



# When is bypass the only solution in femoropopliteal segment disease?

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Consultant Vascular and Endovascular Surgeon  
Frimley Health NHS Foundation Trust

**St. Thomas' Advanced Revascularisation Symposium**  
**8<sup>th</sup> July 2022 London**



## CONFLICTS OF INTEREST

**None**

## ROLES RELEVANT TO TOPIC

**Lead Vascular Surgeon to the MDT Diabetic Limb Salvage Service at Frimley Health NHS Foundation Trust**

*St Thomas' Advanced Revascularisation Symposium*

**Principle Investigator for BASIL-2 trial**

**Principle Investigator for BASIL-3 trial**

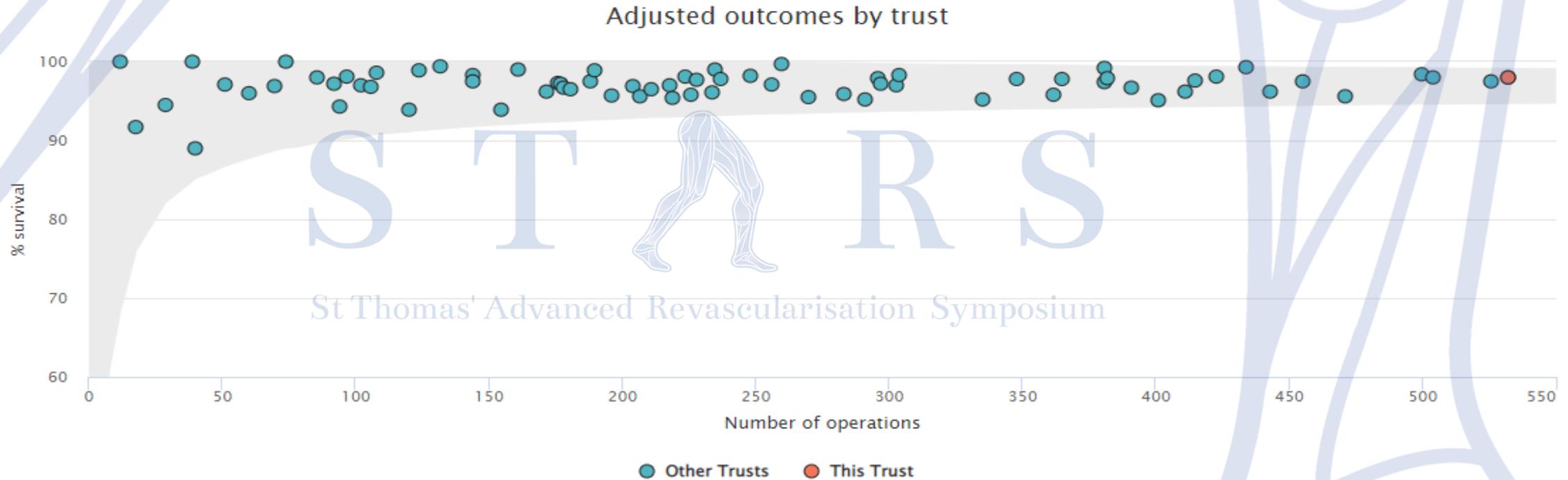
**Chair of the Tri-Counties Diabetic Foot Symposium**

# Lower Limb Bypass

Frimley Health NHS Foundation Trust



## Trust outcomes



**532** bypass cases and **470** endovascular cases in 3 years (2018-2020)

Median Length of stay **5 days (3-12)** for bypass vs **1 day (0-6)** for endovascular

