

Endovascular management (petticoat technique) for the type B dissection



Pr L Canaud

CHU de Montpellier
France

TEVAR for aortic dissection

- **TEVAR for type B dissection:**
 - 1999
 - Gold standard vs open repair: mortality

Trimarchi, S et al. IRAD Investigators. Role and results of surgery in acute type B aortic dissection: insights from the International Registry of Acute Aortic Dissection (IRAD). Circulation. 2006; 114: 1357–1364

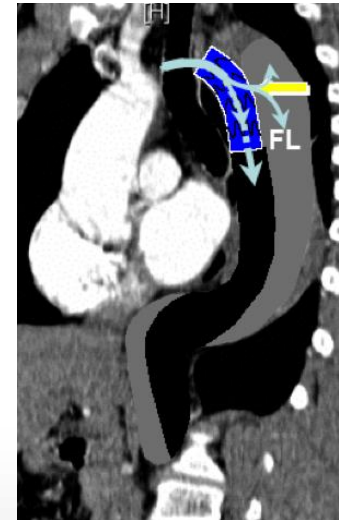
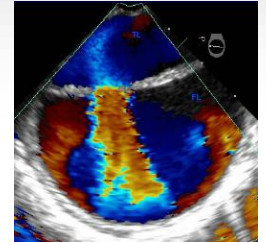
TEVAR for aortic dissection

- **Aim of TEVAR**

- Closure of the proximal entry tear
- To direct aortic flow preferentially into the true lumen



- 1 Decrease false lumen pressure
- 2 Promote false lumen thrombosis
- 3 Thoracic aorta remodelling



TEVAR for aortic dissection

- **Limitations**

- **Acute complicated dissection: malperfusion**
malperfusion of a branch vessel can persist
- **Acute and chronic dissection:**
 - despite thrombosing the false lumen adjacent to the stent-graft
 - thrombosis of the false lumen is not complete owing to retrograde flow through :
 - the residual re-entry tear
 - or intimal fenestrations related to branch vessels.



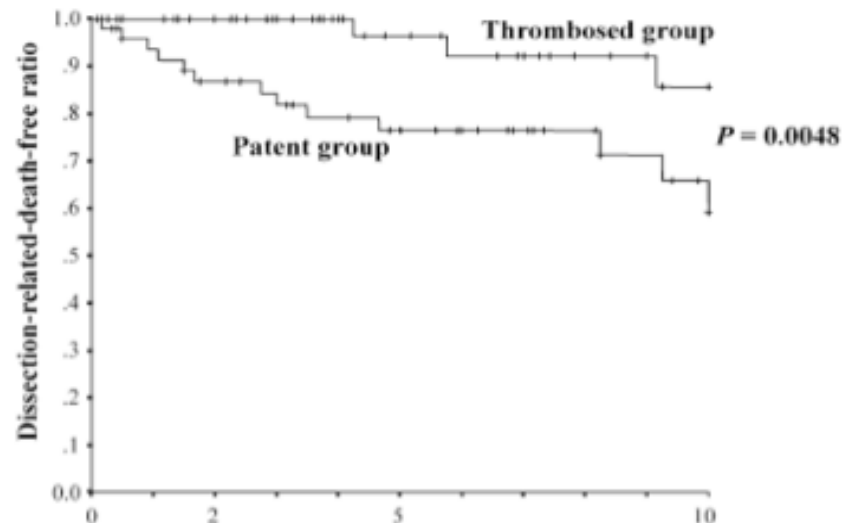
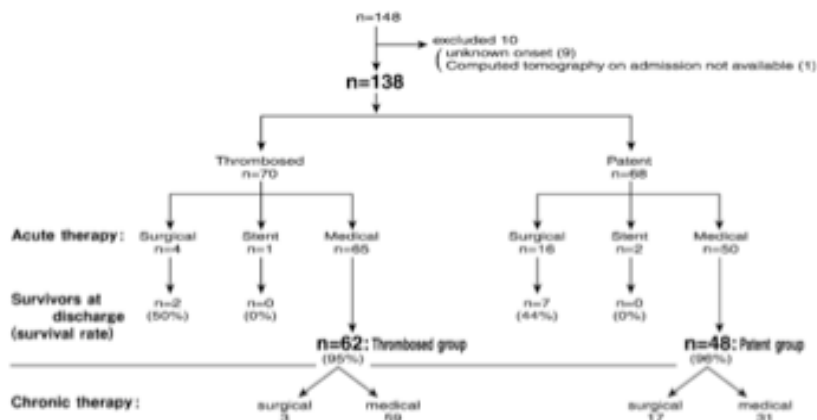
TEVAR for aortic dissection

