Ablation of acardiac twin by alcohol injection into the intra-abdominal umbilical artery

Waldo Sepulveda, MD, Sarah Brewer, MD, Jamiyah Hassan, MD, and Nicholas M. Fisk, PhD

Background: Twin reversed arterial perfusion sequence is a rare complication of monochorionic twinning, in which the normal pump twin perfuses the abnormal acardiac twin in a reversed fashion via an artery-to-artery placental anastomosis. Mortality in the normal twin exceeds 50% as a result of preterm labor, polyhydramnios, and congestive heart failure.

Case: A twin pregnancy complicated by the twin reversed arterial perfusion sequence developed early hemodynamic decompensation in the pump twin with increasing size of the acardiac twin. Ablation of the acardiac twin at 23 weeks' gestation was achieved successfully by injecting 1 mL of absolute alcohol into the intra-abdominal portion of the single umbilical artery.

Conclusion: Direct ultrasound-guided intravascular injection of absolute alcohol is an easy and straightforward technique to occlude circulation to the acardiac twin. This vessel can be identified easily by color Doppler ultrasonography away from the main venous trunk. Selection of this target, rather than occlusion at the level of the umbilical cord, could reduce the risks of cord accidents and inadvertent intravenous injection of the ablative material. (Obstet Gynecol 1995;86:680–1)

Twin reversed arterial perfusion sequence is a unique complication of monochorionic twinning, in which paradoxical perfusion by the normal pump twin of the perfused twin results in partial or complete lack of heart development.1 It is associated with a 55% mortality rate for the normal twin, mainly as a result of preterm labor, polyhydramnios, and congestive heart failure.1,2 Therefore, occlusion of the circulation to the acardiac twin has been recommended to improve perinatal outcome of the pump twin.

Several aggressive maneuvers have been described, including hysterotomy with selective delivery of the perfused twin,1 fetoscopy for ligation or laser coagulation of the umbilical cord,3 and ultrasound-guided needling to block umbilical cord circulation with coils or quick-setting gels.5 Selective delivery is highly invasive, requires aggressive tocolytic therapy, and is associated with serious obstetric complications, including placental abruption, preterm delivery, and rupture of membranes. Fetoscopic techniques, although less invasive than hysterotomy, are technically more difficult, require expensive equipment and highly skilled operators, and are associated with high procedure-related loss rates. Ultrasound-guided needling techniques of the umbilical cord are simpler but are frequently followed by intrauterine death of the pump twin because of cord accidents or recanalization of the cord. We describe the use of direct intravascular injection of absolute alcohol to ablate an acardiac twin.

Case Report

A 20-year-old primigravida had a single intrauterine death diagnosed in a twin pregnancy at 17 weeks' gestation. Ultrasonography showed that the surviving twin was structurally normal with a biometry consistent with dates; the dead twin was grossly hydropic, measured 4.5 cm in length, and had no cardiac activity. On referral at 21 weeks’ gestation, detailed ultrasonographic examination showed continued growth of the suspected dead twin to 8.0 cm. In addition, a severely microcephalic skull, cystic hygromas with generalized edema, and a short and underdeveloped spine were found; the heart, stomach, and upper limbs were absent. Color Doppler ultrasonography (Acuson 128XP/10; Acuson, Mountain View, CA) confirmed the suspicion of the twin reversed arterial perfusion sequence by demonstration of reverse flow within the cord and fetal aorta. Detailed evaluation of the pump twin, including fetal echocardiography and amniotic fluid assessment, was normal. At 23 weeks’ gestation, the normal twin showed polyhydramnios, mild pericardial effusion, and umbilical vein dilation. In addition, the acardiac twin was bigger, measuring 11.0 cm with increasing skin edema. These features were consistent with early signs of hemodynamic decompensation of the pump twin, and intervention to occlude blood supply to the acardiac twin was considered the best option.