Risk adjusted 30 day survival **98%** for bypass vs **98.5%** for endovascular

# Is Surgical Bypass still a valid option for femoro-popliteal segment PAD?

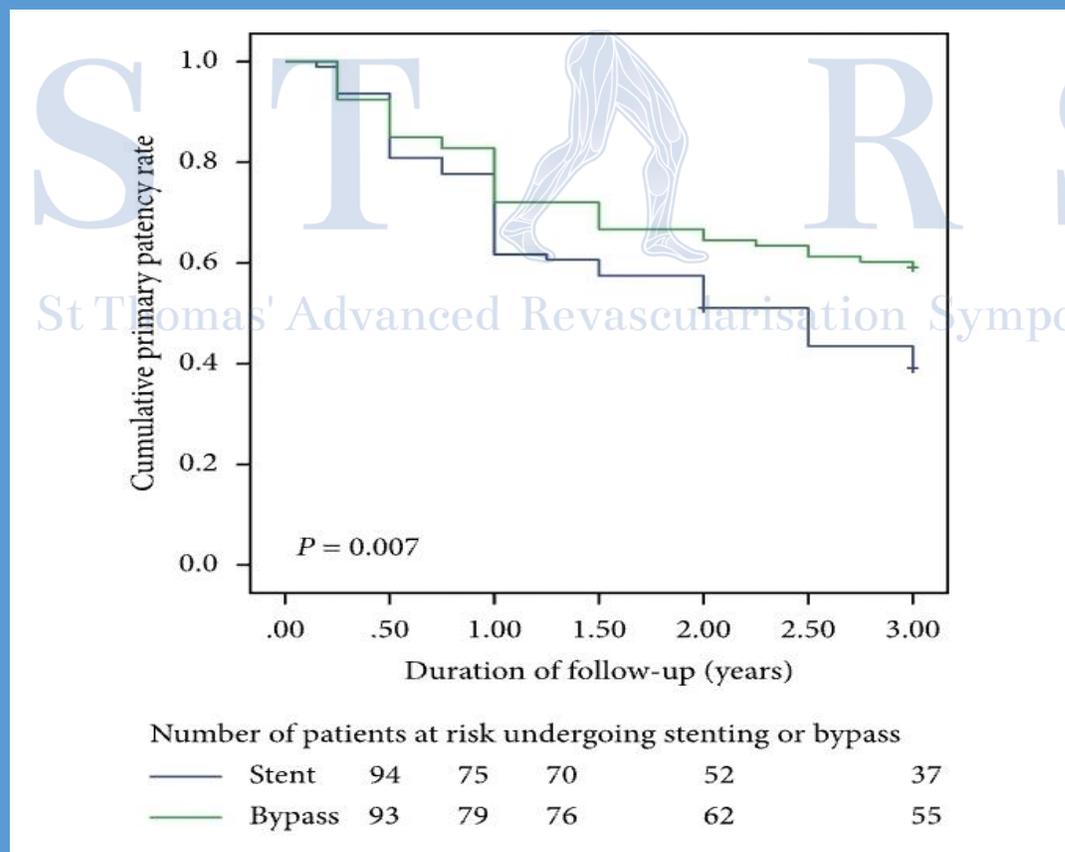
Clinical effect of revascularisation strategies and pharmacologic treatment on long term results in patients with advanced PAD with TASC C and D Femoropopliteal lesions *CY Lee et al. J Interv Cardiol 2022*

Bypass superior for **radiological patency and haemodynamic outcomes** but similar for LEA, MALE Stroke and MI

