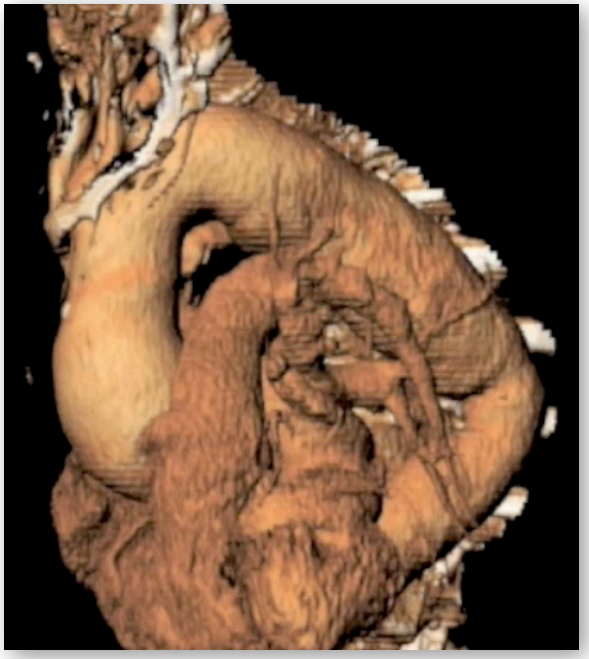
Why and how stent grafts will replace surgery

Matt Thompson



Can endovascular repair be applied to ascending aorta ????

Feasibility / patient selection / introduction technology

Feasibility of EVR in Type A Dissection

- **Morphological suitability for EVR ?**
- **Overcome technical difficulties / endograft design**
- **Clinical outcomes / complications**

- Proximal and distal LZ > 20mm
- True lumen < 38mm
- Total aortic diameter < 46mm
- Absence of significant aortic regurgitation

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- 102 patients
- 32 tubular endograft ascending
- 8 with debranching
- 13 with branched endograft

Endovascular Treatment Ascending Aorta - Challenges

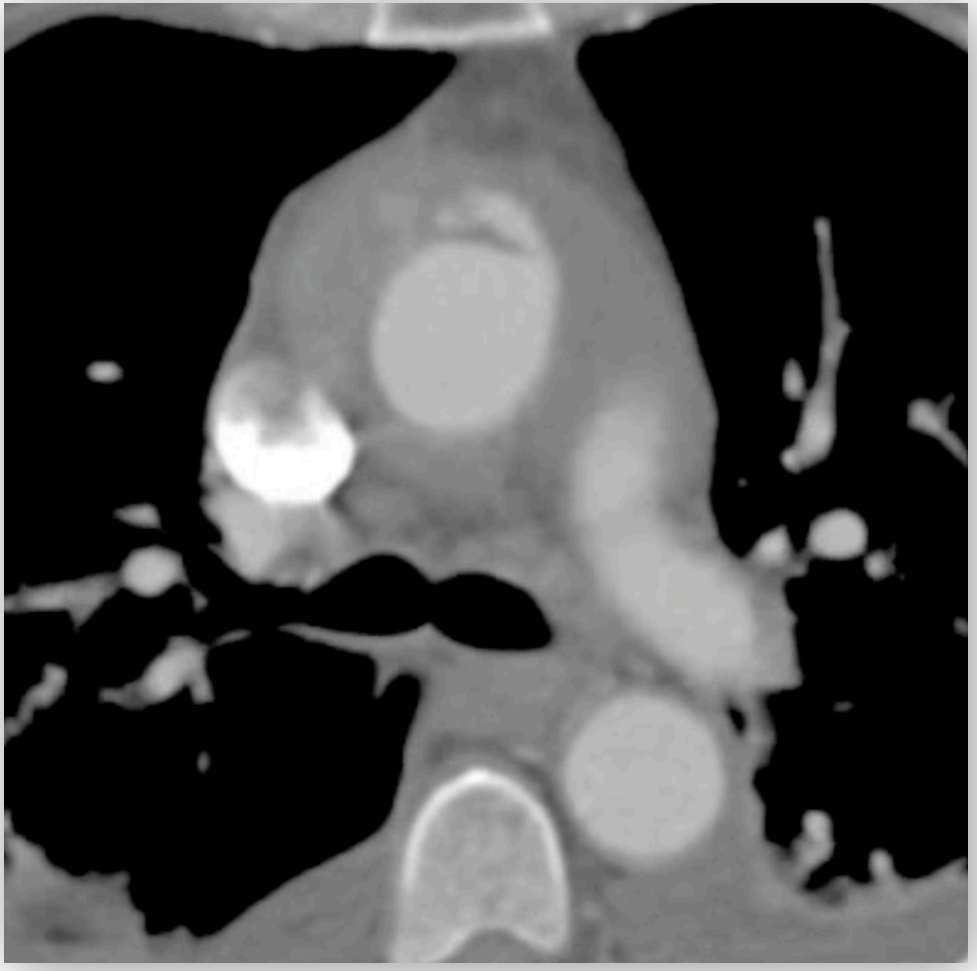
- **Access – ilio-femoral, thoracic aorta, arch, valve**
- **Stability and safety in LV**
- **Impinge on valve, coronary arteries, innominate**
- **Accurate deployment – minimal movement - haemodynamic stress**
- **Conform to reverse curve of ascending**
- **Trauma to ascending – retrograde Type A**