After written, informed consent, a 20-gauge needle was directed to the main intra-abdominal portion of the acardiac twin’s single umbilical artery under color Doppler ultrasonographic control. After fetal blood was aspirated for pH, gases, and karyotype, 1 mL of absolute alcohol (Martindale Pharmaceuticals, Essex, UK) was injected, resulting in immediate interruption of the supplying arterial flow with localized “white-out.” The entire procedure took less than 10 minutes, and there was no effect on the heart rate or umbilical Doppler waveforms in the pump twin. Analysis of fetal blood revealed pH 7.348, oxygen pressure 24.0 mmHg, carbon dioxide pressure 39.0 mmHg, and a normal female karyotype. A follow-up scan the next day confirmed the absence of blood flow in the acardiac twin and normal blood flow velocity waveforms in the pump twin. Polyhydramnios and cardiac insufficiency resolved over the following week, with the size of the acardiac twin decreasing to 8.0 cm.

Eleven days after the procedure, the patient presented with...
clinical signs of chorioamnionitis. Rupture of membranes during admission led to preterm delivery of a normal twin weighing 740 g and a macerated acardiac twin weighing 136 g. Histopathologic examination revealed an edematous acardiac female fetus with a cranial cavity containing brain tissue, pharynx with tongue, and tubular intestinal tissue and structures within a central trigonal cavity including gonads. The placenta was monochorionic-diamniotic, and there was a thrombosed single artery supplying the acardiac fetus but no patent vein. The cord of the normal twin had a velamentous insertion, and there were single artery-to-artery and vein-to-vein superficial anastomoses on the placental surface. Acute chorioamnionitis and focal intervillitis were present. The pump twin was admitted to the neonatal intensive care unit and was discharged on day 77 weighing 1620 g. No embolism-related phenomena were found or suspected in the surviving twin.

Discussion

Our technique of direct intrafetal intravascular injection of absolute alcohol is a modification of that described originally in a letter by Holzgreve et al (N Engl J Med 1994;331:56–7), in which they injected alcohol-soaked suture material through an amniocentesis needle into the umbilical cord, with similar results at 21 weeks gestation. Although not stated in that letter, ablative injections must be given intrarterially to obliterate the paradoxical supply to the acardiac twin because intravenous injection may affect the healthy twin. Because the umbilical artery and vein are very close together and may be difficult to distinguish within the markedly abnormal cord of an acardiac twin, we chose instead to inject the intra-abdominal continuation of the single umbilical artery and therefore the main feeding vessel of the parabiotic tissue. This approach was selected for several reasons. First, this vessel can be identified easily by color Doppler ultrasonography away from the main venous trunk, avoiding an intravenous injection. Second, needleling the intra-abdominal portion of the feeding vessel rather than the umbilical cord obviates the risk of cord accidents, such as rupture or bleeding, especially in the abnormally short and tiny cord of the acardiac twin, which is also difficult to differentiate from the anastomotic vessel. Third, the technique is similar to the one used for fetal blood sampling at the level of the intrahepatic vein, which, in our experience, is an easy procedure and does not require any additional equipment or operators.

An additional modification in our technique was the use of direct alcohol injection without suture material. Our initial intention was to use the technique of Holzgreve et al, but we experienced several difficulties in preparing this mixture; multiple pieces of ethanol-soaked silk could not be expelled from standard syringes, and direct insertion of suture segments into 20-gauge amniocentesis needles resulted in coiling within the hub on flushing. Absolute alcohol is a known vessel sclerosant and has been widely used to interrupt blood supply to renal, cerebral, and gastrointestinal lesions in humans without causing tissue damage remote from the target organ. Thus, it may be that the technique of Holzgreve et al was successful as a result of injection of alcohol rather than as a result of injection of the thrombogenic pieces of suture material.

We confirm that ultrasound-guided injection methods have advantages over the more complex techniques of cord ligation or ablation, but we suggest that direct fetal intravascular injection of alcohol alone may be safer and simpler.

References


Address reprint requests to:
Waldo Sepulveda, MD
RPMS Institute of Obstetrics and Gynecology
Queen Charlotte's and Chelsea Hospital
Goldhawk Road
London W6 OxG
United Kingdom

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