

Spinal anesthetic for emergency cesarean section in a parturient with uncorrected tetralogy of Fallot, presenting with abruptio placentae and gestational hypertension

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Abstract

A subarachnoid block is an effective way of providing anesthesia for cesarean sections. However, it can be considered relatively contraindicated in parturients with uncorrected tetralogy of Fallot (TOF). We report a case of a 22-year-old female patient with TOF and gestational hypertension, who presented for an emergency cesarean section for placental abruption. The surgery was successfully conducted under a spinal anesthetic with a combination of low dose bupivacaine and fentanyl. Fentanyl combined with small-dose bupivacaine in the subarachnoid space can be considered as an alternative technique to general anesthesia, in selected parturients with uncorrected TOF presenting for cesarean section, especially in cases where the risks of administering a general anesthetic are deemed high.

Key words: Spinal anesthetic, tetralogy of Fallot, gestational hypertension, obstetric, heart defects, congenital

Introduction

Cesarean delivery in a pregnant patient with tetralogy of Fallot (TOF) who has not undergone corrective surgery, or one who has had definitive surgery, but continues to harbor residual defects, poses a significant challenge in the perioperative period for the anesthesiologist. Regional anesthesia, if opted for in these patients, must be established gradually. Single-shot spinal anesthesia has traditionally been relatively contra-indicated due to the fear of suddenly reducing the systemic vascular resistance (SVR), which may increase the right-to-left shunt across the ventricular septal defect (VSD) resulting in worsening of hypoxemia. We report the management under spinal anesthesia, of a parturient who had TOF with gestational hypertension and came for emergency cesarean section for abruptio placentae.

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Case Report

This is a case report of a 22-year-old primigravida who was admitted to the hospital at 30 weeks of gestation, with a one-day history of labor pains and occasional bleeding per vaginam for 6 h. She was diagnosed to have TOF during antenatal visit in her 2nd month of pregnancy, but was lost to follow-up after that evaluation. Her echocardiogram at the previous visit had revealed the presence of TOF with a large conotruncal VSD of 2 cm, overriding of the aorta and infundibular pulmonic stenosis. The right ventricular outlet tract gradient was 90 mmHg and had a right-to-left shunt. Throughout her period of pregnancy she did not have any complaints and had no episodes of cyanotic spells. On admission, she had moderate dyspnea of New York Heart Association class II. She was detected to have gestational hypertension. There was productive cough of one week duration. Examination revealed pallor, bilateral pitting pedal edema and grade 2 clubbing in all fingers and toes. Her heart rate was 90/min and blood pressure (BP) 140/98 mmHg. Her oxygen saturation (SpO₂) on room air was 95%. There was parasternal heave and a palpable systolic thrill in the left parasternal area. A harsh pansystolic murmur was there, more prominent in the lower left parasternal border, with intensity of grade 4 and it was radiating to all areas. She also had harsh vesicular breath sounds in the right lower infrascapular and infraaxillary areas. She had cephalic presentation with unengaged head and intermittently contracting uterus. There was minimal bleeding

per vaginum. Investigations carried out included a complete blood picture which showed hemoglobin of 10.6 g/dL, a platelet count of 1.2 lakhs/mm³ and an INR of 1.1. She was taken to the operation theatre for emergency cesarean section with suspected abruptio placentae. The fetal heart rate was 110-130/min. On the operating table, pulse rate was 98/min, non-invasive BP 148/92 mmHg and room air saturation 95%, which improved to 100% with oxygen by mask. In view of the respiratory infection, we planned a subarachnoid block with low-dose local anesthetic and opioid combination since the coagulation profile was normal. This was performed under aseptic conditions after confirming the fetal heart rate once again, with a 25G Quincke needle using injection bupivacaine hyperbaric 0.5%, 1.2 ml and injection fentanyl 25 µg. 4 min after institution of the spinal anesthetic, a sensory level of D8 to pin prick was achieved and surgery commenced with a Pfannenstiel incision. She was extremely anxious and heart rate went up to 120/min, with a concomitant decline in SpO₂ to 88% despite the administration of 60% FiO₂ via a venturi mask. Following administration of a fluid bolus of 300 ml and injection fentanyl 30 µg, the sensory level was re-checked and found to be at D5, about 12 min after the subarachnoid block. The heart rate and saturation improved following these maneuvers. A live preterm male baby was delivered 15 min following administration of the spinal anesthetic, with uterine incision delivery time of 30 s and had Apgar scores of 6 and 9 at 1 min and 5 min respectively. Intra-operatively, there were intermittent episodes of hypotension and concomitant desaturation. These were managed with intermittent boluses of injection phenylephrine 100 µg. She had retroplacental clots of about 200 ml. Total blood loss during the surgery was 500 ml and duration of surgery was 50 min.

