

TEVAR alone or associated with dissection stent in acute type B AoD with malperfusion

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Disclosures

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BMS history in Aortic Dissection

Antegrade Balloon expandable BMS after open repair of the asc aorta

Case Report and Brief Review

Endovascular Treatment of Residual Type A Aortic Dissection Preserving Patency of Supra-Aortic Vessels by Implantation of the Djumbodis® System. No More Surgery for the Aortic Arch?

Plinio Cirillo, MD, PhD, Gabriele Iannelli, MD, Federico Piscione, MD

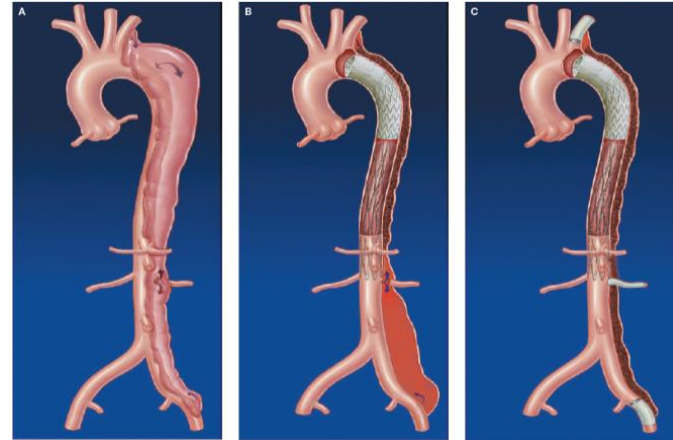
ABSTRACT: A persistent distal false lumen perfusion—residual type A aortic dissection—is found in 50% to 100% of patients following ascending aorta replacement. Complications of persistent or newly developed dissection of the distal aorta are often fatal and require reoperation, leading to a higher morbidity and mortality rate for these patients than with primary surgery. Thus, many efforts have been done to treat this aortic disease by an endovascular approach. Unfortunately, patency of the supra-aortic vessel still remains an unresolved issue. The present report describes the case of a patient with a residual type A aortic dissection persisting after ascending aorta replacement, successfully treated by implantation of a new endovascular device, the Djumbodis® Dissection System, a bare stent with sufficiently large mesh to



BMS in dissection in association with TEVAR

Why it could be a good idea?

PETTICOAT – P Mossop, 2005



“The rationale for bare-metal stent scaffolding in the distal dissected segment is

- to provide immediate support and expansion of the aortic true lumen,*
- thereby reversing distal true lumen collapse*
- and acting to prevent branch vessel malperfusion by reperfusing the true lumen.”*

Objectives



- Malperfusion resolution**
- Distal Aortic REMODELING**



BMS in dissection in association with TEVAR

Aortic remodeling

TEVAR vs TEVAR+BMS

[Eur J Vasc Endovasc Surg](#). 2015 Oct;50(4):450-9. doi: 10.1016/j.ejvs.2015.04.035. Epub 2015 Jun 19.

Modified Petticoat Technique with Pre-placement of a Distal Bare Stent Improves Early Aortic Remodeling after Complicated Acute Stanford Type B Aortic Dissection.

[He H](#)¹, [Yao K](#)², [Nie WP](#)², [Wang Z](#)², [Liang Q](#)³, [Shu C](#)⁴, [Dardik A](#)⁵.

[J Vasc Surg](#). 2016 May;63(5):1216-24. doi: 10.1016/j.jvs.2015.11.037. Epub 2016 Jan 22.

Volume analysis of true and false lumens in acute complicated type B aortic dissections after thoracic endovascular aortic repair with stent grafts alone or with a composite device design.

[Sobocinski J](#)¹, [Lombardi JV](#)², [Dias NV](#)³, [Berger L](#)⁴, [Zhou Q](#)⁵, [Jia F](#)⁵, [Resch T](#)³, [Haulon S](#)⁶.

