

## Extracranial Vertebral Aneurysm in Pregnancy: A Case Report on the Anesthetic Management during a Cesarean Section

Daniela Rodrigues Pinho<sup>1</sup>, Cátia Real<sup>1</sup>, Dalila Veiga<sup>1,2</sup> and Humberto S Machado<sup>1,2,3\*</sup>

<sup>1</sup>Serviço de Anestesiologia, Centro Hospitalar Universitário do Porto, Porto, Portugal

<sup>2</sup>Centro de Investigação Clínica em Anestesiologia, Centro Hospitalar Universitário do Porto, Porto, Portugal

<sup>3</sup>Instituto Ciências Biomédicas Abel Salazar, Universidade do Porto, Porto, Portugal

\*Corresponding author: Humberto S Machado, Serviço de Anestesiologia, Centro Hospitalar Universitário do Porto, Largo Prof. Abel Salazar, 4099-001 Porto, Portugal, Tel: +351935848475; Fax: +351 222 009483; E-mail: hjs.machado@gmail.com

Received date: May 22, 2017; Accepted date: Jun 28, 2017; Published date: Jun 30, 2017

Copyright: © 2017 Pinho DR, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### Abstract

The management of pregnant patients with aneurysms represents a challenge. Vertebral aneurysms are an exceedingly rare condition. Their management is not defined due to the scarcity of cases. The best technique to reduce aneurysm rupture risk with simultaneous maternal and fetal wellbeing preservation is not established. The authors present a case of 41-year old pregnant woman, proposed for an elective cesarean section because of a previously described vertebral aneurysm waiting for repair after delivery. The concerns related to anesthetic management, including the advantages and disadvantages of general and neuraxial anesthesia in this specific case are discussed.

**Keywords:** Anesthesia; Obstetric; Aneurysm; Vertebral; General anesthesia; Cesarean section

### Introduction

Ten to 20% of aneurysms are present in vertebrobasilar location. Aneurysms are the main cause of non-traumatic spontaneous subarachnoid hemorrhage [1-3]. Pregnancy is one of the cited risk factors for aneurysm rupture, with approximately 20 ruptures in 100.000 pregnancies [4]. This may be due to the increase in circulating blood volume and cardiac output and the hormonal changes in the arterial wall that occur during pregnancy [5]. However, Tiel Groenestege et al. [6] reported that pregnancy, labor, or the puerperium did not appear to increase risk of aneurysmal subarachnoid hemorrhage. Subarachnoid hemorrhage brings a mortality risk of 35% for mother and 25% for the fetus [7]. Long-term sequelae are also a potential risk associated with these cases. As such, management of pregnant patients with these vascular abnormalities is a major challenge for the anesthesiologist. This is even truer when it concerns their anesthetic management during labor or cesarean delivery. Few studies were published about the management of cerebral aneurysms in pregnant women. The authors present a case of a multiparous patient with an asymptomatic vertebral aneurysm admitted for cesarean delivery. The concerns related to anesthetic management, including the advantages and disadvantages of general and neuraxial anesthesia are discussed.

### Case Report

A 41-year old multiparous woman, 39 weeks of gestation was scheduled for elective cesarean section because of an asymptomatic left vertebral artery aneurysm in V3 segment, at the level of the second cervical vertebra, diagnosed one year before, after a traffic accident. The patient was followed by neurosurgery in another institution, who decided that she should undergo a cesarean section for delivery. She

was awaiting urgent surgical aneurysm repair after delivery. We had no further information concerning the size of the aneurysm and it was not possible to contact the neurosurgeon that was following this case. Her past obstetric history included one vaginal delivery 12-years ago with epidural analgesia and one non-evolutive pregnancy submitted to surgical abortion under general anesthesia with no complications. The present pregnancy was uneventful. On admission the patient was assessed by the anesthetic team. Her airway evaluation included a Mallampati score II, retrognathism and a thyromental distance less than 6.5 centimeters. She denied symptoms of gastroesophageal reflux before and during her pregnancy. There were no predictors of difficult face mask ventilation. The anesthetic team discussed with the patient and with the obstetric team the risks and benefits of general and neuraxial anesthesia. Attending to the scarcity of clinical information on this patient neurosurgical issue, the few available published literature concerning the best anesthetic management of these cases and to the known increased risk of vertebral aneurysm rupture due to cerebrospinal fluid (CSF) pressure variations associated with spinal anesthesia procedures or dural puncture due to epidural anesthesia, general anesthesia was favored. Due to the above described alteration in airway evaluation, we decided to use videolaryngoscopy for intubation after induction. Difficult airway management equipment availability has been adequately checked. Prior to induction of anesthesia difficult airway equipment was checked and available and sodium citratum 30 mL was administered orally. The patient underwent ASA standard monitoring combined with neuromuscular blockade (using a peripheral nerve stimulator in the adductor pollicis) and anesthesia depth (Bispectral Index®, BIS®) monitoring. Ranitidine 50mg and methoclopramide 10 mg were administered intravenously (IV) for aspiration prophylaxis. Pre-oxygenation and head-up positioning was performed. Prior to induction, a lidocaine IV bolus (1 mg/Kg) was administered. Anesthetic induction was achieved with a 450 mg bolus of thiopental and 70 mg of rocuronium. The first attempt at tracheal intubation with videolaryngoscopy (C-MAC®) failed due to difficulty in directing the orotracheal tube through a visible but

