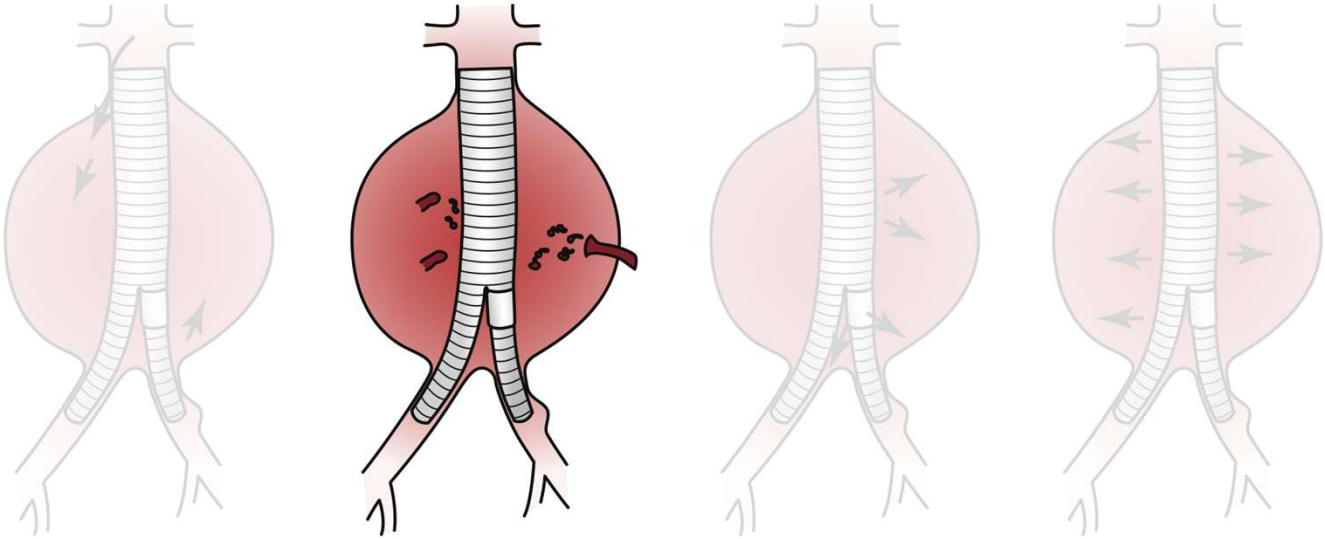
Pre-EVAR embolization of IMA / lumbars to prevent endoleak: Is there any evidence?

Nivethan Vela, MD MSc
5+2 vascular surgery fellow
University of Ottawa

Winnipeg Vascular & Endovascular Symposium 2026

Presenter disclosure

- I have no current relationships with commercial entities


Type I
Type II
Type III
Type IV

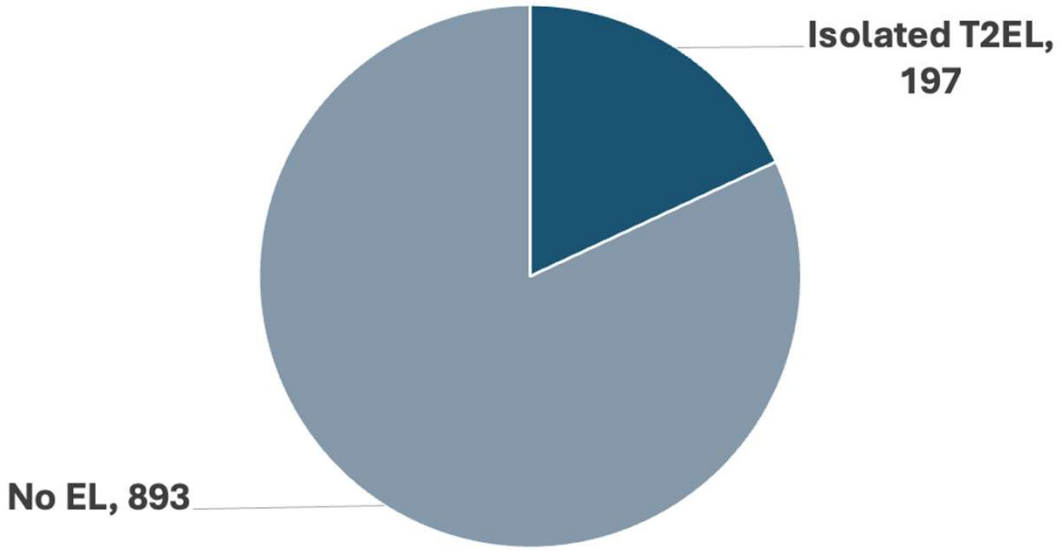
Why do we care about them?