- Limitations: patent false lumen

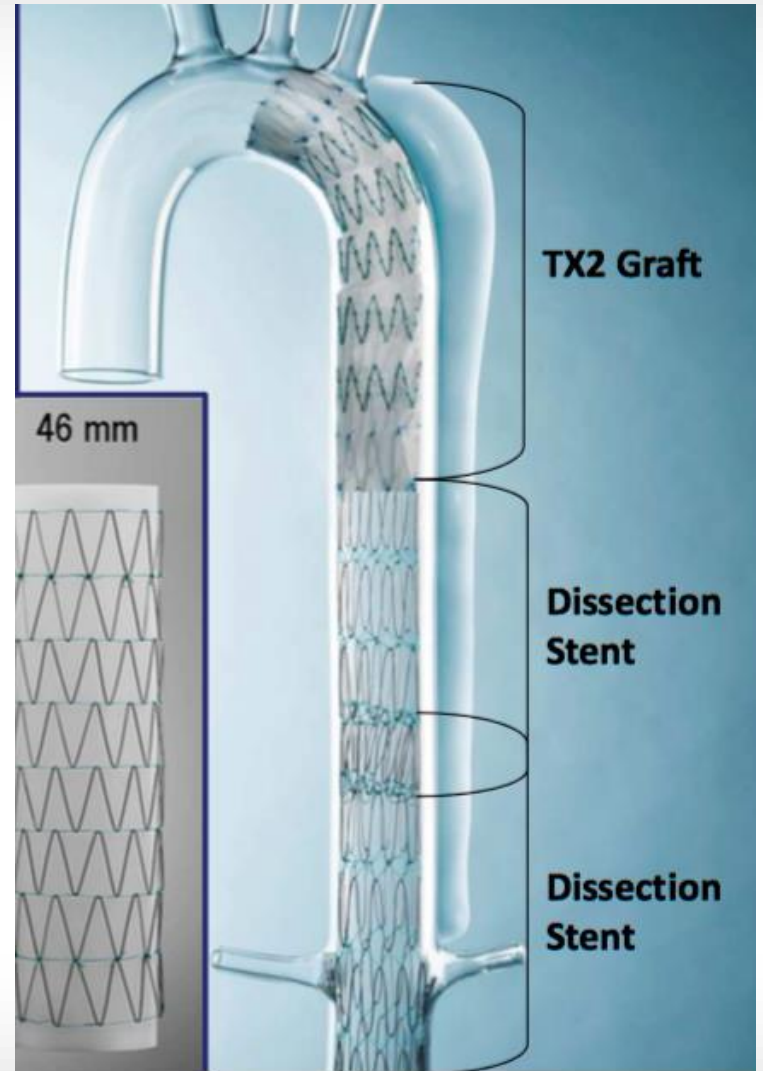
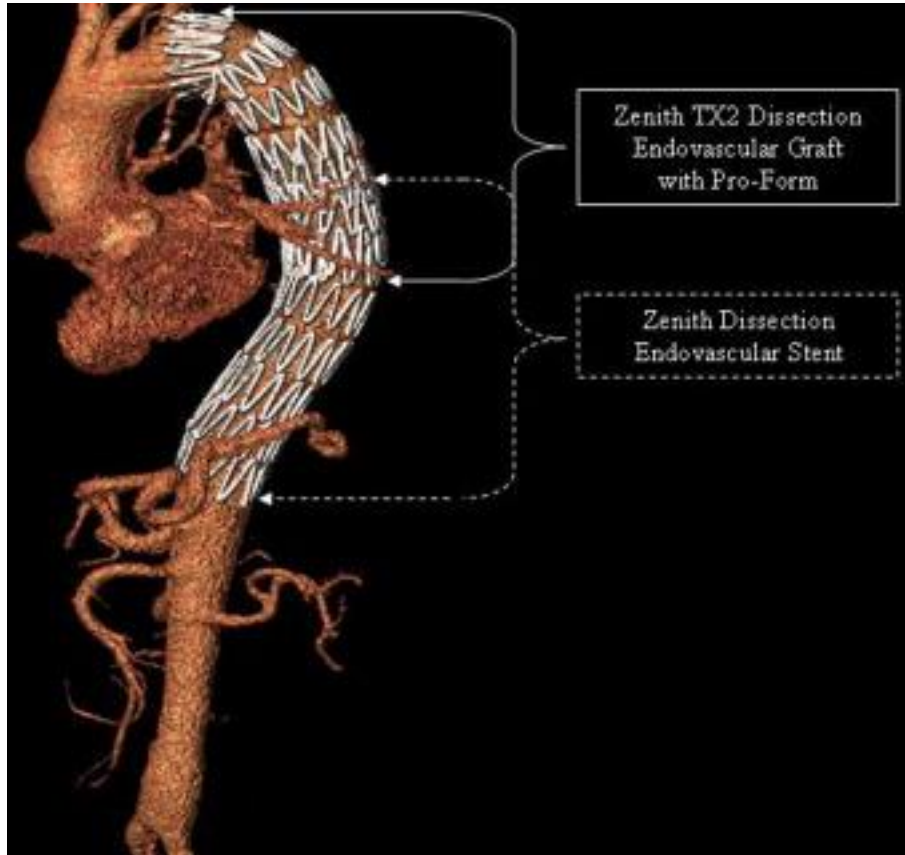
Effects of the patent false lumen on the long-term outcome
of type B acute aortic dissection[☆]

