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SUCCESSFUL ANAESTHETIC MANAGEMENT OF ENDOVASCULAR REPAIR OF AORTIC ANEURYSM: A CASE SERIES FROM A TIER-2 CITY TERTIARY CARE CENTRE

Anaesthesiology

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ABSTRACT

Background: Endovascular repair of aortic aneurysms (EVAR/TEVAR) has emerged as a less invasive alternative to open surgery, particularly in elderly patients with multiple comorbidities. Despite its minimally invasive nature, these procedures pose significant anaesthetic challenges due to haemodynamic fluctuations, risk of contrast-induced nephropathy, potential airway compromise in thoracic aneurysms, and the possibility of spinal cord ischemia. **Methods:** We present a case series of four high-risk patients who underwent elective endovascular aortic aneurysm repair at a tertiary care centre in a tier-2 city. All patients were managed using balanced general anaesthesia with invasive haemodynamic monitoring and dexmedetomidine infusion for sympatholysis. Perioperative data, haemodynamic stability, and postoperative outcomes were analysed. **Results:** Adequate haemodynamic control was maintained in all patients with prompt management of transient fluctuations using vasoactive support. No patient developed intraoperative myocardial ischemia, significant renal dysfunction, airway complications, or neurological deficits. The thoracic aneurysm case was successfully managed with advanced airway preparedness and strict mean arterial pressure maintenance. **Conclusion:** Endovascular repair of aortic aneurysms can be safely performed in high-risk patients with meticulous anaesthetic planning, invasive monitoring, and effective sympatholysis. Thoracic cases require heightened vigilance for airway compression and spinal cord ischemia. A structured multidisciplinary approach is key to favourable perioperative outcomes.

KEYWORDS

Endovascular Aneurysm Repair; Thoracic Aortic Aneurysm; General Anaesthesia; Dexmedetomidine; Haemodynamic Monitoring

INTRODUCTION

An aortic aneurysm is clinically defined as a localized, permanent dilatation of the aorta that exceeds 50% of its normal diameter (3). While abdominal aortic aneurysms (AAA) represent the majority of clinical cases, thoracic aortic aneurysms (TAA) are characterized by significantly higher perioperative complexity due to their anatomical proximity to vital mediastinal structures (6). The natural history of these aneurysms involves progressive enlargement, which carries a life-threatening risk of dissection or catastrophic rupture once critical diameters are reached (4).

The advent of endovascular aneurysm repair (EVAR) has fundamentally altered the management of these patients, significantly reducing perioperative morbidity compared to traditional open surgical techniques (2, 7). Consequently, endovascular interventions are increasingly preferred for elderly patients and those presenting with multiple high-risk comorbidities (1). However, despite being minimally invasive, these procedures present substantial anaesthetic challenges. In abdominal repairs, the primary concerns include acute haemodynamic instability, myocardial oxygen supply–demand imbalances, contrast-induced renal dysfunction, and the constant threat of sudden rupture during intra-arterial manipulation (1, 4).

Thoracic repairs introduce even more complex high-risk features. Large descending thoracic aneurysms often produce a mediastinal mass effect, resulting in tracheobronchial compression, pulmonary artery compression with ventilation–perfusion mismatch, and esophageal displacement, which increases the risk of aspiration (5,6). Furthermore, the deployment of thoracic stent-grafts carries a grave risk of spinal cord ischemia and permanent paraplegia if intercostal arterial supply is compromised (6, 8). A critical concern for the anaesthesiologist is the potential for dynamic airway collapse following the induction of anaesthesia and the use of neuromuscular blockade in patients with pre-existing airway compression (5,6).

Given these multifaceted risks, successful outcomes require a comprehensive perioperative strategy characterized by detailed preoperative evaluation, meticulous beat-to-beat haemodynamic control, and advanced airway preparedness (4, 9). The purpose of this case series is to describe the anaesthetic experience and clinical management of four high-risk patients undergoing elective endovascular repair. By examining our structured approach, we aim to highlight the essential protocols—specifically the use of dexmedetomidine for sympatholysis—that ensure safety in this vulnerable population.

