REPAIR OF PSEUDOANEURYSM OF COMMON CAROTID ARTERY-AN ANAESTHETIC CHALLENGE

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Abstract:
A 56 year old male patient, known hypertensive and chronic smoker was planned for surgical repair of pseudo aneurysm of left common carotid artery. The neck swelling was impinging upon and displacing the trachea. The huge neck swelling and tracheal deviation poses a challenge to anesthesiologists in airway management. 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.

Keyword : Carotid artery pseudo aneurysm, cerebral protection, Tracheal deviation

Introduction
Carotid artery aneurysms or pseudo aneurysms are 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 pre dominate. Etiological factors like mycotic pseudo aneurysms, fibromuscular dysplasias and Bechet's disease (triad of mouth, genital ulcers and relapsing iritis) have also been reported. Histologically aneurysms have been divided into two types: True aneurysms and pseudoaneurysms. True aneurysms arise from partial damage of arterial wall with intact adventitia. Pseudoaneurysms are 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 left common carotid artery pseudoaneurysm is described below.

PRE OPERATIVE EVALUATION:
A 56 year old male patient weighing 52 kg, known smoker and alcoholic admitted with swelling in the left side of neck for 6 months. He gave the history of pain over the swelling and hoarseness of voice. He is a hypertensive for the past 1 year and on regular treatment. No other co-morbid illness. On pre-anaesthetic evaluation, patient was...
comfortable except for the neck swelling, pulse rate of 58/ minute, BP 140/96 mmHg. The patient was mildly anaemic. No jaundice, no clubbing and no pedal edema. On clinical examination an expanding pulsatile mass of 9x7 cm was present over left side of the neck. Bruit was heard over the left carotid artery. Peripheral pulses were felt well over right upper arm. Right upper limb BP (160/96mm Hg) was higher than left upper limb BP(136/80 mm Hg).His blood pressure range- highest level being 190/100 mmHg and lowest level was 130/80 mmHg. On examination of chest-normal vesicular breath sounds were heard. Cardiovascular system- S1S2 was heard, no murmur.Central nervous system- no focal neurologic deficit was found except hoarseness of voice due to left vocal cord palsy. On airway examination the patient had modified mallampatti class-II. He was partially edentulous. Neck movement was restricted due to huge swelling.

Investigations:
Hb%-8.3gm%. Renal function test-within normal limits. Chest X-Ray-mild cardiomegaly.ECHO findings were -Global hypokinesia of left ventricle.Ejection fraction was 37%, moderate LV dysfunction. Grade II diastolic dysfunction was present.X-Ray neck-Trachea was deviated to the right side.CT Angiogram of carotid artery-10x8 cm psedoaneurysm of left common carotid artery just below the bifurcation. On VDL scopy-Left arytenoid was found to be edematous.Left vocal cord palsy and fullness in left pyriform fossa was found.

ANAESTHETIC MANAGEMENT:
The patient was pre-medicated with T.Rantidine 150 mg and T.Metoclopromide 10mg at 6am on the day of surgery. Patient took all his antihypertensive drugs except T.Enalapril. The patient was counseled and consent obtained. The case was planned to be done under general anesthesia under ASA-Physical status III. In the operative table, non- invasive monitors like Spo2, ECG, NIBP, ETCO2 and temperature probe (after induction) were connected to the patient. Base line parameters BP: 130/90 mmHg, PR-59/min and SPO2-98% in room air. Intravenous access was secured with 16 G canula on the dorsum of right hand. Under local anesthesia, 7 Fr triple lumen central venous lines was started in right subclavian vein. Right radial artery was cannulated for invasive BP monitoring. Vasopressors and vasodilators were kept ready. The patient was given inj.Glycopyrrolate 0.2mg and inj.Fentanyl 100µg as premedication.He was pre-oxygenated with 100% oxygen for 5 minutes.Inj.xylocard 1mg/kg is administered 2 minutes intravenously to blunt the intubation response. Being the patient was 52 kg, he was induced with inj.Thiopentone 250mg, after ventilation was confirmed with bag and mask and inj.Succinylcholine 100mg was given. The patient was intubated with 7.5 size flexometalic cuffed endotracheal tube (bougie guided) since Cormack Lehane score was 3 as the external manipulation was avoided due to the possibility of aneurysmal rupture. Post intubation-BP was 170/94mmHg. After coming out from the effect of
succinylcholine, he was given 5mg of inj.Vectoronium. Anesthesia was maintained with N2O:O2 in a ratio of 2:1 and 0.4-0.6% isoflurane and inj.fentanyl 20µg was repeated hourly for analgesia. Non-depolarizing agent-inj.Vectoronium (0.01mg/kg) was used for muscle relaxation. Bladder was catheterized. The patient was maintained in supine position for surgical access.

