

## ***Epidural anesthesia for Caesarian section in a parturient with partially repaired complex cyanotic congenital heart disease.***

### ***Review of the literature.***

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#### **ABSTRACT**

**Epidural anesthesia for Caesarian section in a parturient with partially repaired complex cyanotic congenital heart disease. Review of the literature.**

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The Fontan procedure and its modifications is the definitive therapy for a number of congenital heart diseases. Anesthesia for semi-elective Caesarian section in a pregnant woman with a history of such surgery history can be a real challenge due to probability of high perioperative morbidity and mortality. We present the anesthetic management of a young parturient with a history of a partially repaired complex cyanotic congenital heart disease and perform a literature review.

#### **INTRODUCTION**

The prevalence of clinically significant cardiac disease in pregnancy in the developed world is 0.1%–4.0%, of which congenital heart disease (CHD) accounts for 70%–80%. Ideally, management of pregnant women with pre-existing

cardiac problems should be undertaken by multidisciplinary teams in tertiary centers<sup>1</sup>. Unfortunately, many physicians and health care givers are not familiar or comfortable with caring for these complex patients. We hereby report a case of a pregnant woman with a partially repaired complex congenital cyanotic heart disease who underwent caesarian section (CS) using epidural anesthesia.

#### **CASE REPORT**

A 26years old patient referred at 28 weeks gestation to our Antenatal Anaesthetic Clinic for

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semi-elective Caesarean section due to chorioamnionitis. The woman had been admitted in Obstetrics and Gynecology clinic a week before for spontaneous premature rupture of membranes (SPROM). Her medical history included allergy to paracetamol, moderate myopia (-5,75), insulin dependent diabetes mellitus (IDDM), Beta thalassaemia trait and partially repaired complex cyanotic congenital heart disease. The latter included the following anomalies: Single ventricle with situs solitus, (dextrocardia), transposition of great arteries (TGA: S, L, L) with left positioned ascending aorta, large intra-atrial communication, hypoplastic right ventricle with left superimposed tricuspid valve, right positioned mitral valve with superimposed anterior cuspid and 2<sup>nd</sup> grade insufficiency, pulmonary atresia, moderate hypoplasia of main pulmonary artery (PA), hypoplasia of proximal section of left pulmonary artery, right positioned inferior vena cava (IVC) and small ductus arteriosus. The patient had undergone a modified left Blalock-Taussig shunt at the age of 3yr old and a modified extracardiac Fontan procedure at the age of 16 yr old, which included ligation of Blalock-Taussig shunt, bidirectional right Glenn type shunting, IVC-to-right and central pulmonary arteries anastomoses with concomitant dilatation of pulmonary arteries, reconstruction/enlargement of proximal section of left PA, side-to-side of right atrium-to-

expanded polytetrafluoroethylene extracardiac tube conduit anastomosis and insertion of permanent pacemaker wires. At the age of 24 an umbrella was placed in a cardiac leak window with Seldinger technique.

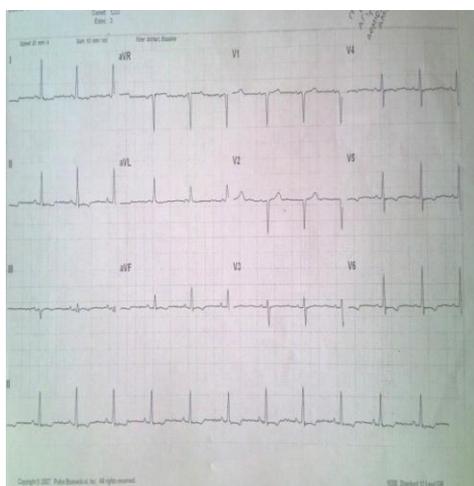
Her obstetrical history was uneventful.

On admission, the patient was 165 cm, 73kg and she was on NYHA Class IIA. Preoperatively, her physical examination showed light central cyanosis, a grade 4/6 holosystolic ejection murmur heard maximally at the upper right sternal border radiating over the entire precordium. On room air, arterial blood gas analysis revealed a PaO<sub>2</sub> 78 mmHg. Oxygen saturation by pulse oximetry (SpO<sub>2</sub>) was 95 %. Hct was 34 % (Hgb 10.6gr/dl). The rest of the laboratory results were unremarkable except from neutrophilic leucocytosis (WBC 11.2 M/ $\mu$ l, 82.5% neutrophils) and elevated C-reactive protein (CRP 4.1). Temperature was 37.2°C, blood pressure 122/75 mmHg and pulse 79 bpm. Electrocardiogram and echocardiography were compatible with her past cardiac history and with no new pathological findings (Image 1A and 1B).