Failure of ”aneurysm repair”

Risk of aneurysm sac expansion

- Causing more sinister type IA endoleak *or*
  - Stent migration *resulting in*
    - Eventual ***rupture***

ENGAGE Registry (1090 Medtronic patients)



Dijkstra, M. L. et al (2020). Incidence, natural course, and outcome of type II endoleaks in infrarenal endovascular aneurysm repair based on the ENGAGE registry data. Journal of vascular surgery, 71(3), 780–789. https://doi.org/10.1016/j.jvs.2019.04.486

Diameter increase

Time (years)	Isolated T2EL	No EL
1	4.8%	2.4%
2	7.1%	2.5%
3	**14.6%**	**2.7%**
4	**18.3%**	**3.5%**
5	**21.9%**	**3.2%**

Type 2 → Type 1

- 22 (10% of T2EL) patients
  - Diagnosed median 1205 days after EVAR
  - 4 (2% of T2EL) patients ruptured
- Freedom from aneurysm rupture at 5 years
  - 99.5% in T2EL group
  - 80.2% in T2EL → T1 group

Why not just treat them when we see them?

Single Belgian centre experience

- 95% technical success rate based on angiography at time of procedure
- But 27% radiological success rate based on surveillance imaging
  - Persistent T2EL

Vandenbulcke, R., Houthoofd, S., Laenen, A., Buyck, P. J., Mufty, H., Fourneau, I., & Maleux, G. (2023). Embolization therapy for type 2 endoleaks after endovascular aortic aneurysm repair: imaging-based predictive factors and clinical outcomes on long-term follow-up. Diagnostic and interventional radiology (Ankara, Turkey), 29(2), 331–341.

What’s the problem?

- Cost
- Time
- Efficacy of intervention
- Burden of multiple interventions
- Risk with each intervention

What if we embolize them prophylactically?

Journal of Vascular Surgery
November 2020

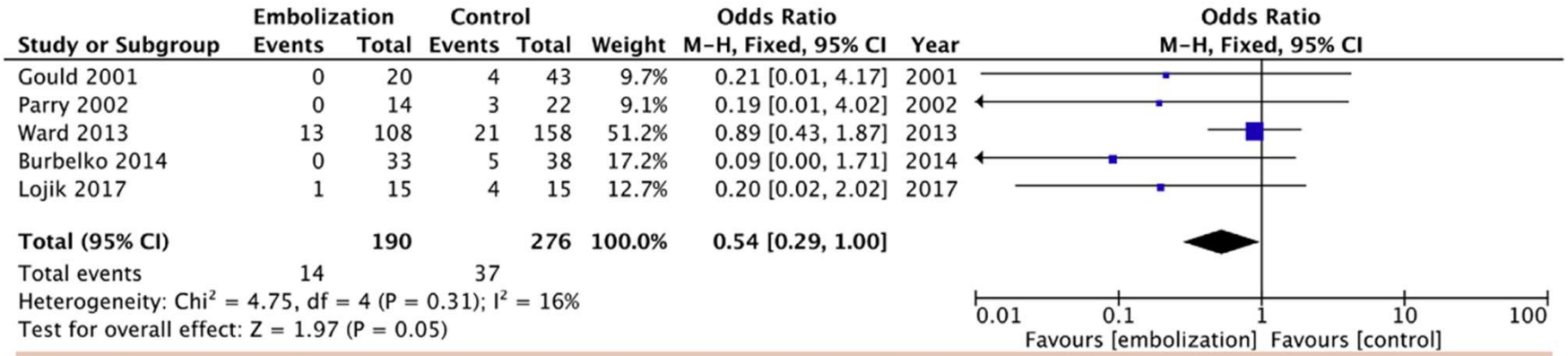
Systematic review and meta-analysis of prophylactic aortic side branch embolization to prevent type II endoleaks

Hok Yee Harry Yu, MBBS, FRCS (Edin), FHKAM (Surg),[a,b] David Lindström, MD, PhD, FEBVS,[a] Anders Wanhainen, MD, PhD,[a] Gustaf Tegler, MD,[a] Baderkhan Hassan, MD, PhD,[a] *and* Kevin Mani, MD, PhD, FEBVS,[a] *Uppsala, Sweden; and Hong Kong SAR, China*

