Isomerism of the atrial appendages associated with 22q11 deletion in a fetus

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Abstract
There is a strong association between prenatally diagnosed structural heart disease and fetal chromosomal abnormalities. Isomerism of the atrial appendages is an exception to this because the fetal karyotype is usually normal in this condition. A case of atrial isomerism diagnosed antenatally with a normal female karyotype but with a microdeletion of chromosome 22q11 is reported.

Case report
A 19 year old primigravida was referred for a detailed fetal echocardiogram. She was about 23 weeks pregnant. There was no family history of congenital heart disease and the couple were not consanguineous.

Ultrasound imaging showed the fetal heart in the left side of the thorax and the stomach on the right side of the abdomen. This finding suggested intestinal malrotation. The left renal pelvis was dilated and polyhydramnios was present.

The fetal heart rate was 80–100 beats per minute and analysis of atrial and ventricular wall contraction indicated complete heart block. There was a complete atrioventricular septal defect (fig 1) and both great arteries arose from the right ventricle with the aorta to the right and running alongside the pulmonary artery. At the level of the fetal diaphragm there was interruption of the inferior caval vein and right sided azygous continuation (fig 2). The arrangement of the great vessels in the abdomen of this fetus suggested isomerism of the atrial appendages.

An amniocentesis was performed to establish the fetal karyotype because dilatation of the renal pelvis was also present. On G banding, the karyotype was that of a normal female 46 XX, but fluorescent in situ hybridisation (FISH) showed a microdeletion of the 22q11 region.

In view of the complex nature of the cardiac defect and the chromosomal abnormality, the mother chose to terminate the pregnancy. A complete fetal postmortem was performed.

The fetus was a female with a few dysmorphic features including mild hypertelorism, downfolding of the upper helix of the right ear, and a sacral tuft.

The thymus was not present and no ectopic thymic tissue could be found. Both lungs were bi-lobed with bronchi that were bilaterally long and hyparterial. The heart was situated in the left chest with the apex to the left. Both atria were morphologically of the left type with...
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Discussion

Isomerism of the atrial appendages and abnormalities of visceral situs during fetal life have been shown to be associated with a normal fetal karyotype.6 Also, the high incidence of recurrence in siblings and the association of parental consanguinity with atrial isomerism, supports the view that this condition arises because of various single gene defects which are recessively inherited.7,8 The chromosomal location of several of these genes has been established and some disease-causing mutations in specific genes identified.5,9

To our knowledge, this is the first reported case of atrial isomerism associated with a deletion in chromosome 22q11. A clear association between deletions in the chromosome 22q11 region and congenital heart defects, particularly conotruncal anomalies, has been reported.5,9

Chromosome 22q11 deletion is also associated with extracardiac abnormalities.10 The presence of a cardiac defect, the absence of a thymus gland, and the hypotelorism present in this fetus are features which are consistent with chromosome 22q11 deletion phenotype. Isomerism of the atrial appendages with the associated intestinal malrotation and polysplenia are not known associations. The conotruncal abnormality which was present in this fetus may be a feature of either the left atrial isomerism or of the chromosome 22q11 deletion. Thus the influence of the 22q11 deletion in the formation of the complex cardiac defect in this fetus remains unclear.

In conclusion, although the risk of aneuploidy in association with atrial isomerism remains low, chromosomal defects may occasionally present. This report reinforces the need to consider fetal karyotyping in all fetuses with a structural cardiac defect detected prenatally, especially if there are additional extracardiac abnormalities. This first reported observation of left atrial isomerism with a deletion of chromosome region 22q11 now needs further analysis to establish whether this is a consistent finding or an unfortunate coincidence.

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