

Single Centre Experience of Endovascular Aortic Aneurysm Repair (EVAR) Using the 'Chimney' Technique

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INTRODUCTION

- Abdominal aortic aneurysms with short infra-renal necks are not suitable for standard EVAR. Fenestrated endovascular options are costly and often require custom-made devices making them unsuitable for use in an emergency setting. The chimney technique allows the use of standard EVAR devices by preserving renal artery patency with covered stents. There are few publications detailing performance and follow-up of this technique.

AIM

- To report the preliminary experience of the University Hospital of Wales using the 'chimney' technique.

METHOD

- All patients who underwent an EVAR with a chimney graft between April 2010 and July 2013 in a single centre under 2 operators were retrospectively assessed.
- Demographics, procedural data and follow-up imaging were analysed.
- Technical success, mortality, complications and endoleaks were reviewed.

RESULTS

Demographics

Total number of patients	9
Mean age	78y (range 73-84)
Men	9 (100%)

Indication

Elective	3 - unfit for open surgery
Emergent [within 7 days]	4 - tender, 7.5 - 9cm AAA
Emergency [within 8-12 hours]	2 - 1 ruptured mycotic AAA 1 impending rupture

Technical success

Primary technical success 8 patients (88%)

{One pt had unsuccessful unilateral stent placement - kidney sacrificed as normal renal function and normal contralateral kidney}

Therefore, Immediate patency rate = 100%

Chimneys successfully placed = 10
[6 unilateral and 2 bilateral]

Devices

Main Body

Cook Zenith	1 (11.1%)
Medtronic Endurant	8 (88.9%)

Chimney Graft

Self expanding - Fluency	5 (50%)
Balloon mounted - Atrium	5

Aortic Stent graft successfully deployed in all cases

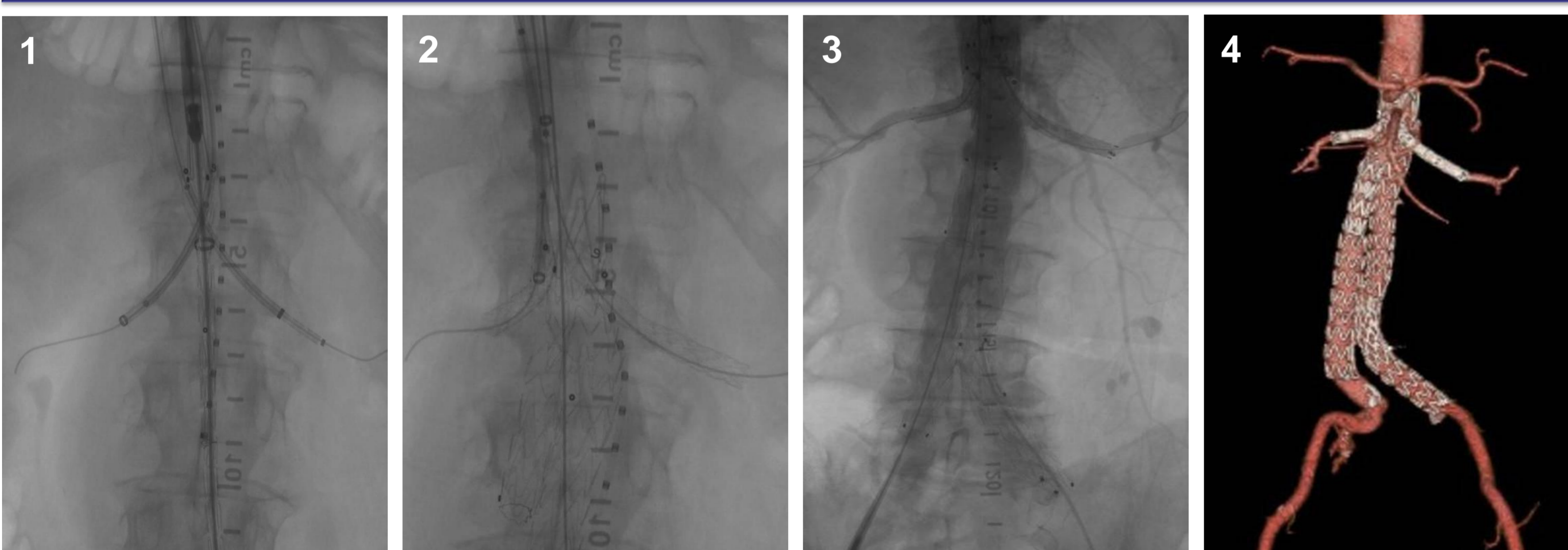
Complications

- In 1 pt the chimney stent excluded a lower renal pole branch
- In 1 pt the chimney stent was overlying the SMA origin and so a SMA bare metal stent was placed

