Chapter 15

Cordocentesis

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Access to the fetal circulation was originally achieved by exposing the fetus at the time of hysterotomy [1]. Subsequently with the development of fibreoptics, fetoscopy was used to visualise and sample vessels on the chorionic plate [2] and the umbilical cord [3]. More recently, improvements in imaging by ultrasonography have made fetoscopic guidance unnecessary and fetal blood can be obtained by ultrasound guided puncture of the fetal heart (cardiocentesis; [4]), intrahepatic umbilical vein (hepatocentesis; [4]) or an umbilical cord vessel (cordocentesis; [5]). Currently the most widely used method both for fetal blood sampling and transfusion is cordocentesis.

Technique

Cordocentesis can be performed by a single operator in an outpatient setting in the ultrasound department without need for maternal fasting, sedation, antibiotics, tocolytics or fetal paralysis [6]. However, various centres use different techniques, which may include: maternal hospitalisation, fasting and sedation; pre- and/or postoperative administration of antibiotics and tocolytic agents; fetal paralysis by the intravascular or intramuscular administration of a variety of neuromuscular agents; ultrasound guidance by a radiologist and needle insertion by an obstetrician; the use of an ultrasound transducer with needle guides; or needles of varying length (8–15 cm) or gauge (20–27).

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In our centre the woman's husband is encouraged to be present during the procedure, and counselling of the parents includes discussing the risks of an affected pregnancy and the available options for further management. The procedure of cordocentesis, including its limitations and potential complications, is explained and a detailed ultrasound examination is performed for fetal biometry and the diagnosis of fetal malformations.

In cases where the placenta is anterior or lateral, the needle is introduced transplacentally into the umbilical cord. When the placenta is posterior, the needle is introduced transamniotically and the cord is punctured close to its placental insertion. The umbilical cord vessel sampled can be identified as artery or vein by the turbulence seen ultrasonically when sterile saline (200–400 μl) is injected into the vessel through the sampling needle.

The volume of fetal blood removed will depend on the gestation and the indication for sampling, but in general is 1–4 ml. In addition to prenatal diagnosis, standard investigations include blood film and Kleihauer–Betke testing, blood gases and karyotyping.

Risks

Maternal complications should be negligible, although there is one reported case of amnionitis and life-threatening adult respiratory distress developing after two attempts at cordocentesis involving a total of eight needle insertions [7]. Risk of fetal death after cordocentesis depends on the indication for blood sampling and the experience of the operator. In a series of 928 cases sampled in our unit for prenatal diagnosis of genetic diseases, or for karyotyping in cases of minor fetal malformation, there were 10 fetal deaths or spontaneous abortions within two weeks of cordocentesis. In addition there were nine deaths 4–20 weeks after cordocentesis; these losses are unlikely to be the result of the procedure. The risks are higher when the mother is obese, the placenta is posterior and the gestation at sampling 16–19 weeks rather than later.

Indications

The main indications for cordocentesis are prenatal diagnosis of inherited blood or metabolic disorders, detection of fetal infection, karyotyping of malformed fetuses, karyotyping and determination of the acid–base status of small-for-gestational-age (SGA) fetuses, and assessment and treatment of red cell isoimmunised and thrombocytopenic pregnancies.

Prenatal Diagnosis of Blood Disorders

In the 1970s and early 1980s the main indications for fetal blood sampling were prenatal diagnosis of the haemoglobinopathies and genetic defects affecting haemostasis [8,9]. Recently the application of recombinant DNA techniques to