
CASE REPORT**Anaesthetic considerations for foetal intervention in the radiological suite:
A case report**

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Abstract

Maternal-foetal surgery is an expeditiously evolving specialty and huge progress has been made in it over the past few years. Twin reversed arterial perfusion sequence also known as “acardiac malformation” is a rare complication of twin monochorionic multiple pregnancies. One twin is acardiac and the other phenotypically normal twin drives blood through twin fetal circulations. It is called reversed perfusion because in the acardiac twin, blood flows in a reverse manner. Here, we present a case of minimally invasive fetal intervention that was successfully managed in the radiological suite itself which we believe is the first case to be reported in the literature.

Keywords: Fetal Intervention, Radiofrequency Ablation, Twin Reversed Arterial Perfusion Sequence

Introduction

Foetal medicine is a new upcoming subspecialty where fetus is the patient and ultrasound scan is the main tool for examining the fetus [1]. Over the last three decades, advances in early diagnosis of foetal anomalies, imaging and surgical techniques have led to a huge expansion in fetal surgery. Foetal surgeries, involving high-risk anaesthesia for the mother and fetus are performed only in a few special centres where the anaesthesiologist plays an integral role [2]. While pregnancy if associated with pathological conditions poses additional challenges [3], fetal surgery/intervention constitutes some unique challenges in different ways. In addition to obstetric anaesthetic considerations, anaesthesiologist needs to be conversant with tocolytic methods as well. Providing fetal analgesia is an added challenge that may be required for some procedures [4]. Twin Reversed Arterial Perfusion (TRAP) sequence, also known

as acardiac malformation, is a unique complication of monochorionic multiple pregnancy in which one of the twins lacks a complete cardiac structure called (“acardiac”) while a morphologically normal co-twin (called “pump twin”) supplies both circulations. The main goals in the management of the TRAP sequence are preserving the survival of the pump twin and reaching the term for delivery. Techniques of choice to interrupt the vascular supply to the acardiac twin include ultrasound-guided laser coagulation, and Radiofrequency Ablation (RFA). RFA is a latest and minimally invasive procedure for management of TRAP sequence [5]. Foetal surgeries are usually performed in special centers. However, our case was done in a non-operating room setting with finite resources. To the best of our knowledge, this is the first case of foetal intervention done in a radiological suite.

Case Report

A 25-year-old primigravida (27 weeks + 6 days of gestational age) with Monochorionic Diamniotic (MCDA) twin pregnancy with TRAP sequence, posted for ultrasound-guided RFA in radiology suite. Patient was in euthyroid state with daily dose 100 mcg of eltroxin without any other comorbidity. Airway examination revealed an MPC class of 3 with short neck. Sub arachnoid block was given with 11 mg of 0.5% heavy bupivacaine and 20 mcg fentanyl. The level of blockade achieved was T6. Vitals were maintained with left uterine displacement, IV fluids and continuous meticulous monitoring. Ultrasound-guided RFA of the TRAP vasculature was successfully performed without any adverse event.

Discussion

There are 3 main categories of maternal–foetal interventions namely minimally invasive maternal–foetal interventions, open maternal–foetal surgeries, and Ex-Utero Intrapartum Treatment (EXIT) procedures. Among these, minimally invasive maternal–foetal intervention is the most commonly performed technique and is typically done in early or mid-gestation. It includes either purely ultrasound-guided procedures or foetoscopic interventions in which trocar is placed through the uterus into the amniotic cavity under ultrasound guidance. In our case, the former one was performed in a Non-Operating Room Anesthesia (NORA) setup.

Recently, NORA has grown in leaps and bounds. The unique challenges posed include new working environment, limited working space and patient access, lack of resources and personnel. Maintaining normal maternal physiology, optimizing utero-placental perfusion, and avoiding foetal asphyxia form the cornerstones in anesthetic management of a parturient. A recent retrospective study conducted in an exclusive foetal centre by

Ferschl *et al.*, (2020) observed that monitored anesthesia care with local anesthesia was superior to spinal anesthesia in terms of reduced preincision operating room time and lesser maternal hemodynamic disturbances [6]. Nevertheless, we preferred spinal anesthesia in our patient as the interventional radiologist wanted a “still patient” because an anxious mother or a mobile foetus could potentially displace the RFA needle resulting in bleeding, foetal trauma, or compromised umbilical circulation resulting in foetal death. Also, he was anticipating a technical difficulty with prolonged procedural duration. Few other compelling reasons were to avoid polypharmacy and its undesirable effects, risks of gastric aspiration, and intubating a potentially difficult airway in a parturient that too in a NORA setting in case of conversion to GA.

Though pituitary–adrenal, sympathoadrenal, and nociceptive components of the stress response are present by 19 weeks of gestation, thalamocortical projections emerge around 24 weeks only [7]. Current neuroscientific evidence supports the possibility of foetal pain even before the cut-off of 24 weeks which was arrived at as per the “consensus”. This is because the thalamic projections into the subplate emerging around 12 weeks gestation are functional and equivalent to thalamocortical projections itself [8]. Foetal anaesthesia serves other purposes including inhibition of foetal movement, prevention of hormonal stress responses, prevention of possible adverse effects on long-term neurodevelopment and ensuring profound uterine relaxation [7].

It is important to note that the umbilical cord and placenta have no known pain receptors and procedures that only involve these tissues do not require foetal administration of analgesics. So, most minimally invasive foetal interventions are performed with local anesthetic infiltration, with or

without maternal sedation. Neuraxial techniques or general anesthesia may be necessary depending on the number and size of port sites, anticipated patient position, surgeon preference, and maternal comorbidities, such as aspiration risk, severe anxiety, and inability to tolerate the supine position with uterine displacement for the length of the procedure. Only minimal-to-moderate sedation should be used in either monitored anesthesia care or neuraxial anesthesia to preserve airway reflexes and maintain a level of consciousness so the patient can be directed to reposition herself or hold still during the procedure.

Although preoperative tocolytics may be administered, profound intraoperative uterine relaxation is not necessary for minimally invasive procedures, and maternal administration of sedatives and analgesics only provides limited fetal analgesia via transplacental transfer [7]. The fetus depends on uteroplacental support, and during fetal surgeries, preserving the uteroplacental circulation by

maintaining maternal hemodynamics, achieving adequate uterine relaxation, preserving appropriate intrauterine fluid volume, and avoiding uterine contractions are critical [7]. According to our experience, anaesthesia for RFA of TRAP sequence can be planned under regional anaesthesia, even though general anaesthesia may be required in certain cases. Maternal postoperative analgesia can be considered especially for more invasive procedures like open maternal-foetal surgeries or EXIT procedures.

Conclusion

Successful accomplishment of foetal interventions requires multidisciplinary team effort with detailed pre-procedural planning and discussion among team members. This should focus on choice of anaesthesia, type of intervention and duration, post-operative analgesia, pre-operative maternal history including uterine activity, and the preference of the proceduralist.

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