Follow Up

- 30 day mortality 2 (22%)
 - 1 at day 2 of myocardial infarction
 - 1 at day 25 (ruptured mycotic aneurysm) of multi-organ failure and sepsis
- Two patients (25%) died after 30 days
 - 35 days Non-aneurysm related
 - 29 months High Grade Lymphoma
- Of the 8 pts who underwent successful chimney 2 procedures had failed at time of first follow up CT;
 - 1 Chimney occluded at 5 weeks & patient died (bilateral chimneys) - cause of death not aneurysm related
 - 1 Chimney occluded at 6 weeks (still alive)
- 4 patients with 5 remaining chimneys have long-term follow-up
 - Cumulative follow-up period 111 months
 - Mean 27.8 months
 - Range 17 - 33 months

FIGURES



1 - DSA showing Chimney stent positioning via brachial/axillary access 3 - Angiography confirms patency of endografts
2 - Simultaneous deployment of Chimney stents and main body endograft followed by simultaneous balloon inflation in all 3 stents 4 - Ct follow-up 3D reconstruction demonstrating patency of endografts

Endoleaks

- One small Type I and two Type II endoleaks were noted on completion angiography and had resolved by the 6 week FU CT with no intervention
- Two type 2 endoleaks developed during follow-up
 - Case 1 - associated slowly increasing sac size. Intention to intervene, but patient died at 29/12 prior to re-intervention
 - Case 2 - sac size not increased in 12 months. For continued observation.

Re-intervention

- Re-intervention was limited to angioplasty for stenosis in the SMA stent

DISCUSSION

- One small Type I and 2 Type II endoleaks were noted on completion but resolved by 6 week FU having required no intervention.
- Two Type II endoleaks developed in the follow-up period:- 1 was planned for intervention (after 2year CT), but died of Lymphoma prior to re-intervention. The second, has maintained a stable sac size over 12 months and so no intervention is planned.
- More frequently, Type II endoleaks are being managed expectantly, with relatively few cases developing either actual or threatened clinical risk requiring intervention. With studies reporting incidences of endoleak between 3.9 and 16% ^(1,2) this clearly impacts on re-intervention rate.
- Although a small sample size, no Type I endoleaks related to the chimneys have been observed - contrary to the 10.2% reported by Wilson et al ⁽³⁾.
- In one case, the chimney could not be placed and as such the kidney was sacrificed. The patient has thus far achieved 28 months follow-up without further complications.
- 2 Chimneys occluded by the 1st F/U CT. Extrapolating this as a 20% occlusion rate, we see that it is much higher than seen in standard EVAR limb occlusion by Cochenec et al ⁽⁴⁾.
- In our small sample of patients whose chimneys remained patent beyond 6 weeks good long term patency has been demonstrated (up to 33 months).
- 2 patients (25%) died within 30-days of procedure. By comparison, the American College of Surgeons National Surgical Quality Improvement Program reported a 30-day mortality of 5.1% for elective repair of AAA involving renal or visceral vessels and 25% in cases of rupture for 2011. Similarly, the EVAR 1 study reports a mortality of 1.7% for elective EVAR.
- The high 30 day mortality reflects the predominantly acute nature of disease treated in these patients as well as the small sample size.

CONCLUSIONS

This technique offers an endovascular option, primarily in the emergent situation, which might otherwise not be available in the management of AAAs with short infra-renal necks. In the elective scenario a fenestrated stent graft may offer the best approach.

REFERENCES

- Rationale and design of the Endurant Stent Graft Natural Selection Global Postmarket Registry (ENGAGE): Interim analysis at 30 days of the first 180 patients enrolled; Bockler D et al, J Cardiovasc Surg 2010;51:481-9
- Endovascular Aortic Aneurysm Repair with the Endurant Stent-graft: Early and 1-year Results from a European Multicenter Experience; Giovanni Torsello et al. J Vasc Interv Radiol 2010; 21:73-80
- Systematic review of chimney and periscope grafts for endovascular aneurysm repair. A. Wilson, S. Zhou, P. Bachoo, A. L. Tambyraja. Br J Surg 2013; 100: 1557-1564
- Limb graft occlusion following EVAR: clinical pattern, outcomes and predictive factors of occurrence. Cochenec et al. Eur J Vasc Endovasc Surg 2007; 34(1):59-65
- Endovascular versus Open Repair of Abdominal Aortic Aneurysm: The United Kingdom EVAR Trial Investigators. N Engl J Med 2010; 362:1863-1871