

Asplenia and polysplenia syndromes with abnormalities of lateralisation in a sibship

J ZLOTOGORA AND E ELIAN

From the Department of Pediatrics, Hasharon Hospital, Petah-Tiqva, and Tel-Aviv University Medical School, Israel

SUMMARY In the family presented here the first child had asplenia syndrome with cor biloculare¹ transposition of the great vessels, pulmonary stenosis, and anomalous pulmonary venous drainage. Another sib had situs inversus with polysplenia syndrome, including very similar cardiovascular defects and biliary atresia. The possibility that these two syndromes, namely asplenia and polysplenia, are different manifestations of a similar defect in the normal asymmetrical development of internal organs is discussed.

Some degree of lateral asymmetry is one of the characteristics of the internal human body configuration. A mirror image of the asymmetrical organs is found in situs inversus, while in the asplenia and polysplenia syndromes there is a striking tendency for internal symmetry. In the asplenia (Ivemark) syndrome the tendency is for the left lung, atrium, and left lobe of the liver to resemble the right counterpart in mirror image, while in the polysplenia syndrome the tendency is for these organs to resemble those normally on the left side. Cardiovascular anomalies are common to both syndromes, but generally they are multiple, complex, and of a more primitive nature in the asplenia syndrome.¹

Most cases of both syndromes are sporadic, but familial occurrence has been reported for each of the syndromes.²⁻⁸ A family in which one child had the polysplenia syndrome and the second one had the asplenia syndrome was reported by Polhemus and Schafer in 1952.⁵ We wish to report here a similar family and to discuss the implications of such a finding.

Family report

Both parents are Jewish of Indian origin and are not related. From five pregnancies, there are three live and healthy girls. The other two children, the first and the last, are the subject of this report.

CASE 1

A girl was born at term in 1971 after a normal pregnancy and delivery. She was small for gestational

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age and weighed 2060 g. At the age of 5 days she was noted to be cyanotic and a grade 3/6 systolic murmur was heard along the left sternal border. At cardiac catheterisation, transposition of the great vessels with double outlet of the right ventricle and pulmonary stenosis were demonstrated. The child failed to thrive and died at 3 months of age following an episode of septicaemia.

The necropsy findings were as follows: cor biloculare, single ventricle and atrium, transposition of the great vessels with pulmonary stenosis and anomalous pulmonary venous drainage, including a common pulmonary vein and anomalous connection between the upper lobe of the left lung and superior vena cava. Apart from the absence of the spleen and a symmetrically bilobed liver, the configuration of the abdominal organs was normal.

CASE 2

In 1978 a 2800 g boy was born to the same family after a normal pregnancy and delivery. Cyanosis was noted shortly after birth, and on examination the heart sounds were heard to the right of the sternum. There was a grade 2/6 systolic murmur. X-ray examination of the chest confirmed the dextrocardia and the stomach gas shadow was located under the right diaphragm suggesting complete situs inversus.

Cardiac catheterisation revealed complete transposition of the great vessels with double outlet of the right ventricle, pulmonary stenosis, and ventricular septal defect. The inferior vena cava entered the azygous vein. Isotope scan showed the liver on the left side and the spleen on the right side of the abdomen. No Howell-Jolly bodies, which are nuclear remnants in the red blood cells, were

seen on repeated peripheral blood smear examinations. The chromosomal karyotype was normal. Obstructive jaundice was noted at the age of 3 weeks and the results of laboratory investigations suggested the presence of biliary atresia. Laparotomy at 2 months of age confirmed the intrahepatic atresia and the complete situs inversus. It also revealed a preduodenal portal vein and multiple spleens. A Roux-en-Y portoenterostomy was performed, but because of inadequate function a second portoenterostomy was necessary. The child died some hours after the operation.

The necropsy showed the complete situs inversus and the multiple malformations characteristic of the polysplenia syndrome. Both lungs were bilobed and symmetrical and there was dextrocardia with atrial and ventricular septal defects, transposition of the great vessels with double outlet of the right ventricle, and pulmonary stenosis. In addition, anomalous pulmonary venous return was also demonstrated, each pulmonary vein being connected to the corresponding lung. The inferior vena cava terminated in the azygous vein. The liver was very enlarged and bilobed, occupying the upper abdomen almost completely. On the right side, the spleen was enlarged and bilobed, and in addition four accessory spleens were present in the isthmus.

Discussion

Both asplenia and polysplenia syndromes affect all the major internal organs and are closely related. From the clinical standpoint these two disorders can be separated. In the asplenia syndrome the cardiovascular malformations tend to be more complex and severe, there is an increase in severe infection,⁹ Howell-Jolly bodies are seen in peripheral blood smears, and the spleen is absent on the scan, while the liver is central. In polysplenia the associated defects are usually less severe or may even be absent; an increased incidence of biliary atresia has been reported in these patients.¹⁰ The diagnosis can be made by demonstration of multiple spleens on the abdominal scan.

The occurrence of splenic anomalies is rare in sibships. Only eight families have been reported in which asplenia was present in more than one sib,^{4 6-8} and one family with two affected sibs with polysplenia has been reported.⁶

In the family reported here and the family described by Polhemus and Schafer,⁵ one child had asplenia and another polysplenia. All the four affected children demonstrated very similar severe cardio-

vascular defects. The close similarity of the anomalies found in four children of two families seems to be more than a coincidence, and the question arises whether the asplenia and polysplenia syndromes present in these children are secondary to a similar disturbance, most probably congenital. This disturbance leading to a failure of normal asymmetrical development could result in a bilateral symmetry of the right or the left side.

The assumption of a primary defect of laterality led Smith¹¹ to classify both syndromes as 'laterality anomalads'; laterality anomalad with bilateral right-sidedness for asplenia, and laterality anomalad with bilateral left-sidedness for polysplenia.

The mode of inheritance of both syndromes remains unclear. The possibility of a multifactorial origin of autosomal transmission has been suggested.⁶ In all instances when a sib is affected by one of these syndromes, the other sibs have to be examined not only for the same syndrome, but also for the other splenic syndrome. It seems that the best results can be obtained by abdominal scanning.

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Requests for reprints to Dr Ezra Elian, Department of Pediatrics, Hasharon Hospital, Petah-Tiqva, Israel.