anterior larynx. With improved head extension and a different operator tracheal intubation was successful. For maintenance, a combination of sevoflurane (<0.5 MAC) and a O<sub>2</sub>/N<sub>2</sub>O mixture was titrated to maintain a BIS<sup>®</sup> at 40-60. The patient remained hemodynamically stable during the procedure. A 3510 g female baby was delivered with Apgar scores of 5, 8 and 10 at 1, 5 and 10 min, respectively. After delivery, an IV bolus of oxytocin 5U was administered slowly followed by an infusion of 10U in 1000 mL saline. Fentanyl 0.25 mg was administered IV. The procedure lasted 55 minutes. Estimated blood loss was 400 mL. Before the end of the surgery 1g acetaminophen, 40 mg parecoxib, 100 mg tramadol and 4mg of ondansetron were administered. Before extubation, the train of four ratio was 0.93 without neuromuscular blockade antagonism. After the procedure, the patient was hemodynamically stable, without neurological deficits. In the ward, her pain was adequately controlled with conventional analgesia. She was discharged home two days later.

## Discussion

All the risks of a general anesthesia in a pregnant patient, especially in this case in which the mother presented potential difficult airway management, were weighted against the increased risk of aneurysm rupture.

The anesthesia team did not have enough clinical information concerning the vertebral aneurysm size and associated risk of rupture. However, it was known that she was proposed to urgent surgical aneurysm repair after delivery, which rose concerns related to aneurysm rupture. The high vertebral location of the aneurysm represents a risk for brainstem functions and even for intracranial subarachnoid hemorrhage due to the aneurysm extension near the foramen magnum. Due to this specific location, the anesthesia team considered less dangerous to perform a general anesthesia, maintaining mother hemodynamic stability and avoiding the potential incremental of rupture risk due to CSF pressure variations in association with spinal anesthesia or dural puncture due to epidural catheter insertion. The patient had no sequelae until being discharged home.

To our knowledge this case is the first to present the anesthetic management of a pregnant patient with a vertebral aneurysm during a cesarean. Aneurysms involving the posterior cervical arterial circulation are rare and usually associated with trauma. They generally affect the V3 segment, the most mobile segment of the vertebral artery [8]. Pregnant women with a cerebral aneurysm have been advised to avoid expulsive efforts during vaginal delivery to avoid associated increase in cerebral blood and CSF during a prolonged Valsalva maneuver which could increase aneurysmal rupture risk. This could contribute to the risk of transmural pressure increase. The essential aspects of the anesthetic management of those patients are to maintain normoventilation and strict hemodynamic stability. The best anesthetic technique is not defined.

Neuraxial anesthesia is considered the best technique for labor in most cases due to its higher safety for both mother and fetus [9,10]. However, there are reports of intracranial subdural hematoma formation after epidural anesthesia and subarachnoid hemorrhage after spinal anesthesia [11-17]. It is thought that they were the result of acute CSF pressure changes. A reduction in intracranial pressure caused by a spinal anesthetic or inadvertent dural puncture during epidural technique can precipitate aneurysm rupture. In a recent case report it was argued that a neuraxial anesthetic could be used in a

stable pregnant patient for cesarean delivery with no aneurysm repair required [18]. Another case report discussed the use of epidural anesthesia for a cesarean section in a patient with a cerebral artery aneurysm [19]. However, others recommend avoiding neuraxial anesthesia in pregnant patients with intracranial hemorrhage or abnormalities in intracranial vasculature [20]. Our patient was waiting aneurysm repair. It was previously decided by her neurosurgeon that a cesarean should be the option for delivery to avoid Valsalva efforts.

The existing evidence about the management of patients with cerebral aneurysms is for their endovascular or surgical treatment. Regarding general anesthesia in obstetrics, pregnant patients are prone to regurgitation of gastric contents, with an increased risk for pulmonary aspiration. A rapid sequence induction of anesthesia technique is recommended. Difficult airway is another issue. Our patient presented some features suggestive of difficult laryngoscopy. Rocuronium was chosen for neuromuscular block in rapid sequence intubation due to the possibility of immediate reversal with sugammadex and to avoid suxamethonium-related side effects. Oxygen desaturation did not occur during the two attempts at intubation.

