Fetal Complete Heart Block : An Expectant Management

BOONCHAI UERPAIROJKIT, M.D.*, DHIRAPHONGS CHAROENVIDHYA, M.D.*,
PAIROJ CHOTTIVITTAYATANAKORN, M.D.**, YUEN TANNIRANDORN, M.D.*,
WICHAI BENJACHOLLAMAS, M.D.***, SUKHIT PHAOSAVASDI, M.D.*

Abstract

Fetal complete heart block is a rare cardiac arrhythmia occurring in prenatal life. The diagnosis usually requires a multimodality approach of imaging technology especially M-mode and Doppler ultrasound. The management guideline is not conclusive. We presented 2 cases of fetal complete heart block diagnosed prenatally. The fetuses were closely monitored conservatively and delivered at term. Permanent cardiac pacemakers were performed neonatally with satisfactory outcomes.

Fetal cardiac arrhythmia is an interesting and important antenatal problem. It may occur in as many as 2 per cent of all pregnancies(1) and may be responsible for 20 per cent of all referrals for fetal echocardiography(2). Fetal complete heart block is a rare abnormal fetal cardiac rhythm which may occur in a fetus with normal or abnormal cardiac structure. The diagnosis should be differentiated from fetal bradycardia due to fetal distress or blocked atrial premature contraction. Management guideline of this condition is not conclusive at present. We reported two cases of fetal complete heart block managed expectantly with close surveillance of the fetal welfare and cardiac status. Both fetuses survived postnatally after permanent cardiac pace maker pacing.

Case 1

A 37-year-old pregnant woman, gravida 2 abortus 1, was refered to our fetal cardiovascular unit due to a slow fetal heart rate detected by ultrasound at 34 weeks of gestation. Physical examination revealed unremarkable findings. The uterus was appropriate in size for her gestational age. Auscultation revealed fetal heart rate of 124 beats/minute (b/m.). The base line heart rate on non stress test was 120-140 b/m without acceleration on fetal movement (Fig. 1). Our ultrasound scanning

* Department of Obstetrics and Gynecology,
** Department of Pediatrics,
*** Department of Surgery, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

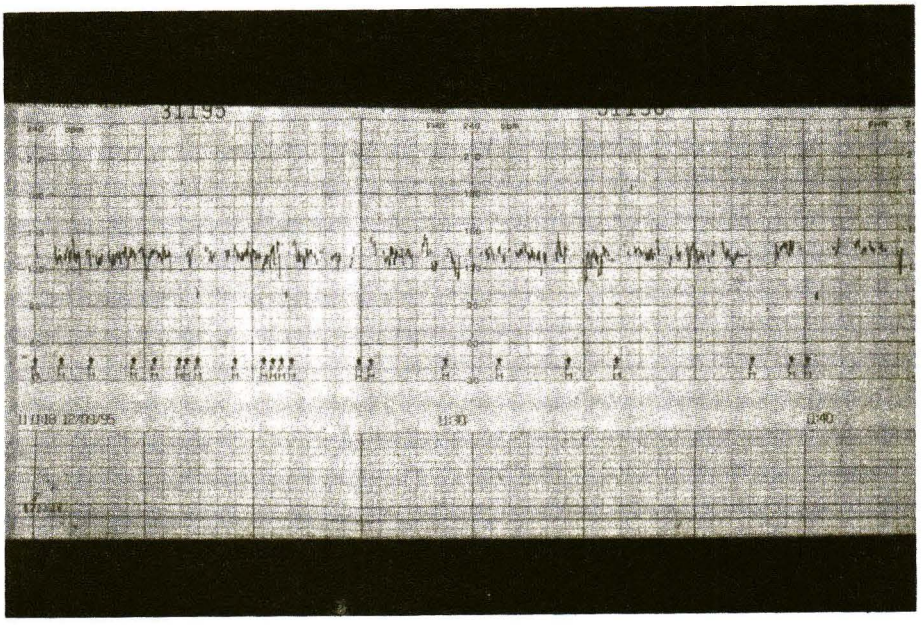

Fig. 1. Non stress test demonstrated base line fetal heart rate of around 120-140 b/m.

