Report Article

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Anaesthetic Considerations in Thoracic Endovascular Aortic Repair

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Abstract

Thoracic, abdominal and thoraco-abdominal aortic pathologies have highest mortality and morbidity causing pathologies in cardiovascular surgery. Co-existing diseases and age significantly increase risk of anaesthesia and mortality rate in treatment of these patients. Endovascular techniques are used increasingly due to minimally invasive approach, decreased anaesthesia risk during implementation, reduced length of hospital stay, and low mortality and morbidity rates. The aim of this case report is focused on anaesthetic experiences in endovascular techniques performed at our center.

Keywords: Thoracic Endovascular Aortic Repair; Tran's Oesophageal Echocardiography.

Introduction

The Aortic pathologies (Thoracic, abdominal and thoraco-abdominal)causes a significant mortality and morbidity in cardiovascular surgery. Co-existing diseases and age significantly increase risk of anaesthesiain management of these patients. In the recent times Endovascular techniques are increasingly used due to minimally invasive approach, decreased anaesthesia risk during implementation, reduced length of hospital stay, and low mortality and morbidity rates. The aim of this case report is focused on anaesthetic experiences in endovascular techniques performed at our center.

Case Report

Fifty years old lady following a Bentall procedure presented with abdominal pain on evaluation found to have Stanford type B aortic dissection(dissection flap seen extending from arch up to bifurcation of aorta with celiac trunk and left renal artery arising from false lumen and right renal artery from true lumen. No evidence of anastomotic leak or pseudo aneurysm formation seen at anastomotic site).The patient was posted for TEVAR procedure in a hybrid operating room. After taking informed written consent patient taken to the operating room and after establishing standard monitorsunder General Anaesthesia (anticipating the duration of the procedure and cooperation of the patient) with invasive monitoring, anaesthesia maintained with sevoflurane, vecuronium and fentanyl under controlled ventilation. During Intraoperative period Blood pressure was controlled with Nitroglycerine and Propofol infusion and titrated accordingly to maintain mean arterial BP of 80-90mmHg. At the beginning of the procedure heparin 100U/Kg i.v was administered to achieve an activated clotting time in the level twice as high of normal. Procedure went uneventful and shifted to PACU where she was extubated and shifted to ward on the same day. Rest of the hospital stay was uneventful and started to mobilize on third postoperative day.

Discussion

- TEVAR is an established management for aortic aneurysms and dissections where the deployed stent covers the length of diseased aorta to exclude blood flow into the false lumen or aneurysmal cavity. Aortic dissections are classified based on Debakey and Stanford classification. (Table 1) In the case mentioned above being a Type B Aortic Dissection which are managed medically unless there are life-threatening complications. (ACC/AHA Class I recommendation; level of evidence B (1) TEVAR for the therapy of complicated acute type B dissection is highly recommended (STS guideline: Class I recommendation; level of evidence A). (1)Aortic dissection is more common in men (1)It is commonly associated with hypertension but less so with atherosclerosis. There is always an urgent need for definitive aortic imaging (TEE, CT, MRI) (ACC/AHA Class I recommendation; level of evidence B). The most commonly done study is CECT because it is widely available.Although MRI has a near 100% sensitivity and specificity, the time taken for the procedure during emergency has to be taken into consideration.The Role of TEE at experienced centres is commendable. Furthermore, TEE can look for aortic valve, assessing ventricular function including regional wall motion, coronary dissection, and diagnosing cardiac tamponade and pericardial effusion. The prerequisite for endovascular repair is a sufficient proximal and distal landing zone of at least 2 cm for safe deployment and durable fixation (ACC/AHA Class I recommendation; level of evidence C). The following are contraindications for TEVAR-Unsuitable landing zone, Iliacocclusion, Torturous iliac vessels, Short and conical proximal neck.
- The choice of anesthesia is between GA Versus local or regional anaesthesia under sedation depending on severity of the disease and anesthetist preference. In our case we preferred General anesthesia with Invasive blood pressure monitoring through the right radial artery which is preferred site for blood pressure monitoring, given that the left subclavian artery may be covered and/or the left brachial artery may be accessed as part of the procedure. (2) Central venous access for the use of vasoactive drugs and central venous pressure monitoring. TEEhelps in hemodynamic monitoring, procedural guidance, and endoleak detection (ACC/ACC Class IIa recommendation; level of evidence B). If spinal cord monitoring is planned (SSEPs and/or MEPs), the anesthetic technique must be designed not to interfere with their signal quality.
- Perioperatively Blood Pressure is controlled with intravenous agents in the following order of preference Esmolol> Metoprolol > calcium channel blockers such as verapamil or diltiazem > SNP. Vasodilator therapy should not be initiated before heart rate control to avoid the associated reflex tachycardia that might aggravate the aortic dissection(ACC/AHA Class III recommendation; level of evidence C)
- If epidural analgesia is used then a dilute solution of local anesthetic and narcotic is preferred to minimize hypotension and to permit serial neurologic assessment of lower extremity function. Paraplegia after thoracoabdominal procedure is a serious complication occurring at midthoracic level and is associated with a high periprocedure mortality.The arterial supply to the spinal cord is provided by the anterior spinal artery and paired posterior spinal arteries that branch off the vertebral arteries. Radicular arterial branches off the descending thoracic aorta provide collateral arterial supply to the anterior and posterior spinal arteries. The arteria magna or artery of Adamkiewicz refers to a large radicular branch located between the T9 and L2 vertebral levels that supplies the anterior spinal artery. The Risk factors for spinal cord ischemia are perioperative hypotension (decreased SCPP), prior abdominal/descending thoracic aortic procedures (compromised spinal collateral arterial network) coverage of the entire descending thoracic aorta (significant loss of intercostal arteries)(3) CSF drainage at lumbar level is a recommended spinal cord protection strategy in patients with identified risk factors.
- Renal Protection during Thoracoabdominal Aortic procedure are Preoperative hydration and intraoperative mannitol administration as reasonable