Koichi Akutsu^{a,b}, Jun Nejima^{a,b,c,*}, Kaname Kiuchi^a, Kenji Sasaki^d,
Masami Ochi^c, Keiji Tanaka^a, Teruo Takano^b

Clinical courses



Petticoat concept



Petticoat concept

- **First reported in 2005 by Mossop**

Mossop PJ et al. Staged endovascular treatment for complicated type B aortic dissection. Nat Clin Pract Cardiovasc Med. 2005;2:316-21.

- **2006 a series of 12 patients was reported**

Nienaber CA et al. Provisional extension to induce complete attachment after stent-graft placement in type B aortic dissection: the PETTICOAT concept. J Endovasc Ther. 2006 Dec;13(6):738-46.

Systematic review of outcomes of combined proximal stent-grafting with distal bare stenting for management of aortic dissection

- **Methods**

Studies involving combined proximal stent-grafting with distal bare stenting for management of aortic dissection were systematically searched and reviewed.

- **Results**

- 4 studies were included
- 108 patients:
 - acute (n = 54)
 - chronic (n = 54)

Canaud L et al. JTCVS. 2012. Systematic review of outcomes of combined proximal stent-grafting with distal bare stenting for management of aortic dissection.

Systematic review

- **Indication for intervention**
 - Malperfusion : 70.3%
 - Refractory hypertension: 37.9%
 - Refractory chest pain: 33.3%
 - Rapid aortic enlargement or aortic diameter > 40 mm: 32.4%
 - Periaortic effusion/hematoma: 9.2%

Systematic review

- **Perioperative outcomes**
 - Technical success rate: 95.3% (range 84-100)
 - ***Surgical conversion: bare-metal strut became lodged: 0.9%***
 - ***Adjunctive endovascular procedures: 29.6%***
 - 30-day mortality rate: 2.7% (range 0-5)
 - Morbidity rate (<30d) 51.8% (range 0-65)
 - Stroke 2.7%
 - Paraplegia 2.7%
 - Retrograde dissection 1.8%
 - Renal failure 14.8%
 - Severe cardiopulmonary complications 5.5%
 - Bowel ischemia 0.9%
 - Type I endoleak: 9.2% (10/108)

Systematic review

- **Postoperative outcomes**
 - Deaths related to aortic: 4.6%
 - Re-intervention rate: 12.9%
 - Delayed retrograde type A: 1.9%
 - Aorto-bronchial fistula: 0.9%

Systematic review

- **Stent-graft complications:** **9.3%**
 - Thoracic stent-graft migration: 4.7%
 - Device failure: 4.6%