METHOD

Ethical Considerations - The study was conducted after obtaining approval from the institutional ethics committee, and written informed consent was obtained from all participants in accordance with the Declaration of Helsinki.

Participants The study cohort consisted of four male patients, aged between 49 and 70 years, scheduled for elective endovascular aortic repair. These patients represented a high-risk population; three presented with infrarenal abdominal aortic aneurysms (AAA), while one patient presented with a large descending thoracic aortic aneurysm (TAA) characterized by significant mediastinal compression. Based on the American Society of Anesthesiologists (ASA) physical status classification, two patients were categorized as ASA IV and two as ASA III. Comorbidities were prevalent, most notably systemic hypertension in all patients, along with ischemic heart disease (IHD), chronic obstructive pulmonary disease (COPD), and a history of cerebrovascular accident. Functional capacity was significantly limited, with most patients performing at less than 4 METS.

Preoperative Assessment- To ensure a robust and "clean" methodology, each patient underwent a rigorous preoperative evaluation. This included a focused airway assessment (incorporating Mallampati classification), a comprehensive cardiopulmonary examination, and CT aortography to map the aneurysm's anatomy. For the patient with the thoracic aneurysm, radiological evidence was specifically scrutinized for signs of tracheal compression, lung volume loss, and vertebral erosion, which highlighted a higher perioperative risk profile and the need for advanced airway preparedness (5, 6).

Anaesthetic Procedure- In accordance with high-risk protocols, standard monitoring was supplemented by an invasive arterial line placed prior to induction for continuous, beat-to-beat blood pressure monitoring. Central venous access was secured when clinically indicated by the patient's status.

Premedication and Induction- Patients received standardized premedication consisting of titrated intravenous midazolam (0.04 mg/kg) and fentanyl (2 mcg/kg). Induction was achieved using etomidate (0.2 mg/kg), which was selected specifically for its profile as a haemodynamically stable induction agent (1). To mitigate the risk of dynamic airway collapse—a critical concern in the presence of mediastinal mass effect—neuromuscular blockade was withheld until adequate mask ventilation was confirmed.

Maintenance and Haemodynamic Control- Anaesthesia was maintained using isoflurane in an oxygen–air mixture . Muscle relaxation was provided with vecuronium (0.1 mg/kg). A dexmedetomidine infusion was utilized intraoperatively in all cases to provide sympatholysis and enhance haemodynamic stability during critical procedural phases, such as stent deployment (4, 6). This balanced anaesthetic regimen was designed to minimize shear stress on the aneurysm wall while preserving end-organ perfusion (3). To ensure the rapid management of acute blood pressure fluctuations, titrated infusions of nitroglycerin and noradrenaline were prepared and kept on standby for immediate use in all cases

Data Recording- Detailed perioperative data were systematically recorded for analysis. These included continuous haemodynamic trends, the occurrence of any airway events, the total requirement for vasoactive support, and the duration of postoperative recovery.

RESULTS

All four high-risk patients underwent successful endovascular aortic repair under general anaesthesia. Throughout the procedures, haemodynamic parameters were maintained within the target ranges, with transient blood pressure fluctuations promptly corrected via the use of titrated vasoactive infusions . Critically, there were no intraoperative instances of aneurysm rupture, major arrhythmias, or myocardial ischemia. Furthermore, despite the high-risk nature of the thoracic case, no difficulties in ventilation or oxygenation were encountered.

Blood loss was recorded as minimal in all cases, and no procedure required an emergency conversion to open surgical repair. All participants fulfilled established extubation criteria immediately following surgery and were transferred to the intensive care unit (ICU) for further observation. The postoperative course was uneventful for the entire cohort; specifically, no neurological deficits suggestive of spinal cord ischemia were observed, and renal function remained preserved in the abdominal subgroup . All patients were successfully discharged from the ICU within 48 hours.

