HEART

Editorial

Pregnancy in women with congenital heart defects: what are the risks?

Increasing numbers of people with congenital heart defects (CHD) are surviving into adulthood as a result of advances in paediatric cardiology and cardiac surgery. As this patient group enters adulthood, reproductive issues and recurrence risks become a new and crucial focus for patients, partners, and caregivers.

Maternal and fetal risk

The pregnancy related changes in intravascular volume, cardiac output, and systemic vascular resistance may result in maternal or fetal deterioration in women with CHD. Pregnancy in women with CHD, not complicated by Eisenmenger syndrome, is associated with low mortality.[1–3] However, they continue to be at risk for other cardiac complications such as arrhythmia, heart failure, or stroke. Poor maternal functional class, cyanosis, and the presence of significant aortic stenosis have been repeatedly mentioned as potential risk factors for maternal cardiac deterioration.[1–5] Maternal cyanosis is also a risk factor for fetal and neonatal complications.[1–3 5] One recent study reported a 12% likelihood of a livebirth when the arterial oxygen saturation at rest was < 85%; the livebirth rate improved to 63% when the oxygen saturation was ≥ 85%.[5] In a recent study of 252 pregnancies in women with heart disease, the following independent predictors of cardiac events were identified[3]:
- poor maternal functional class or cyanosis
- history of transient ischaemic attack or heart failure
- history of arrhythmia
- left heart obstruction
- myocardial dysfunction.

These five predictors can be combined into a risk score to predict the likelihood of maternal cardiac complications. This risk score is presently being evaluated in a prospective national study being completed in Canada.

Although the very good pregnancy outcomes reported by Genoni and colleagues[6] will be encouraging to patients who had Mustard repair as well as to their physicians, in view of the limited data available,[3 7–11] prospective studies will provide a better estimate of maternal and fetal risk. As the number of pregnant women with each complex congenital malformation are limited, prospective cohort studies examining this patient population will need to adopt a multicentre design with similar study organisation as randomised clinical trials. The prospective determination of pregnancy outcomes in women with CHD will enhance not only their preconception counselling but also their clinical care during pregnancy.

Recurrence, prenatal detection, and prevention of CHD

There are many patients with CHD who reach reproductive age and who have never had genetic assessment and counselling regarding the cause, inheritance, recurrence risk, and prenatal diagnosis options available to them. In many cases, it is pregnancy that instigates re-evaluation of their cardiac condition. Therefore, all patients with CHD should be offered genetic assessment and counselling regarding their reproductive plans.

In the genetic assessment of adults with CHD, it is crucial to obtain information regarding the patient's prenatal and postnatal history (including maternal exposure to teratogens such as alcohol, medications, rubella infection or maternal insulin dependent diabetes mellitus), to obtain a detailed family history, and to perform a thorough physical examination looking for associated major and minor congenital abnormalities.

The cause of CHD, as for other congenital abnormalities, can be divided into four categories: multifactorial, single gene disorders, chromosome abnormalities, and maternal diseases and exposure. Most CHD is inherited in a multifactorial manner. The recurrence risk is therefore empiric and is obtained by studying families with a specific type of CHD. Multifactorial disorders are isolated (not associated with other abnormalities) and in general the recurrence risk is obtained by taking the square root of the incidence in the specific population. Thus, the recurrence risk in children of parents with atrioventricular canal was found to be 10%, with tetralogy of Fallot 3%, and with transposition of great arteries 0%.[11 12] Moreover, the recurrence risk associated with obstructive left sided lesions such as hypoplastic left heart syndrome, coarctation of the aorta, and bicuspid aortic valve was found to be high (14%, 8%, and 11%, respectively).[13] The finding of a higher recurrence risk when the mother is affected raised the possibility of mitochondrial inheritance.[14] However, not all studies agree with this observation.[15]

A thorough physical examination is needed to identify patients with a single gene disorder and chromosome abnormalities. The presence of dysplastic pulmonary valve and characteristic facial features can lead to the diagnosis of Noonan syndrome which has a 50% recurrence risk. Abnormalities of the upper limbs suggest the diagnosis of Holt-Oram syndrome, which also has a recurrence risk of 50%. If the gene mutation causing such conditions has been identified, then early prenatal diagnosis can be made available to the parents.[16]

Most patients with CHD associated with a chromosome abnormality have low fecundity. However, patients with mild manifestations as well as with microdeletions such as 22q11.2 (velocardiofacial and Di George syndromes) and William syndrome (7q11.2) can reproduce, and their risk for transferring the chromosome with the deletion to the next generation is 50%. However, as in most autosomal dominant conditions, intrafamilial variability in the severity of the manifestations should be expected and discussed. The high incidence of microdeletion 22q11.2 (also called CATCH 22) in patients with conotruncal abnormalities has led us to perform FISH analysis for 22q11.2 in adults with

these cardiac lesions as well as fetuses with CHD when no other chromosome abnormalities could be detected.

Prenatal diagnosis should be discussed with all patients with CHD. Their diagnostic options will depend on the diagnosis. When no specific cause is found, fetal echocardiography at 18–20 weeks' gestation is recommended (some lesions can be detected as early as 14 weeks' gestation). When a specific chromosome abnormality, microdeletion or gene mutation is identified, invasive prenatal testing, such as chorionic villus sampling or amniocentesis should be discussed and the risks and benefits associated with each procedure should be outlined.

Although treatment and detection of CHD are important, prevention of these lesions is possible and should be discussed with all couples contemplating pregnancies. Rubella immunisation should be checked, exposure to teratogens and, in some cases, finding a substitution (such as switching from warfarin to heparin in the beginning of the pregnancy), and preconception control of insulin dependent diabetes mellitus should be pursued. The recent finding that preconception consumption of multivitamins including folic acid substantially decreases the incidence of CHD emphasises the importance of this treatment in preventing CHD as well as other congenital abnormalities.[17]

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