Multifocal atrial tachycardia: an unusual cause of cardiogenic shock In a newborn

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La tachycardie atriale polymorphe: une cause rare de choc cardiogénique chez un nouveau né

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RÉSUMÉ

Prérequis : La tachycardie atriale polymorphe (TAP) ou chaotique est un trouble du rythme rare chez l'enfant, représentant moins de 1% des tachycardies supraventriculaires observées durant l'enfance. La majorité des enfants présentant une TAP sont antérieurement sains et souvent peu ou asymptomatiques. Très peu d'enfants avec TAP vont présenter une détresse cardiorespiratoire sévère mettant en jeu le pronostic vital.

But : Rapporter un nouveau cas de TAP.

Observation : Nous rapportons un cas rare de TAP révélée par une insuffisance respiratoire sévère et un choc cardiogénique chez un nouveau-né de 12 jours. L'échodoppler cardiaque a montré une communication interauriculaire type ostium secondum isolée avec une fonction ventriculaire gauche réduite. Le nouveau né a été traité avec succès par amiodarone intraveineuse. Un relais par amiodarone orale et digoxine a été fait. Quatre mois plus tard, le trouble du rythme n'a pas récidivé et la fonction ventriculaire est revenue à la normale.

Conclusion : Notre observation est originale par son association à communication interauriculaire type ostium secondum isolée et la survenue d'une insuffisance cardiaque révélant une TAP à la période néonatale.

Mots-clés

Tachycardie atriale multifocale, choc cardiogénique, nouveau né, antiarythmiques, communication interauriculaire type ostium secondum.

SUMMARY

Background: Chaotic or multifocal atrial tachycardia (MAT) is a rare tachyarrhythmia in children, accounting for less than 1% of supraventricular tachycardia seen in childhood. The majority of children with MAT are healthy; a few may exhibit mild to life-threatening cardiorespiratory disease.

Aim: To report a new case of MAT revealed by a severe respiratory distress and cardiogenic shock.

Case report: We report a rare case of MAT revealed by a severe respiratory distress and cardiogenic shock in a 12-day-old newborn. The echocardiogram demonstrated an isolated secundum-type atrial septal defect with a decreased left ventricular function. He was successfully treated with intravenous amiodarone. A relay by oral amiodarone and digoxine was made. Four months later, he had no recurrence of arrhythmia and left ventricular function returned to normal.

Conclusion: Our case is original by its association to an isolated ostium secondum-type atrial septal defect and by the occurrence of a congestive heart failure revealing the arrhythmia and the structural heart disease during the neonatal period.

Key-words

Multifocal atrial tachycardia, cardiogenic shock, newborn, anti-arrhythmic drugs, secundum-type atrial septal defect.

Multifocal atrial tachycardia (MAT) is an uncommon arrhythmia, usually seen in elderly patients with acute and chronic respiratory disease (1). In children, the incidence of MAT is unknown, but it appears to be low (2). Clinical tolerability of MAT is variable depending on the ventricular rhythm and its clinical manifestations in children vary from a benign asymptomatic arrhythmia to sudden death (2, 3). Cases of MAT complicated by severe cardiorespiratory failure are rare and require medical treatment which relies mainly on amiodarone and other class anti-arrhythmic drugs (1, 4). This article reports a rare case of MAT in a 12-day-old newborn revealed by severe cardiorespiratory failure and successfully treated by intravenous amiodarone.

CASE REPORT

A previously well 12-day-old boy was admitted to the pediatric intensive care unit for severe respiratory distress. He was delivered at term with a birth weight of 3500 gram after an uneventful pregnancy with good Apgar scores. Initial physical examination demonstrated an afebrile, pale infant who was tachypneic (72 breaths/min) with slight intercostal and subcostal retractions. Breath sounds were clear. Oxygen saturation was 80% on room air. He presented also an important tachycardia at 270beats/min with weak pulses, cold extremities, prolonged capillary refill time and hypotension at 55/30 mmHg. There were no cardiac murmurs or gallop rhythm on the auscultation of the heart. Hepatomegaly (liver size estimated at 9 cm) was found on the abdominal examination. A chest X-ray showed cardiomegaly without abnormalities of the lung parenchyma (Figure 1). As an emergent therapeutical approach we applied ice to the patient's face very briefly but no effect was observed on tachycardia. The electrocardiogram (ECG) showed typical characteristics of MAT, with irregular heartbeats, at 200–250 beats/minute (Figure 2).