187 patients  
Observational study  
Prospective database

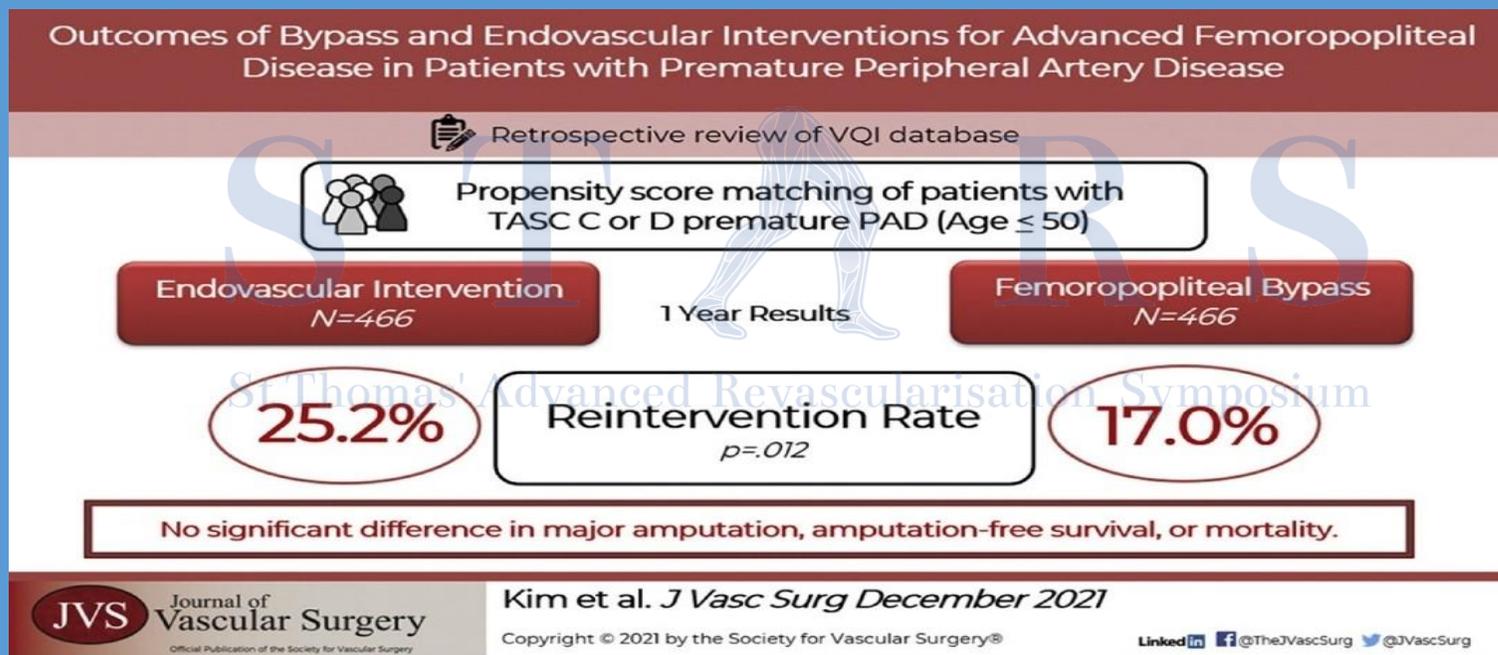
Rutherford III, IV, V

Severe IC  
Rest Pain  
Tissue Loss



Postintervention ABI			
One month	0.92 ± 0.1	0.95 ± 0.16	0.113
36 months	0.53 ± 0.16	0.72 ± 0.14	<0.001
Primary patency			
12 months	70 (74.5)	76 (81.7)	0.231
24 months	52 (55.3)	62 (66.7)	0.112
36 months	37 (39.4)	55 (59.1)	0.007
Secondary patency			
24 months	74 (78.7)	79 (84.9)	0.27
36 months	61 (64.9)	73 (78.5)	0.039

# Is a surgical bypass or endovascular revascularisation first approach better for the younger patient with femoropopliteal disease?