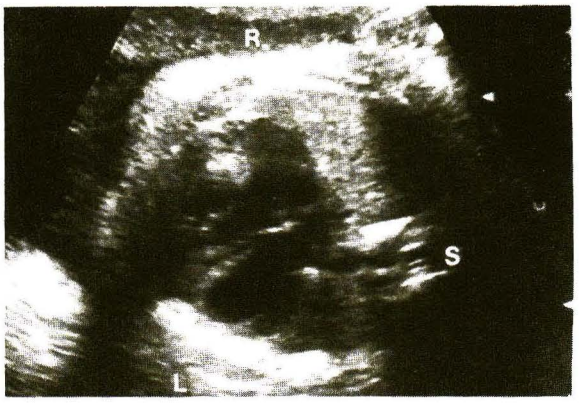

Fig. 2. A 4-chamber view demonstrated cardiomegaly and increased myocardial thickness. (L = left, R = right, S = spine.)

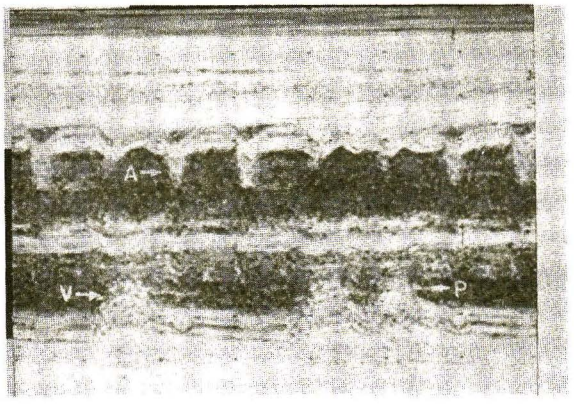

Fig. 3. M-mode demonstrated atrial contraction and ventricular contraction running independently with occasional PVC. (A = atrial contraction, V = ventricular contraction, P = PVC.)

revealed normal biometric measurement for gestational age. Anatomic survey apart from the fetal heart could not reveal any abnormality. Fetal cardiac scanning demonstrated marked cardiomegaly on 4-chamber-view. The myocardial wall was increased in thickness and echogenicity (Fig. 2). Complete fetal echocardiographic study demonstrated both normal inflow and outflow tracts. Both atrioventricular valves met at the crux. M-mode echocardiography was employed to determine the fetal heart rate and rhythm. The atrial contraction was in normal rhythm with the rate of 125 b/m. The ventricle was noted to have a slow rate of around 55 b/m. with occasional premature ventricular contractions

(Fig. 3). The atrium and the ventricle were noted to contract in an asynchronous pattern. Fetal complete heart block with occasional premature ventricular contractions (PVC) was diagnosed. The patient was informed of her fetal condition and management plan. Maternal test for antinuclear antibody was positive for fine speckle and peripheral type. The fetal echocardiography performed twice weekly revealed unremarkable change. Elective low transverse caesarean section was performed at 38 weeks of gestation due to breech presentation. A female baby weighing 2,950 g was delivered with Apgar scores of 9 and 10 at 1 and 5 minutes respectively.

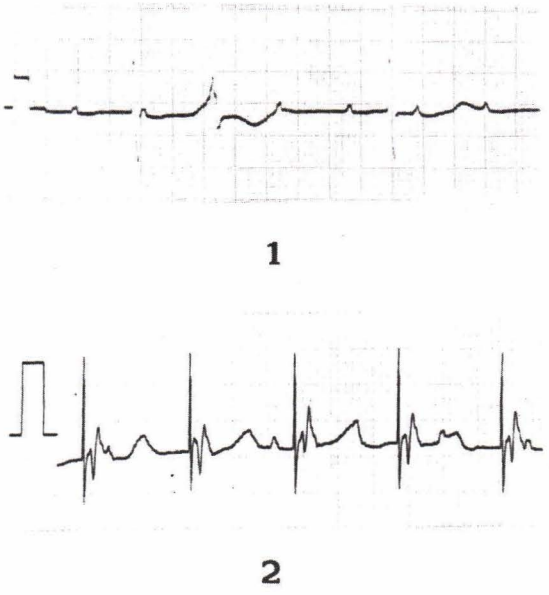

Fig. 4. Electrocardiogram of the newborn before (1) and after (2) pacemaker implantation with a heart rate setting at 100 b/m.

