How To Size Lower Extremity Target Arteries For Endo Treatments Accurately Using Intravascular Ultrasound (IVUS): How Does It Help

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Disclosures

- Nothing to disclose in relation to this presentation
- I am NOT using IVUS during my procedures

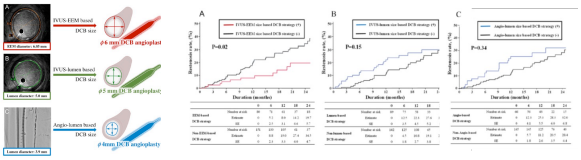
IVUS-EEM

	Parameter	Diameter (mm)	Area (mm2)
⟷	Proximal EEM*	6.80 ± 1.0 (3.1-14.1)	38.1 ± 12.5 (8.8-154.1)
⇢	Proximal Lumen	5.27 ± 1.0 (2.0-12.5)	22.5 ± 9.3 (3.0-122)
⟷	Minimum lesion EEM	5.91 ± 1.0 (2.65-11.3)	28.9 ± 9.9 (5.5-101.42)
⟷	Minimum lesion	2.3 ± 0.6 (0-6.2)	4.30 ± 2.6 (0-30.1)
⇢	Distal Lumen	4.93 ± 1.2 (2.4-13.2)	19.7 ± 9.4 (4.5-124.4)
⟷	Distal EEM	6.28 ± 0.9 (1.0-9.9)	31.6 ± 9.3 (6.8-77.8)
⟷	Maximum Calcified Angle	•None 167 (17%) •<90 212 (22%) •<180 167 (17%) •<270 134(14%) •<360 161(17%) •360 129(13%)	
⇢	Wire Route	True 835(86%) Sub-true 126 (13%) All sub 9(0.9%)	

Fig. 1 Baseline intravascular ultrasound data. EEM: external elastic membrane

Yasu Y et al CVIR Endovascular / 2022;5:52

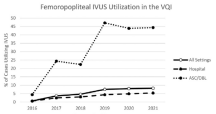
IVUS-EEM



DCBs of IVUS-EEM size, but not of Angio-lumen size or IVUS-lumen size, were associated with reduced risk of restenosis after FP-EVT

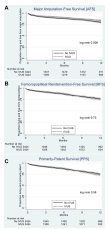
Kurata N et al JEVT 2023;30:260-280

IVUS utilization and outcomes



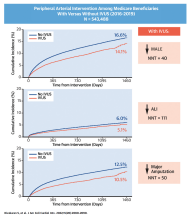
ARTICLE HIGHLIGHTS

- **Type of Research:** Retrospective cohort study of Vascular Quality Initiative data
- **Key Findings:** Intravascular ultrasound (IVUS) use was not associated with a difference in reintervention-free survival or primary patency-related survival at 12 months in femoropopliteal interventions. Improved amputation-free survival was observed with IVUS use, although multivariable analysis suggests this finding may be due to confounding related to the higher prevalence of claudicants and the less comorbid population in which IVUS is used.
- **Take Home Message:** IVUS use does not seem be associated with a significant impact on amputation-free survival, primary patency, or reintervention-free survival after femoropopliteal interventions in the Vascular Quality Initiative.



Smith JA et al J Vasc Surg 2023;78:209-16

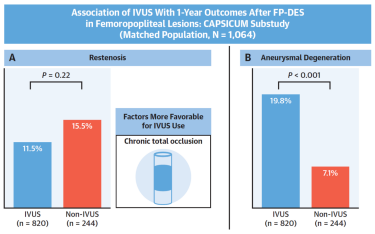
IVUS and outcomes



- Lower risk of short- and long-term MALE
- Amputation benefit mainly in CLTI setting
- Why does ALI decrease when using IVUS?

Divakaran S JACC Cardiovascular Interventions 2022;15:2080–2090

IVUS and (adverse) outcomes?



Tsujimura T et al JACC Cardiovascular Interventions 2022;15:1569–1578

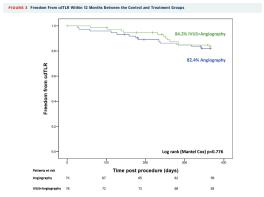
IVUS and outcomes

- Vessel diameter was observed to be significantly larger in the IVUS subgroup (5.13 vs 4.89 mm, p<0.001)
- Lesion length (117.47 vs 90.64 mm, p<0.001), dissection (52.7% vs 22.0%, p<0.001), and calcification were also observed to be more frequent in the IVUS subgroup
- IVUS and angiography decrease CD-TLR and increase nominal deployment (biomimetic stent) compared with angiography alone

Krishnan P et al JEVT 2023 online ahead of print

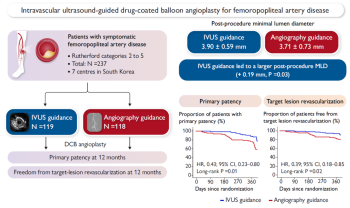
IVUS-RCT

- Significant reduction in the rate of restenosis after endovascular intervention
- **No influence on TLR at 1 year**