Study characteristics

Author, year	Design	Indication	# Embo'd	Months f/u
Gould, 2001	Single centre retro	Any patent ≥ 2 mm	20	19
Parry, 2002	Single centre retro	Patent IMA & LA ≥ 1.5	14	24
Axelrod, 2004	Single centre retro	Patent IMA	30	6
Muthu, 2007	Single centre retro	Patent IMA	65	12
Nevala, 2010	Multi centre retro	Patent IMA	40	40
Ward, 2013	Single centre retro	Patent IMA (on angio)	108	32
Burbelko, 2014	Single centre retro	Any patent ≥ 2.5	33	30
Muller-Willie, 2014	Single centre retro	Patent IMA	31	1
Aoki, 2017	Single centre retro	Any patent ≥ 2	24	0.25
Fukuda, 2017	Single centre retro	Patient IMA	143	15
Hiraoka, 2017	Single centre retro	Any patent ≥ 2	58	6
Lojik, 2017	Single centre retro	Any patent ≥ 2	15	--
Manunga, 2017	Single centre retro	Patent IMA	12	24

Reduced incidence of sac enlargement



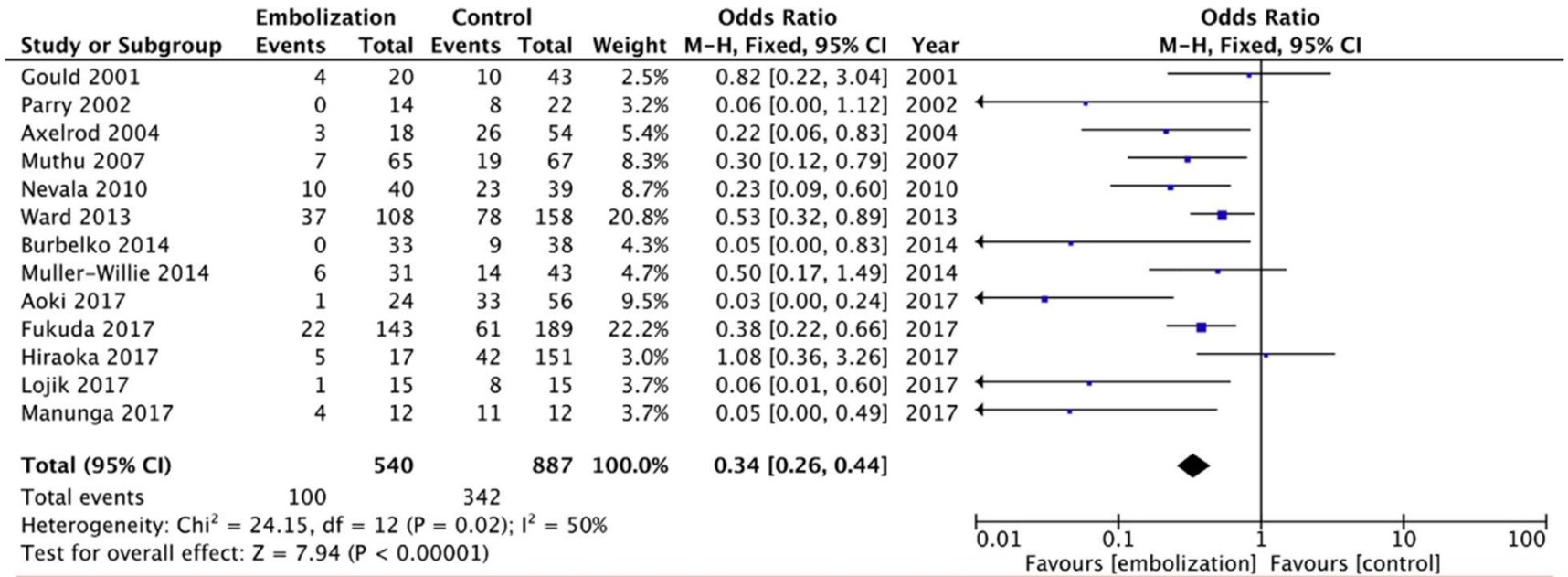
Study or Subgroup	Embolization Events	Embolization Total	Control Events	Control Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
Gould 2001	0	20	4	43	9.7%	0.21 [0.01, 4.17]	2001
Parry 2002	0	14	3	22	9.1%	0.19 [0.01, 4.02]	2002
Ward 2013	13	108	21	158	51.2%	0.89 [0.43, 1.87]	2013
Burbelko 2014	0	33	5	38	17.2%	0.09 [0.00, 1.71]	2014
Lojik 2017	1	15	4	15	12.7%	0.20 [0.02, 2.02]	2017
Total (95% CI)		**190**		**276**	**100.0%**	**0.54 [0.29, 1.00]**	
Total events	14		37				

Heterogeneity: $Chi^2 = 4.75$, df = 4 (P = 0.31); $I^2 = 16\%$

Test for overall effect: Z = 1.97 (P = 0.05)

Fig 2. Forest plot of incidence of sac size enlargement. *CI,* Confidence interval; *M-H,* Mantel-Haenszel.