Figure 1 : Chest radiograph on admission showed cardiomegaly without abnormalities of the lung parenchyma

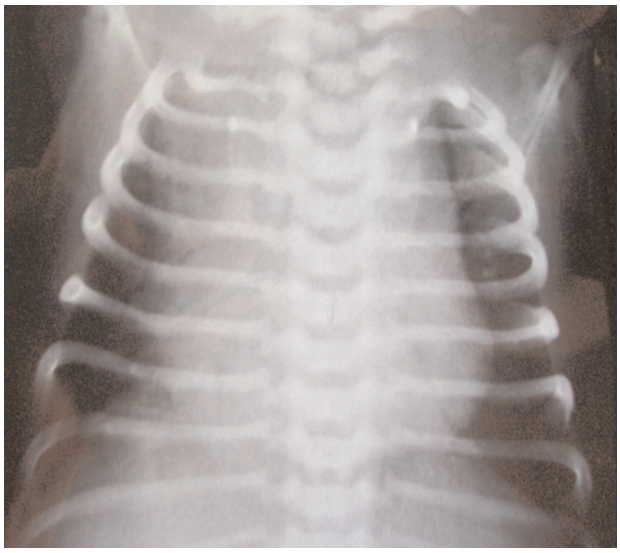
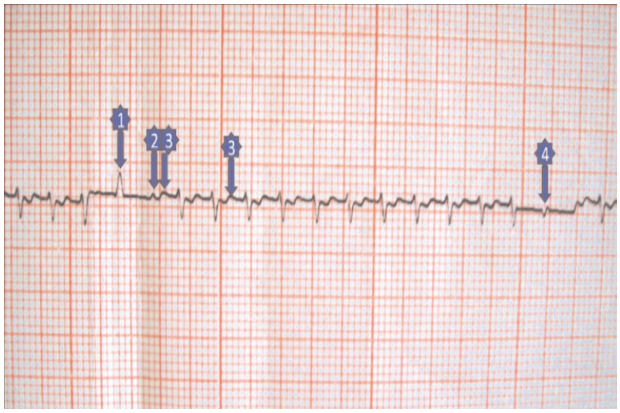


Figure 2 : Electrocardiogram on admission showed 4 different types of P waves (arrows). Irregular rapid atrial rhythm and variable rapid ventricular conduction



The echocardiogram demonstrated an isolated ostium secundum-type atrial septal defect (OSASD) that was 0.6 cm in diameter with a minor left-to-right shunting through the defect and a decreased left ventricular function with a percent of fractional shortening at 20%. The results were normal for blood urea and creatinine, blood counts, C- reactive protein and electrolytes. Blood gas analysis showed metabolic acidosis and hypoxemia (pH = 7, 27 – PaO2 = 66 mmHg – PCO2 = 26 mmHg- HCO3- = 12 mmol/l – PaO2 = 57 % - P (A-a) O2 = 611 mmHg). The lactatemia was raised at 8.6 mmol/l and liver enzymes AST and ALT were increased at 339 and 209 IU/l, respectively. Blood cultures and tracheal aspirates were negative. Viral immunofluorescence in tracheal aspirates was negative. Cardiogenic shock was attributed to MAT. The newborn was intubated and ventilated. The arrythmia was treated initially by cardioversion (1Joule/kg twice) without result then by continuous intravenous infusion of amiodarone (500 mg/m2/day) allowing gradual restoration of a sinus rhythm within 48 hours with normalization of the hemodynamic state. A relay by oral amiodarone and digoxin was made on day 3 after admission. The patient was weaned from the mechanical ventilation on day 4 after admission and discharged at home on day 7. Four months later, he had a normal growth, no recurrence of symptomatic arrhythmia and the echocardiography showed a normal left ventricular function, a minor left-to-right shunting through the atrial defect without pulmonary hypertension. The treatment was then stopped.