Table 1: Comparison of Clinical and Perioperative Variables

Parameter	Patient 1	Patient 2	Patient 3	Patient 4
Age/Sex	67/M	49/M	70/M	56/M
Type of Aneurysm	Abdominal	Abdominal	Abdominal	Thoracic (descending)
Major comorbidities	IHD COPD, HTN	HTN, prior stroke	HTN	HTN
Functional capacity	<4 METS	<4 METS	<4 METS	Limited by dyspnoea
ASA status	IV	III	III	IV
Airway assessment	Mallampati III	Mallampati II	Mallampati II	Mallampati II
Special mrisk factors	Difficult airway	Cerbro-vascular risk	Large aneurysm	Airway compression, mass effect
Anesthesia technique	GA with dexmede-tomidine	GA with dexmede-tomidine	GA with dexmede-tomidine	GA with dexmede-tomidine
Intraoperative event	None	none	none	none
ICU stay	<48hrs	<48hrs	<48hrs	<48hrs
Outcome	Successful	Successful	Successful	Successful

Case 1- 67-year-old male scheduled for infrarenal abdominal aortic aneurysm (AAA) repair. His clinical profile was significant for ischemic heart disease (IHD), chronic obstructive pulmonary disease (COPD), and systemic hypertension. With a functional capacity of less than 4 METS and an ASA physical status of IV, he represented a high-risk candidate for perioperative cardiac and respiratory events. Furthermore, his airway assessment (Mallampati III) identified him as a difficult airway challenge, requiring specialized preparedness for induction.

Case 2- 49-year-old, male presented for abdominal aneurysm repair with a history of prior stroke and hypertension. Although the youngest in the series, his functional capacity was also restricted to less than 4 METS, and he was classified as ASA III. His management primarily addressed his high cerebrovascular risk and the need for strict blood pressure maintenance to prevent perioperative neurological complications.

Case 3- 70-year-old male with a large abdominal aneurysm and systemic hypertension. Classified as ASA III with a functional capacity of less than 4 METS, the primary anaesthetic focus in his case was the prevention of aneurysm rupture during the high-stress phases of intra-arterial manipulation.

Case 4- 56-year-old male, presented the most complex case in the series with a large descending thoracic aortic aneurysm (TAA) causing significant mediastinal mass effect. As an ASA IV patient with a functional capacity limited by dyspnoea, his radiological profile was particularly concerning, demonstrating tracheal compression, left lung volume loss, and vertebral erosion. These factors indicated a precarious airway and a substantial risk for dynamic airway collapse following the induction of anaesthesia and the administration of neuromuscular blockade.

DISCUSSION

The primary objective of anaesthetic management during endovascular aortic repair (EVAR and TEVAR) is the maintenance of tight haemodynamic control to minimize shear stress on the aneurysm wall while preserving perfusion to vital end-organs(1,4) The favorable outcomes observed in the present case series highlight the importance of meticulous preoperative preparation, invasive monitoring, and a carefully titrated balanced anaesthetic technique in high-risk patients.

In the abdominal aneurysm subgroup, the predominant anaesthetic concerns included maintenance of myocardial oxygen balance, management of hemodynamic lability, and prevention of contrast-induced renal injury(1,4) Patients undergoing EVAR frequently have significant cardiovascular comorbidity and limited functional capacity, predisposing them to perioperative myocardial supply–demand mismatch[1]. In the present series, these risks were effectively mitigated using balanced general anaesthesia supplemented with dexmedetomidine and continuous beat-to-beat monitoring via invasive arterial lines. Prompt correction of transient blood pressure fluctuations with vasoactive infusions likely contributed to the absence of intraoperative myocardial ischaemia or postoperative renal dysfunction in this cohort.

