

Anaesthetic Implications And Management Of Carotid Artery Pseudoaneurysm In A Child

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Citation

N Pal, S Das, U Kiran, A Bhan. *Anaesthetic Implications And Management Of Carotid Artery Pseudoaneurysm In A Child*. The Internet Journal of Anesthesiology. 2006 Volume 12 Number 1.

Abstract

An eleven year old child was planned for surgical repair of large right carotid artery pseudoaneurysm. The swelling was impinging upon and deviating the trachea. The affected carotid artery was clamped during the repair. The present case highlights the precautions taken, the detection and the strategies for preventing the impending cerebral insult during such surgeries whenever the carotid artery is clamped.

INTRODUCTION

Carotid artery aneurysms/ pseudoaneurysms are fairly uncommon. These impose a threat of expansion, rupture, hemorrhage and embolism. Next to trauma, as mentioned in the Western literature where atherosclerotic and false aneurysms predominate, in the Indian subcontinent syphilis remains the main etiological cause. Etiological factors like mycotic pseudoaneurysms, fibromuscular dysplasias and Bachel's disease₁ (triad of mouth, genital ulcers and relapsing iritis) have also been reported. Histologically aneurysms have been divided into two types: True aneurysms and Pseudoaneurysms₂. True aneurysms arise from partial damage of arterial wall with intact adventitia. Pseudoaneurysm is more common and develop when entire arterial wall is lacerated and surrounded by a hematoma. Large pseudoaneurysm may produce vascular impairment to the head and neck and airway distortion. A case of right common carotid artery pseudoaneurysm is described.

thyroid. Magnetic resonance imaging revealed large partially thrombosed pseudoaneurysm of the right common carotid artery deep to the sternomastoid muscle (Fig.3). The final diagnosis was made by conventional angiography .

ANAESTHETIC MANAGEMENT

An 11 year old, 25 kg weighing female child presented with a (6×10×10) cm swelling on the right side of neck was progressively enlarging over six months. Although it was asymptomatic, it presented with difficulty to eat and speak for a couple of months. On examination it was a well defined pulsatile expansile cystic swelling with a few lobulations extending from ear lobe to clavicle; both upper and lower lobes free (Fig.1a, b). Roentgenogram of the neck revealed trachea pushed to the left side by soft transverse shadows (Fig.2). Ultrasound revealed a large cystic swelling in the anterior compartment of neck compressing the right lobe of

Figure 1

Figure 1 : Patient showing the extent of swelling



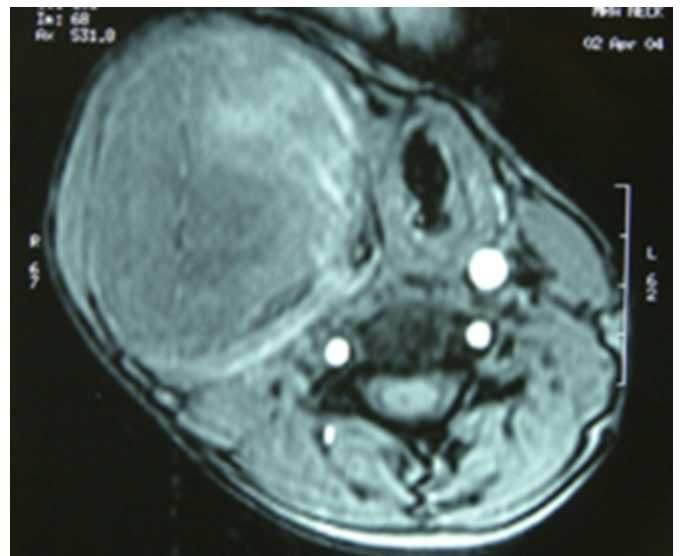
Figure 2

Figure 2 : Roentgenogram antero-posterior view of neck



Figure 3

Figure 3 : Magnetic Resonance Imaging of a transverse section through the swelling



The patient was premedicated with morphine 0.1mg/kg i.m. and promethazine 0.5mg/kg i.m. an hour before surgery. She was given O₂ with Hudson mask and was supervised for signs of respiratory depression. She was preoxygenated with

100% O₂ for 5 minutes followed by induction with titrated dose of thiopentone sodium 4mg/kg i.v. and fentanyl 2 microgm/kg i.v. Ventilation was confirmed with bag and mask. Rocuronium 0.9mg/kg i.v. was given, laryngoscopy performed and the trachea intubated under vision with a cuffed flexometallic endotracheal tube of 24 Fr. Although the trachea was deviated to the left and there was some subglottic resistance, with proper external manipulation a laryngoscopy Grade 2 (Cormack & Lehane) was achieved. Fiberoptic bronchoscope was available but not used. Anaesthesia was maintained with oxygen, nitrous oxide, isoflurane, fentanyl, midazolam and pancuronium. Monitoring used were electrocardiography (ECG), invasive arterial blood pressure (BP), central venous pressure (CVP), oximetry (SpO₂), arterial blood gas analysis (ABG), endtidal carbon dioxide (ETCO₂), airway pressure, urine output and temperature. Bispectral Index (BIS) was used to monitor the level of narcosis and ischemic injury during the period of cross clamp. The patient was ventilated with a circle system using a soda lime circuit.