Reduced incidence of T2EL



Study or Subgroup	Embolization Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Fixed, 95% CI	Year
Gould 2001	4	20	10	43	2.5%	0.82 [0.22, 3.04]	2001
Parry 2002	0	14	8	22	3.2%	0.06 [0.00, 1.12]	2002
Axelrod 2004	3	18	26	54	5.4%	0.22 [0.06, 0.83]	2004
Muthu 2007	7	65	19	67	8.3%	0.30 [0.12, 0.79]	2007
Nevala 2010	10	40	23	39	8.7%	0.23 [0.09, 0.60]	2010
Ward 2013	37	108	78	158	20.8%	0.53 [0.32, 0.89]	2013
Burbelko 2014	0	33	9	38	4.3%	0.05 [0.00, 0.83]	2014
Muller-Willie 2014	6	31	14	43	4.7%	0.50 [0.17, 1.49]	2014
Aoki 2017	1	24	33	56	9.5%	0.03 [0.00, 0.24]	2017
Fukuda 2017	22	143	61	189	22.2%	0.38 [0.22, 0.66]	2017
Hiraoka 2017	5	17	42	151	3.0%	1.08 [0.36, 3.26]	2017
Lojik 2017	1	15	8	15	3.7%	0.06 [0.01, 0.60]	2017
Manunga 2017	4	12	11	12	3.7%	0.05 [0.00, 0.49]	2017
Total (95% CI)		**540**		**887**	**100.0%**	**0.34 [0.26, 0.44]**	
Total events	100		342				

Heterogeneity: $Chi^2 = 24.15$, df = 12 (P = 0.02); $I^2 = 50\%$

Test for overall effect: Z = 7.94 (P < 0.00001)

Fig 3. Forest plot of incidence of type II endoleak. *CI,* Confidence interval; *M-H,* Mantel-Haenszel.

Randomized controlled trials

Multi-centre RCT in Japan (CLARIFY IMA)

- ≥50 mm AAA *or* rapid sac enlargement of ≥5 mm in 6 months
- IMA ≥2.5 mm
- Favourable neck
  - >15 mm length
  - <28 mm diameter
  - Angulation <60^{o}
- Total 138 patients

Ichihashi, S.,& CLARIFY IMA Investigators (2025). Editor's Choice - Multicentre Randomised Controlled Trial to Evaluate the Efficacy of Pre-emptive Inferior Mesenteric Artery Embolisation during Endovascular Aortic Aneurysm Repair on Aneurysm Sac Change. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery, 70(2), 219–226. https://doi.org/10.1016/j.ejvs.2025.04.028

No statistically significant difference across any outcome

		Pre-embolized	Control
Post-op	Diameter Δ (mm)	--	--
	T2EL	38%	46%
12 months	Diameter Δ (mm)	-1.0 (+/- 2.9)	-0.8 (+/- 2.7)
	T2EL	45%	47%
24 months	Diameter Δ (mm)	-2.3 (+/- 7.4)	-1.7 (+/- 6.7)
	T2EL	49%	44%

