FETAL PAROXYSMAL AURICULAR TACHYCARDIA

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Although paroxysmal auricular tachycardia is most common in adults between the ages of 20 and 40 years, many examples of its occurrence in children have been described following Buckland's (1892) account of the condition in an eleven-year-old girl. During the past 25 years the arrhythmia has been recognized in antenatal life and the present paper reports two further examples affecting the foetus.

CASE REPORTS

Case 1. P.H. was the second child of healthy parents. The mother's first pregnancy in 1944 was uneventful and at term she was delivered of a normal, female child. Three years later in 1947 the mother had a miscarriage at two months. Her third pregnancy in 1949 was normal until two weeks before the expected date of delivery when there was a sudden increase in the size of her abdomen, due to the development of hydramnios, which necessitated her admission to hospital. A plain X-ray of the mother's abdomen showed the baby to be in full extension, a position considered to be the result of gross distension of the foetal abdomen. The foetal heart rate was recorded as varying between 130 and 140 beats a minute, the rhythm being regular. Two days after the mother was admitted to hospital her membranes were ruptured artificially, labour commenced within an hour and 9½ hours later she was delivered of a live, female child.

At birth the baby was very ill with severe dyspnoea and cyanosis. There was extensive oedema affecting the skin and subcutaneous tissues of the limbs, face, chest, and abdomen. The abdomen was distended by fluid in the peritoneal cavity. The heart size and cardiac sounds were normal. The heart rate was above 200 beats a minute and the rhythm appeared regular although electrocardiography (Fig. 1) revealed the rate to be 228 beats a minute with a slight irregularity of the rhythm. The tracing was consistent with a 1:1 auricular tachycardia. A chest X-ray showed the heart to be normal in size, shape, and position; the lung fields were clear.

The child was nursed in an oxygen tent and no fluids were administered during the first 48 hours of life. Ten hours after birth quinidine sulphate was administered orally in the dose of 1/6 grain, four-hourly, but as there was no slowing of the heart rate and her condition deteriorated, the quinidine was abandoned after 24 hours and digoxin substituted in a dosage of 0.125 mg. intramuscularly at two-hourly intervals for three doses. An immediate response followed (Fig. 2) with the heart rate falling to 120 beats a minute and there was an associated improvement in the baby's condition. An electrocardiogram taken at this period confirmed that the cardiac rate and rhythm were normal. Following a large diuresis the oedema subsided rapidly and by the ninth day the weight had dropped from the birth weight of 9 lb. 1 oz. to 6 lb. 5½ oz. Breast feeding was satisfactorily established and the baby was discharged home on the twelfth day of life weighing 6 lb. 8¾ oz.

At the age of six weeks, a routine visit was made to Out-Patients where it was found that her general progress had been satisfactory. The heart rate, however, was again over 200 beats a minute, though there was no evidence of cardiac failure. She was admitted to hospital where an electrocardiogram confirmed the recurrence of the auricular tachycardia. Digoxin was again administered in the dosage of 0.125 mg. two-hourly for three doses. Normal rhythm was re-established at once and there were no further attacks of cardiac arrhythmia during the following eight years of routine observation.

FIG. 1.—Case 1. Electrocardiogram taken on the first day of life, demonstrating the supraventricular tachycardia. Standard leads.

FIG. 2.—Case 1. Graph, showing the effect of quinidine and digoxin on the heart rate.

Case 2. C.K. was the first child of healthy parents. The mother's pregnancy was normal until a month before the expected date of delivery when she developed abdominal pain which was thought to be the onset of labour and she was admitted to hospital. At this time it was observed that the foetal heart rate although regular was very rapid, over 200 beats a minute. After 24 hours rest in bed the mother's abdominal pains ceased and the foetal heart rate slowed to 140 beats a minute (Fig. 3). Three days later, however, the foetal tachycardia returned but attempts to obtain an electrocardiogram were unsuccessful. The mother was detained in hospital, although symptom-free, for a month when she went into labour spontaneously and was delivered normally of a male child weighing 8 lb. 14 oz.

On examination the child was healthy, and the heart beats regular at a rate of 140 a minute. The heart size and sounds were normal as, too, was the electrocardiogram. A chest X-ray revealed no abnormality. Breast feeding was readily established and the infant discharged home on the twelfth day weighing 9 lb. The child has attended Out-Patients at intervals since that time and was last seen when 4½ years of age. There is no evidence of any congenital abnormality of the heart.

The evidence suggests that both these patients developed auricular tachycardia during antenatal life. In Case 1, although no abnormality of the cardiac rate was detected before birth, the baby was born in congestive failure with auricular tachycardia. The recognition of the foetal abdominal distension prior to the onset of labour strengthens the belief that cardiac embarrassment must have been of at least some days duration.

In the second baby, although it was not possible to obtain electrocardiographic evidence that the foetus had auricular tachycardia, there is no other satisfactory explanation for a prolonged tachycardia of such degree terminating in the delivery of a normal healthy baby.

FIG. 3.—Case 2. Record of the foetal heart rate during the last month of pregnancy.