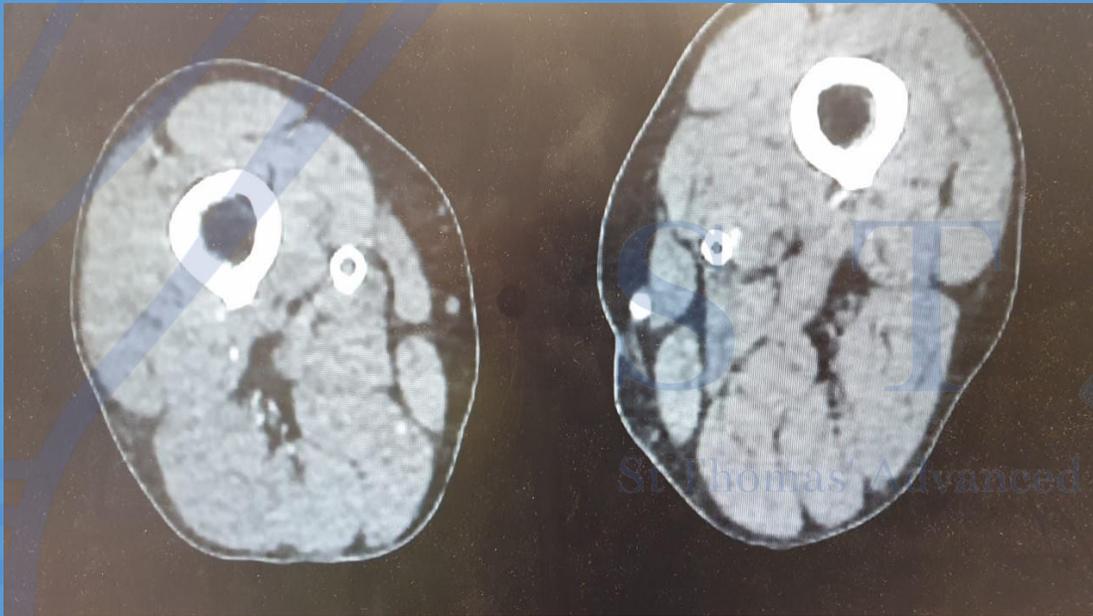


Impact of femoropopliteal endovascular interventions on subsequent open bypass

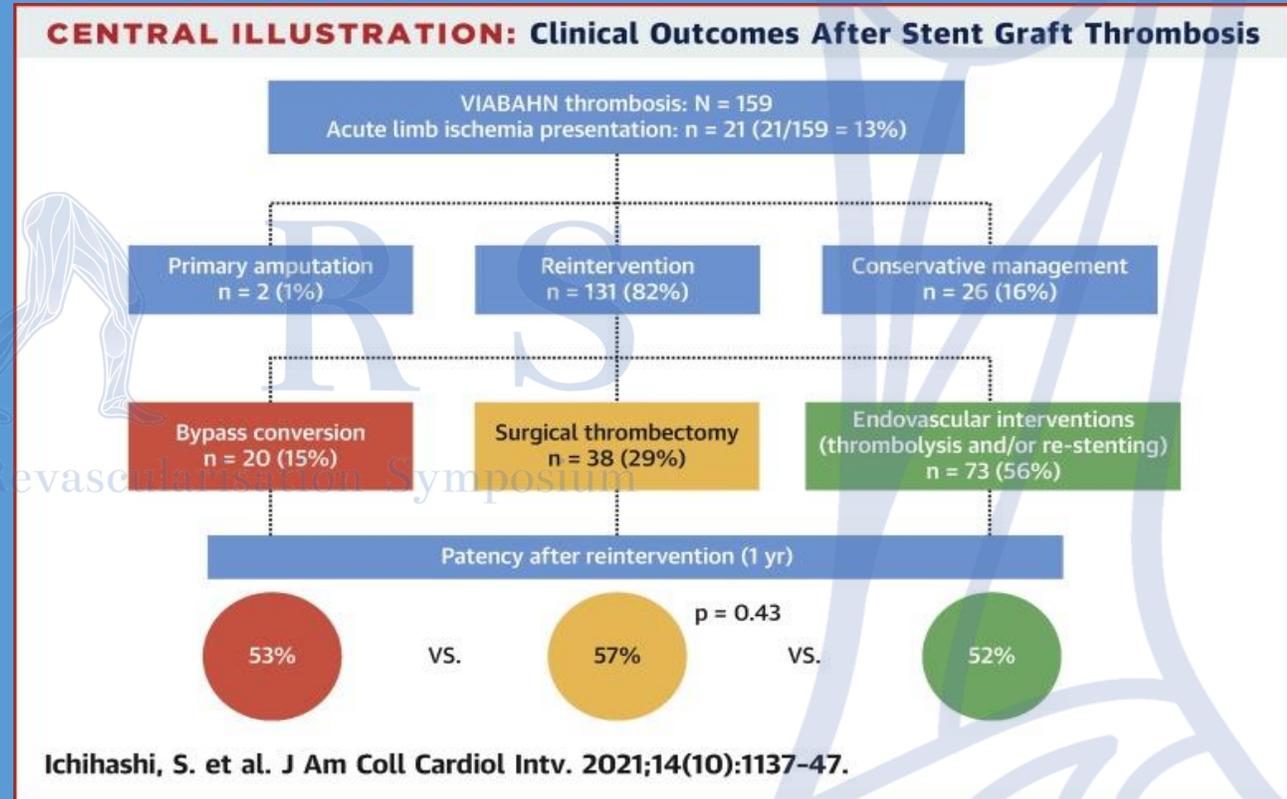
*Gifford SM et al. 2016 JVS*

43% patients need a more distal target vessel for bypass – **“NO FREE LUNCH FOR ENDOVASCULAR FIRST STRATEGY”**