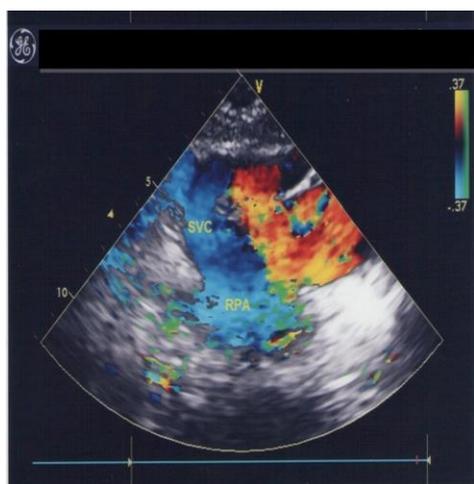
Preoperatively medical regiment included ritodrine 5 mg t.i.d p.os (stopped one day before operation), insulin isophane human 8 ui s.c. p.m., captopril 25 mg prn pos, tinzaparine 3500 antiXa ui o.p.d. s.c., folic acid 5mg o.p.d. p.os, ferrus sulfate 263,5 mg d.i.d. p.os, beta-methasone acetate 2 doses of 3mg iv., cefox-

itin 1gr q8h i.v, amikacin 500mg q8h i.v. and ampicillin/sublactam (1g/0.5g) q8h i.v.

**Image 1. A.** Electrocardiogram showing sinus rhythm and **B.** Frame of echocardiography examination showing flow away from the transducer (blue) in the end-to-side superior vena cava (SVC) to right pulmonary artery (RPA) anastomosis and opposite flow in ascending aorta.



1A



1B

The patient was given ranitidine and metoclopramide i.v. 1 h before the operation.

The heart rate and E.C.G. were monitored continuously using a 3-lead system, the arterial pressure was monitored directly through right radial artery cannulation and a central line was inserted through RJV.

Endocarditis prophylaxis was given. Pulmonary artery catheterization was considered. However it was felt that because of the anatomy, interpretation of values would be extremely difficult.

With the patient in the sitting position a lumbar epidural catheter was inserted through a standard 18gauge Tuohy needle to L3/L4 intervertebral space. Preservative free Normal Saline was employed to test for the loss of resistance. Following a test dose of 3 ml Lidocaine 2% the patient was placed in the supine position with a left lateral tilt.

Throughout the procedure her CVP was maintained between 6-7 mmHg with intravenous Ringer Lactate.

Epidural boluses of 5 ml of Ropivacaine 0.75% were given 5, 15 and 30 min after the test dose (with the addition of fentanyl 25 mcg to the first two boluses). The choice of the specific anesthetic agent was made due to its safer hemodynamic profile.<sup>4</sup>

Sensory blockade to touch and cold was achieved at 6<sup>th</sup> and 4<sup>th</sup> thoracic dermatomes respectively.

Cardiovascular parameters remained stable during the development of the block. Blood

pressure ranged from 110/65 mmHg to 125/75 mmHg and cardiac index 4.7-5.2 lt/min/m<sup>2</sup>.

Just after delivery, 10 mg of furosemide was given to the patient and she was put on oxytocin infusion. Following that her blood pressure fell to 80/40 mmHg and she became nauseous. Treatment consisted of 50 mcg increments of phenylephrine to a total dose of 100 mcg and another liter of Ringer's solution was infused. After the operation, the patient was transferred to the intensive care unit and a continuous infusion of Ropivacaine 4 mg.h<sup>-1</sup> and morphine was commenced.

She remained in the intensive care unit for 24 hours and in a general obstetric ward for another five days.

Her postoperative course was uncomplicated and she was discharged from the hospital a 6 days after Caesarian section.

## DISCUSSION

In the developed world, CHD is now more common in pregnant women than acquired heart disease. Among pregnant women with heart disease, the proportion with heart disease of congenital origin has risen in two decades from 5% to almost 80%<sup>2</sup>. This reflects advances in cardiac surgery and medication, meaning that 85% of the 7 in 1 000 infants with congenital heart disease now survive to adulthood and reproductive maturity<sup>2-3</sup>. Major risks to the fetus of these women include preterm birth (oc-

curred in 20%) and small for gestational age (occurred in 4%–8%)<sup>4</sup>.

The choice of anesthesia in these patients should be guided by the nature of the cardiac disease and the urgency of delivery. Traditionally in Greece, general anesthesia has been recommended for these patients. An effort to avoid a drop in systemic vascular resistance (SVR) and to bypass the chance of a poor regional block along with the high probability of perioperative maternal and fetal morbidity and mortality are some of the reasons behind that trend.