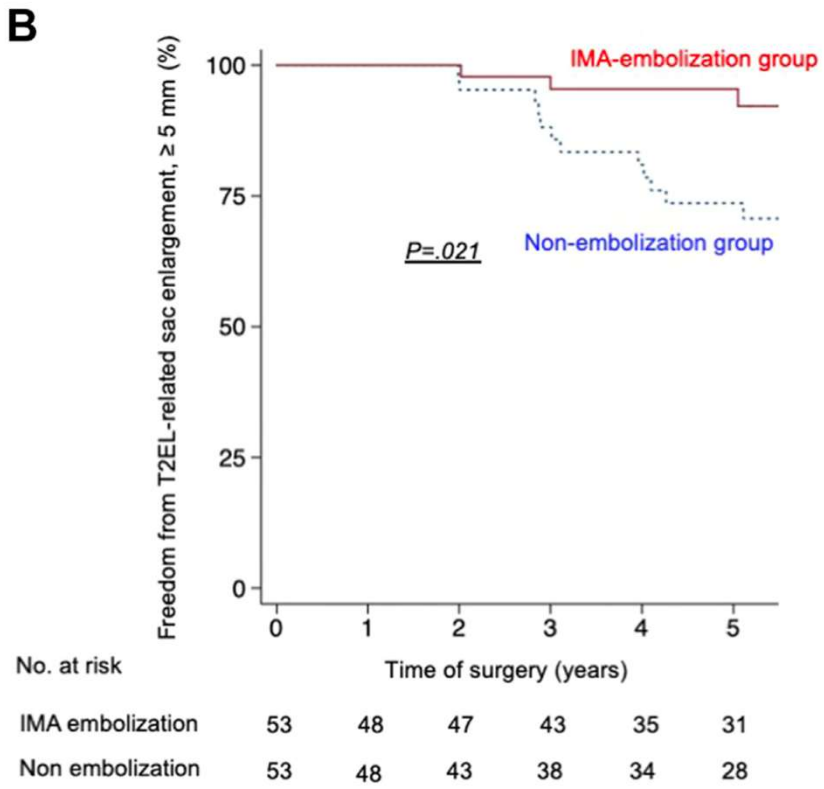
Single-centre RCT in Japan for *higher risk patients*

- Patent IMA with:
  - IMA ≥3 mm *or*
  - Lumbar arteries ≥2 mm *or*
  - Aortoiliac aneurysm
- 98 total patients in protocol (46 embo, 52 control)
- 5 years of follow-up

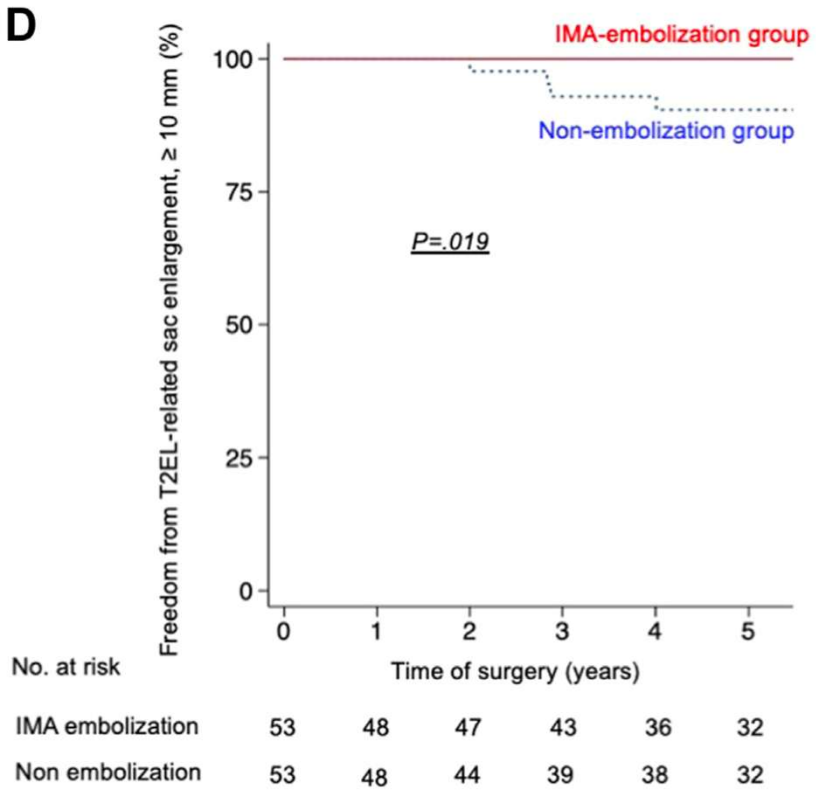
Takeuchi, Y., et al. (2024). Five-year follow-up of randomized clinical trial for pre-emptive inferior mesenteric artery embolization during endovascular aneurysm repair. Journal of vascular surgery, 80(3), 693–701.e3. https://doi.org/10.1016/j.jvs.2024.04.058

5 year outcomes	Pre-embolized	Control
Diameter Δ (mm)	**-5.1 +/- 10.2**	**-0.42 +/- 13.0**
T2EL	**24%**	**54%**
Reintervention #	5	6

Sac enlargement ≥ 5 mm



Sac enlargement ≥10 mm



Major reinterventions

Embolized group

- **1 Type 1A open repair**
- 1 Type 1A (chimney)
- 1 Type 1B
- 1 limb occlusion
- 1 renal stenosis

Control

- **1 T2EL with enlargement & rupture**
- 1 Type 1B
- 2 x Type 3
- 1 limb occlusion
- 1 renal stenosis

Summary of Takeuchi (2024) Trial

Pre-op IMA embolization in *higher risk* patients leads to:

- Less T2EL in 5 years
- Lower rate of sac enlargement $\geq$ 10 mm in 5 years

But no difference in the the rate of major aneurysm related complications in 5 years

How did we get here?