# How should we rescue Endovascular Therapy failure in the femoropopliteal segment?



Clinical Impact of Stent Graft Thrombosis in Femoropopliteal Arterial Lesions,  
*Ichihashi S et al. 2021 JACC: Cardiovascular Interventions 2021*



Surgical bypass can be considered as a **final bail out option** before or after endovascular re-interventional failure especially in the presence of severe acute limb ischaemia

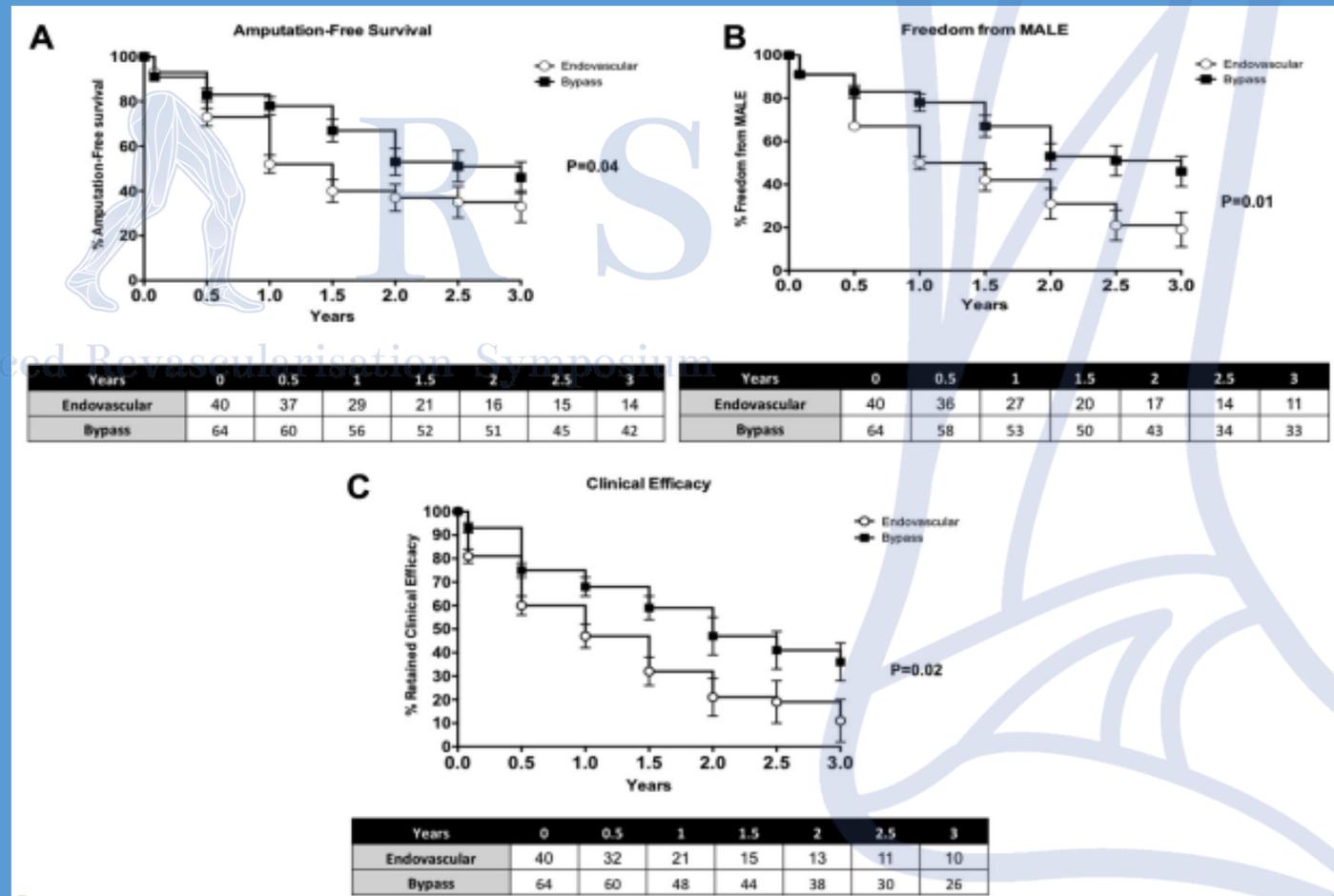
# What about rescuing a failed femoropopliteal bypass?