The infant 12-lead surface electrocardiogram (ECG) demonstrated complete atrioventricular block with an atrial rate of 150 b/m and a ventricular rate of 50 b/m with frequent premature ventricular contractions. The chest film demonstrated marked cardiomegaly. A cardiac permanent pace maker implantation with heart rate setting at 100 b/m (Fig. 4) was performed at one week after delivery. The postoperative condition was unremarkable. The chest film revealed marked decrease in the heart size (Fig. 5). The infant was discharged home one week later. She is now 18 months old and still doing well at the time of writing.

Case 2

A 24 year-old pregnant woman, gravida 1, was refered to our care due to a slow fetal heart

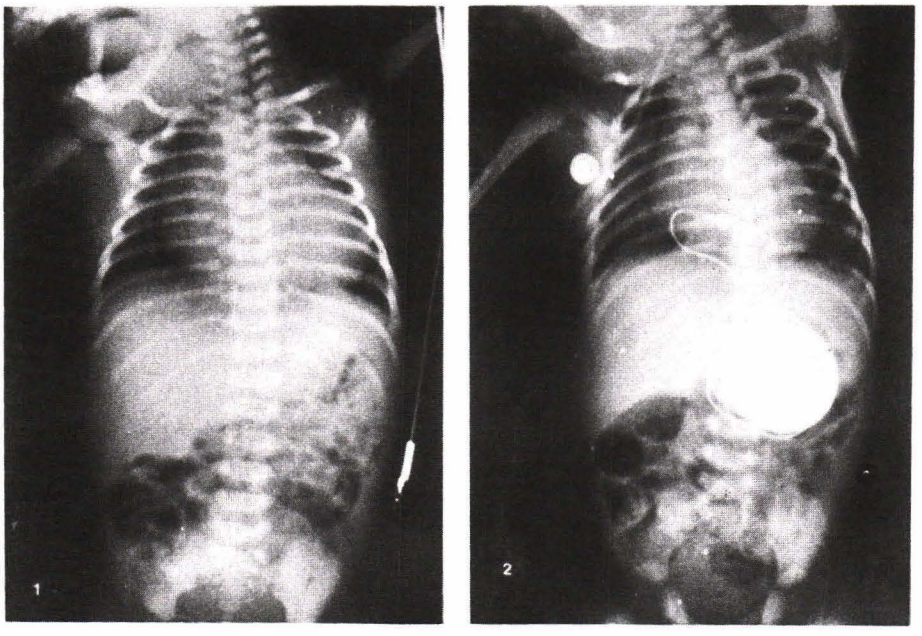

Fig. 5. Chest film of the newborn before (1) and after (2) pacemaker implantation.

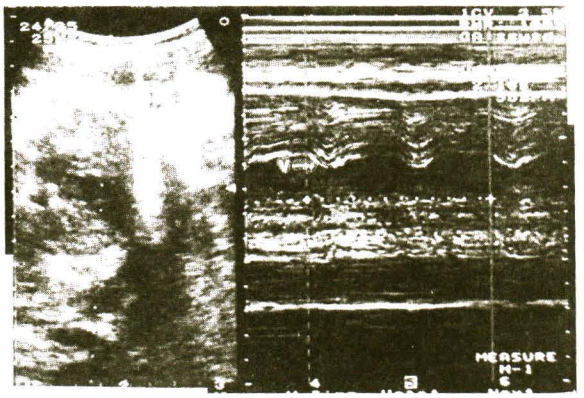

Fig. 6. M-mode revealed a ventricular rate of 55 b/m. (V = ventricular contraction)