Discussion

Comparison of outcomes

*Review of series reporting results of
stent-graft placement without distal bare stenting*

	Year	n	Acute	Technical Success, %	Retrograde Dissection, %	Stroke , %	Paraplegia, %	Renal Failure %	Adjunctive distal reperfusion	Aortic rupture, %	30-Day Mortality, %
<u> Eggebrecht ⁸</u> (meta-analysis)	2006	609	248	98	1.9	1.9	0.8	N/A	N/A	2.3	5.3
<u> Dialetto ⁹</u>	2005	56	14	100	4	0	0	N/A	0	1.7	10.7
Nethanson ¹⁰	2005	40	23	95	N/A	2.5	2.5	13	0	0	2.5
Sayer ¹¹	2008	78	38	100	1.2	0	2.5	N/A	0	3.8	5.1
Böckler ¹²	2009	54	24	93	3.7	0	0	N/A	0	0	11.1
Kische ¹³	2009	180	37	98.3	1.8	3.9	2.8	N/A	2.7	4.2	5
Younes ¹⁴	2010	23	11	100	0	5.5	5.5	0	0	0	5.5
Parsa ¹⁵	2010	55	22	100	0	0	2	1.8	0	0	2
Yang ¹⁶	2012	61	33	100	1.6	1.6	1.6	1.6	1.6	6.5	6.5
Overall		1156	450 38.9%	98.3	1.8	1.9	1.2	N/A	1	2.5	5.5

Comparison of outcomes

*Review of series reporting results of
stent-graft placement without distal bare stenting*

- The technical success rates : 95.3% (ST+BS) vs 98.3%
- The mean 30-day mortality: 2.7% (ST+BS) vs 2.9%
- **Severe morbidity : 33.3 (ST+BS) vs 11.1%**
 - Dissection into the ascending aorta (3.7 vs 1.8%)
 - Neurological complications (5.5 vs 3.1%)
 - Aortic rupture (3.7 vs 2.5%)

63.8% of the patients presenting with malperfusion or impending rupture

Comparison of outcomes

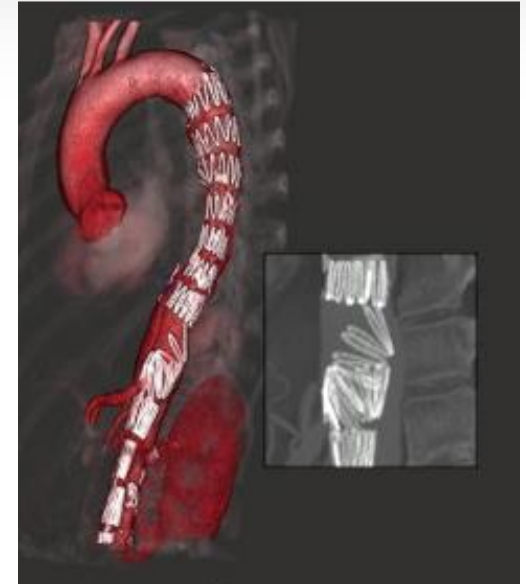
*Review of series reporting results of
stent-graft placement without distal bare stenting*

- **Nienaber et al reported severe morbidity :**
16.6% (ST+BS) vs 11.1%
 - Staged approach to the procedure
 - Allowing recovery from the acute insult
 - Evaluating the need for extension of the graft using the bare metal components: Persistence of a distal malperfusion
- *Nienaber CA et al. Provisional extension to induce complete attachment after stent-graft placement in type B aortic dissection: the PETTICOAT concept. J Endovasc Ther. 2006 Dec;13(6):738-46.*

Comparison of outcomes

*Review of series reporting results of
stent-graft placement without distal bare stenting*

- **Device concerns** **4.6%**
 - Stent misalignment: 1
 - Focally ruptured bare stent: 1
 - Component separation or device: 2
 - Bare stent becoming dislodgment: 1
- **Thoracic stent-graft migration: 4.7%**

