Successful ablation of acardiac twin with Histoacryl

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Introduction

An acardiac-twin pregnancy occurs very rarely, only in 1:35,000 deliveries and in one in 100 monozygotic twins [1]. The twins are always monochorionic. The pathomechanism of the acardiac-twin formation lies in the preexistence of arterio-arterial anastomosis, either on the surface of the placenta or in the placental arterial system, or more rarely as a direct connection of the fetal umbilical cords [2]. Thus, the acardiac twin does not have its own placenta, and the arterial pressure of one twin overpowers that of the other twin. It is rare, but for the healthy fetus, a very serious complication. The acardiac twin does not have its own heart pump, and its function is overtaken by the healthy sibling with all the circulation consequences on it. The blood flow of the acardiac twin is then reversed. The whole mechanism creates a so-called twin-reversed-arterial-perfusion sequence. In most cases, the head and upper body of the acardiac twin do not develop. The healthy fetus develops arterial-steal phenomenon with the development of cardiac insufficiency, polyhydramnion, and consequently heart failure.

The mortality rate of the pumping twin is more than 50% [2]. Today, we have several therapeutic possibilities. The treatment of choice is selected according to the week of the pregnancy and the level of development of each of the mentioned pathomechanism. At hand, we have the possibility of pregnancy termination, expectation management, intrafetal ablation, or interventional anastomosis sclerotherapy (alcohol ablation, thermal ablation, laser ablation, bipolar coagulation). Several new techniques, like radiofrequency ablation, are being investigated, but more studies are needed to prove their safety and efficacy [3]. Based on these reports, we have tried to treat the condition of acardiac-twin pregnancy by, in other medical fields, a well-tried method. We have used TissueSeal’s Histoacryl (B-Braun, Bratislava, Slovakia) in order to occlude the circulation of the acardiac twin and interrupt the twin-reversed-arterial-perfusion sequence. Histoacryl is used as a tissue seal for wound closure or for vessel closure by interventional radiologists. It consists of monomeric n-butyl-2-cyanoacrylate, which polymerizes quickly in connection with tissue fluid.

Case Report

We have diagnosed an acardiac twin in the 12th week of pregnancy in a 35-year-old patient, gravida 2, para 1, with biamnionic monochorionic twin pregnancy. The patient, after being fully

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consulted and informed, decided to continue the pregnancy. Further ultrasound examinations revealed that the acardiac twin did not develop head, skull, and upper extremities. The stomach was absent and the trunk absent due to want of multi-septal hygroma. Until the 17th week, the healthy fetus did not show signs of fetal distress. We have performed prenatal echocardiography of the “pumping fetus” in the 20th week of the pregnancy. It has developed myocardial hypertrophy and pericardial transudate. Because of the presumed development of chronic fetal hypoxia and consequently congenital heart failure in the 21 weeks + 5 weeks of pregnancy, after fully informing the mother about the status of the fetus, we have performed intrauterine intervention by intra-arterial ablation of the acardiac twin. As the ablation material, we have used 0.3 mL of TissueSeal’s Histoacryl, diluted by 6:1 ratio with a diluting liquid (Lipiodol Ultra Fluid, GUERBET, France). Under ultrasound guidance, we have inserted a 22-gauge needle into the acardiac-twin main feeding umbilical-cord vessel. We have then applied the ablating material in 5% glucose during 30 seconds. Glucose was used, because in contact with saline or other material, the tissue glue agglutinates. Consequently, after the application of the material, the blood flow of the acardiac twin has stopped immediately. At the same time, the healthy twin did not show signs of increased distress and had normal heart rate. The whole procedure took 12 minutes. Further observations of the pumping twin showed normal heart rate and Doppler flowmetry. The patient was released from the hospital after 2 days of follow-up with planned outpatient visits. In the following weeks, the heart function of the healthy fetus restored, including the pericardial transudate. The fetus grew in physiological margins. Meanwhile, the acardiac twin showed signs of mummification and slow shrinking, with no influence on the healthy fetus. The amniotic-fluid volume of the acardiac twin reduced continuously (Figure 1). In the 33rd week of pregnancy, 11 weeks after the intervention, the fetus showed signs of distress, and pathological levels of umbilical-blood-flow indexes with signs of fetal blood-flow centralization. Therefore, after the corticoid lung preparation of the fetus, we have performed delivery by Cesarean section in the 33 weeks + 5 weeks of pregnancy. The female baby was healthy, weighing 2380 g, with Apgar score 9/10, umbilical blood pH 7.22, with base excess 4.6 mmol/L. The acardiac female fetus resembled a mummified mass weighing 300 g (Figure 2A). The X-ray examination of the acardiac fetus with placenta revealed foci of Histoacryl in the umbilical cord of the acardiac twin (Figure 2B). Nine months after the delivery, the surviving child is doing well with no signs of related embolic phenomenon.

Discussion

Several attempts have been made to occlude the umbilical artery of the acardiac twin, including fetal ablation or interventional anastomosis closure (e.g., laser ablation, alcohol ablation, thermoablation) [4]. This case has shown a different possibility of invasive intrauterine treatment approach to acardiac twins with a tissue-sealing material. We have tried this technique because of its presumed safety, simplicity, and experience in treating adult-patient conditions by interventional radiologists. Since our institution is a tertiary medical university center, under our laws, we did not need an agreement from the regional ethics committee. However, the patient had to sign a detailed informed consent, and was fully acknowledged before the intervention. Even though the golden standard in these cases is considered laser ablation, it cannot be used in every patient [5]. In each case, an individual approach and management are necessary. In order to prevent preterm premature rupture of membranes after fetal ablation, mini-invasive techniques have to be selected. For laser techniques, a relatively big insertion into the intra-amniotic space is needed, which is associated with a higher risk of preterm premature

Figure 1. Magnetic-resonance-imaging scan of the healthy and acardiac fetus after ablation.

Figure 2. (A) Acardiac fetus with placenta after delivery. (B) X-ray picture with hyperechogenic places of Histoacryl.
rupture of membranes [5]. Therefore, we have chosen the 22-gauge needle and the application of TissueSeal’s Histoacryl as the least invasive type of procedure. Furthermore, the acardiac twin can be developed into several different types, and according to this, the appropriate technique and approach have to be selected [3,6]. We think that, in case of intervention, the decision has to be made as early as possible and the intervention performed in the earlier weeks of the pregnancy. This way, we can avoid some specific complications associated with acardiac-twin feticide [7,8]. Some authors describe umbilical-cord transection to be effective in these cases [9]. However, we think that these approaches mean too big interventional and represent a high risk for the course of the pregnancy. Ville [5] describes a high percentage of failure when using this laser ablation, even though it is considered to be the standard care of therapy. In order to minimize the risks, we have used a “tissue-sealing” material, Histoacryl. The material has appropriate qualities for vascular closure and even for amnion-defect closure [10]. The extremely fast complete closure of the acardiac-fetus vascular system even prevented blood-steal phenomenon from the healthy fetus. There are no data about using Histoacryl in the treatment during pregnancy. However, it is a widely used material by interventional radiologists for ablation of tumors and in surgery as wound closure [11]. Its price is €75, and it is fully covered by health insurance.

According to our experience, it seems that Histoacryl is also a suitable material for the ablation of an acardiac twin and for the safety of the mother. However, further experience is needed in order to prove its efficacy.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

References