Sympathetic stimulation caused by laryngoscopy, and the hemodynamic liability with general anesthesia are also major concerns. Hypertension increases the risk of aneurysm rupture and hypotension can have a detrimental consequence in maternal cerebral and fetal-placental perfusion. The risk of cerebral aneurysm rupture is estimated to be around 0.5 to 2% during anesthesia induction with mortality of 75% [2]. Several strategies can be used to reduce that risk such as intravenous lidocaine or  $\beta$ -blocker administration before laryngoscopy. In this case,  $\beta$ -blocker administration (esmolol) was previously discussed with the neonatology team, but due to its potential to induce fetal bradycardia, they did not agree with its prophylactic administration. Therefore, we have chosen lidocaine to prevent laryngoscopy hypertensive response.

Anesthetic drug's effects on the fetus have to be discussed. A systematic review found that when comparing the effects of general anesthesia and regional anesthesia for labor, there were no significant differences in neonatal Apgar score and the need for neonatal resuscitation [21]. In our case, the child born with a low Apgar score and recovered well afterwards only with tactile stimulation (no need of resuscitation maneuvers or drug administration).

More studies have to be performed to support an evidence based anesthetic management of these cases.

## References

1. Priebe H (2007) Aneurysmal subarachnoid hemorrhage and the anesthetist. *Br J Anaesth* 99:102-118.
2. Hamid RK, Hamid NA, Newfield P, Bendo AA (2012) Anesthetic Management of Cerebral Aneurysms and Arteriovenous Malformations. In: *Handbook of Neuroanesthesia*. 5th Ed. Lippincott Williams & Wilkins: London.
3. Wang L, Paech MJ (2008) Neuroanesthesia for the pregnant woman. *Anesth Analg* 107:193-200.
4. Harrigan MR, Thompson BG (2004) Pregnancy and treatment of vascular disease. In: Winn HR Eds, Youmans neurological Surgery. 5th Ed. Saunders; Philadelphia.
5. Meyers PM, Halbach VV, Malek AM, Phatouros CC, Dowd CF, et al. (2000) Endovascular treatment of cerebral artery aneurysms during pregnancy: report of three cases. *AJNR Am J Neuroradiol* 21: 1306-1311.

6. Tiel Groenestege At, Rinkel GJ, van der Bom JG, Algra A, Klijn CJ (2009) the risk of aneurysmal subarachnoid hemorrhage during pregnancy, delivery, and the puerperium in the Utrecht population: Case-crossover study and standardized incidence ratio estimation. *Stroke* 40:1148-1151.
7. Roman H, Despargues G, Lopes M, Emery E, Clavier E, et al. (2004) Subarachnoid hemorrhage due to cerebral aneurysmal rupture during pregnancy. *Acta Obstet Gynecol Scand* 83: 330-334.
8. Morasch MD, Phade SV, Naughton P, Garcia-Toca M, Escobar G, et al. (2013) Primary Extracranial Vertebral Artery Aneurysms. *Ann Vasc Surg* 27: 418-423.
9. Leighton BL, Halpern SH (2002) The effects of epidural analgesia on labor, maternal, and neonatal outcomes: A systematic review. *Am J Obstet Gynecol* 186: S69-S77.
10. Silva M, Halpern SH (2010) Epidural analgesia for labor: Current techniques. *Local and Regional Anesthesia* 3: 143-153.
11. Hilt H, Gramm J, Link J (1986) Changes in intracranial pressure associated with extradural anaesthesia. *Br J Anaesth* 58: 676-680.
12. Sreedhar R, Gadhinglajkar SV (2002) Lumbar puncture can precipitate bleed from unsuspected intracranial aneurysm. *Indian J Anaesth* 46: 386-390.
13. Wells JB, Sampson IH (2002) Subarachnoid hemorrhage presenting as post-dural puncture headache: a case report. *Mt Sinai J Med* 69:109-110.
14. Eggert SM, Eggers KA (2001) Subarachnoid haemorrhage following spinal anaesthesia in an obstetric patient. *Br J Anaesth* 86: 442-444.
15. Benzon H (1984) Intracerebral hemorrhage after dural puncture and epidural blood patch: nonpostural and noncontinuous headache. *Anesthesiology* 60:258-259.
16. Laubach S, Reber A (2004) Subarachnoid haemorrhage after spinal anaesthesia for cesarean section. *Anaesthesist* 53: 723-726.
17. Saitoh K, Hirabayashi Y, Mitsuata H, Shimizu R (1994) Subarachnoid hemorrhage unexpectedly found on spinal anesthesia. *Anesthesiology* 81:1312.
18. Carvalho Lde S, Vilas Boas W (2009) Anesthetic Conduct in Cesarean Section in a Parturient with Unruptured Intracranial Aneurysm. *Rev Bras Anestesiol* 59: 748-750.
19. Gupta A, Hesselink F, Eriksson L, Wyon N (1993) Epidural anesthesia for caesarean section in a patient with a cerebral artery aneurysm. *Int J Obstet Anesth* 2:49-52
20. Davie CA, O'Brien P (2008) Stroke and pregnancy. *J Neurol Neurosurg Psychiatry* 79:240-245.
21. Afolabi BB, Lesi FE (2012) Regional versus general anaesthesia for cesarean section. *Cochrane Database Syst Rev*10: CD004350.