rate recognized by ultrasonography at 32 weeks of gestation. Fetal biometry revealed an appropriate size for gestational age. Fetal echocardiography was noted to be anatomically normal. The heart size was in the normal range. M-mode echocardiography demonstrated an atrial contraction and a ventricular contraction to run independently with a regular atrial rate of 122 b/m and a regular ventricular rate of 55 b/m. (Fig. 6). Fetal complete heart block was diagnosed. Maternal test for anti Ro was negative. The patient was scheduled for once to twice weekly follow-up scan for monitoring of fetal cardiac status and well being. At 39 weeks of gestation, the patient experienced leakage of fluid. Pelvic examination revealed the cervical os to be long and closed. Low transverse caesarean section was then performed and a female baby weighing 2,840 g with an Apgar score of 8 and 9 at 1 and 5 minutes respectively was delivered. The newborn was closely observed at the neonatal intensive care unit for evidence of cardiac failure. The heart rate remained unchanged and the pediatrician noticed deterioration of cardiac function. Cardiac pacing was eventually performed without complications. The infant was discharged home in good condition and is now 6 months old.

DISCUSSION

The diagnosis of intrauterine cardiac arrhythmias requires highly specialized techniques using several complementary ultrasonographic modalities, each having inherent strengths and weaknesses. Electrocardiogram (ECG) routinely used in the adults or child is not useful in fetuses because the ECG cannot clearly demonstrate atrial activity[3]. M-mode echocardiography and Doppler echocardiography are typically ultrasonic modalities used for defining fetal arrhythmias[4,5]. Isolated extrasystole, specifically atrial premature contraction, remains the most common type of cardiac arrhythmias occuring in the fetal life[6,7].

Fetal bradycardia is usually defined as a fetal heart rate of below 100 beats per minute. Fetal complete heart block is an uncommon congenital heart problem that occurs in about 1 of 20,000 newborns[8]. The diagnosis is mainly determined by M-mode echocardiography which usually demonstrates a normal atrial rate with a very slow ventricular rate running independently. Both of the reported cases were demonstrated to have normal atrial rate around 120 b/m and a very slow ventricular rate of around 55 b/m running in an asynchronous pattern. In case 1, it appeared that there was a ventricular premature contraction occasionally interspersed with an idioventricular rhythm which indicated a more severe disturbance in cardiac function as can be noted with prominent cardiomegaly. Fetal complete heart block should be distinguished from other types of fetal bradycardias such as blocked atrial premature contraction, block atrial flutter and most importantly bradycardia due to fetal distress which usually, instead of having a constant slow heart rate and an asynchronous atrial and ventricular rhythm, has a gradual decrease in the fetal heart rate and the atrial and ventricular rhythm usually run in a synchronous pattern[6]. Fetal complete heart block has been reported to be associated with complex cardiac anomaly in about 50 per cent. Of those without anomaly, a sensitive test for anti Ro (SSA) or anti La (SSB) is usually positive. Both of our cases were demonstrated to have normal cardiac structure which were confirmed by neonatal echocardiography. However, Maternal antinuclear antibody was positive only in case 1. This could result from a lower sensitivity of the test used in our patients.

The treatment for *in utero* complete heart block is not very promising at present. Corticosteroid, beta-sympathomimetic and plasmaphoresis and *in utero* pacemaker pacing have been reported in the treatment of this fetal condition. Yet, the result is still under investigation. Nevertheless, beta sympathomimetic specifically salbutamol has been demonstrated to increase fetal heart rate and

improve ventricular function and has been recommended for fetuses with evidence of cardiac failure or deteriorating cardiac function[9]. As the fetuses in both cases were detected late in gestation and the heart rate was still around 55 b/m, close follow-up examination revealed no deterioration of the cardiac size and function. No evidence of hydrop fetalis was noted. We chose to manage the fetuses expectantly. Physiologically, the fetal heart can overcome the slow heart rate by compensatory ventricular dilatation and an associated increase in fractional shortening and as a result ventricular free wall hypertrophy[10] as also noted prominently in case 1.

The prognosis of the fetus with complete heart block has been demonstrated to be very poor in those associated with structural heart disease. Nevertheless, those with isolated complete heart block, especially with a ventricular rate of over 55 b/m, usually have a good prognosis. Both reported cases were free of structural anomaly and had a good outcome after having a cardiac pace maker implanted early in the neonatal period.