Eur J Vasc Endovasc Surg Vol 27, February 2004

Is a Type II Endoleak after EVAR a Harbinger of Risk? Causes and Outcome of Open Conversion and Aneurysm Rupture during Follow-up

C. J. van Marrewijk, G. Fransen, R. J. F. Laheij, P. L. Harris,[2] J. Buth[*1] and for the EUROSTAR Collaborators

How did we get here?

- Expansion ($\geq$ 8 mm) occurred more often in patients with T2EL
- Expansion in 25% of patients with late conversion
- Late conversion patients had 54% stent migration

“For migration and aneurysm expansion, an independent association with late conversion was observed”

How did we get here?

26 late conversions in a cohort of

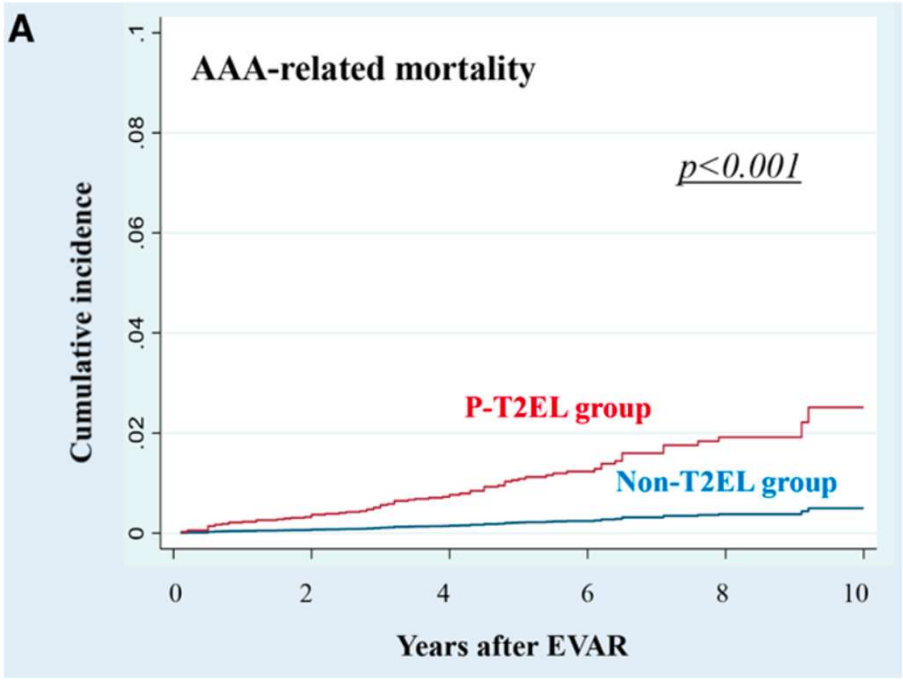
3595 patients

(0.7%)

17 099 Patients from 2006 to 2015 in Japan

4757 (29%) with T2EL

12 142 (71%) without



Seike, Y, et al. & Japanese Committee for Stentgraft Management (JACSM) (2022). Nationwide Analysis of Persistent Type II Endoleak and Late Outcomes of Endovascular Abdominal Aortic Aneurysm Repair in Japan: A Propensity-Matched Analysis. Circulation, 145(14), 1056–1066. https://doi.org/10.1161/CIRCULATIONAHA.121.056581*

17 099 Patients from 2006 to 2015 in Japan

4757 (29%) with T2EL

52 (1%) with AAA-related mortality

38 (0.8%) with AAA rupture

12 142 (71%) without

21 (0.2%) with AAA-related mortality

13 (0.1%) with AAA rupture

Seike, Y, et al. & Japanese Committee for Stentgraft Management (JACSM) (2022). Nationwide Analysis of Persistent Type II Endoleak and Late Outcomes of Endovascular Abdominal Aortic Aneurysm Repair in Japan: A Propensity-Matched Analysis. Circulation, 145(14), 1056–1066. https://doi.org/10.1161/CIRCULATIONAHA.121.056581*

