ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 11 | November - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"UNUSUAL PRESENTATION OF A USUAL COMPLICATION IN TEVAR"

Cardiovascular

Dr Ameya Nalavade M.D., FIACTA, Associate Consultant, Cardiac Anaesthesia, Sir H. N. Reliance Foundation Hospital And Research Centre, Mumbai

Dr Harvesp Panthakey M.D., FCPS, Senior Consultant, Cardiac Anaesthesia, Sir H. N. Reliance Foundation Hospital And Research Centre, Mumbai

Dr Hemant Mehta M.D., Director, Anaesthesia And Pain Management, Sir H. N. Reliance Foundation Hospital And Research Centre, Mumbai

ABSTRACT

Thoracic Endovascular Aortic Repair (TEVAR) has revolutionized the management of descending thoracic aneurysms with significant clinical outcome benefit. Multiple series have demonstrated the safety and efficacy of TEVAR in high-risk TAA patients. Recent meta-analysis demonstrated that TEVAR as compared with surgical repair reduced perioperative complications especially in patients with high surgical risk. Endovascular manipulation of a diseased aorta with endovascular devices carries significant risks. Endoleaks are known complications following TEVAR. We present a case of localised aortic aneurysm at the PDA site, which was stented but developed type 3 endoleak, which was detected on 2-months follow-up, and needed a second graft within a previous Aortic stent.

KEYWORDS

INTRODUCTION

Thoracic Endovascular Aortic Repair (TEVAR) has revolutionized the management of descending thoracic aneurysms with significant clinical outcome benefit. Endovascular stent grafts are tube grafts reinforced by a wire frame that are collapsed within a catheter for delivery and deployment within the aortic lumen. The principle of TEVAR is that the deployed stent complex spans the length of diseased aorta to exclude blood flow into the aneurysm cavity. TEVAR requires a landing zone for each end of the tubular graft.

Endovascular stent graft repair for isolated descending thoracic aortic aneurysms with a proximal landing zone that involves the left subclavian artery can be accomplished using a two-stage procedure. Multiple recent meta-analyses have demonstrated the outcome importance of not sacrificing the left subclavian artery during TEVAR to avoid the risks for stroke, paraplegia, and left upper extremity ischemia. The recent guidelines from the Society of Vascular Surgery strongly support this principle.

Multiple series have demonstrated the safety and efficacy of TEVAR in high-risk TAA patients. TEVAR for TAA, whether entirely endovascular or hybrid, is in recent clinical development especially for patients with excessive operative risk. Recent meta-analysis demonstrated that TEVAR as compared with open aortic repair reduced **perioperative mortality**, **paraplegia**, **pneumonia**, **cardiac complications**, **renal failure**, **bleeding**, and **transfusion**, as well as **length of hospital stay**.

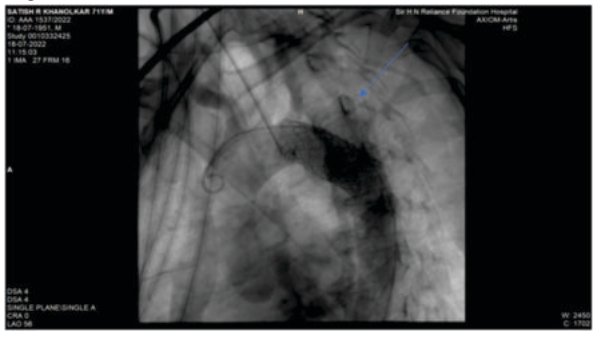
Case Report

71 y/male, a known case of hypertension, diabetes mellitus and asthma, presented with sudden onset change in voice since last 2 weeks. This was associated with frequent coughing while drinking water. He consulted an Otolaryngologist. Indirect laryngoscopy was s/o left vocal cord palsy. A Neurologist, Cardiologist and Cardiovascular surgeon were involved as CT thorax was s/o PDA site Aortic diverticulum/loculated saccular pseudoaneurysm with a narrow neck distal to the left subclavian artery take-off as the cause of left recurrent laryngeal nerve compression. After careful evaluation and discussion with multi-disciplinary team involving Cardiovascular surgeon, Cardiologist, and neurologist, it was decided to perform an Endovascular stenting of aneurysm distal to left subclavian artery.

Patient's pre-anaesthesia evaluation was unremarkable except for his comorbidities which were adequately controlled (ASA grade 2). He was fasted from 12 midnight prior to procedure. Vitals were noted in pre-operative area. After wheeling in the Cath-lab, basic monitors like Ecg, NIBP, pulse oximeter were applied. A 20G iv cannula was secured in right forearm. Patient was given 1 mg Midazolam iv for anxiolysis. A right radial artery 3F catheter was inserted for invasive blood pressure monitoring. NIBP cuff was placed on left arm to compare bilateral upper limb blood pressures in an event of left subclavian artery occlusion. General anaesthesia was induced with 2 mg Midazolam, 100 mg Fentanyl and 14 mg Etomidate iv. Rocuronium 70 mg iv was used as muscle relaxant to facilitate endotracheal intubation with 8 mm cuffed portex ETT. ETT placement was confirmed with auscultation and capnography. Another 18G iv was secured in left hand. Antibiotic prophylaxis according to institutional protocol was given along with Inj Pantoprazole 40 mg for acid prophylaxis, Inj Hydrocortisone 100 mg iv for reactive airways and Inj Dexamethasone as part of multimodal analgesia. Anaesthesia was maintained with 50:50 O2-N2O mixture and sevoflurane maintaining a MAC of 0.9-1.0. Muscle relaxation was achieved with 10 mg IV Atracurium top-ups every 30 minutes.