Debakey	Stanford
Type I- the entire aorta is involved	Type A- involvement of the ascending aorta or aortic arch regardless of the site of origin or distal extent
Type II - confined to ascending aorta	Type B – confined to the descending aorta distal to the origin of the left subclavian artery
Type III- Intimal tear originating in the descending aorta with either distal or retrograde extension	

Table. 1: Classification of Aortic Dissection.

nephroprotective strategies. The use of Furosemide or dopamine is questionable. Apart from contrast induced Nephropathy, Rhabdomyolysis from lower extremity ischemia can be was recently identified as a mechanism for renal dysfunction [4]. The risk factors for stroke after TEVAR include a history of prior stroke, mobile aortic arch ather-oma.

- In the Post-operativeperiod early emergence is preferable for neurologic assessment and use of intravenous analgesia for adequate pain control managed with small boluses of opioids or NSAID or epidural analgesia if catheter already in place which is protocol based [5] The Complications arise out of TEVAR are Failed deployment – conversion to GA (2%), Arterial rupture, Embolization, Ischemia of spinal cord/kidneys/bowel/legs, Endoleak, Infection (graft infection- high mortality), Graft migration, Post implantation syndrome, Others-Hypothermia, Coagulopathy, delirium, stroke, hemodynamic lability, renal failure, respiratory failure, metabolic disturbances. The advantages of TEVAR offers Overall reduction of perioperative mortality, Less systemic complications, Less bleeding and transfusion, Reduces overall length of hospital stay.
- EVAR I trail showed reduced 30 day mortality compared to open surgery but there were higher rates of graft related complications and interventions. The EVAR II trial-there were significantly fewer aneurysm related deaths in the endovascular group, compared to no intervention. The rates of complication and intervention were similar to the rates observed in EVAR I. EVAR offers a clear operative mortality benefit over open repair, but this early benefit is not translated into a long term survival advantage

Conclusion

EVAR should be considered as a beneficial alternative treatment option for high-risk and inoperable, elderly patients. Postoperatively, the rate of being intubated and the length of stay in intensive care unit were found significantly lower in endovas-cular aortic repair (EVAR). Anaesthesia approach to be selected in these patients may be affected not only by general condition and cooperation of the patient, but also by the location of the pathology and duration of the process. Thus, the anaesthesiologists should be prepared to face issues related to the patient's safety both during the administration of anaesthesia and in the postoperative period.

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