The thoracic aneurysm case in our series posed substantially greater anaesthetic complexity due to significant mediastinal mass effect. Large descending thoracic aneurysms may produce tracheobronchial compression with the potential for dynamic airway collapse following induction of anaesthesia and administration of neuromuscular blockade(5,6). In addition, deployment of thoracic stent-grafts carries a recognised risk of spinal cord ischaemia (SCI) and paraplegia secondary to compromise of intercostal arterial supply (6,8,10). Maintenance of adequate mean arterial pressure and avoidance of prolonged hypotension are therefore critical components of spinal cord protection (8,10). In the present case, careful airway preparedness and vigilant haemodynamic control enabled successful conduct of TEVAR without respiratory or neurological complications, underscoring the importance of anticipatory planning in such high-risk scenarios.

A notable feature of this case series was the routine use of dexmedetomidine infusion. By providing effective sympatholysis, dexmedetomidine reduces catecholamine-mediated haemodynamic surges and decreases volatile anaesthetic requirements, thereby contributing to improved intraoperative stability (1,4). In our experience, its use was associated with smooth perioperative hemodynamics and absence of significant arrhythmias or hypertensive episodes during critical procedural phases such as stent deployment.

CONCLUSION

Endovascular repair of abdominal and thoracic aneurysms can be performed safely in high-risk patients at tier 2 tertiary care center (routinely low volume for such cases) when guided by meticulous anaesthetic planning and strict haemodynamic control. Thoracic cases require heightened vigilance regarding airway compression and spinal

cord ischemia. The integration of invasive monitoring, carefully titrated balanced anaesthesia, and close coordination between anaesthesia and vascular teams are the key determinants of successful perioperative outcomes.

REFERENCES

1. Kothandan H, Haw Chieh GL, Khan SA, Karthekeyan RB, Sharas SS. Anaesthetic considerations for endovascular abdominal aortic aneurysm repair. Ann Card Anaesth. 2016;19(1):132-141. doi:10.4103/0971-9784.173029.
2. Nataraj V, Mortimer AJ. Endovascular abdominal aortic aneurysm repair. Contin Educ Anaesth Crit Care Pain. 2004;4(3):91-94.
3. Thomson DA. Anaesthesia for patients with abdominal aortic aneurysm. Contin Educ Anaesth Crit Care Pain. 2000;2(1):17-21.
4. Atwal G, Wylie W. Anaesthesia for endovascular aortic aneurysm repair (EVAR). ATOTW Tutorial 303. World Federation of Societies of Anaesthesiologists; 2014.
5. Totonchi Z, Givtaj S, Sakhaei M. Anaesthetic management in a patient with type A aortic dissection and superior vena cava syndrome. Res Cardiovasc Med. 2015;4(3):e27424. doi:10.5812/cardiovascmed.27424.
6. Oosthuizen A. Thoracic endovascular aortic surgery. S Afr J Anaesth Analg. 2022;28(1).
7. Norris EJ, Beattie C, Perler BA, et al. Double-masked randomized trial comparing alternate combinations of intraoperative anesthesia and postoperative analgesia in abdominal aortic surgery. Anesthesiology. 2001;95(5):1054-1067.
8. Canaud L, Ozdemir BA, Patterson BO, Holt PJ, Loftus IM, Thompson MM. Neurologic complications after thoracic endovascular aortic repair. J Vasc Surg. 2014;59(2):429-435. doi:10.1016/j.jvs.2013.08.088.
9. Coselli JS, LeMaire SA, Preventza O, et al. Outcomes of thoracic endovascular aortic repair: review of perioperative considerations. Ann Thorac Surg. 2016;102(5):1814-1821. doi:10.1016/j.athoracsur.2016.05.090.
10. Tanaka A, Estrera AL. Spinal cord protection in thoracic and thoracoabdominal aortic repair. Semin Thorac Cardiovasc Surg. 2019;31(1):29-36. doi:10.1053/j.semtcvs.2018.11.003.