**Intra operative events:**

Position-supine with neck extension. Through an incision over anterior border of sternomastoid Common carotid, Internal carotid and External carotid artery and aneurysm was exposed. Common carotid artery, Internal and external carotid artery controls were taken. Peri-aneurismal dissection was done. During perianeursymal dissection the patient had one episode of bradycardia (Heart rate-42), and it was treated with inj.Atropine 0.3mg. Inj. Hydrocortisone 100mg and inj. Heparin 100U/kg was given intravenously. Internal carotid artery was clamped first, then ECA and CCA was clamped. Aneurysm sac was opened and clots were evacuated. Cerebral blood flow was established using In line straight shunt between Common carotid artery and Internal carotid artery. Aneurysm sac was excised and interposition bypass was done using reverse saphenous vein graft. Before closing the distal anastomosis shunt was removed. During carotid cross clamping-N2O was cut down and only 100% O2 was given. Total cross clamp time-9 minutes including the time for shunting. Cerebral flow was established after closing the distal anastomosis. Before release of the clamp, inj. Mannitol 0.5gm/kg i.v. was given in order to correct the metabolic acido-sis. Complete haemostasis was secured. Patient was hemodynamically stable throughout the procedure. Throughout the procedure no vasopressor or vasodilator was used since the BP was maintained between 126-170mmHg systolic and 76-98mmHg diastolic. ETCO2 level was kept between 26-35 to maintain normocarbia or mild hypocarbia since CO2 is a potent cerebral vasodilator. Temperature was maintained around 34°C. Blood loss was around 400ml. Patient was transfused with 2 units of packed red blood cell since the patient had low hemoglobin pre operatively. 2000 ml of crystalloids were given. Urine output was 750ml. Total duration of surgery was 3 hours. Patient was reversed with inj.Glycopyrrolate 0.4 mg and inj.Neostigmine 2.5mg. After thorough oral suction the patient was extubated. Post- extubation, the patient’s blood pressure was 150/80 mmHg. He was assessed for neurological deficit on the table. There was no neurological problem. The patient had mild hoarseness of voice, comparatively better than pre-operative period. Patient was observed in ICU for 24 hours. Post-operative period was uneventful and the patient was
hemodynamically stable without any support of vasopressors or vasodilators. The hoarseness of voice settled down completely on 3rd post-operative day.

**Discussion:**

Anesthetic management goals for carotid aneurysm repair\(^{(1)}\) include the 1. Protection of the heart and brain from ischemic injury 2. Control of the heart rate and blood pressure and 3. Ablation of surgical stress response. These goals must be achieved with another important goal in mind—to have an awake patient at the end of surgery for neurological examination.

In the pre-operative assessment, the anesthesiologists must determine whether the manifestations of generalized arteriosclerosis, such as coronary disease, hypertension and renal disease are present. Medical conditions such as obesity, diabetes mellitus and pulmonary disease secondary to cigarette smoking should be sought. At least 50% of deaths following carotid artery surgeries are cardiovascular in origin, thus hypertension must be controlled preoperatively. Blood pressure should be measured in both arms. A range of acceptable blood pressures, where the patient is free of symptoms of both cardiac and cerebral ischemia, should be determined. Determine the normal range of blood pressure (both the highest and the lowest blood pressure) from ward charts. Knowing this range allows the anesthesiologist to determine the range of blood pressures, which are likely to be tolerated without treatment in the operation theatre. The patient’s neurological status and airway will need to be evaluated. The patient’s airway needs to be assessed for ease of ventilation and intubation. The patient in whom it is difficult to establish ventilation may become hypercarbic during induction, and the increase in Paco2 may have adverse effects on cerebral blood flow. 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 and X-ray neck. And the other concern was not to injure the swelling by excess manipulation during intubation. Ideally the patient should present to the operating room calm and awake. One of the anaesthetic goals for carotid surgery under general anesthesia is to have a patient who immediately emerges from anesthesia and is able to co-operate for neurological examination. A patient who is over sedated at the end of surgery will be problematic. To achieve the goals, a thorough and reassuring pre-operative visit alone may provide sufficient anxiolysis. The anesthesiologist should explain the pre-operative procedure and what can be expected in the post-operative period.

