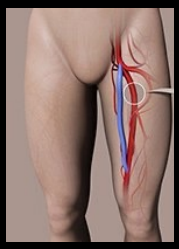
A RADIOLOGIST'S VIEW OF OPEN BYPASS VERSUS ENDOVASCULAR AS FIRST TREATMENT FOR CLTI:

BYPASSES STILL HAVE AN IMPORTANT ROLE



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Conflicts of interest

- Nothing to declare

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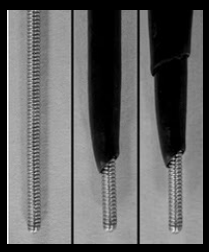
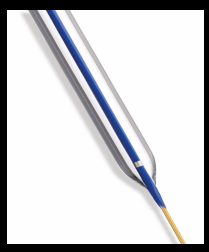
Evolution of vessel dilatation



DOTTER dilators, 1964



Balloon catheters, 2020

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Endovascular Arguments

Percutaneous Angioplasty	Femorodistal bypass
Comorbidities eligible	Eligibility varies
Variable access options	Standard anatomical approach
Native vessels recanalization	Vein conduit necessary
Low complication rate	High complication rate
Demanding interventional skillset	Demanding surgical skillset
May be repeated multiple times	Revision very difficult
Maintains bypass options	Burns angioplasty options
2-3 vessels recanalization	Single line of flow to the foot

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However, …

- Poorer long-term patency & multiple redo
- Demanding skillset for pedal access and new technologies (atherectomy, DVA, etc)
- Multiple stents (long metal jackets) for heavily calcified lesions eventually fail
- Wasting $$$$$ of catheters/devices without success in approx. 10% of the cases

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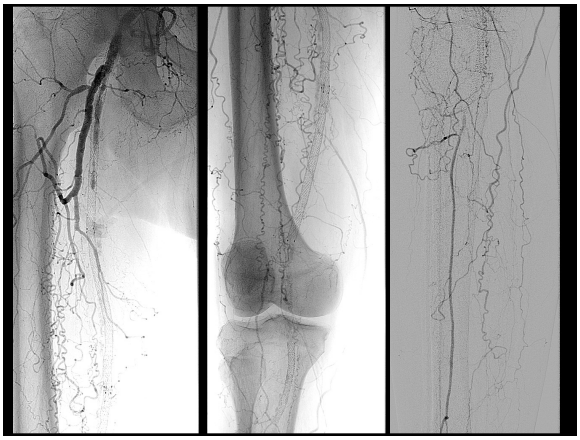

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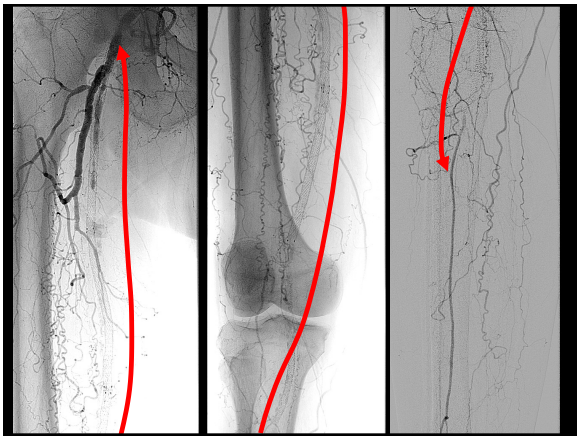

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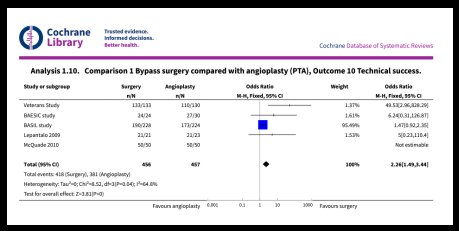
Bypass versus Surgery for CLTI



Significant Odds ratio 2.2 times lower rate of technical failure (38/456 versus 76/457)

Antoniou et al. COCHRANE review 2017

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Bypass versus Surgery for CLTI

Study characteristics (n=3)