DISCUSSION

In a study of 41 cases of paroxysmal tachycardia occurring in children under the age of 14 years, Nadas *et al.* (1952) found that 25 were under the age of four months. Of these 25 patients, only one child was a girl and 18 were without any recognizable factor to account for the tachycardia. This contrasted with the 16 children over the age of four months in whom the sexes were more equally represented and in whom an aetiological factor was frequently demonstrable. Some 16 cases (Table) have now been reported where an auricular tachycardia commenced in foetal life. The sex incidence has been about equal (9 male, 7 female) and in only two babies has there been an associated malformation of the heart; one of these was reported by Taussig (1947) when she described a child with congenital auricular flutter associated with an auricular septal defect, the other by Siderides *et al.* (1957) who recorded the same arrhythmia occurring in association with fibro-elastosis. The difference in sex incidence between the cases of auricular tachycardia presenting in antenatal life and those occurring in children under the age of four months suggests that either the aetiology of the tachycardia differs in the two groups, or there is a tendency for the arrhythmia to be controlled spontaneously after delivery in the female child. It must be emphasized that some babies with auricular tachycardia detected first in the early months of life may have had paroxysms of tachycardia in utero, that were unrecognized, and while the total number of patients reported with auricular tachycardia remains small, dogmatic conclusions about the significance of this differing sex incidence remain unjustified.

The development of the arrhythmia in foetal life might be determined by some physiological change occurring in utero, but this can hardly be responsible when the tachycardia recurs some weeks after birth as in Case 1. It would appear more likely that there is an underlying functional instability of the auricular muscle and that this liability is corrected as the infant matures.

Anderson and Adams (1953) have commented upon the high birth weight of the infants with congenital auricular tachycardia, but in Case 1 the high birth weight was explained by the water retention occurring during the phase of cardiac failure. The weight fell by over 2½ lb. when the

tachycardia had been controlled and the œdema had subsided. The details of the other published cases do not permit further amplification of this view.

The electrocardiographic findings in 14 cases are available for study. In 9 the diagnosis is given as auricular flutter with varying degrees of block, the remaining 5 are designated as paroxysmal tachycardia although some of the authors state that auricular flutter cannot be excluded. The difficulty in differentiation between these two disturbances of rhythm is well recognized and Evans (1944) comments on the unity of the two arrhythmias and produces some support for the view that they are in fact inseparable and that the term auricular tachycardia embraces both disturbances of rhythm.

TABLE
FœTAL AURICULAR TACHYCARDIA

Author	Sex	Birth weight	Type	Treatment
		lb. oz.		
Carr and McClure, 1931	F	10 13½	Flutter	None
Tollas, 1933	M	?	?	None
Sherman and Schless, 1934	M	7 8	Flutter	Digitalis
Tarlower and Lattin, 1942	F	8 12	Flutter	Digitalis
Hedberg, 1945	M	8 12	Flutter	Digitalis
Garvin and Kline, 1947	F	8 1½	Supraventricular	Digitalis
				Quinidine
Taussig, 1947	F	?	Flutter	Digitalis
Stadler, 1948	M	7 13	Flutter	Digitalis
McLean, 1952	M	8 14	Flutter	Digitalis
Sancetta, Redding, and Haubrich, 1952 ..	M	7 11	Supraventricular	Bilateral carotid pressure
Anderson and Adams, 1953	F	7 3	Flutter	Digitalis
Wilburne and Mack, 1954	F	7 14	Supraventricular	Digitalis
Hilrich and Evrard, 1955	M	8 4	Supraventricular	Digitalis
Siderides, Antonius, and Richlan, 1957 ..	M	8 0	Flutter	Digitalis
Kesson	F	9 1	Supraventricular	Digitalis
	M	8 14	Supraventricular	None

On those occasions where auricular tachycardia is suspected or proved in fœtal life, the present evidence does not suggest that there should be any departure from the usual management of pregnancy or labour. Hyman (1930) made a study of the fœtal heart by phonocardiography and he detected arrhythmia in 9 per cent of his patients. The disturbances of rhythm were divisible into three groups, first those cases with sinus arrhythmia, secondly those with extrasystoles, and thirdly those showing gross irregularity of the heart rhythm. In neither group I nor II was the arrhythmia of any clinical importance, but in group III it was held to be of serious significance as 3 out of his 11 cases in this group died in utero. Hyman believed the arrhythmia was the result of auricular fibrillation and he made the suggestion that digitalization of the mother might have produced a more favourable result. This view should be accepted with reservations at present since his descriptions were necessarily incomplete and no account is taken of the possibility that the arrhythmia in the fatal cases may have resulted from terminal fœtal distress.

When the arrhythmia persists after delivery, although the tachycardia can cease spontaneously as shown by the cases described by Carr and McClure (1931) and Tollas (1933) the condition is potentially too grave to justify expectant treatment. Attempts at vagal stimulation are rarely effective in controlling the tachycardia in infancy, although Sancetta *et al.* (1952) met with success. Nadas (1952) describes a fatality that may have resulted from this procedure. Digitalis is undoubtedly the drug of choice and Garvin and Kline (1947) report the sole example where the drug failed and quinidine was required before normal rhythm was established. Digitalis must be given in full dosage, but the choice of preparation should be that which the practitioner is accustomed to use. There is little evidence to suggest that the continued administration of the

drug after normal rhythm is established will prevent a recurrence and it seems preferable to withhold the drug until the arrhythmia is again present. Although the onset of further attacks may be insidious, it is unlikely that the child would suddenly become gravely ill before therapy could be instituted.

The prognosis as far as the arrhythmia is concerned is good provided digitalis is given early and in adequate amounts. There is a risk of the recurrence of the arrhythmia but this, too, shows a good response to digitalis. In the absence of any underlying congenital malformation of the heart the arrhythmia is unlikely to reappear after the age of six months. In those cases where digitalis in adequate amounts fails to control the tachycardia, there is usually an underlying malformation of the heart, and the prognosis will depend on the nature of the structural defect.

SUMMARY

Two cases of fetal auricular tachycardia are recorded, and the cases previously described are briefly reviewed.

The treatment and prognosis is discussed.

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