Cardiology in the Young

cambridge.org/cty

Continuous spinal anaesthesia for partial gastrectomy in an adult patient with unrepaired tetralogy of Fallot

Joana S. Corda Teixeira[1], Mariana J. D. Correia[1], Andrea Haas[1] and António Tralhão[2]

[1]Department of Anesthesiology, Centro Hospitalar de Lisboa Ocidental EPE, Lisboa, Portugal and [2]Department of Cardiology, Centro Hospitalar de Lisboa Ocidental EPE, Lisboa, Portugal

Brief Report

Cite this article: Corda Teixeira JS, Correia MJD, Haas A, and Tralhão A (2019) Continuous spinal anaesthesia for partial gastrectomy in an adult patient with unrepaired tetralogy of Fallot. *Cardiology in the Young* **29**: 845–846. doi: 10.1017/S1047951119000994

Received: 22 September 2018
Revised: 18 March 2019
Accepted: 9 April 2019
First published online: 4 June 2019

Key words:
Tetralogy of Fallot; cyanotic congenital heart disease; continuous spinal anaesthesia; gastrectomy

Author for correspondence:
J. S. C. Teixeira, Department of Anesthesiology, Centro Hospitalar de Lisboa Ocidental EPE, Avenida Almirante Reis, nº100, 6ºesq, 1150-022 Arroios, Lisboa, Portugal. Tel: +351964675271; E-mail: joana.corda@gmail.com

Abstract

Correction of tetralogy of Fallot during infancy usually eliminates the risks associated with general anaesthesia. In rare cases of uncorrected defects persisting into adulthood, anaesthetic management during non-cardiac surgery may therefore be challenging. We describe the use of continuous spinal anaesthesia to successfully circumvent the operative risk of major abdominal surgery in an adult patient with uncorrected tetralogy of Fallot.

Tetralogy of Fallot (TOF) represents 3–9% of all cyanotic congenital heart disease, with an incidence of 3–6 per 10,000 births. The majority of these infants will undergo surgical repair. However, some patients may reach adulthood with uncorrected defects. If non-cardiac surgery is required, anaesthetic management may prove to be challenging, thus creating the need for a lesser risk strategy. We describe the use of continuous spinal anaesthesia (CSA) for partial gastrectomy in a patient with unrepaired TOF.

Case report

A 58-year-old female was scheduled for partial gastrectomy due to stage III gastric adenocarcinoma. Her medical history was notable for complex grown-up cyanotic congenital heart (GUCH) disease. The array of findings included pulmonary atresia, right ventricular (RV) hypertrophy and non-restrictive ventricular septal defect (VSD) with overriding aorta, thus resembling TOF. Due to the small diameter of her pulmonary arteries and the presence of major aortopulmonary collaterals (MAPCAs), she was considered inoperable.

Clinical examination disclosed a frail (1.60 m, 37 kg) patient, with evident central cyanosis [(PaO2 41 mmHg, O_2 saturation of 63%)]. Laboratory tests disclosed a haemoglobin of 18.1 g/dl, 181,000 platelets/μl, and normal thromboelastogram.

Recent transthoracic echocardiography (TTE) and cardiac magnetic resonance further depicted at least three MAPCAs. Systemic and pulmonary venous returns were normal. There was significant left ventricle (indexed end-diastolic volume 147 ml/m^2) and RV dilatation (indexed end-diastolic volume 253 ml/m^2). Left ventricular ejection fraction (EF) was 45% and RV EF was 40%. Besides systolic impairment, diastolic dysfunction of RV could also be inferred from right atrial dilatation, RV hypertrophy, and inferior caval vein plethora.

Blood supply to the lungs was provided by several MAPCAs. On the right, one MAPCA irrigated both the superior and middle lobes, while another irrigated the lower lobe. On the left, one MAPCA provided flow only to a small vestigial portion of the left inferior lobe. All of these vessels had either non-occlusive thrombosis and/or ostial stenosis. During her follow-up for GUCH, she did a heart catheterisation that showed an aortic pressure of 147/73 (mean 103) mmHg, a pressure in the proximal portion of the right upper MAPCA of 74/44 (mean 55) mmHg, being 21/19 (mean 19) mmHg in its distal portion, excluding significant pulmonary hypertension in this territory.

In the operative setting, after standard and Bispectral Index monitoring, a radial arterial line and internal jugular venous catheter were inserted. Subsequently, in the sitting position, we placed an over-the-needle (27G –10 cm) 23G spinal catheter at the L3–L4 level after which 10 μg sufentanyl were administered. The patient was positioned in supine position and cardiac monitoring was started with TTE. Hyperbaric bupivacaine (5 mg) were given through the spinal catheter. Furthermore two boluses of 3.5 mg of bupivacaine in a 15-minute time frame were needed to achieve T4 level. There were no significant changes in blood pressure, heart rate, or estimated cardiac output. Supplemental oxygen (2 L/minute) through nasal cannula and headphones with patient-selected music were provided. No anxiolytic drugs were needed. Arterial blood gases were monitored as shown in Table 1.

Table 1. Initial and final ABG.