Trial Name	BASIL 1	BASIL 2	BEST-CLI*	
			Cohort 1	Cohort 2
Study Characteristic				
Endovascular technique				
Atherectomy	-	-	102 (7.3%)	31 (8.1%)
Angioplasty alone	203 (44.9%)	142 (41.2%)	396 (28.4%)	96 (24.9%)
Drug-coated balloon angioplasty	-	21 (6.1%)	206 (14.8%)	50 (13.0%)
Bare metal stents	-	29 (8.4%)	278 (38.8%)	84 (42.2%)
Drug-eluting stents	-	21 (6.2%)	171 (23.8%)	42 (21.1%)
Stent-grafts	-	-	61 (8.5%)	25 (12.6%)
Technical success				
Endovascular-first	173/216 (90%)	130/165 (87%)	596/704 (84.7%)	154/191 (80.6%)
Surgery-first	190/195 (97.4%)	137/145 (96%)	651/662 (98.3%)	188/188 (100.0%)

>10% lower success rates with ENDO

Mufarrih SH, Am J Cardiol 2024;214:149-156

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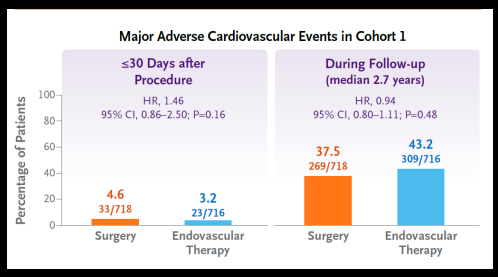
BEST-CLI adverse MACE



No increased rates of early or late MACE with bypass

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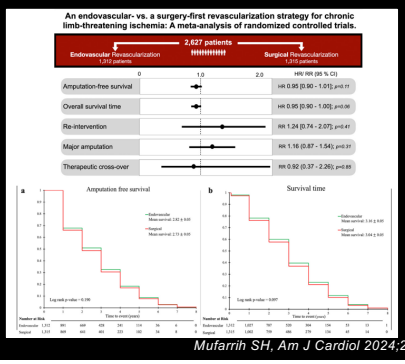
Bypass versus Surgery for CLTI



Mufarrih SH, Am J Cardiol 2024;214:149-156

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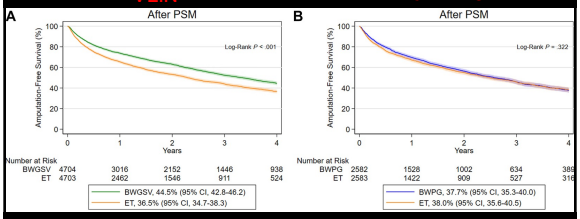
PSM pairs VQI outcomes

VEIN GRAFTS



When a single-segment GSV conduit is available and the revascularization is within the femoropopliteal region, bypass is superior to ENDO in terms of OS, freedom from amputation, and amputation-free survival up to 4 years

Jarrintan J Vasc Surg. 2024 Oct;80(4):1169-1181.

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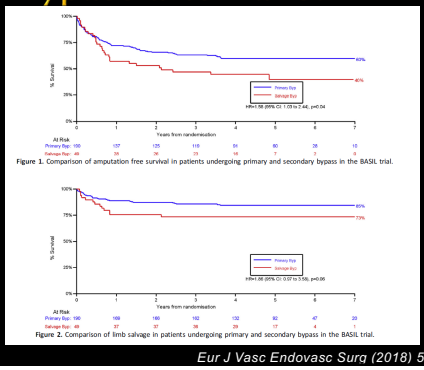
Bypass after failed PTA



Eur J Vasc Endovasc Surg (2018) 55, 666-671

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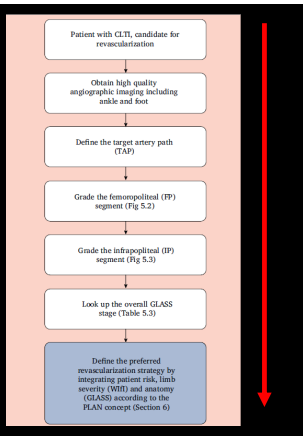
Strategy for CLI



Global Vascular Guidelines for CLTI- EJVES 2019

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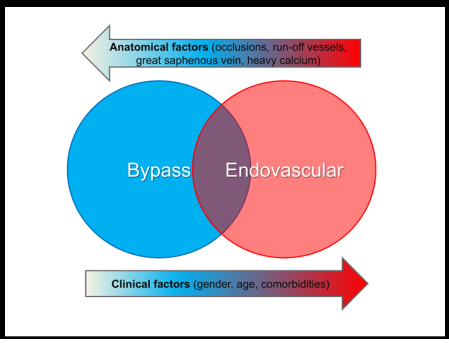
Treatment synergies