At 1 year – similar conclusions

Both promoted thoracic aortic remodeling
BMS increased TL expansion in the abdo aorta
but Transaortic diameter remained similar



Malperfusion in Aortic dissection

Malperfusion conflict at the imaging exam $\neq$ malperfusion syndrome

Clinically and/or chemically expressions

1st cause of life-threatening complication in the acute phase

Mainly dynamic or at least a combination of static + dynamic

[Williams Radiology 1997]

Visceral ischemia in type B: [Jonker JTCS 2015]

- Incidence 7.1%
- 30d Mortality = 25% to 62%

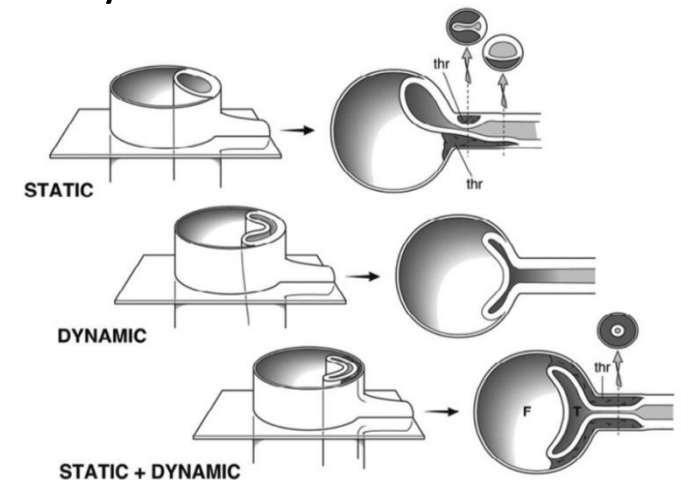


Figure 1. Diagram illustrating the different types of branch vessel obstruction: static, dynamic, or both. (Adapted with permission from Williams et al.³)

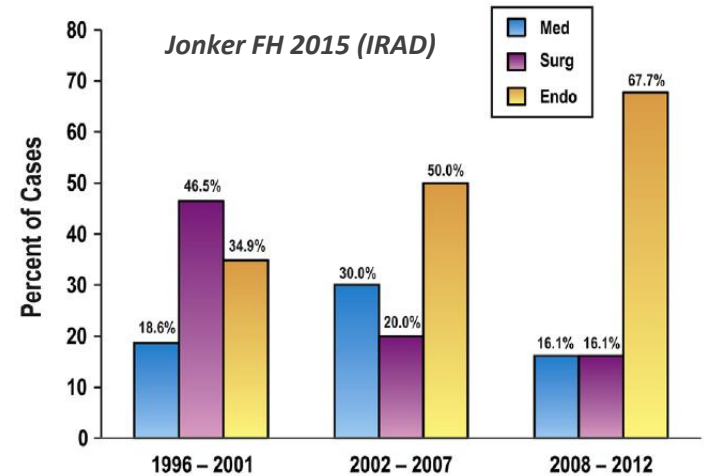
Current Malperfusion management algorithm

TEVAR

TEVAR + distal SG extension (up to CT coverage)

TEVAR + distal SG extension + selective stenting and/or fenestration

Open revascularisation as bailout



Current Malperfusion management

TEVAR ± adjuncts

1

Exclusion and coverage of the primary Entry tear is **ESSENTIAL**
→ Would solve majority of malperfusion conflicts

The New England Journal of Medicine

ENDOVASCULAR STENT-GRAFT PLACEMENT FOR THE TREATMENT OF ACUTE AORTIC DISSECTION

MICHAEL D. DAKE, M.D., NORIYUKI KATO, M.D., R. SCOTT MITCHELL, M.D., CHARLES P. SEMBA, M.D.,
MAHMOOD K. RAZAVI, M.D., TAKATSUGU SHIMONO, M.D., TADANORI HIRANO, M.D., KAN TAKEDA, M.D., ISAO YADA, M.D.,
AND D. CRAIG MILLER, M.D.

1999

ABSTRACT

Background The standard treatment for acute aortic dissection is either surgical or medical therapy,

A

CUTE aortic dissection is one of the most catastrophic diseases that can affect the aorta. There are 10 to 20 cases per million

15 (59) patients with malperfusion
average length of the device = 6.9 ± 1.5 cm
Overall 30d death (59)=11%



Current Malperfusion management

TEVAR ± adjuncts

2

Persistent malperfusion after SG deployment

Can be corrected using:

- Distal SG extension if presence of major re entry between distal part of prox SG and SMA
- Selective stenting and/or fenestration

	N of patients	TEVAR	Add stenting	SG length	30d death
Sfyroeras GS 2011	23	100%	22%		9%
Ryan C 2013	65	100%	41%		21%
Conrad MF 2009	17(33)	100%		19.5cm	12%
O'Donnel S 2011	28	100%			11%
Sobocinski 2018 (unpublished yet)	41	100%	41%	19.7cm	17%