General anesthesia however carries risks, such as the potential for tachycardia and hypertension in response to catecholamine release after laryngoscopy, during anesthesia and in recovery given the relatively poor pain control achievable with systemic opioids; the possibility of a difficult or failed intubation and aspiration of gastric contents and the pulmonary arterial pressure rise due to intermittent positive ventilation.

The use of regional anesthetic techniques and especially epidural anesthesia - because of its slow onset and a reduced chance of precipitating haemodynamic deterioration- has been used successfully in similar cases<sup>5-7</sup>. In fact, some studies report that pregnant women with heart disease managed within an organized program may undergo labour and delivery

with acceptable rates of complications and that CS, epidural analgesia/anesthesia, and general anesthesia rates are similar to those in the general obstetrical population<sup>8</sup>. Nevertheless, it is essential the avoidance of an inadequate block. Oxytocin infusion should also be slow in order to avoid direct vasodilatation and reduction of the SVR<sup>9</sup>. In addition, considering the importance of maintaining SVR, the prophylactic and therapeutic use of vasoconstrictor drugs therefore seems logical and attractive. We used phenylephrine because the patient was tachycardic<sup>10</sup>.

Invasive monitoring has been used, except from a PA catheter. It has been suggested that the use of PA catheters has not reduced the peripartum mortality; also insertion can be difficult due to low cardiac output and anatomy. Echocardiography represents another possibility for monitoring these patients and could be employed.

Finally, women must be closely monitored postpartum for at least 72 hours following delivery. Postdelivery care should focus on fluid balance, anticoagulation, and analgesia maintained to prevent tachycardia and catecholamine increase.

## CONCLUSION

As cardiac surgery and medical care for congenital heart disease are advancing, more and more adults are being seen with such problems, some complex, and with varying degrees

of successful intervention. It is also necessary to be familiar with the natural history of many of the CHD lesions, both unrepaired and repaired, in order to anticipate the complications inherent to an individual's situation. Considering the fact that every such case tends to be unique and the ever growing literature about management of pregnant women with CHD; emphasis is on the care with which the anesthetic technique is used rather than the technique itself. The goal: cardiovascular stability.

## REFERENCES

1. Gelson E, Johnson M, Gatzoulis M, et al. Cardiac disease in pregnancy. Part 1: congenital heart disease. *The Obstetrician & Gynaecologist* 2007;9:15–20.
2. Drenthen W, Pieper PG, Roos-Hesselink JW, et al. Outcome of pregnancy in women with congenital heart disease: A literature review. *J Am Coll Cardiol* 2007; 49: 2303-11.
3. Siu SM, Sermer M, Coleman JM, et al. Prospective multicenter study of pregnancy outcomes in women with heart disease. *Circulation* 2001; 104:515-21.
4. Khairy P, Ouyang DW, Fernandes SM, et al. Pregnancy outcomes in women with congenital heart disease. *Circulation*. 2006;113:517-24.
5. Koraki E, Vasiliadis K, Aslanidis Th, et al. Epidural anesthesia for a caesari-

- an section in a woman with a single ventricle. *Eur J Anaesth.* 2009; 26(9):788-90.
6. Fوجل, Druzin M, et al. Epidural anaesthesia for labour and Caesarean section in a parturient with a single ventricle and transposition of the great arteries. *Caul J Anaesth* 1990; 37:680-4.
  7. Hamleyn C, Douglass C, Ploot F, et al. Low-dose segmental combined spinal-epidural; an anaesthetic technique for caesarean section in patients with significant cardiac disease. *Int Soum Obst Anesth* 2005;14:355-61.
  8. Goldszmidt E, Macarthur A, Silver-sides C, et al. Anesthetic management of a consecutive cohort of women with heart disease for labor and delivery. *Int J Obstet Anesth.* 2010;19(3):266-72.
  9. Tamhane P, O’Sullivan G, Reynolds F. Oxytocin in parturients with cardi-acdisease. *Int J Obstet Anesth.* 2006;15(4):332-33.
  10. Reim R, Hess W, Bahlemann. Primary caesarean section. Use of phenylephrine during anesthesia in a patient with hypertrophic obstructive cardiomyopathy. *Anaesthetist* 2000;49:527-31.

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**Key words:** congenital heart disease, pregnancy, epidural anesthesia, Fontan procedure.

#### **Acknowledgements:**

The authors would like to thank Dr. George Sarris, Director of the Department of Pediatric and Congenital Heart Surgery at Mitera Children’s Hospital, Athens, Greece for providing information about the patients’ previous cardiac surgeries.

**Author Disclosures:** Authors Charitidou S, Aslanidis Th, Moutsianos G, Balaouras D, Mameletzi S have no conflicts of interest or financial ties to disclose.

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