Anesthetic management of endovascular repair of penetrating ulcer of descending thoracic aorta

To The Editor,

Penetrating aortic ulcer (PAU) is often mistaken for aortic dissection (AD) on clinical grounds with challenging surgical management. The literature for anesthetic management for such case is sparse. We present here the anesthetic management of PAU of descending thoracic aorta (DTA) for endovascular repair in a 32-year-old, 60-kg male.

Patient presented with shortness of breath. On evaluation, chest X-ray revealed collapsed right lung. Pulmonary angiogram ruled out pulmonary thromboembolism. Chest CT scan showed right hemothorax, lung collapse, contralateral mediastinal shift, partial thrombosis involving aortic arch, and DTA [Figure 1]. Abdominal CT revealed diffuse descending aortic wall thickening. A penetrating ulcer in DTA caused hemothorax which sequentially sealed the ulcer limiting further expansion or respiratory symptoms worsening. Hence, patient presented with a chronic symptomatology. The hemothorax was subjected to a diagnostic tap prior to surgery which did not yield a free flow suggesting an organized collection and chronic nature of the hemothorax. An intercostal drain (ICD) placement was planned post-endovascular repair.

The initial decision of an open surgery was switched to thoracic endovascular repair (TEVAR) because of poor lung compliance on right side and need for thoracotomy on both sides. General anesthesia (GA) with ASA standard monitoring was planned. Two 16-G IV canulas were established. Right radial artery was cannulated and transduced for arterial BP monitoring prior to induction of anesthesia. Preferably it should have been done in emergency room, but provision for invasive monitoring was not present. Anesthesia was induced with 150 mcg fentanyl, propofol 100 mg, and atracurium 40 mg IV. Trachea was intubated with 8.5 mm cuffed tracheal tube. A sheath was inserted in the right internal jugular vein for rapid fluid infusion and cardiac pacing, if required as deployment of stent has been associated with complications like aortic rupture and bradyarrhythmias.<sup>1</sup> Pornratanarangsri et al. have advocated the use of temporary rapid ventricular pacing as a safe, simple, predictable, and effective method of inducing sustained hypotension, enabling precise deployment of endovascular stent grafts and safe post-stent ballooning during endovascular repairs.<sup>1</sup> Anesthesia was maintained with atracurium and fentanyl infusion and sevoflurane with oxygen and air on volume control ventilation.

Inguinal incisions were made on both sides—right side to gain femoral artery access and graft insertion, and left side for injection of radiocontrast and heparin. The inguinal area on the right side was marked and prepared before induction to ensue quick establishment of cardiopulmonary bypass, should a cardiovascular complication occur. Patient was kept in a state of deliberate hypotension before and during the deployment of the graft and in a state of relative hypertension after the graft deployment. Deliberate hypotension was maintained by keeping a higher minimum alveolar concentration (MAC = 1.3–1.5) of sevoflurane and with nitroglycerine infusion of 0.5–2 µg/kg/min to maintain a mean arterial pressure of 60–70 mmHg. The

![Figure 1: A CT scan of the chest and abdomen showing hemothorax on the right side (black arrow) with mediastinal shift toward left and an intramural hematoma in the descending thoracic aorta on the left (grey solid arrow)](image-url)
procedure was uneventful. An ICD was placed in the right hemithorax post-repair. Patient was electively ventilated for 24 h postoperatively due to poor preoperative pulmonary reserve and extubated the next day. The remaining course of hospital stay was uneventful.

Shennan first described PAU in 1934.[5] These plaques can have myriad presentations—intramedial dissection at ulcer site, aortic wall hematoma, adventitial extension, pseudoaneurysm, or rupture into the hemithorax. Both PAU and AD have a similar clinical presentation but penetrating ulcers have different pathologic entity.[1] The most common site is DTA. These ulcers have a poorer prognosis than a classic AD.[4] Coady et al. have reported a higher risk of aortic rupture in PAU than AD.[6] PAU with depth >10 mm or diameter >20 mm have a higher progression risk and should be repaired.[8]

TEVAR requires expertise and skillful anesthetic management. The preferred mode of anesthesia is GA. Standard ASA monitoring should be done. Adequate large bore intravenous access should be obtained for quick fluid resuscitation. Arterial access is taken on the right arm. Left arterial access might be needed for further stent grafting or the stent graft may be covering the take-off of left subclavian artery, thus giving false BP values. During TEVAR, patients should be kept in permissive hypotension before stent deployment. Care should be taken to maintain adequate spinal cord perfusion. We maintained a mean arterial pressure between 75 and 85 mmHg after stent deployment through titration of sevoflurane to a MAC of 0.8. Sudden surges in BP were managed by esmolol boluses of 100 μg. Other methods of spinal cord protection include selective hypothermia, cerebrospinal fluid drainage, and use of high-dose steroids.[8] After stent deployment, the mean arterial pressure should be increased to ensure adequate perfusion.[9]

PAU occurs most often in elderly patients with extensive atherosclerotic disease.[10] Our case was unique in presenting at a young age. With a higher population reaching the elderly age group, we are more likely to encounter patients with this symptomatology and knowledge about anesthetic management is imperative. Salim et al. have emphasized that PAU is a unique entity and its natural history should be studied independently to better understand appropriate management strategies. This research is currently lacking, and larger studies or registries may be helpful in optimizing PAU management.[4] Future studies are required to have more definitive management protocols for such cases.

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Conflicts of interest
There are no conflicts of interest.

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