TABLE 3. Management of patients with and without visceral ischemia

Definitive management	Visceral ischemia, n (%)	No visceral ischemia, n (%)	P value
Total patients	104 (7.1)	1352 (92.9)	
Medical management	22 (21.2)	901 (66.6)	<.001
B-blockers	19	719	
Calcium channel antagonist	14	554	
ACE inhibitor	11	488	
Surgery	31 (29.8)	161 (11.9)	<.001
Replacement of descending aorta	20	90	
Abdominal aortic repair	2	9	
Surgical aortic fenestration	6	4	
Other/unknown	3	58	
Endovascular management	51 (49.0)	290 (21.4)	<.001
Endovascular aortic fenestration	16	41	
Thoracic stent graft	32	224	
Celiac/SMA/renal artery/iliac stent	17	53	

ACE, Angiotensin-converting enzyme; SMA, superior mesenteric artery.

Jonker FH 2015 (IRAD)



Current Malperfusion management

TEVAR ± adjuncts

In TEVAR:

- stroke 2-7%
- spinal cord ischemia 2-4%

Eggebrecht H Circulation 2009

Moulakakis KG Ann Cardiothorac Surg 2014

Those complications are not typically seen with fenestration and stenting alone



Current Malperfusion management

TEVAR ± adjuncts

In TEVAR:

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May fenestration technique be associated with TEVAR when numerous intercostals fed by the false lumen are seen on the preop CTA?



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TEVAR ± adjuncts

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May fenestration technique be associated with TEVAR when numerous intercostals fed by the false lumen are seen on the preop CTA?

«Distal fenestration of the false lumen in aortic dissection will (would) result in the largest false lumen reduction »

ex vivo study, Veger AVS 2017



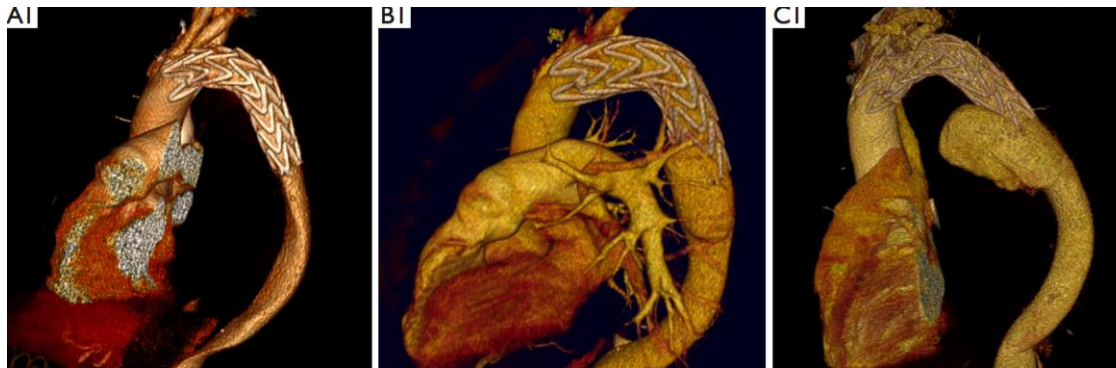
Current Malperfusion management

TEVAR with distal extension

Compromise between malperfusion resolution and spinal ischemia risk

SINE lower risk in patients with coverage >145mm

Li Q J Thorac Dis 2015



Stent graft-induced new entry after endovascular repair for Stanford type B aortic dissection

Zhihui Dong, MD,^a Weiguo Fu, MD,^a Yuqi Wang, MD,^a Chunsheng Wang, MD,^b Zhiping Yan, MD,^c Daqiao Guo, MD,^a Xin Xu, MD,^a and Bin Chen, MD,^a *Shanghai, China*

JVS 2010

3% incidence - 26% mortality
Majority of Marfan Syndrome



Modification in Malperfusion management algorithm

TEVAR

TEVAR + distal SG extension (up to CT coverage)

TEVAR + BMS towards abdominal aorta

NEW!!