Arterial Blood Gases	pH	pCO_2 (mmHg)	pO_2 (mmHg)	Lact (mmol/L)	Hb (g/dl)	HCO_3 (mmol/L)	base excess (mmol/L)
Initial	7.44	37	41	1.0	15.2	25.1	0.9
Final	7.27	51	38	1.9	15.8	23.4	−3.5

Performed with 2 L/minute supplemental oxygen

Spinal re-dosing was adjusted to patient needs and performed approximately every 40 minutes. The procedure lasted 3.5 hours. A total of 30 mg bupivacaine and 20 µg sufentanyl were administered. A topical infiltration of the vagus nerve was performed by the surgeon with 3 ml of 2% lidocaine intra-operatively, due to involuntary diaphragm contraction. Antiemetic therapy included 4 mg of dexamethasone, 4 mg of ondansetron, and 0.625 mg of droperidol. Analgesia consisted of 1 g of paracetamol and 30 mg of ketorolac. Fluid therapy amounted to 500 ml of pre-procedural colloid and 2300 ml of intra-procedural crystalloids. Blood loss was minimal and there were no significant haemodynamic changes. No vasoactive drugs were required. Multi-modal post-operative analgesia included 200 µg spinal morphine, a 24-hour spinal perfusion of ropivacaine 0.1% at a rate of 2 ml/hour, and 1 g of intravenous paracetamol every 8 hours. The patient had ICU bed booking, but remained in an intermediate care unit for 48 hours before going to the surgical ward. The post-operative period was uneventful, except for a mild digital paresthesia in the left lower limb that subsided after 2 months of gabapentin 200 mg/day.

Discussion

In our patient, a complex but stable interaction between uncorrected TOF and lungs through MAPCAs ensured enough tissue oxygenation to sustain life, at the expense of hypoxia-induced biventricular dysfunction and cachexia. Interestingly, the presence of MAPCAs stenosis and thrombosis may have indeed offered a protective mechanism to the distal lung similar to a surgical banding of the pulmonary arteries, thus preventing the development of deleterious and eventually fatal pulmonary hypertension.

Understandably, neuraxial techniques are feared in TOF patients due to the potential worsening of hypoxemia and cardiovascular collapse caused by reduction in systemic vascular resistance and increased right-to-left shunting through the VSD, warranting the need for safer approaches. Also the haemostasis abnormalities, including thrombocytopenia, suppressed platelet aggregation, factor deficiencies, and fibrinolysis[1] could contraindicate the technique. Although epidural and combined spinal epidural analgesia had already been described for labour analgesia and anaesthesia in patients with unrepaired TOF, we found no reported cases of CSA use.

CSA allows incremental dosing of local anaesthetic and titration of the block to an appropriate level. It is associated with fewer haemodynamic changes than single-dose spinal anaesthesia[2–4] or continuous epidural anaesthesia.[3,5] We chose bupivacaine due to its hyperbaric properties, making the spread of the block more predictable and adjustable with patient positioning, and added sufentanyl to strengthen the quality of the block.

Lastly, despite the efficacy and safety of CSA, there is still room for improvement, as some case series still report non-negligible rates of post-dural puncture headache and paresthesias.[6,7]

Conclusion

We describe the first use of CSA for major abdominal surgery in a patient with unrepaired TOF, showing the feasibility and safety of a tailored anaesthetic approach that allowed curative intent surgery with minimal peri-operative risk.

Author ORCIDs. Joana Sofia Corda Teixeira 0000-0001-6163-2616.

Acknowledgements. We would like to thank the General Surgery, Cardiac and Transfusion Medicine and Hemotherapy services for their continuous help during this case.

Financial Support. This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Conflicts of Interest. None.

Ethical Standards. Informed consent was obtained from the patient.

References

1. Zabala LM, Guzzetta NA. Cyanotic congenital heart disease (CCHD): focus on hypoxemia, secondary erythrocytosis, and coagulation alterations. Pediatr Anaesth 2015; 25: 981–989. doi: 10.1111/pan.12705.
2. Saber R, Metainy SEL. Continuous spinal anesthesia versus single small dose bupivacaine – fentanyl spinal anesthesia in high risk elderly patients: a randomized controlled trial. Egypt J Anaesth 2015; 31: 233–238. doi: 10.1016/j.egja.2015.03.006.
3. Klimscha W, Weinstabl C, Ilias W, et al. Continuous spinal anesthesia with a microcatheter and low-dose bupivacaine decreases the hemodynamic effects of centroneuraxia blocks in elderly patients. Anesth Analg 1993; 77: 275–280.
4. Sztark F, Petitjean ME. Hemodynamic effects of spinal anesthesia in the elderly: single dose versus titration through a catheter. Anesth Analg 1996; 82: 312–316.
5. Sutter P, Gamulin Z, Forster A. Comparison of continuous spinal and continuous epidural anaesthesia for lower limb surgery in elderly patients. Anaesthesia 1989; 44: 47–50.
6. McKenzie C, Carvalho B, Riley E. The Wiley spinal catheter-over-needle system for continuous spinal anesthesia. Reg Anesth Pain Med 2016; 41: 405–410.
7. Dresner M, Pinder A. Anaesthesia for caesarean section in women with complex cardiac disease: 34 cases using the Braun Spinocath spinal catheter. Int J Obstet Anesth 2009; 18: 131–136. doi: 10.1016/j.ijoa.2008.09.009.