Post-operatively, the patient was shifted to a high dependency unit, positioned propped up and administered oxygen with FiO₂ of 60% via a venturi mask. She was transfused one unit of packed red blood cells and was hemodynamically stable. A post-operative echocardiogram revealed the same findings as on the previous study carried out 5 months earlier. Her post-operative period was otherwise unremarkable and she was discharged on the 10th post-operative day.

Discussion

The tetrad of TOF consists of a large VSD, a dextroposed aorta which overrides this defect to varying degrees, a pulmonary outflow obstruction which may be infundibular or valvular or both and right ventricular hypertrophy. The size of the defect, the extent to which the aorta is dextroposed, the degree to which there is an obstruction to pulmonary blood flow and the dynamic changes after birth

vary tremendously. Combinations of these variations result in congenital heart lesions with various clinical pictures, yet all bear the designation of TOF. There are many case reports and a limited number of case series^[1,2] dealing with obstetric and cardiac considerations of parturients with TOF during pregnancy, labor and delivery. These include patients with unoperated, palliated, incompletely repaired and completely repaired TOF. Occasionally women with undiagnosed TOF may also present for obstetric management. However, a surprisingly limited number of these publications actually dwell on the anesthetic management of these high-risk parturients presenting for labor and delivery. A recent case series dealt with the anesthetic management and pregnancy outcomes of parturients with surgically repaired TOF,^[3] but such data for unrepaired TOF are scanty. These patients with unrepaired TOF could become pregnant, are at increased risk of fetal loss, have greater incidences of fetal malformations and more chances of developing adverse outcomes such as cardiac failure, arrhythmias and reduced contractile function of the right ventricle in addition to the risks of cyanosis and cyanotic spells. Naguib *et al.*^[4] in their study have reported that the hemodynamic load characteristic to the pregnant state, along with cardiac structural changes, account for about 7% of all adverse events, especially dilatation and decreased function of the right ventricle, with a greater occurrence of ventricular or supraventricular tachyarrhythmias.

With an uncorrected TOF, the classical anesthetic goals are maintenance of SVR and avoidance of decrease in peripheral vascular resistance as these changes could potentially increase the pre-existing right-to-left shunt. In our patient, who presented for an emergency cesarean section, however, we also had to contend with a co-existing respiratory tract infection and a “bad” chest condition, which prompted our decision to opt for a regional technique, to avoid if possible, mechanical ventilation induced respiratory complications. While general anesthesia would traditionally be considered the favored technique in patients with TOF, any hypoxia, hypercarbia, acidosis or hypothermia resulting therefrom as also the effects of intermittent positive pressure ventilation, could decrease pulmonary blood flow, by increasing pulmonary vascular resistance (PVR). In a patient with an active lower respiratory tract infection, the potential for triggering undesirable airway sequelae, such as a bronchospastic episode during airway manipulation is always there. Any such episode in a cyanotic patient might result in a degree of hypoxemia difficult to manage. Furthermore, a decrease in SVR could also result from the effects of the anesthetic drugs administered as part of a general anesthetic regimen. Hence, we opted for a spinal anesthetic with a combination of “low-dose” bupivacaine (6 mg) along with fentanyl (25 µg) to minimize

the subsequent fall in SVR. Such a regimen is routinely used at our Institute for many high-risk parturients presenting for cesarean deliveries and generally serves us well. A spinal anesthetic in this case, also allowed minimal alterations in ventilation perfusion relationships and did not result in any increase in PVR. Along with a strategy of volume loading and intermittent phenylephrine boluses, it helped us manage the right to left shunting effectively, although we did have a few episodes of hypotension and desaturation, resulting from worsening of the shunt. A graded epidural anesthesia, might potentially, have avoided these episodes, but was precluded by the emergent nature of the surgery. Our patient had a room air SpO₂ of 95% and we presume she had a less severe form of TOF. We believe that in such patients, with less severe TOF, a regional anesthetic with preservation of spontaneous respiration and consequently, minimal interference with the complex ventilation-perfusion interactions in these patients, might have its advantages. In parturients having significant cardiac lesions, the decision to implement invasive hemodynamic monitoring should be dictated by her current cardiopulmonary status, the anticipated mode of delivery and anesthetic regimen opted for. The patient had tolerated the right-to-left shunting without any significant decompensation for the entire duration of her pregnancy and her baseline SpO₂ of 95%, did not suggest very severe shunting. In view of all this and the emergent nature of the surgery, we preferred to go in without invasive monitoring. While routine use of invasive monitoring in these patients might well have its proponents, a clear understanding of the pathophysiology, risk stratification and anticipation and recognition of critical events are pivotal to proper management

of these high risk cases. We admit however that whether pregnant women with more severe forms of TOF can tolerate the anesthetic technique described here is something that requires further study.

Conclusion

A subarachnoid block with a low dose local anesthetic-opioid combination, may be a simple, quick, safe and effective alternative to a general anesthetic for a very high-risk parturient with uncorrected TOF and multiple obstetric problems, requiring an elective or emergency cesarean section and may be considered by anesthesiologists in carefully selected patients.

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