Procedural Details

- **ECG gated CT (3D workstation)**
- **TOE pre and intra-procedurally**
- **Consignment stock of ascending grafts**
- **Femoral access where possible**
- **5-10% oversizing**
- **Overdrive pacing for cardiac standstill**

Cook Medical Type A Dissection Device

- **Device diameters – 28-46mm**
- **Device length– 65mm covered 85mm total**
- **Delivery system**
  - **100cm length Flexor system 16 – 20 Fr**
  - **Soft, flexible, tip**
  - **Hydrophilic coated for improved tracking**
- **Not approved for commercial use**



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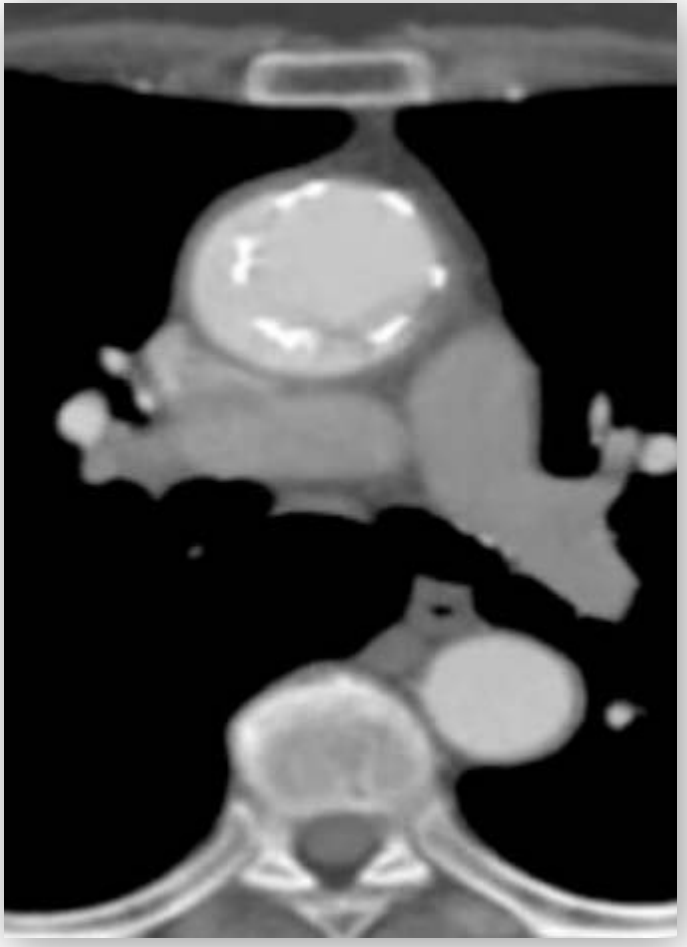
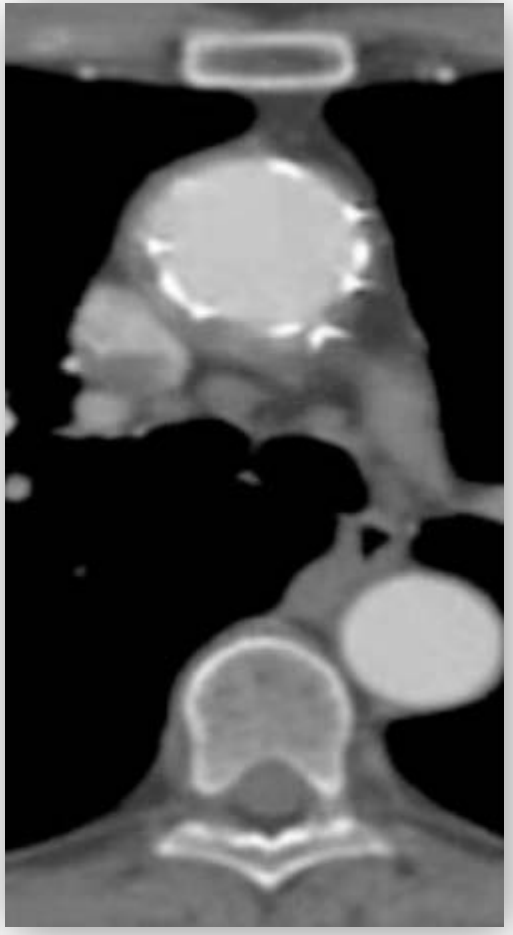
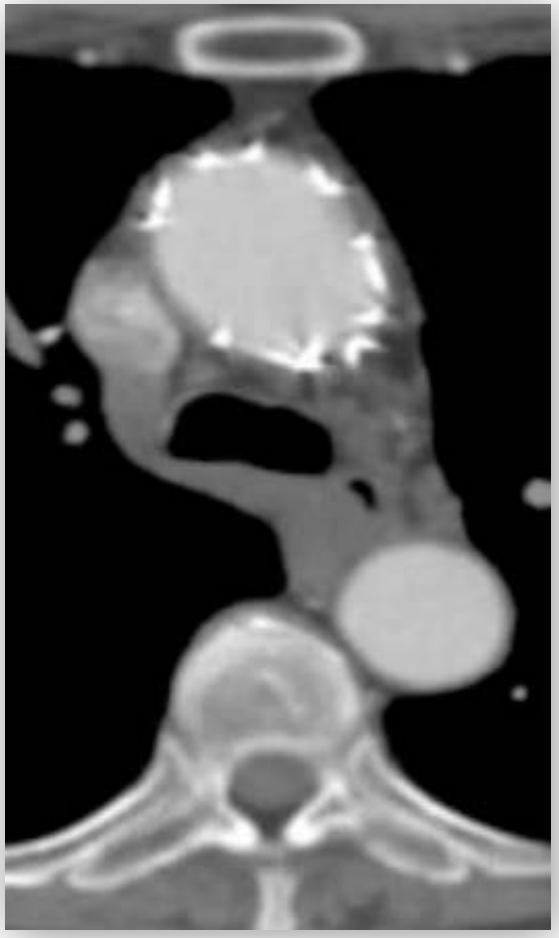
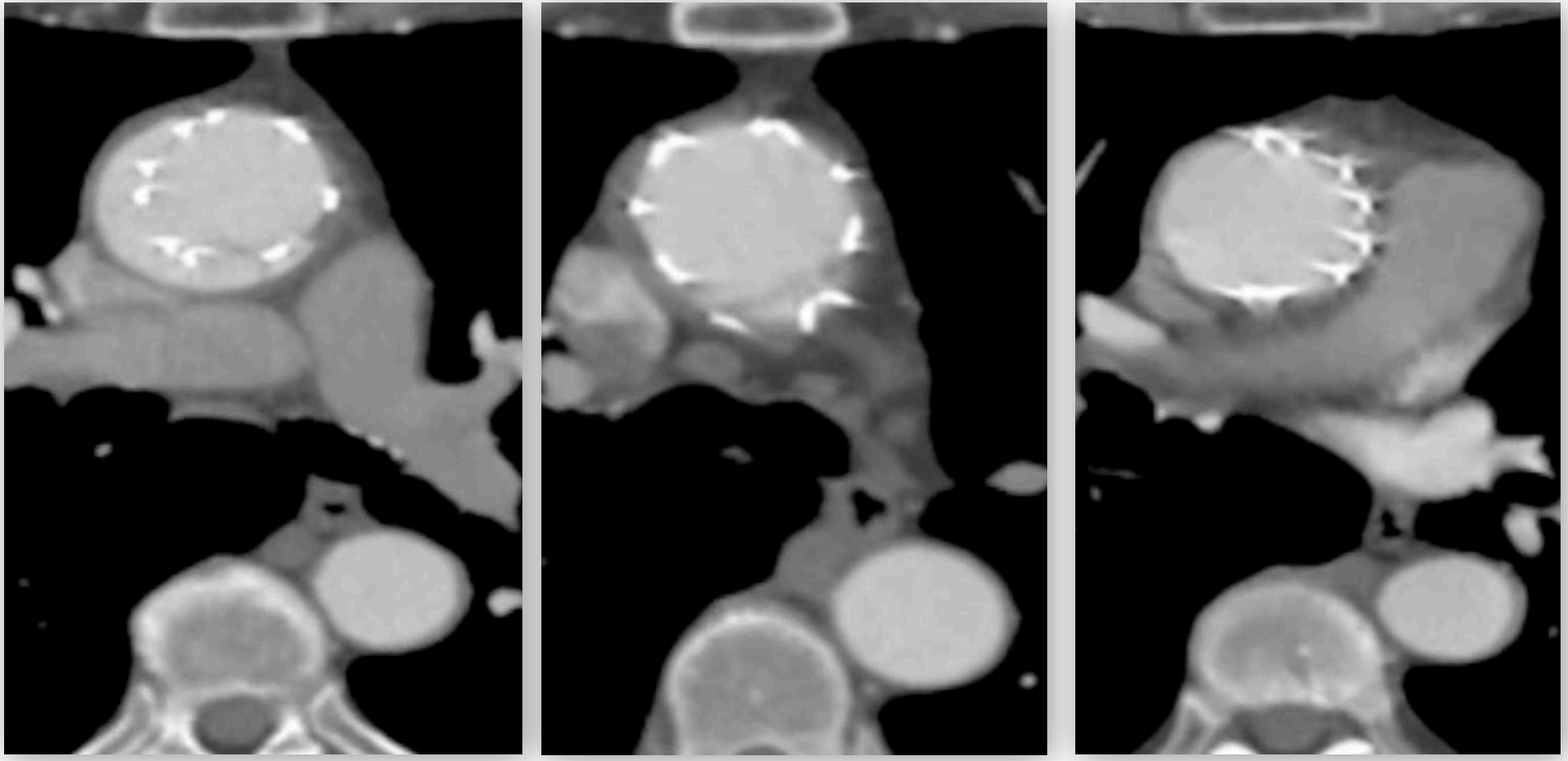