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Summary

- ENDOvascular is not a “risk-free shot” at revascularization for CLTI
- ENDO significantly more failures than BYPASS
- VEIN bypass still recommended for above knee procedures (patient selection)
- RCTs maintain an AFS benefit for vein bypass surgery over ENDO

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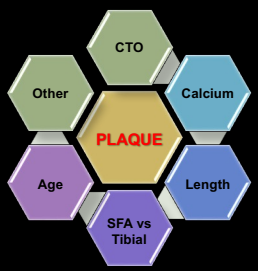
Angioplasty aims

- Maximize lumen gain
- Avoid dissections
- Avoid stenting
- Plaque remodeling
- Facilitate drug uptake



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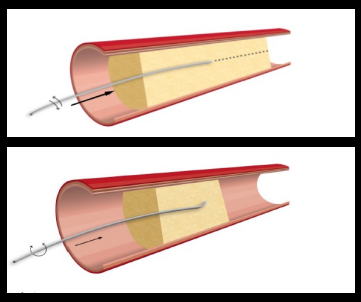
Intraluminal approach



Brandao D, et al. 2012

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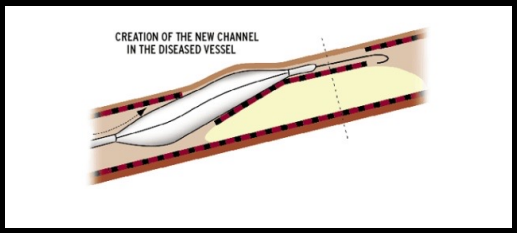
Subintimal approach



Bolia technique 1990s

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Medicare propensity matched 5,928 endo vs 5,928 bypass

All Patients	Endo (n = 5928)	Open (n = 5928)	P
Amputation or mortality, %	7.4	8.9	0.002
Amputation, %	2.5	2.7	0.416
Mortality, %	5.3	6.7	0.001
Patients with claudication	Endo (n = 1572)	Open (n = 1524)	P
Amputation or mortality, %	1.8	2.5	0.215
Amputation, %	0.1	0.3	0.239
Mortality, %	1.7	2.2	0.366
Patients with CLI	Endo (n = 4356)	Open (n = 4404)	P
Amputation or mortality, %	9.3	11.2	0.005
Amputation, %	3.3	3.5	0.580
Mortality, %	6.5	8.3	0.001

30-day outcomes
Reduced mortality with ENDO

Wiseman JT, Ann Surg 2017;265:424–430

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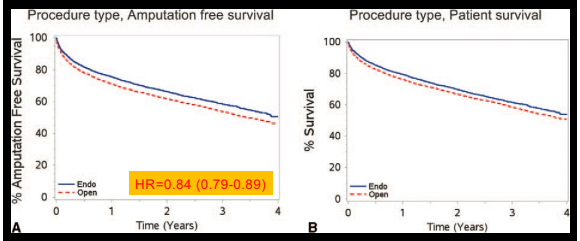
Medicare propensity matched 5,928 endo vs 5,928 bypass



Amp-free survival **Overall survival**

Wiseman JT, Ann Surg 2017;265:424–430

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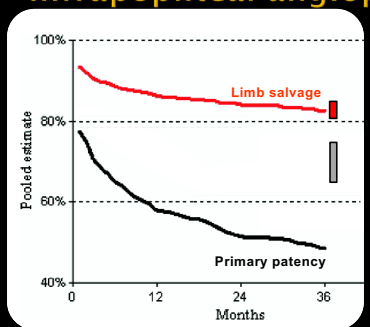
Infrapopliteal angioplasty



Bypass 82-84%

Bypass 66-76%

Romiti M, et al. 30 studies 1990-2006
Meta-analysis of infrapopliteal angioplasty. J Vasc Surg. 2008

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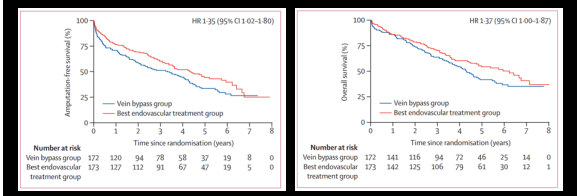
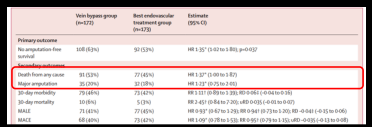
BASIL-2 (Lancet 2023)



