Type II endoleak in Thoraflex hybrid stent-graft for frozen elephant trunk operation

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June 13, 2022

Abstract

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Article type – case report

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Short title – endoleak 2 in FET

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Words – 1363

Key words – open stent graft, aortic dissection, frozen elephant trunk, Thoraflex, endoleak

Acknowledgements – none

Funding - none

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Abstract

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Introduction

Type II endoleaks after hybrid stent grafts for frozen elephant trunk operation have been rarely described.

Case Report

A 55 year old hypertensive woman presented 6 years ago with an uncomplicated Stanford type B acute aortic dissection (SVS/STS acute type $B_{3,10}$) managed conservatively. Follow up CT scans showed progressive aneurysmal dilatation of zone 3 (63mm) and zone 4-10 (47mm) with retrograde extension into arch (non A-non B extension in Stanford type B, SVS/STS chronic type $B_{2,10}$)(Fig 1A). She was asymptomatic but had strong family history of sudden death (no connective tissue disorders).

She underwent a frozen elephant trunk (FET) operation with 26/28F, 150mm hybrid stent graft (Thoraflex THP2628X150B, Vascutek, Inchinnan, Scotland) with uneventful recovery. Postoperative scan (day 7) confirmed false lumen obliteration around stent-graft, good placement and distal seal of endostent (Fig 1B). She represented 1 month later with breathlessness and anemia (haemoglobin 88 gm%). CT scan showed large zone 2/3 collection (Fig 1C, 1D) with contrast extravasation between the aortic wall and stent endograft with type IIa endoleak (retroleak from a large 3rd intercostal artery)(Fig 2,3).

She was managed conservatively and remained stable. Subsequent serial scans showed no extravasation, stable size and thrombosis of the sac.

Comment

There is emerging expert consensus for concurrent single stage stabilization of arch and 'downstream' dissected aorta with hybrid stent grafts (1). Endoleaks with stent grafts after FET have not been extensively reported or characterized. Type 1b endoleaks (distal stent leaks) are the most commonly described. Leuhr reported 11% incidence of endoleaks (not classified) in a European multicentre study (2). Kandola et al reported 10/36(28%) endoleaks in their experience of single stage FET with Thoraflex device over a 10 year period. Only one (2.7%) was a type 2 endoleak that did not cause sac expansion and was managed conservatively (3). Similarly, stent graft induced new entry (SINE) endoleaks have not been extensively reported or characterized after FET. The reported incidence of distal SINE after thoracic endovascular aneurysm repair (TEVAR) is up to 25%. They are due to excessive oversizing (>10%) of the distal stent graft relative to the true lumen of the chronic dissection. These are usually asymptomatic and discovered on routine surveillance imaging.

Classification and reporting of endoleaks after stent grafts in aortic dissection are distinct from those after endovascular interventions in non-dissected aortas due to the presence of the stent graft in the true lumen and the additional false lumen (4). A type II endoleak is a retroleak into the space between the stent graft and the aortic wall (IIa – single vessel, IIb – two or more vessels). This extravasation can further extend into the false lumen from a fenestration between false and true lumens of the dissected aorta with resultant pressurization, sac expansion and rupture. In hybrid stent grafts (i.e. Thoraflex), the retroleak can potentially occur from a bronchial or intercostal artery that branch off from the proximal descending thoracic aorta.

Sizing for hybrid stent grafts in chronic dissections remains contentious but is largely guided by experience from TEVAR. Generally a 10% oversize for the distal luminal diameter and a 3cm distal landing zone for a good seal is considered optimum. The proximal seal in FET is provided by the cuff anastomosis and is of little concern for type 1a endoleaks. For a small true lumen in dissected aorta however, even slight oversizing may rupture the dissection membrane at the distal end and an undersized middle of the stent graft may not

completely obliterate the dilated aortic sac. Unlike open repair where large feeder aortic branches are closed directly, these vessels continue to feed the low pressure sac with retrograde flow (with potential gradual pressurization and expansion of the sac). The natural history in FET usually is a gradual thrombosis and obliteration of the false lumen in over 90%. An intraoperative open aortoscopy before stent graft deployment can potentially identify large aortic branches in the descending thoracic aorta (5).

Indications for operation are persistent extravasation with sac enlargement after failure of conservative management. The enlarging sac may compress/stretch surrounding structures pulmonary arteries, airways, recurrent laryngeal nerve and cause erosion or perforation.

Identification of feeding inflow vessels and characterizing endoleak type is possible with digital subtraction and dynamic computed tomography angiography. Access to these vessels is difficult as they open between the stent graft and the aortic wall. TEVAR and direct ostial embolization are not possible due to problems with access. Percutaneous transthoracic sac embolization and open surgery or conservative follow up may be the only options.

There is very limited experience of managing endoleaks after FET (6). Treatment remains challenging and most experience is from endovascular aortic aneurysm repair (EVAR) and TEVAR. In EVAR, they are common but mostly benign. Akmal et al in a review of 6 EVAR studies reported overall technical success rates of 17-100% with translumbar, transarterial, and transcaval embolization approaches with various agents (7).

Prophylactic feeder vessel embolization prior to EVAR is a promising treatment with limited experience. Rokosh et al reported significantly greater mean reduction in the maximum aortic diameter (0.69 vs 0.54 cm; P = .006), with a greater proportion experiencing sac regression of [?]5 mm (53.5% vs 48.7%) at mid-term follow-up (14.6 ± 6.2 months) (8). The reintervention rates were similar without prophylactic embolization even though it was a significant independent predictor of sac regression (odds ratio, 1.34; 95% confidence interval, 1.04-1.74; P = .024). This approach is fraught with risks of perforation, rupture and spinal cord ischemia in the setting of an acute aortic dissection. There are also logistical problems of operating in hybrid theatres and need for emergency interventional radiology services.

Type 2 endoleaks after FET may be seen more often as worldwide experience with hybrid stent grafts continues to increase.

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Figure Legends -

Figure 1 – Progression of the initially stable Stanford type B to non A-non B with retrograde extension into arch and increasing dilatation of zone 2/3 in contrast CT scans of the chest (A – preoperative sagittal scan, B – immediate postoperative sagittal scan at 1 week showing false lumen obliteration around the stent. C – coronal scan and D – axial scan at 1 month showing increase in size). ThF – Thoraflex hybrid stent graft, TL – true lumen, FL – false lumen.

Figure 2 – Sagittal CT scan of the chest showing the large intercostal feeder vessel (white arrow).

Figure 3 – 3D reconstruction of the thoracic aorta showing the large intercostal

feeder vessel for type IIa endoleak (red arrow).