Post Operative CT



18/12 CT

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Review

Progress in Endovascular Management of Type A Dissection CME

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WHAT THIS PAPER ADDS?

- The surgical management of acute type A aortic dissection is evolving. This paper describes how endovascular solutions are likely to improve outcomes in this challenging pathology. It reports the world experience to date and the specific challenges that remain to the pioneers of endovascular therapy in the proximal aorta.

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ABSTRACT

Proximal acute aortic dissection [type A] remains a disease with a poor prognosis. High peri-operative open surgical mortality [up to 30%] and a significant turn-down rate [up to 40%] substantiate the bleak prospects for patients with this disease. Thoracic endovascular stent grafting has revolutionized the treatment of distal [type B] acute aortic dissection. Endovascular surgeons are now looking to improve the treatment of type A dissection by offering endovascular techniques to supplement conventional surgical therapy. Less invasive endovascular therapy, obviates the need for sternotomy and cardiopulmonary bypass, may reduce perioperative morbidity and offers a solution for those patients declined conventional intervention due to co-morbidity or severe complications of the disease. Thoracic stent grafting in the ascending aorta presents specific challenges due to proximity to the aortic valve, navigation over the steep aortic arch and pulsatile aortic movement. Endovascular surgeons have treated type A dissection off-license using aortic cuffs and stents designed for infra-renal aortic surgery. Now grafts specifically designed for treating type A dissection are being developed and deployed under trial [compassionate license] in patients deemed unfit for open surgery. This paper explores how endovascular solutions may fit into the future care of patients with acute type A dissection.

Introduction

Type A acute aortic dissection [TAAD] is a catastrophic arterial insult, which requires emergency cardiac surgical intervention. Although surgical results have improved with superior grafts and compatible suture materials, enhanced cardiopulmonary bypass, cerebral protection, biologic glue and tailored postoperative surveillance, overall in-hospital mortality remains as high as 30%.[1] This statistic also fails to account for the considerable proportion of patients (up to 40%) turned-down for operative intervention due to co-morbidity or haemodynamic instability.[2] The in-hospital mortality for patients managed medically is also dismal (59% die without leaving hospital).[3]

Endovascular solutions have become the preferred management of many complex aortic diseases involving the aortic arch and descending thoracic aorta. Thoracic endografting has an established role in acute complicated type B aortic dissection superseding primary open surgery. The ascending aorta represents the new endovascular frontier,[4] and clearly there is a requirement for improved outcomes in TAAD. In this paper the possible role of endovascular solutions to TAAD is explored.

Epidemiology

The reported estimates of thoracic aortic dissection [TAD] are 2.9–4.3 cases per 100,000 persons per year. Approximately two-thirds of TADs involve the ascending aorta [Stanford type A].[5] The incidence appears to be rising, although this may simply be a function of improved diagnostic imaging. TAAD is more common in men, with an average age at onset of 63 years.[2] The principle risk factors are hypertension, aortic dilatation, congenital

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Author	Country	Year	N=	30-day mortality [%]
Case reports				
Ihnken et al.[27]	USA	2004	1	0
Zhang et al.[28]	China	2004	1	0
Zimpfer et al.[29]	Austria	2006	1	0
Senay et al.[30]	Turkey	2007	1	0
Palma et al.[31]	Brazil	2007	1	0
Metcalfe et al.[25]	UK	2011	1	0
Series				
Ye et al.[26]	China	2011	10	10

Appropriate case load for endovascular ascending repair ???

ORIGINAL CONTRIBUTION

The International Registry of Acute Aortic Dissection (IRAD)

Table 4. Management and Outcomes of Acute Aortic Dissection

	Type A (n = 289) Management, No. (%)	
	Surgical	Medical
No.	208 (72)	81 (28)
In-hospital mortality	54 (26)	47 (58)
Total*	101 (34.9)	

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Conclusions Acute aortic dissection presents with a wide range of manifestations, and classic findings are often absent. A high clinical index of suspicion is necessary. Despite recent advances, in-hospital mortality rates remain high. Our data support the need for continued improvement in prevention, diagnosis, and management of acute aortic dissection.

