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SHORT REPORT

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Spinal muscle atrophy type 1 (Werdnig-Hoffman disease) with complex cardiac malformation

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We report a case of spinal muscle atrophy type 1 (Werdnig-Hoffman disease) with a complex congenital heart malformation.

Heart involvement in spinal muscle atrophy (SMA) is virtually unknown. In fact, congenital heart disease was at one stage regarded as an exclusion criterion in the diagnosis of SMA [6].

A male infant was admitted to the special care baby unit soon after delivery. He was a first-born child to unrelated young healthy Caucasian parents with no family history of either congenital cardiac or neuromuscular problems. Antenatal scan demonstrated both polyhydramnios and increased nuchal skin fold thickness. Amniocentesis was performed and the fetus had a normal karyotype. The mother noticed decreased fetal movements. The infant was born at 37 weeks gestation by normal vaginal delivery and needed ventilation soon after birth for absent respiratory effort. He was noted to have a short neck, narrow asymmetrical chest wall, marked contractures at elbows, hips, knees and ankles (arthrogryposis), abnormal palmer creases, carpo-pedal oedema and camptodactyly. There was no spontaneous movement or muscle fasciculation. The features were those of the Pena-Shokeir phenotype [8], a combination of joint contractures, fetal akinesia, carpo-pedal oedema and ventilator dependence secondary to pulmonary hypoplasia. The baby remained ventilator dependent. A murmur was noted in the 2nd week of life.

Blood chemistry showed very high levels of creatinine kinase (4000 U). By day 10, this had fallen to 300 U. Chest X-ray films showed poor aeration of the left lung. Sensory nerve conduction studies showed no significant response. Needle electromyogram (EMG) showed a widespread pattern of active denervation with profuse fasciculation and positive waves in all muscle groups. A muscle biopsy showed adipose tissue with fibrous septa but no muscle fibres, suggesting amyoplasia.

Echocardiography showed a virtually common atrium, multiple apical muscular ventricular septal defects (VSD), pulmonary hypertension, a hypoplastic aortic arch and severe coarctation of the aorta.

The diagnosis of SMA type 1 was confirmed by molecular genetic studies.

In view of the combination of SMA and a complex congenital cardiac defect, a decision was made jointly with the parents to withdraw intensive care. The baby died shortly after withdrawing ventilator support.

SMAs are characterised by degeneration of the lower motor neurons associated with muscle paralysis and atrophy. The acute form of Werdnig-Hoffmann disease (SMA type 1) is characterised by severe generalised muscle weakness and hypotonia at birth or within 6 months. Death, commonly due to respiratory problems, usually occurs within the first 2 years [7].

Heart involvement in SMA is virtually unknown [6]. However, there have been a few reports of co-existing congenital heart disease with different types of SMA. In 1990, Moller et al. [4] reported presence of atrial septal defect (ASD) in three siblings with SMA 1. One of the children had aortic valve stenosis. DNA analysis was not performed. They believed it is unlikely that this was caused by chance alone and hypothesised that the familial clustering might result from other mechanisms, e.g. chance, persistent environmental factors, or concurrence of a monogenic disorder.

In 1995, Burglen et al. [1] reported a series of six unrelated children, born to unrelated healthy parents of European origin who had severe congenital heart defects with clinical, histopathological, and electromyographic features of SMA 1. One patient had an ASD, one had

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both ASD and VSD, one had tricuspid atresia with a univentricular heart, one had a partial atrioventricular canal, one had isolated aortic coarctation, and one had both coarctation and an ASD.

Mulleners et al. [5] reported two children with congenital heart disease, one with early fatal SMA 1 and an ASD and the other with SMA 3 and a complex cardiac defect (ASD, L-transposition of the great arteries and a small patent ductus arteriosus). Another case with SMA 1 and a small muscular VSD was reported in 1996 by Devriendt et al. [2]. Other forms of cardiac involvement in SMA include ECG abnormalities with or without cardiomypathy [3].

We believe that this is the first report of an association between SMA 1 and this complex cardiac defect (common atrium, multiple VSDs and aortic coarctation). This case adds to the growing list of SMA association with congenital heart disease. The nature and the cause of this association remain unknown. Complex congenital cardiac defects should be considered as another (but uncommon) cause of morbidity and mortality in children with SMA.

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