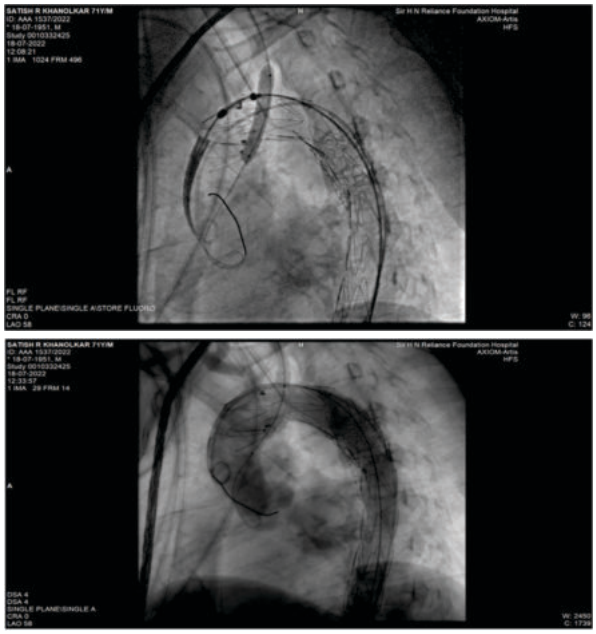
Arch and descending part of Aorta just beyond left subclavian take-off was stented with 32x28x160mm on-covered stent. Flow to the left subclavian confirmed on DSA by an interventional radiologist. Hemodynamics were stable throughout the procedure. There was no radio-radial delay or significant difference in bilateral upper limb pressures. Patient was extubated, neurological recovery confirmed without any adverse event and shifted to Icu for observation followed by discharge on day 3.

Patient came for follow-up with Interventional Cardiologist after 2 months. His follow-up CT showed grade 3 Endoleak along the lateral aspect of the stented lumen with maximum diameter of 34x32 mm. There was a cranial and lateral outpouching distal to the left subclavian artery which was new. There was no evidence of dissection or migration of stent.



After consultation with interventional radiologist and cardiovascular surgeon and careful evaluation of his clinical condition, it was decided to do an in-stent grafting of the Aorta with left carotid chimney graft for distal arch aneurysm. Laboratory tests were normal. Anaesthesia considerations were same as for previous case.

After basic ASA monitoring, General anaesthesia induction was done with IV Midazolam, Etomidate and Rocuronium. An 8 mm endotracheal tube was secured. Right radial artery cannulation was done for invasive blood pressure monitoring. Left radial artery was also cannulated to detect any left subclavian artery occlusion as it is a known complication following stenting of the Aortic arch. After giving antibiotic prophylaxis, Inj. Pantoprazole 40 mg and Inj. Hydrocortisone 100 mg IV, Procedure was started. Anaesthesia was maintained with 50:50 O2-N2O mixture and sevoflurane maintaining a MAC of 0.9-1.0. Muscle relaxation was achieved with 10 mg IV Atracurium top-ups every 30 minutes. Procedure was accomplished via a right femoral arteriotomy and left femoral and left carotid percutaneous route. Procedure was uneventful. Flow to the major arch branches was confirmed on DSA. There was no difference in right and left radial artery pressures. Sheaths were removed and Femoral arteriotomy was closed. Patient was extubated and observed in PACU. After confirming that the patient had no adverse neurological event, he was shifted to icu. He was shifted to ward on postop day 1 and discharged on postop day 3.



DISCUSSION

Incidence of Thoracic aortic aneurysms (TAAs) are 10.4 in 100,000 people per year, with an estimated incidence of rupture and dissection at 3.5 per 100,000 per year, with a high (90%) mortality rate in cases of acute rupture.

The current guidelines from The Society of Thoracic Surgeons (STS) suggest TEVAR for aneurysms of the descending thoracic aorta when the aortic diameter is larger than 5.5 cm (class IIa recommendation; level of evidence B, when the patient has significant comorbidity; class IIb recommendation; level of evidence C, when the patient has no significant comorbidity). When the aortic diameter is less than 5.5 cm, the STS guidelines advise against TEVAR (class III recommendation; level of evidence C).

Although TEVAR has been shown to have decreased early morbidity and mortality compared with open surgical repair, endovascular manipulation of a diseased aorta with endovascular devices continues to have significant risks. Common complications still include stroke, spinal cord ischemia, device failure, unintentional great vessel coverage, access site complications, and renal injury.