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MT '13

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Comparison of Medically Versus Surgically Treated Acute Type A Aortic Dissection in Patients <80 Years Old Versus Patients ≥80 Years Old

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Although recent progress in emergency surgery has resulted in an increase in the indication for older patients with acute type A aortic dissection (AAD), some patients remain who cannot undergo surgical treatment and little is known about the prognosis of patients with AAD who receive medical treatment, especially in elderly patients. Of the 82 patients with AAD who were admitted to our institution, 48 received medical therapy only. We retrospectively reviewed their clinical data and analyzed the prognostic value of the clinical

"Of the 82 patients with AAD who were admitted to our institution, 48 received medical therapy only"

with AAD who were treated medically.

Methods

From January 2006 to December 2009, we conducted a retrospective review of patients with AAD admitted to our hospital. The patients were identified retrospectively by reviewing the hospital diagnosis records and the surgical data-

after considering the conditions and indications, surgery was performed immediately. The decision for surgical treatment was mainly determined by the patient's conditions and co-morbidities. If the patients had a history of a complication with severe chronic obstructive pulmonary disease or renal disease requiring hemodialysis or severe liver cirrhosis, the risk of an aggressive therapy was considered high. Advanced age or low physical activity, such as bedridden patients requiring care support, and severe dementia were also considered factors contraindicating surgical treatment. The presence of another condition (i.e., cardiopulmonary arrest on arrival [CPAOA]) that did not seem to respond to resuscitation or poor neurologic recovery with severe brain damage due to stroke was considered to provide limited

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How To Introduce New Technology – IDEAL

	1 Idea	2a Development	2b Exploration	3 Assessment	4 Long-term study
Purpose	Proof of concept	Development	Learning	Assessment	Surveillance
Number and types of patients	Single digit; highly selected	Few; selected	Many; may expand to mixed; broadening indication	Many; expanded indications (well defined)	All eligible
Number and types of surgeons	Very few; innovators	Few; innovators and some early adopters	Many; innovators, early adopters, early majority	Many; early majority	All eligible
Output	Description	Description	Measurement; comparison	Comparison; complete information for non-RCT participants	Description; audit, regional variation; quality assurance; risk adjustment
Intervention	Evolving; procedure inception	Evolving; procedure development	Evolving; procedure refinement; community learning	Stable	Stable
Method	Structured case reports	Prospective development studies	Research database; explanatory or feasibility RCT (efficacy trial); diseased based (diagnostic)	RCT with or without additions/ modifications; alternative designs	Registry; routine database (eg, SCOAP, STS, NSQIP); rare-case reports
Outcomes	Proof of concept; technical achievement; disasters; dramatic successes	Mainly safety; technical and procedural success	Safety; clinical outcomes (specific and graded); short-term outcomes; patient-centred (reported) outcomes; feasibility outcomes	Clinical outcomes (specific and graded); middle-term and long-term outcomes; patient-centred (reported) outcomes; cost-effectiveness	Rare events; long-term outcomes; quality assurance
Ethical approval	Sometimes	Yes	Yes	Yes	No
Examples	NOTES video[6]	Tissue engineered vessels[7]	Italian D2 gastrectomy study[8]	Swedish obese patients study[9]	UK national adult cardiac surgical database[10]

RCT=randomised controlled trial. SCOAP=Surgical Clinical Outcomes Assessment Programme. STS=Society of Thoracic Surgeons. NSQIP=National Surgical Quality Improvement Program. NOTES=natural orifice translumenal endoscopic surgery.

Table: **Stages of surgical innovation**

Lancet 2009; 374: 1105-12

Expansion of EVR for Ascending Aorta

- **Endovascular treatment ascending aorta feasible – dedicated devices**
- **Insufficient data to define outcomes – promising**
- **Proof of concept in compassionate use – how to expand use**
- **Requires honest appraisal of cardiac surgery for acute Type A**