DISCUSSION

The incidence of MAT is very low in newborns, accounting for about 0.02% after screening the standard ECGs among 3383 apparently healthy newborn infants (5). MAT is characterized by the electrocardiographic findings including: multiple (at least 3) distinct P-wave morphologies; irregular P–P intervals; isoelectric baseline between P-waves and occasionally rapid ventricular rate (1, 2). Similar to the more common forms of

supraventricular tachycardia (SVT) seen in childhood, MAT is characterized by very rapid atrial rates up to 400 beats/min and ventricular rates at 150 to 250 beats/min but unlike most SVT, it is markedly irregular and pauses may be observed following blocked premature atrial impulses (1). The majority of children with MAT are healthy infants under 1 year of age. About 40% of patients with MAT have underlying structural heart diseases (SHDs), another 40% have no other conditions beside MAT, and the rest have a variety of other conditions such as respiratory illnesses (4). SHDs reported to be associated to MAT are, in the majority of cases, complex heart disorders and include OSASD, hypertrophic cardiomyopathy, persistent ductus arteriosis, tetralogy of Fallot, atrioventricular sepal defect, pulmonary atresia and single ventricle (1, 4). To the best of our knowledge, our case is the first report of MAT associated to an iolated OSASD in a newborn. In previous reports, atrial dysrhythmias associated to isolated OSASD are commonly found in old children and adults. The closure of the atrial defect didn't influence significantly the atrial arrhythmia. Besides, atrial arrhythmias could appear in these patients postoperatively (6, 7). If MAT is not associated to a SHD, patients are usually asymptomatic at diagnosis, even if some have rapid heart rates. Symptoms of congestive heart failure, such in our case, are rarely reported. Cardiogenic shock developed by our patient was caused by the MAT because the reduction of the arrhythmia allowed the resolution of the shock and the progressive normalization of the ventricular function. This arrhythmia allowed, in our case, the early discovery of an isolated OSASD. There is no standard, proven therapeutic approach to patients with MAT. The treatment for MAT is indicated only in symptomatic children with rapid ventricular rate and cardiac decompensation because the response to antiarrhythmic drugs is unpredictable, MAT is asymptomatic in most children and diverse effects of antiarrhythmic agents are thought to account for the poor outcomes in some patients (4). In our report, MAT was complicated by cardiogenic shock and needed urgent medical treatment. A variety of medications have been evaluated in the management of MAT and their responses are variable. Cardioversion was attempted in some patients and is of no avail (1). Digoxin, the most commonly used medication in previously reports, was given to slow the ventricular response but conversion to sinus rhythm was not often effective. Besides, death was attributed to digitalis intoxication in some reports, so some authors are reluctant to suggest digoxin as a therapeutic agent (4). Other medications including sotalol, encainide, flecainide, and propafenone have also been tried previously. However, small sample size and frequent combination with other antiarrhythmic drugs limited the documentation of their effectiveness (4). Some cases received propranolol in combination with other drugs, but its use may be hazardous in infants who experience bradycardia (4). Amiodarone, a newer class III antiarrhythmic drug, has been successfully used, alone or in association with other drugs, to treat MAT (1, 4). In current practice, it was recommended in recent reports, to treat underlying illness and, when present, treat echocardiographically documented ventricular dysfunction with digoxin.

For symptomatic patients, pharmacologic intervention is required; amiodarone may be an excellent choice and long-term follow-up is recommended. Asymptomatic patients are followed without pharmacologic treatment (4). Our newborn was treated successfully by amiodarone and digoxin with restoration of a normal ventricular function and without recurrence of the arrhythmia after 4 months of follow-up. Surgical closure of the OSASD will be considered in our patient, during infancy, if the auricular arrhythmia recurred or if other indications of surgery occurred such as failure to thrive, pulmonary hypertension or recurrent respiratory infections (8). Otherwise, surgical or preferably percutaneous closure of OSASD is undertaken in the fourth or fifth year of life if a spontaneous closure of the ASD was not observed before this age (9).

CONCLUSION

This report illustrates a rare case of MAT in a 12-day-old newborn revealed by cardiogenic shock and associated to an isolated OSASD with successful medical treatment by amiodarone and digoxin. Our case is original by its association to an isolated OSASD and by the occurrence of a congestive heart failure revealing the arrhythmia and the SHD during the neonatal period.

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