Agenesis Corpus Callosum

The corpus callosum is the main transverse tract of fibres which connects the two cerebral hemispheres, thereby integrating motor, sensory and cognitive performances of the brain. The corpus callosum accounts for 11% of the weight of the supratentorial brain and carries some 180 million axons. It is made up of 4 parts. It forms in an anteroposterior direction and all 4 parts have developed by 17 weeks, however there is considerable further growth during the pregnancy and even postnatally Agenesis of the corpus callosum may be either partial or complete. It has been possible to make the diagnosis on antenatal ultrasound for some time. Features which suggest the diagnosis are:

1) dilatation of the third ventricle
2) upward displacement of the third ventricle
3) dilatation of the lateral ventricles and occipital horns giving appearance of tear drop ventricles
4) separation of the frontal horns and bodies of the lateral ventricle and a wide intrahemispheric fissure
5) a concave medial border of the frontal horns
6) absence of the septum pellucidum and corpus callosum

ACC can occur for a variety of reasons which include chromosome anomalies (trisomy 8,11,13,14,15,18), as part of a genetic syndrome (for example Aicardi, Andermann, Shapario and acrocallosal syndrome) as a result of a toxic cause for example fetal alcohol syndrome or as a result of a viral illness or a vascular lesion.

ACC is frequently associated with other anomalies (36-85% depending on series) either within the CNS or in other organ systems. Commonly associated features include hydrocephalus, Arnold chiari malformation and microcephaly. Craniofacial and limb anomalies are also common. In addition there may be cardiac and renal anomalies.

ACC can be associated with a normal outcome. Data in the literature is biased as there are few large series in which normal adults or children have been subjected to routine CT scanning. In one series of over 7000 cases from the USA they found 5 cases of partial or complete agenesis, in a normal population, an incidence of 0.069%.

Overall ACC carries a significant risk of some form of impairment. In a series of 56 cases from the UK two thirds had epilepsy; half had intellectual impairment and a third a psychiatric disorder. However 9/56 were apparently normal.

For prenatally diagnoses lesions the data is even more sparse. Gupta and Lilford suggest that an isolated prenatal lesions 85% were neurologically intact, although Vergarmi et suggested a lower figure of 35%. In the later paper the outlook appeared better in males due to the known association with Aicardi syndrome and females.

Chadie et al (France 2008) studied 20 cases of isolated ACC and found a normal outcome in 11 moderate disability in 5 and severe disability in 4 cases.
Fratelli et al (UK 2007) 35 isolated cases of which only 11 live births. 4 lost to follow up. If the lost to follow up cases were normal then the incidence of developmental delay would be 36%

Investigations for ACC.
As with all cases a careful history including a family history should be obtained. The fetus requires very careful scanning looking for any other CNS or extra CNS anomaly.
Consider a fetal echo.
Karyotyping should be offered and the cytogenetics laboratory should be aware of the clinical diagnosis. QFPCR alone is not sufficient due to the association with a variety of trisomies and other chromosome defects.
A TORCH screen should be requested.
An MRI is very valuable in confirming the diagnosis and assessing the rest of the brain.

Management
If the karyotype is abnormal counsel along the lines for the particular chromosomal anomaly.
It is very difficult to give general data for fetal outcome as such data is not available. The following loose general rules can be used as a rough guide.
Partial agenesis has a better outlook than complete.
Isolated has a much better outlook than when other anomalies are found.
Boys have a better outcome than girls.

Unfortunately this still leaves considerable uncertainly and one can only convey this to the parents and allow them to make their own decision. Advice from paediatric neurologists in this situation can be unhelpful as the majority of cases of ACC they deal with have significant handicap. This is part is as a result of ascertainment bias.

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