TEVAR + distal SG extension + selective stenting and/or fenestration

Open revascularisation as bailout



BMS in dissection in association with TEVAR

Malperfusion

TEVAR+BMS

Prospective multicenter clinical trial (STABLE) on the endovascular treatment of complicated type B aortic dissection using a composite device design

Joseph V. Lombardi, MD,^a Richard P. Cambria, MD,^b Christoph A. Nienaber, MD,^c *JVS 2012*
Roberto Chiesa, MD,^d Omke Teebken, MD, PhD,^e Anthony Lee, MD,^f Peter Mossop, MD,^g and
Priya Bharadwaj, PhD,^h on behalf of the STABLE investigators, *Camden, NJ; Boston, Mass; Milan, Italy;*
Rostock and Hannover, Germany; Boca Raton, Fla; Fitzroy, Victoria, Australia; and West Lafayette, Ind

40 mixed patients
68% with malperfusion
9 patients with add stents
30d death: 5%

J Vasc Surg. 2014 Mar;59(3):645-50. doi: 10.1016/j.jvs.2013.09.004. Epub 2013 Nov 16.

Experience of the Zenith Dissection Endovascular System in the emergency setting of malperfusion in acute type B dissections.

Alsac JM¹, Girault A², El Batti S², Abou Rjeili M², Alomran F², Achouh P², Julia P², Fabiani JN².

15 patients
6 patients with add stents
3 MAE, no 30d death

J Cardiovasc Surg (Torino). 2017 Feb 9. doi: 10.23736/S0021-9509.17.09744-0. [Epub ahead of print]

The Petticoat concept for endovascular treatment of Type B aortic dissection.

Bertoglio L¹, Rinaldi E², Melissano G², Chiesa R².

 **Author information**



BMS in dissection in association with TEVAR

Malperfusion

TEVAR vs TEVAR+BMS

**AORTIC NON COVERED
STENTS TO TREAT
COMPLICATED ACUTE
TYPE B AORTIC DISSECTIONS:
LESSONS LEARNED FROM
SEVEN YEARS FROM S.O.S
AORTA**



90 patients with malperfusion
In 3 groups

AVS 2017

*Jean-Marc Alsac, Salma El Batti, Auréline Boitet,
Marwan Abou Rjeili, and Pierre Julia*

*Unité de chirurgie vasculaire, Hôpital Européen Georges
Pompidou, Paris, France.*



BMS in dissection in association with TEVAR

Malperfusion

TEVAR vs TEVAR+BMS

Comparison of STABLE 2 cohort with a Lille-Malmö cohort presenting with malperfusion at onset – *abstract submitted to the 2018 SVS*

similar in preoperative medical characteristics / similar lengths of dissection

At presentation, comparable organ system involvement in malperfusion:

- renal (54% TEVAR, 57% STABLE),
- gastrointestinal (42% TEVAR, 44% STABLE),
- lower extremities (34% TEVAR, 52% STABLE),
- and spinal cord (10% TEVAR, 2.4% STABLE)

30-day all-cause mortality was not different ($P=0.22$)

30-day rate of malperfusion-related mortality (deaths from bowel/mesenteric ischemia or MOF)

12% in the TEVAR group and 2.4% in the STABLE group ($P=0.038$)



BMS in dissection in association with TEVAR – Evolution from the original concept

Balloon-induced Intimal disruption – STABILISE concept

11 selected patients

No postoperative malperfusion

No late AE or aortic-related deaths

False Lumen:

- Complete obliteration in the thoracic Ao,
- 90% patients obliteration in the abdo Ao

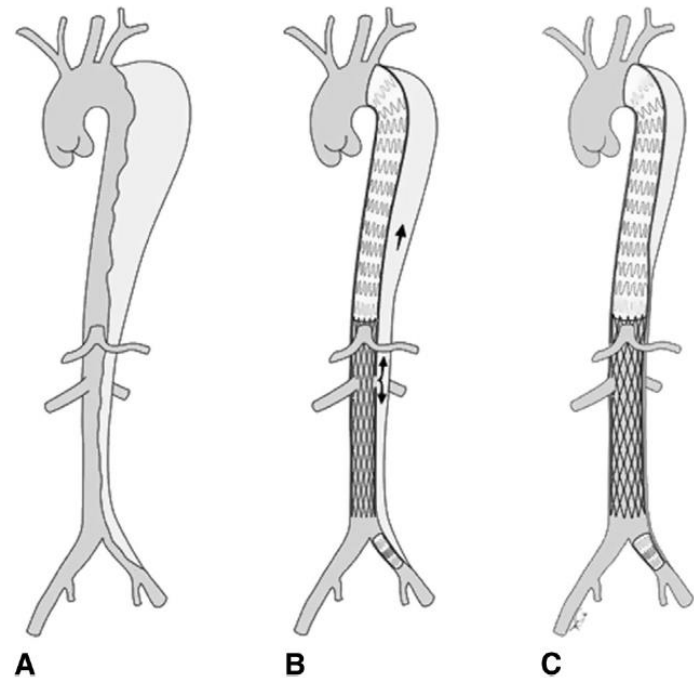
Mossop P, JTCS 2014

90 selected patients (n=24)