The patient was positioned surgically optimally with a 15 degree head raise. The mass was approached through an incision of about 10 cm extending from angle of mandible to the sternum. A partial upper sternotomy was made and thymus was removed. Thiopentone sodium 10mg/kg i.v., hydrocortisone 100mg i.v. and methylprednisolone 30mg/kg i.v. was given. Heparin 1mg/kg i.v. was given so as to maintain an activated clotting time (ACT) of around 200 seconds. The innominate artery was looped and clamped. Aneurysm opened; clots were evaluated and were rents identified. A Gore-Tex patch was applied and sutured incorporating all three rents. Romovac blood drainage tube was placed at the site. Total Innominate artery clamp time lasted for about 10 minutes. The patient was cooled externally with air cushions, water blankets and ice-packs around the scalp. Nasopharyngeal temperature was maintained around 35°C. Mean BP was maintained around 60 to 80 mmHg throughout the surgery. Minimum mean BP recorded was 40 mm Hg for a duration of one minute during the clamp period. BIS remained below a value of 58 throughout. Minimum BIS value recorded was 40 for thirty seconds during the clamp period. Continuous vigilance for signs of facial puffiness (oedema), engorged neck veins and pupillary reaction were observed.

Total blood loss was about 600 ml. One unit of blood was transfused fast and the rest of the volume loss replaced with crystalloid and colloid in such a way that the hemoglobin

and hematocrit on ABG was maintained around 10 gm/dl and 30% respectively. On release of the clamp, mannitol 0.5gm/kg i.v. and sodium bicarbonate 30 mEq i.v. was given in order to correct the metabolic acidosis.

Once surgery was over protamine 1.3mg/kg i.v. was given slowly to reverse the ACT to baseline value. The patient was shifted to ICU and electively ventilated. Blood collected through the drainage tubes was around 300ml over a period of 4 hours. The patient was re-explored and a small arterial bleeder discovered and ligated. Blood loss was replaced with blood. Ventilation was continued to allow spontaneous reversal of neuro-muscular blocking agents followed by extubation next day morning. Patient was fully awake with well preserved cognitive functions and no signs of neurological insult.

DISCUSSION

Common carotid artery pseudoaneurysms are a rare occurrence. Anaesthetic goals are to maintain proper analgesia and amnesia along with watching for the cerebral functions during clamping of the Carotid artery₃. Best recommended is the regional anaesthesia with superficial and deep cervical block and light sedation so that the patient can follow commands during surgery.

In our case option for regional anaesthesia was ruled out as the extent of incision was large and sternotomy had to be done. Hence, the case was conducted under general anesthesia with precautions for cerebral protection. The most vulnerable period for any carotid artery surgery is the duration for which it has been clamped. Prolonged clamp time may lead to neurological insult due to compromised blood supply which is being maintained by a single carotid artery and the collaterals. Bispectral Index (BIS) gives reliable information about the cerebral status during the clamp period₄.

Another very vulnerable period is immediately after release of clamp when the chances for thrombus migration leading to embolic phenomenon and subsequent stroke are maximum.

Along with a short clamp time, moderate hypothermia, keeping the blood pressure at high-normal range (in order to increase collateral flow) with certain neuroprotective drugs preserves the neurological status better. Thiopentone sodium helps to reduce the cerebral activity level and hence the CMRO₂. Steroids stabilize membranes and prevent cellular damage due to reduction in cerebral basal metabolic rate and

hence demand for O₂ supply. Abrupt bradycardia and hypotension can be avoided by infiltration of 1% lidocaine at the carotid bifurcation.

In our case a difficult intubation was anticipated due to the huge mass, restricted mouth opening and tracheal shift and subglottic stenosis as indicated by history, chest roentgenogram and CT scan. And the other concern was not to injure the swelling by excess manipulation during intubation. After confirming for ventilation, the child was given short / intermediate acting non-depolarizing neuromuscular blocking agent, rocuronium, which further relaxed the mouth opening and shifted the swelling little more laterally so as to enable the passage of the flexometallic endotracheal tube with some external and internal manipulation.

Other complications of surgery in such cases are recurrent laryngeal nerve, superior laryngeal nerve and hypoglossal nerve palsy and wound infection.

DRAWBACKS

More objective monitoring for blood flow in the cerebral arteries can be provided by Transcranial Doppler (TCD) during the period of cross clamping. Ischemia is graded as SEVERE if reduction in flow velocity is > 85%, MILD to MODERATE if reduction is between 60 – 85% and absent if < 60%. Also it can be very helpful in detection of emboli perioperatively⁶.

Carotid artery stump pressure measurement and regional blood flow measurement can really be helpful for: identifying need for carotid artery shunting and identifying patient who may benefit with blood pressure augmentation. Critical stump pressure below which hypoperfusion may be suspected is 50 mm Hg⁷.

Another issue is whether or not to use a carotid artery bypass shunt. Baker⁷, et al, Wylie and Ehrenfeld⁸, Heilbum⁹, and Young¹⁰ et al do not use it routinely in carotid artery revascularization. Wylie and Ehrenfeld suggest using an internal shunt only in patients with carotid stump pressure below 40mm Hg, while Baker et al suggest that in general thromboendarterectomy can be performed safely without the use of shunts.

In the present case other than BIS none of the above mentioned had been carried out because of presumed short duration of cross clamp time⁹.

CONCLUSION

Carotid artery pseudoaneurysm may result in tracheal deviation. Management of the difficult airway along with a thorough preanaesthetic assessment is essential. During surgical repair a momentary carotid artery clamping can be conducted safely with proper precautions and monitoring for neurological status. Prompt replacement of blood loss for maintenance of hemodynamic stability is also one of the prime responsibility of the anaesthetist.

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