17 099 Patients from 2006 to 2015 in Japan

4757 (29%) with T2EL

52 (1%) with AAA-related mortality

38 (0.8%) with AAA rupture

12 142 (71%) without

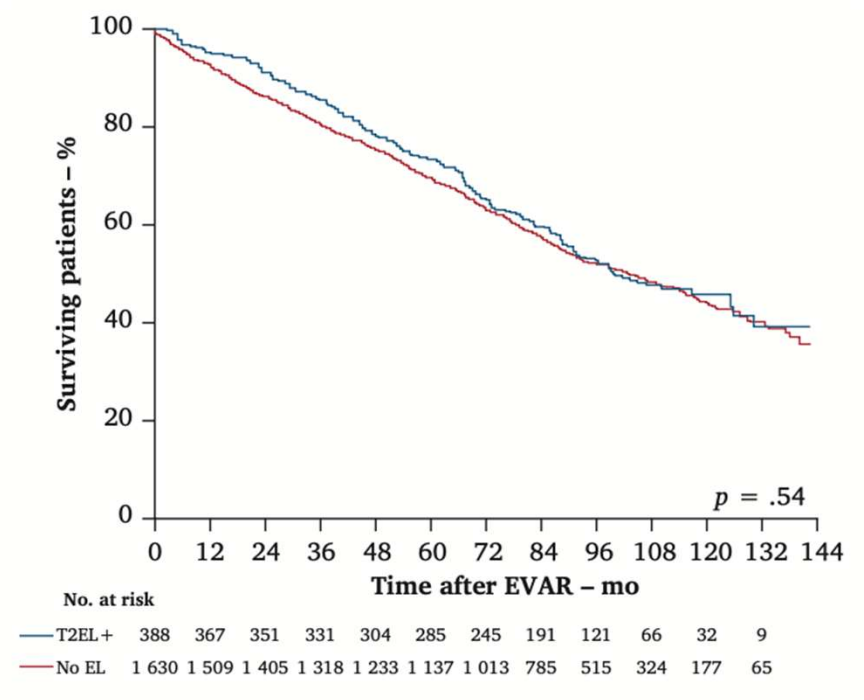
21 (0.2%) with AAA-related mortality

13 (0.1%) with AAA rupture

"Freedom from all-cause mortality showed no significant difference between the groups"

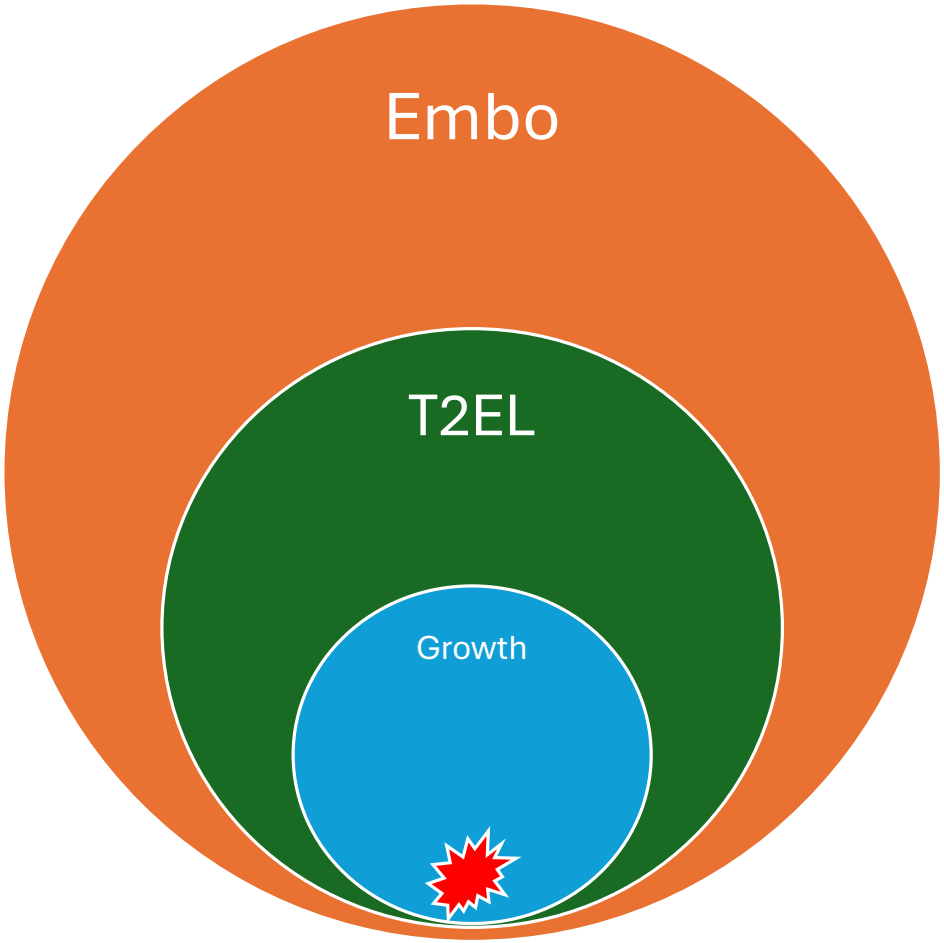
Seike, Y, et al. & Japanese Committee for Stentgraft Management (JACSM) (2022). Nationwide Analysis of Persistent Type II Endoleak and Late Outcomes of Endovascular Abdominal Aortic Aneurysm Repair in Japan: A Propensity-Matched Analysis. Circulation, 145(14), 1056–1066. https://doi.org/10.1161/CIRCULATIONAHA.121.056581*