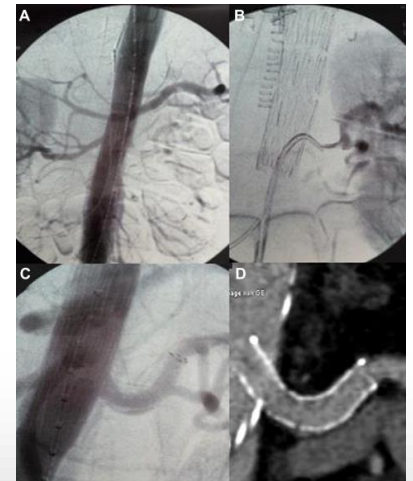


Comparison of outcomes

*Review of series reporting results of
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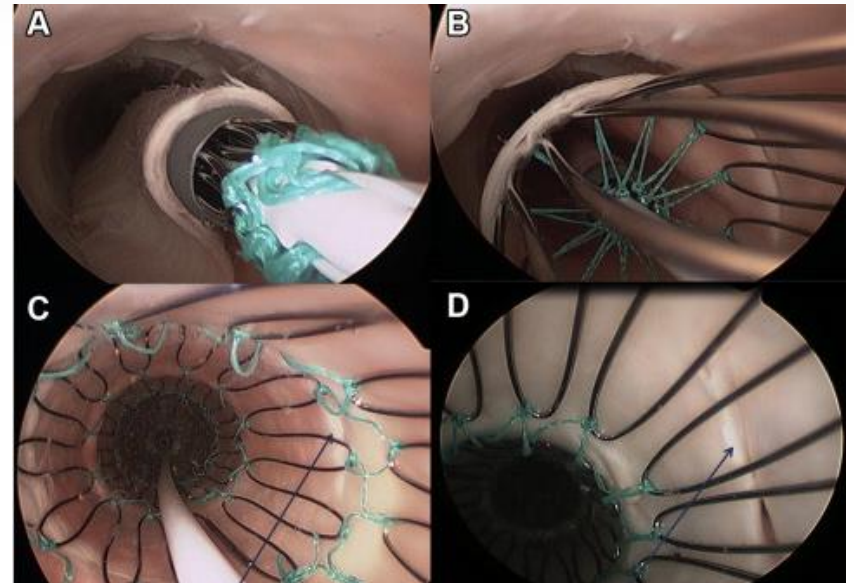
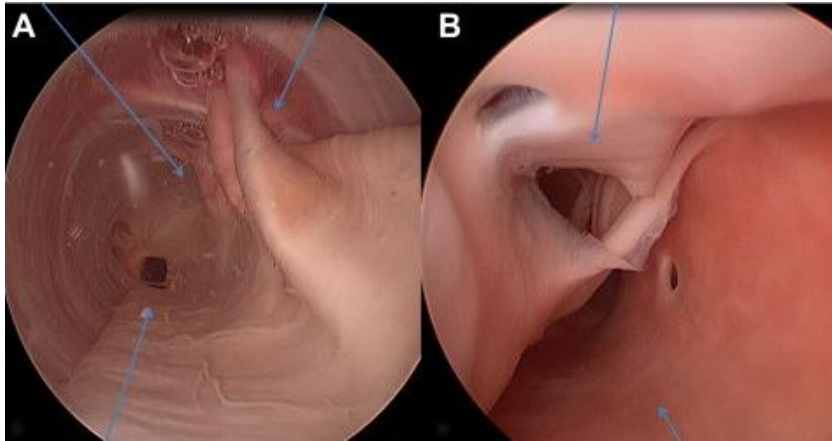
- **Adjunctive endovascular: 17.6% (SG+BS) vs 1% (SG)**
 - Bare-metal stenting *can compromise branch vessel perfusion*
 - *Experimental study in Montpellier*

*Assesment of abdominal branch vessels patency
after bare-metal stenting of the thoracoabdominal aorta
in a human ex-vivo model of acute type B
aortic dissection. J Vasc Surg. 2013.*