Complications of TEVAR
Spinal cord ischemia
Stroke
Endoleaks
Endograft collapse
Vascular access and device delivery injuries
Renal failure

An endoleak is defined as the presence of persistent blood flow into the aneurysm sac after graft placement and is one of the most common complications associated with endovascular aneurysm repair. Normally after aneurysm repair, blood flows through a stent graft. The stent graft prevents blood from flowing into the damaged part of your artery (the aneurysm sac). Blood shouldn't flow outside of the stent graft within the aneurysm sac. Endoleaks that happen within 30 days of an endovascular repair procedure are called “early endoleaks.” Endoleaks that form more than 30 days after a procedure are called “secondary endoleaks” or “late endoleaks”.

	Table 1	Summary of classification of Endoleak and their management	
	Endoleak	Cause of sac perfusion	Management
1		Flow from the proximal or distal graft attachment site	Prompt
	a	Proximal graft attachment site	Angioplasty, Palmaz or cuff extension, chimney extension and embolization
	b	Distal graft attachment site	Angioplasty and extension of distal limb
	c	Endoleak at the site of an iliac occluder plug	Insertion of an additional iliac occluder plug or embolization
2		Retrograde flow through patent aortic side branch vessels	Conservative if sac size stable Embolization if sac size increase
3		Mechanical graft failure	Prompt
	a	Modular disconnection Leak at a fenestration, branch, or visceral stent	Placement of additional endograft components
	b	Fabric tear	
4		Graft porosity	Conservative. Transient phenomenon.
5		Sac size increase with no visible Endoleak	May consider catheter angiography with cone beam CT

Type 3 endoleaks result from a structural defect of the endograft, and can be subdivided into EL 3a, caused by component modular disconnection and EL 3b, secondary to a fabric tear. These are high flow endoleaks like type 1 endoleaks, resulting in sac pressurisation and therefore EL3 mandate immediate treatment. Certain grafts are associated with higher incidence of type III endoleaks and thus these can be prevented through judicious device selection. The standard treatment is relining the endograft by deploying a new endograft within the preexisting graft.

The Society of Vascular Surgery (SVS) reporting standards for EVAR (2002) and TEVAR (2010) classifies the presence of either a type I or type III endoleak at the completion of the index procedure (early endoleak) to be a technical failure. It is obvious that prevention of endoleaks, with careful preoperative planning, endograft size selection, assessment of proximal and distal landing zones, and appropriate endograft overlap, is the best strategy to avoid type III endoleaks. Early type III endoleaks should be treated at the time of diagnosis. This often can be achieved by repeat ballooning at areas of component overlap or additional endograft placement to achieve better component overlap. In cases where the proximal aortic extension has separated from the main body, and either there is a significant distance that must be bridged or the aneurysm neck has increased in diameter, larger endograft devices are likely to be necessary. Lastly, if no endovascular options are available or if they have failed, conversion to open surgical repair may be considered.

CONCLUSION

The prevention, early detection and appropriate management of post-TEVAR complications depends on diligent, multidisciplinary care. Endoleaks are the most frequent complication after EVAR and the most common indication for secondary intervention. Secondary endoleaks remain an ongoing challenge following endovascular repair of the thoracic and abdominal aorta. The significance of type I and III endoleaks is well understood, requiring prompt treatment, which includes endovascular and surgical options. Type III endoleaks are an uncommon subgroup that are less common in newer generation devices. In the modern device era, type III endoleaks are most often

associated with endograft component separation (type IIIa), and the majority are treated by endovascular techniques to stent over the junctional endograft defect. However, these endovascular reinterventions are not free of adverse events and endoleak recurrence can occur, highlighting the need for continued surveillance in these patients.

REFERENCES

1. Ameli-Renani S, Pavlidis V, Morgan RA. Secondary Endoleak Management Following TEVAR and EVAR. Cardiovasc Intervent Radiol. 2020 Dec;43(12):1839-1854. doi: 10.1007/s00270-020-02572-9. Epub 2020 Aug 10. PMID: 32778905; PMCID: PMC 7649162.
2. Chen SW, Lee KB, Napolitano MA, et al. Complications and Management of the Thoracic Endovascular Aortic Repair. Aorta (Stamford). 2020;8(3):49-58. doi:10. 1055/s-0040-1714089
3. Professional, C. C. medical. (n.d.). Endoleak: Types & treatment. Cleveland Clinic. https://my.clevelandclinic.org/health/diseases/16960-endoleak
4. Chadnick, Z., & Singh, K. (2021). Complications Associated with Aortic Aneurysm Repair. IntechOpen. doi: 10.5772/intechopen.97529
5. Stoecker JB, Glaser JD. Review of Type III Endoleaks. Semin Intervent Radiol. 2020 Oct;37(4):371-376. doi: 10.1055/s-0040-1715874. Epub 2020 Oct 1. PMID: 33041482; PMCID: PMC7540642.
6. Chatterjee S, Preventza O, Orozco-Sevilla V, Coselli JS. Perioperative management of patients undergoing thoracic endovascular repair. Ann Cardiothorac Surg 2021;10(6):768-777. doi: 10.21037/acs-2021-taes-74