearts, and what have you, will gather in the dim, rosy light of the ballroom to take part in the intricacies of the fox-trot.

The occasion, of course, is the Annual Medical Ball. Everyone will be there. Plans are already underway to present at this gay soiree, entertainment in the Moulin Rouge tradition. Why even the posters will be in French, painted by Jose Ferrier.

The tariff, surprisingly, will be the same as usual. Corsages, however, are taboo. The reason for this is not of course a question of coin. Medical students just don't like flowers. Besides, an ape has been engaged as master of ceremonies, and it would just eat the foolish things anyway.

Specialists, oil Barons, and Newfoundlanders will probably be hanging flowers on their mates, so take warning boys. Anything with flowers hanging on it is not to be handled.

The dress, by jove, will be frightfully formal. The music-makers have not as yet been decided upon, but early in the study, Bili Rubin and his Jaundiced Five were dropped from consideration.

Finally, an admonition: don't break any more of those New Year's Resolutions; observe them closely until March 5th, then we'll shatter them all at once, together, with a will.

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