In the awake patient undergoing carotid aneurysm surgery under regional anesthesia, repeated neurological examination can be done to assess the adequacy of cerebral perfusion. If the patient receives general anesthesia, cerebral perfusion or function should monitored. Monitors include EEG, SSEP, Transcranial Doppler, carotid stump pressure and jugular venous oxygen saturation. Cerebral oximetry—a non-invasive monitor—that can be used continuously.

**Choice of anesthesia:**\(^{(1)}\)

Patient undergoing carotid surgery may have regional or general anesthesia. Benefits of general anesthesia include a still patient and a quiet operative field, early control of the airway and ventilation, and the ability to protect the brain ischemia. A disadvantage of general anesthesia is the inability to perform repeated neurological evaluation during surgery.
Regional anesthetic techniques-1.superficial and deep cervical plexus block 2.Cervical epidural anesthesia. The primary advantage of a regional anesthetic is that the patient remains awake allowing for repeated neurological evaluation. And also the greater stability of blood pressure with a decreased incidence of peri-operative myocardial infarction. Complications include seizures, alteration of mental status and loss of patient co-operation. In our case option for regional anesthesia was ruled out as the extent of incision was large and the possibility of rupture of aneurysm. Hence the case was conducted under general anesthesia with precautions for cerebral protection like establishment of local shunt, steroids and inj.Mannitol 20%. Titrated doses of opioids and minimal concentration of isoflurane were used to facilitate early recovery. During induction and intubation, the patient’s blood pressure can be kept in his normal range by the use of vasopressor like phenylephrine and vasodilators such as nitroglycerin or sodium nitroprusside as indicated. Anesthesia can be maintained with a combination of volatile agents and opioids. The addition of opioids to isoflurane will decrease the heart rate, reduce the requirement of volatile anesthetics and when correctly dosed, allow for a prompt, smooth emergence from general anesthesia. Intra-operative management of blood pressure:

Once the carotid cross-clamp is removed, the patient's blood pressure should be maintained in its low normal range. It reduces the myocardial oxygen consumption, decreases the amount of stress on the suture line in the carotid artery and finally minimizes the possibility of reperfusion hemorrhage.

Cerebral protective measures:
Short clamping time, moderate hypothermia, local shunt, drugs like thiopentone which reduces the cerebral activity 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.

Reperfusion Injury:
Poorly controlled BP after the carotid cross-clamp has been removed contributes to reperfusion injury. Maintaining good pressure control with antihypertensive drugs once the carotid obstruction is eliminated decreases the incidence of reperfusion injury.

Post-operative complications:
Neurological complications are usually embolic in nature, occurring during surgery whereas the remainder is from reperfusion injury, intracranial hemorrhage and anesthetic effects. Circulatory instability includes either hypotension or hypertension. Therapy needs to be instituted with fluids and vasopressors depend upon the cause. The reasons for hypertension include hypoxemia, hypercarbia, pain and a full bladder. Another common cause of postoperative hypertension and tachycardia has been attributed to blunting of the carotid baroreceptor mechanism.
secondary to carotid sinus dysfunction caused by surgical trauma. The patient’s blood pressure should be maintained in the low normal range post operatively. Elevated blood pressure can be treated with hydralazine 5mg or labetolol 10mg intravenously in incremental doses. Alternatively sodium nitroprusside or nitroglycerine can be used. Respiratory insufficiency includes vocal cord paralysis from intra operative traction on the laryngeal nerves. The most commonly injured nerves are hypoglossal, recurrent laryngeal and superior laryngeal Airway obstruction due to hematoma formation at the operative site. The hematoma needs to be evacuated as quickly as possible. Other complications are supraglottic edema and tension pneumothorax.

Conclusion:
Carotid artery aneurysm may result in tracheal deviation. Management of difficult airway, thorough pre-operative assessment and optimization of blood pressure control before surgery are essential in the anesthetic management of carotid artery surgeries. During aneurysm repair, carotid clamping can be accomplished with proper precautions to reduce the incidence of cerebral insult. Anaesthetic agents should be given in titrated doses to facilitate early recovery for post-operative neurological assessment.

REFERENCES:
5. Hamilton WP. Do let the blood pressure drop and do use myocardial depressants? Anesthesiology 1976; 45:273-274.