Median AFS interval 3.3 years in the vein bypass versus 4.4 years in endovascular



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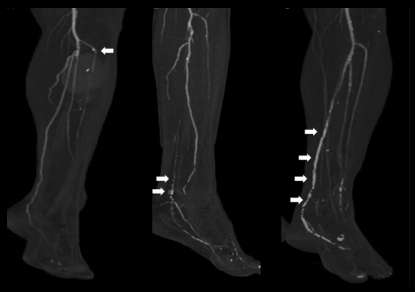
Tibial artery calcification



	minimal	intermediate	extensive
SUCCESS:	95%	92%	71%
AFS @ 2y:	95%	79%	59%

Kang I-S, et al. JVS 2016

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Endovascular-first

or bypass-first

For CLI?

Recommendation 35. Choosing between techniques with equivalent short- and long-term clinical outcomes

- In a situation where endovascular revascularization and open repair/ bypass of a specific lesion causing symptoms of PAD are associated with equivalent short- and long-term symptomatic improvement, endovascular techniques should be used first [B]

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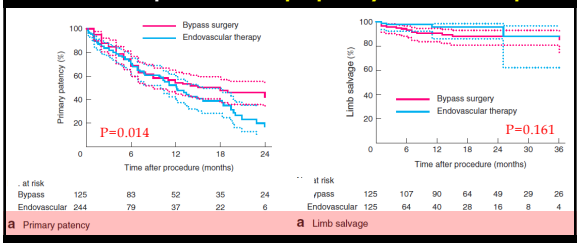
Infrapopliteal angioplasty vs distal bypass

279 limbs in 243 patients → 125 propensity matched limb pairs



Complications: 21·6% versus 36·0% in surgical bypass; P=0·041
Hospital stay: 5 versus 18 days in surgical bypass; P =0·001

Patel S, et al. Propensity matched comparison BJS 2016

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Endo vs Bypass after failed Bypass

Procedure	Incidence
LEB	
SSV	518
Femoropopliteal bypass w/ single segment saphenous vein	252 (48.6%)
Femoral distal bypass w/ single segment saphenous vein	185 (35.7%)
Popliteal distal w/ single segment saphenous vein	81 (15.6%)
Alterative	627
Femoropopliteal bypass w/prosthetic/spliced vein/composite	307 (48.9%)
Femoral distal bypass w/ prosthetic/spliced vein/composite	264 (42.1%)
Popliteal distal bypass w/ prosthetic/spliced vein/composite	56 (8.9%)
IEI	461
Femoropopliteal angioplasty/stenting/atherectomy	345 (74.9%)
Tibial angioplasty/stenting	116 (25.1%)

National Utilization and Outcomes of Redo Lower Extremity Bypass versus EndovascularIntervention after a Previous Failed Bypass. Ann Vasc Surg 2018

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Endo vs Bypass after failed Bypass

Table 3. 30-Day MALE and MACE Outcomes: Endovascular vs Optimal Conduit vs Subptimal Conduit

Parameter	Endovascular	LEB SSV	LEB Alternative	p-value
MALE	73 (15.8%)	56 (10.8%)	97 (15.5%)	0.03
Untreated Loss of Patency	11 (2.4%)	16 (3.1%)	34 (5.4%)	0.02
Re-intervention	38 (8.2%)	37 (7.1%)	52 (8.3%)	0.74
Amputation	36 (7.8%)	19 (3.7%)	33 (5.3%)	0.02
MACE	18 (3.9%)	14 (2.7%)	35 (5.6%)	0.049
CVA or MI	11 (2.4%)	9 (1.7%)	30 (4.8%)	0.01
Mortality	9 (2.0%)	6 (1.2%)	8 (1.3%)	0.53
Deep incisional SSI	2 (0.4%)	19 (3.7%)	11 (1.8%)	0.001
Bleeding	55 (11.9%)	172 (33.2%)	253 (40.4%)	<0.0001
Acute renal failure	2 (0.4%)	5 (1.0%)	2 (0.3%)	0.31
Discharge to home	395 (85.7%)	392 (75.7%)	424 (67.6%)	<0.0001
Return to OR	67 (14.5%)	84 (16.2%)	125 (19.9%)	0.05
Hospital LOS (days)	4.0 ± 7.0	6.9 ± 7.6	7.0 ± 6.3	<0.0001
Readmission	4 (0.9%)	9 (1.7%)	16 (2.6%)	0.12