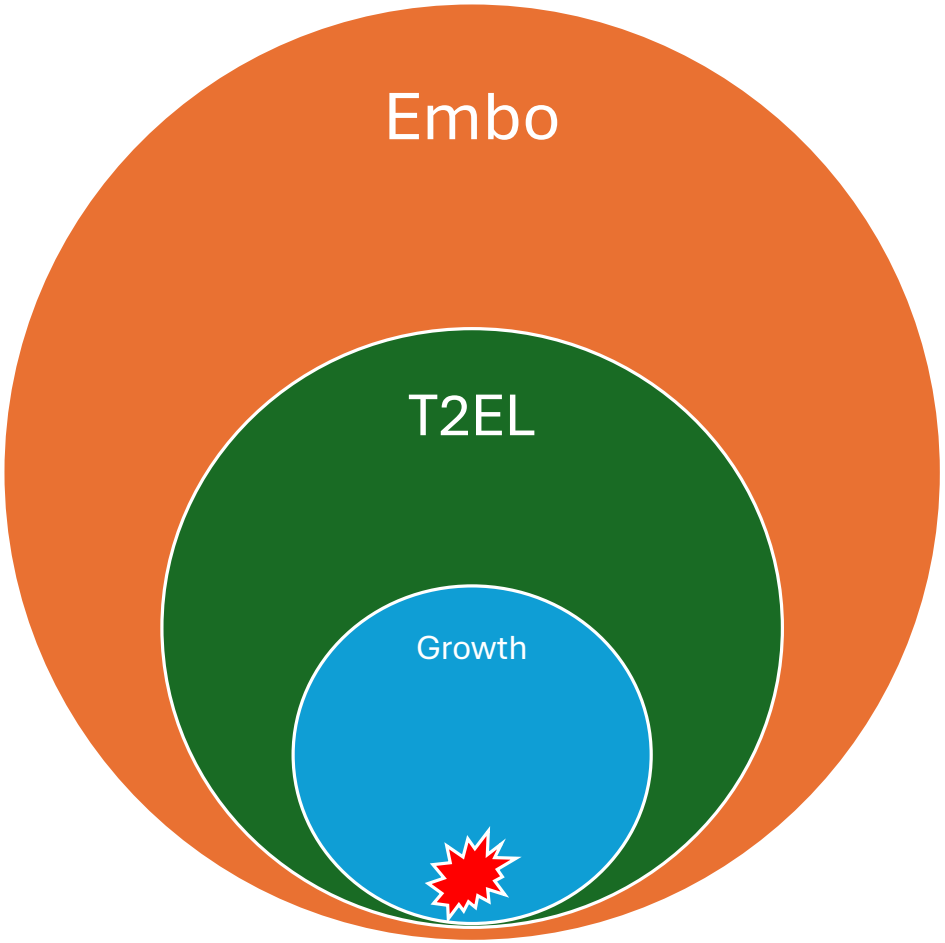
Netherlands (’07 to ‘12) – 2018 patients



Mulay, S., & ODYSSEUS study group (2021). Type 2 Endoleak With or Without Intervention and Survival After Endovascular Aneurysm Repair. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery, 61(5), 779–786. https://doi.org/10.1016/j.ejvs.2021.01.017

Closing thoughts


Embo
T2EL
Growth


Embo
T2EL
Growth

Pre-EVAR embolization of IMA / lumbars to prevent endoleak: **We shouldn’t do this**

Nivethan Vela, MD MSc
5+2 vascular surgery fellow
University of Ottawa

Winnipeg Vascular & Endovascular Symposium 2026

Thank you!