Comparison of 3 grps of patients (TEVAR / TEVAR+BMS/STABILISE)

STABILISE=Protective factor of aneurysmal progression and mortality during FU

Alsac JM, AVS 2017

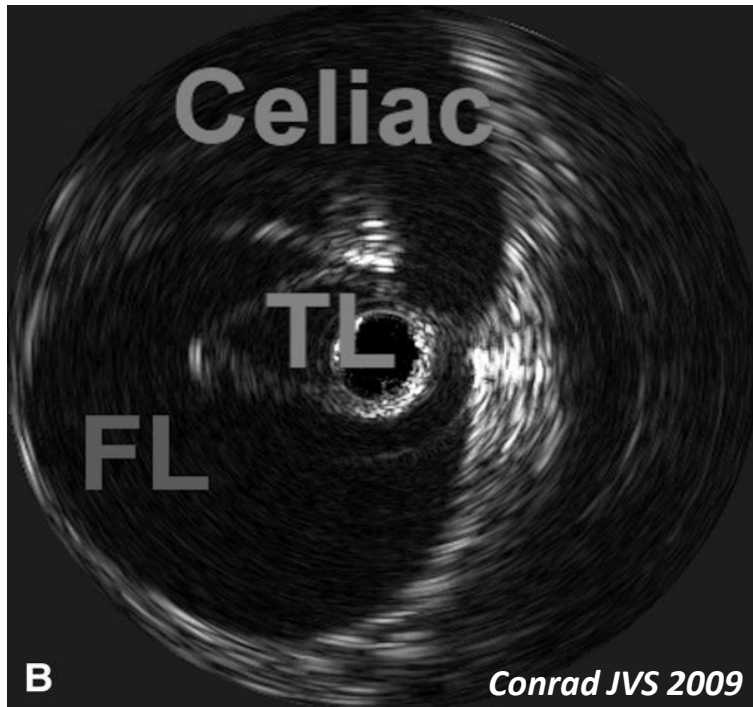


Aortic remodeling & malperfusion



Malperfusion management – additional tool

IVUS/OCT: May improve better understanding of the dissection morphology



Not use routinely - Expensive
To confirm wire within the right lumen
Visualisation of Intimal Tears
To assess branch perfusion

[Chin Med J \(Engl\). 2015 Sep 5;128\(17\):2322-9. doi: 10.4103/0366-6999.163386.](#)

Effect of Intravascular Ultrasound-assisted Thoracic Endovascular Aortic Repair for "Complicated" Type B Aortic Dissection.

[Guo BL](#), [Shi ZY](#), [Guo DQ](#), [Wang LX](#), [Tang X](#), [Li WM](#), [Fu WG](#)¹.

Author information

Abstract

BACKGROUND: Intravascular ultrasound (IVUS) examination can provide useful information during endovascular stent graft repair. However, its actual clinical utility in thoracic endovascular aortic repair (TEVAR) for type B aortic dissection (type B-AD) remains unclear, especially in complicated aortic dissection. We evaluated the effect of IVUS as a complementary tool during TEVAR.

METHODS: From September 2011 to April 2012, we conducted a prospective cohort study of 47 consecutive patients with "complicated" type B-AD diagnosed. We divided the patients into two groups: IVUS-assisted TEVAR group and TEVAR using angiography alone group. The general procedure of TEVAR was performed. We evaluated the perioperative and follow-up events. Patient demographics, comorbidities, preoperative images, dissection morphology, details of operative strategy, intraoperative events, and postoperative course were recorded.

RESULTS: A total of 47 patients receiving TEVAR were enrolled. Among them (females, 8.51%; mean age, 57.38 ± 13.02 years), 13 cases (27.66%) were selected in the IVUS-assisted TEVAR group, and 34 were selected in the TEVAR group. All patients were symptomatic. The average diameter values of IVUS measurements in the landing zone were greater than those estimated by computed tomography angiography (31.82 ± 4.21 mm vs. 30.64 ± 4.13 mm, $P < 0.001$). The technique success rate was 100%. Among the postoperative outcomes, statistical differences were only observed between the IVUS-assisted TEVAR group and TEVAR group for total operative time and the amount of contrast used ($P = 0.013$ and $P < 0.001$, respectively). The follow-up ranged from 15 to 36 months for the IVUS-assisted TEVAR group and from 10 to 35 months for the TEVAR group ($P = 0.646$). The primary endpoints were no statistical difference in the two groups.