Allan RB et al JACC Cardiovascular Interventions 2022;15:536-546

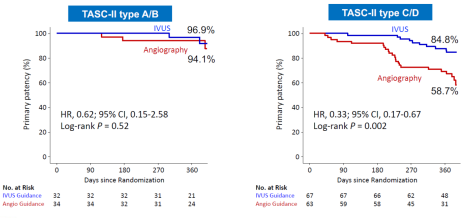
IVUS-RCT



CLINICAL BENEFIT

Ko Y-G et al EHJ 2024 in press

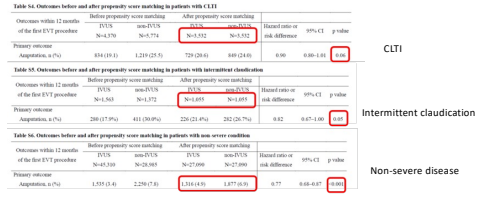
IVUS-RCT



Ko Y-G et al ACC24

IVUS-propensity score-match

CONCLUSIONS: In this retrospective study, IVUS-guided EVT was associated with a lower amputation risk than non-IVUS–guided EVT. Our findings should be interpreted carefully because of the limitations of an observational study using administrative data. Further studies are warranted to confirm whether IVUS-guided EVT leads to decreased amputations.



3 subgroups: CLTI IC non-severe condition

Setogawa N Circulation Cardiovascular Interventions 2023;16:e012451

IVUS-propensity score-match

- 56,633 procedures in 44,042 patients (propensity matching yielded a total cohort of 1,854 patients matched (1:1); 33.9% CLTI
- IVUS was more commonly used for lesions >15 cm in length (46.6% vs. 43.3%) and for aortoiliac disease (31.8% vs. 27.2%)
- **Rates of atherectomy and stenting were significantly higher with IVUS PVI (21.1% vs. 16.8%)**
- One year patency was better with IVUS-PVI (97.7% vs. 95.2%, P=0.004).
- **On subgroup analysis, IVUS PVI was associated with improved patency in CLTI patients, TASC C or D lesions, and treatment length >15 cm**
- Adjunctive IVUS use during PVI did not significantly impact 1-year amputation
- Treatment modalities such as atherectomy, stenting or balloon angioplasty did not significantly impact patency at 1-year

Brahmandam A et al Ann Vasc Surg 2024; 106: 410–418

IVUS-scoping review

Table 1. Characteristics of the Included Studies.

Study	Design	Sample size (PVI/Angiography)	Age (years)	Male	Application of IVUS	Primary outcome	Results	
Allan et al[19] America	RCT	76/74	72.1/73.0	53/44	Measuring lesions	12-month freedom from binary restenosis rate.	Lower binary restenosis rate (especially cases treated with DCB) and larger mean vessel diameter in the PVUS group; no significant difference between groups for ctFTLR	No difference
Tsujimura et al[20] Japan	Retrospective cohort	244/244	74/74	172.3/175.0	Measuring lesions	12-month restenosis rate	No significantly different between groups for restenosis rate, ctFTLR rate, and higher frequency of aneurysmal degeneration in the IVUS group	No difference
Tsubakimoto et al[21] Japan	Retrospective cohort	34/37	75.1/75.6	27/25	Measuring lesions and guiding wiring passage	12-month primary patency and 12-month ctFTLR rate.	Higher primary patency rate, freedom from ctFTLR rate, and complete clinically true lumen angioplasty rate in the IVUS group	Favors IVUS
Iida et al[22] Japan	Retrospective cohort	224/224	72/71	184/177	Measuring lesions and guiding wiring passage	5-year primary patency rate	Higher primary patency rate at a cost of 5 years in the PVUS group	Favors IVUS

Meng W et al JEVT 2023;online ahead of print

IVUS-systematic review and meta-analysis

ARTICLE HIGHLIGHTS

- **Type of Research:** Systematic review and meta-analysis
- **Key Findings:** Intravascular ultrasound-guided endovascular therapy was associated with a significantly lower risk of major amputation compared with angiography alone.
- **Take Home Message:** Intravascular ultrasound-guided endovascular therapy may possibly improve patency and clinical outcomes including major amputation when used adjunctively with angiography for patients with lower extremity peripheral arterial disease. Applicability into routine practice needs further investigation.

- TLR and mortality comparable
- Trend towards lower restenosis rate
- Amputation rate significantly lower (but not in FEM POP lesions)
- Higher patency in FEM POP lesions

Tsukagoshi I et al J Vasc Surg 2024;79:963-972

IVUS meta-analysis

- Six studies, n=1883 (CLTI n=940)
- The use of IVUS + angiography compared to angiography alone showed **larger reference vessel diameter** in both all-inclusive Rutherford classifications and the CLTI subset
- The use of IVUS + angiography compared to angiography alone showed no difference in CD-TLR at 12 months, lower extremity amputation, and all-cause mortality for Rutherford 1-6
- The use of **IVUS + angiography** compared to angiography alone in the **CLTI subset** analysis **improved limb salvage**

Gee A et al Vasc Endovascular Surg. 2024 Oct 16:15385744241292861

Conclusion

- Conflicting/non-uniform data
- Do we know what to measure and are we measuring properly?

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