National Utilization and Outcomes of Redo Lower Extremity Bypass versus EndovascularIntervention after a Previous Failed Bypass. Ann Vasc Surg 2018

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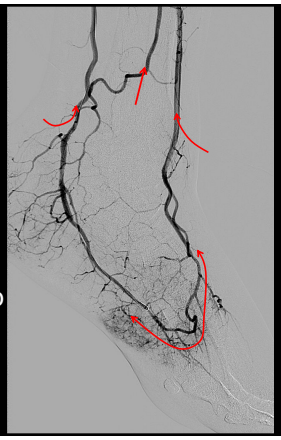
TRANSPEDAL

5 different access options !

Retrograde tibial
OR
Pedal-plantar loop

(Down and Over)



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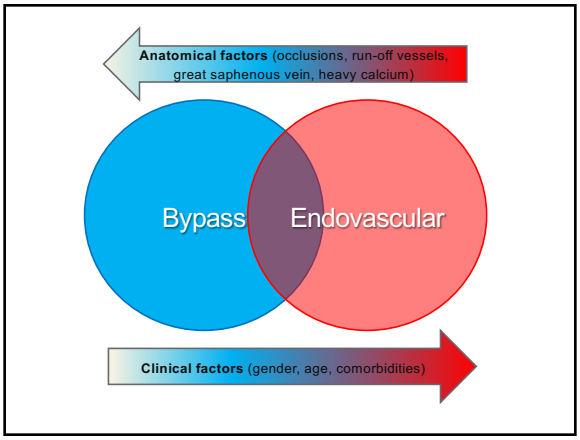
Anatomical factors (occlusions, run-off vessels, great saphenous vein, heavy calcium)
Bypass
Endovascular
Clinical factors (gender, age, comorbidities)

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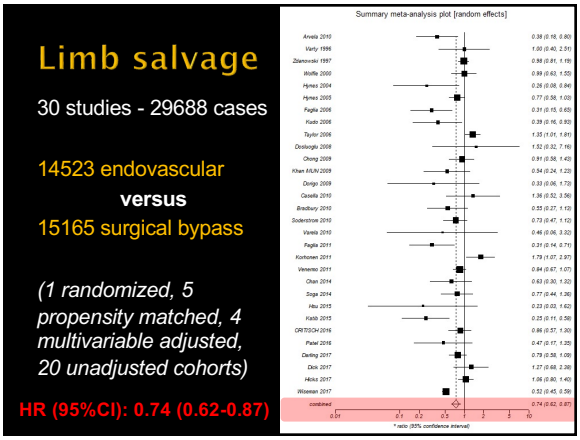
Limb salvage
30 studies - 29688 cases
14523 endovascular
versus
15165 surgical bypass
(1 randomized, 5 propensity matched, 4 multivariable adjusted, 20 unadjusted cohorts)
HR (95%CI): 0.74 (0.62-0.87)
Summary meta-analysis plot [random effects]

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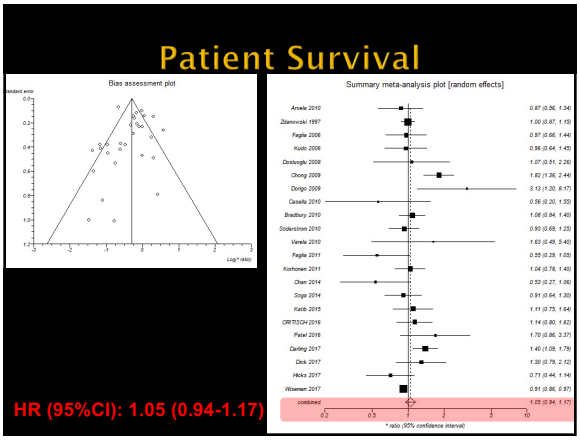
Patient Survival
Bias assessment plot
Summary meta-analysis plot [random effects]
HR (95%CI): 1.05 (0.94-1.17)

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