CONCLUSIONS: Intraoperative IVUS-assisted TEVAR is clinically feasible and safe. For the endovascular repair of "complicated" type B-AD, IVUS may be helpful for understanding dissection morphology and decrease the operative time and the amount of contrast used.



Malperfusion management - funny idea...

BMS without prox stent graft

Uncovered stent implantation in complicated acute aortic dissection type B

Alexander Massmann, MD,^a Takashi Kuniyara, PhD, MD,^c Peter Fries, MD,^a
Günther Schneider, PhD, MD,^a Arno Buecker, MD,^a and Hans-Joachim Schäfers, MD^b

Objective: To retrospectively evaluate the technical feasibility and midterm results of uncovered thoraco-abdominal stent placement in complicated acute aortic dissection Stanford type B (cAADB).

Patients and Methods: Fourteen consecutive patients (3 females; range, 44-71 years) with cAADB who had symptomatic gastrointestinal malperfusion and claudication underwent immediate uncovered stent implantation (diameter, 7-28 mm; length, 40-100 mm) into the true lumen of the thoracoabdominal aorta (n = 23) and visceral arteries (n = 5).

Results: Stenting resulted in elimination of gastrointestinal ischemia and symptoms in 13 of 14 patients; persisting symptoms led to secondary surgical revascularization in only 1 patient. More than 1 stent (≤ 4) was placed in 7 patients (2 celiac, 1 mesenteric, 2 renal, 8 aorto-iliac). Follow-up computed tomographic angiography (CTA) revealed collapse of 4 aortic stents (diameter, 9-25 mm; length, 100 mm) at 1 week in the absence of symptoms. Balloon reexpansion was possible in all 4 stents, but recollapse occurred within 1 month. Despite stent collapse, the patients remained asymptomatic; ultrasonography and CTA documented sufficient perfusion of the visceral arteries in all patients. Follow-up ranged from 6 months to 5 years (average, 2.5 years). Except for the patient who underwent iliacomesenteric bypass for unspecific abdominal pain, no other patient required additional interventional or surgical therapy.

Conclusions: Acute aortic dissection with suspicion of visceral ischemia should prompt for immediate intervention. Thoracoabdominal uncovered stent implantation is a technically feasible and effective minimally invasive approach that provided successful relief of acute visceral ischemia and claudication in cAADB. Stent size should be less than the normal aortic diameter to avoid possible stent collapse. (J Thorac Cardiovasc Surg 2014;148:3003-11)

Rational:
To reduce surgical insult

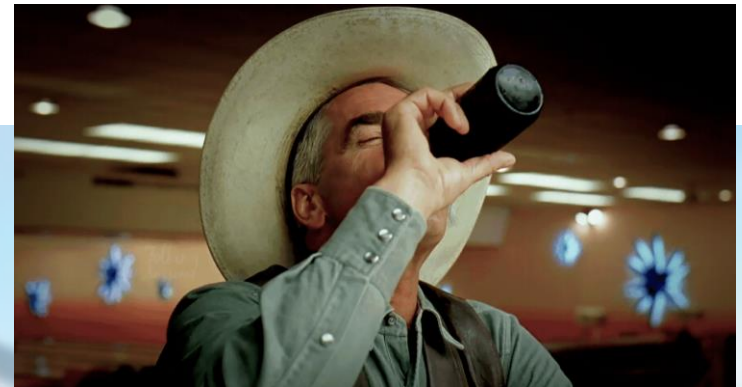


Conclusions

- **Malperfusion in Ao Dissection: predictor of poor outcomes**
- **Coverage of Prox Entry tear is of prime importance since most of malperfusions are dynamic**
- **BMS in addition of TEVAR may improve resolution of malperfusion after TEVAR – but comparative data with strong evidence are missing**
- **Balloon-induced Flap disruption(STABILISE) may appear promising – but would expose patients to higher risk of aortic rupture**



TEVAR alone or associated with dissection stent in acute type B AoD with malperfusion



Jonathan Sobocinski, Richard Azzaoui, Adrien Hertault, Matthieu Delloye, Mohamad Koussa, Stéphan Haulon
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