SUMMARY

Two cases of fetal complete heart block were diagnosed antenatally in the third trimester. The patients were managed expectantly with close observation of the fetal cardiac status and welfare. The fetuses were delivered at term by caesarean section. Permanent cardiac pace maker pacing were performed neonatally. The postoperative conditions were uneventful. Both fetuses survived and have been doing well.

(Received for publication on May 21, 1997)

REFERENCES

1. Shenker L. Fetal cardiac arrhythmia. Obstet Gynecol Surv 1979;34:561-72.
2. Steinfeld L, Rappaport HL, Rassbach HC, Martinez E. Diagnosis of fetal arrhythmias using echocardiographic and Doppler techniques. J Am Coll Cardiol 1985;8:1425-32.
3. Fyfe DA, Kline CH. Fetal echocardiographic diagnosis of congenital heart disease. Pediatr Clin North Am 1990;37:45-68.
4. Strasburger JF, Huhta JC, Carpenter RJ, et al. Doppler echocardiography in the diagnosis and management of persistent fetal arrhythmias. J Am Coll Cardiol 1985;7:1386-91.
5. Devore GR, Siassi B, Platt LD. Fetal echocardiography III. The diagnosis of cardiac arrhythmias using real-time-directed M-mode ultrasound. Am J Obstet Gynecol 1983;146:792-9.
6. Uerpairojkit B, Charoenvidhya D, Witoonpanich P, Tannirandorn Y, Phaosavasdi S. Fetal echocardiography : Obstetric application. Thai Obstet Gynecol Bull 1994;3:1-9
7. Kleinman CS, Donnerstein R, Jaffe CC, et al. Fetal echocardiography: a tool for evaluation of in utero cardiac arrhythmias and monitoring of in utero therapy: analysis of 71 patients. Am J Cardiol 1983;51:237-43
8. Michaelsson M, Engle MA. Congenital complete heart block: an international study of natural history. Cardiovasc Clin 1972;4:85-101.
9. Groves AM, Allan LD, Rosenthal E. Therapeutic trial of sympathomimetics in the three cases of complete heart block in the fetus. Circulation 1995;92:3394-6.
10. Veille JC, Covitz W. Fetal cardiovascular hemodynamics in the presence of complete atrioventricular block. Am J Obstet Gynecol 1994;170: 1258-62.

ภาวะหัวใจทารกเต้นช้าในครรภ์ชนิด Complete heart block : การรักษาแบบประคับประคอง

บุญชัย เอื้อไพโรจน์กิจ, พ.บ., ธีระพงศ์ เจริญวิทย์, พ.บ.*,*
*ไพโรจน์ โชติวิทยธนากร, พ.บ.**, เยื้อน ตันนิรันดร, พ.บ.*,*
*วิชัย เบญจชลมาศ, พ.บ.***, สุชิต เผ่าสวัสดิ์, พ.บ.**

ภาวะหัวใจทารกในครรภ์เต้นช้าผิดปกติชนิด Complete heart block เป็นภาวะที่พบได้น้อยมาก การวินิจฉัยมักต้องใช้เทคโนโลยีของคลื่นเสียงความถี่สูงหลายๆชนิดโดยเฉพาะอย่างยิ่งชนิด M-mode และคลื่นเสียงความถี่สูงดอพเลอร์ ได้รายงานทารก 2 ราย ที่ตรวจพบว่ามีภาวะ Complete heart block ขณะอยู่ในครรภ์ ทารกทั้ง 2 รายได้รับการตรวจติดตามอย่างใกล้ชิดจนคลอดเมื่อครรภ์ครบกำหนด เด็กแรกเกิดได้รับการทำผ่าตัดใส่ Permanent cardiac pacemaker ได้ผลเป็นที่น่าพอใจทั้ง 2 ราย

* ภาควิชาสูติศาสตร์-นรีเวชวิทยา,
** ภาควิชากุมารเวชศาสตร์,
*** ภาควิชาศัลยศาสตร์, คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพฯ 10330