Comparison of outcomes

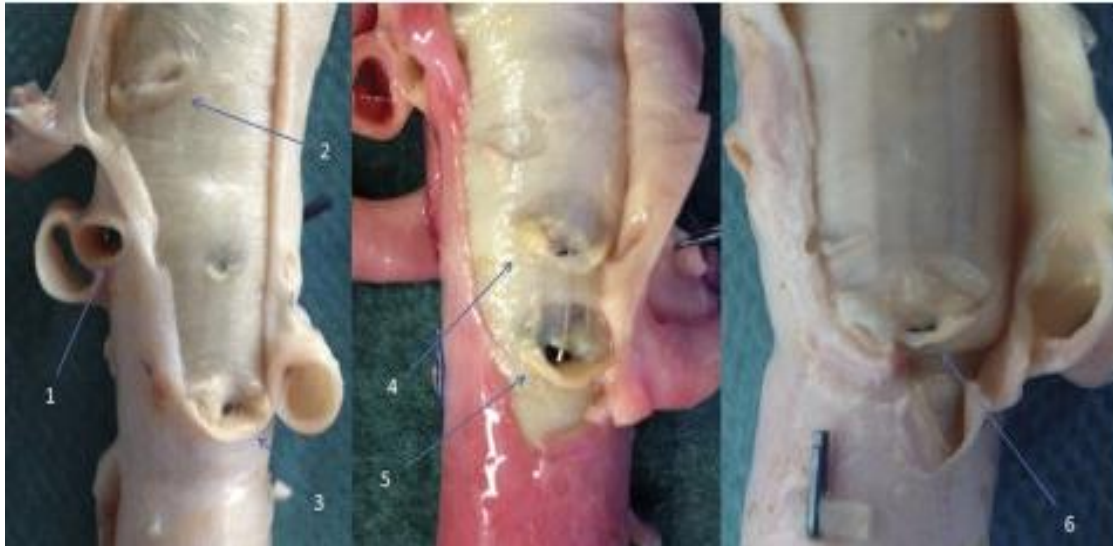
*Review of series reporting results of
stent-graft placement without distal bare stenting*



- *Assesement of abdominal branch vessels patency after bare-metal stenting of the thoracoabdominal aorta in a human ex-vivo model of acute type B aortic dissection. J Vasc Surg. 2013.*

Comparison of outcomes

*Review of series reporting results of
stent-graft placement without distal bare stenting*



- Pressure gradient drop in 25% of the cases in the abdominal branches
- Pressure gradient drop in 54.5% of these arteries were supplied by the false lumen

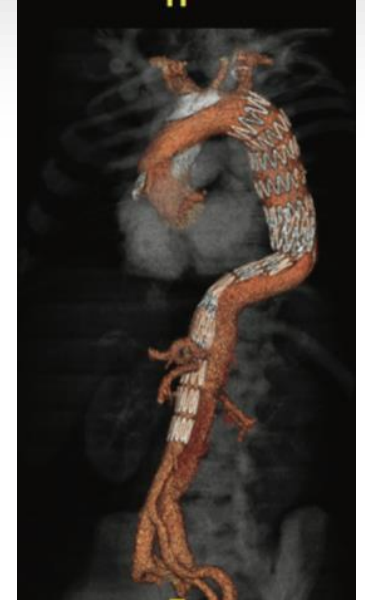
- *Assesment of abdominal branch vessels patency after bare-metal stenting of the thoracoabdominal aorta in a human ex-vivo model of acute type B aortic dissection. J Vasc Surg. 2013.*

Comparison of outcomes

*Review of series reporting results of
stent-graft placement without distal bare stenting*

- **False lumen patency**

- Improved true lumen perfusion and diameter
- But apparently failed to suppress false lumen patency
- At 1-year false lumen patency:
 - 29.6% of the patients at the thoracic level
 - 86.5% of the patients at the abdominal level



- **Yang et al⁹ studied aortic remodeling after TEVAR**

False lumen patency of 19.4% of at the thoracic level

- *Yang CP et al . Aortic remodeling after endovascular repair with stainless steel-based stent graft in acute and chronic type B aortic dissection. J Vasc Surg. 2012;55:1600-10.*

Conclusion

Endovascular management (petticoat technique) for the type B dissection

- **Improved true lumen perfusion and diameter however it failed to completely suppress false lumen patency**
- **Carries not negligible risks of severe morbidity 33.3%**
- **Device complications: 9.3%**

Endovascular management (petticoat technique) for the type B dissection

- **Can compromise branch vessel perfusion**
 - Adjunctive endovascular procedure 17.6% vs 1%
 - Experimental study
- **Could be proposed in case of persistence of a distal malperfusion syndrome**
 - After primary entry tear closure
 - Rather than a single stage extensive repair of the thoracoabdominal aorta