## Outcomes of native superficial femoral artery chronic total occlusion recanalization after failed femoropopliteal bypass

*Davies MG et al. 2017 JVS*

**Surgical Bypass is superior**  
to EVT native SFA  
recanalization for

- Amputation Free Survival
- Freedom from MALE
- Clinical Efficiency



# DOES THE EXTENT OF ANATOMICAL DISEASE MATTER?



The FP and IP segment grade combined provides the Global Limb Anatomical Staging System (GLASS) for technical complexity

Technical failure > 20%  
1yr LB patency is < 50%  
**SURGICAL BYPASS**  
should be considered for  
**GLASS stage III disease.**

Global Vascular Guidelines

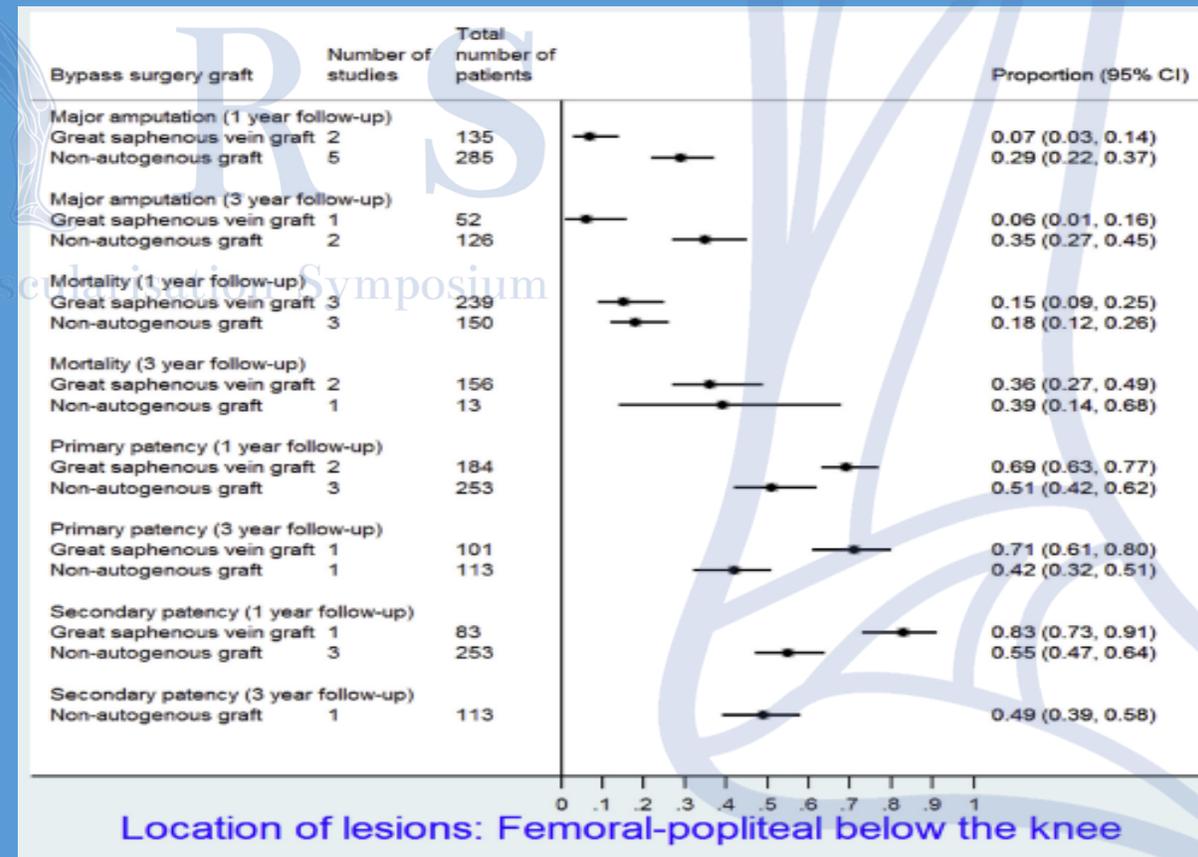
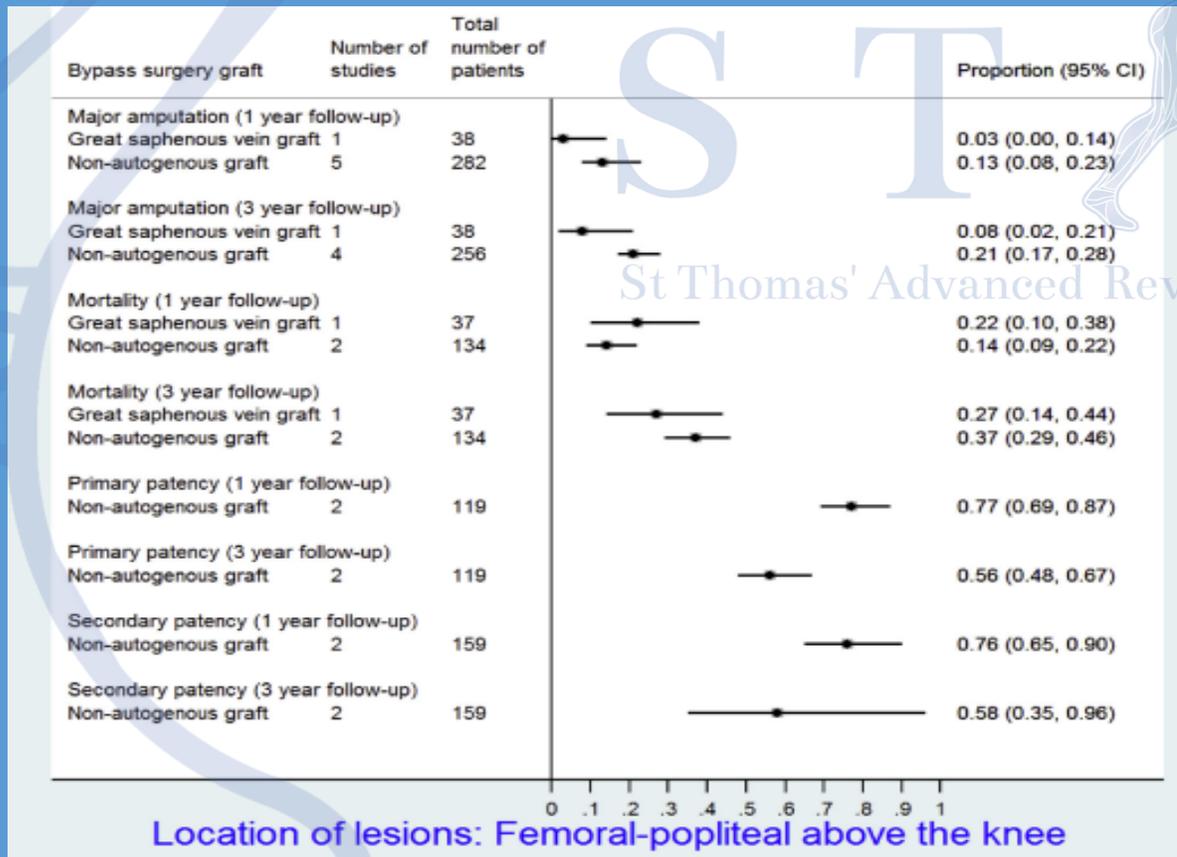
*Conte M et al. JVS 2019*

FP Grade 0	Mild or no significant (<50%) disease		IP Grade 0	Mild or no significant disease in the primary target artery path	
FP Grade 1	<ul style="list-style-type: none"> <li>Total length SFA disease &lt; 1/3 (&lt; 10 cm)</li> <li>May include single focal CTO (&lt; 5 cm) as long as not flush occlusion</li> <li>Popliteal artery with mild or no significant disease</li> </ul>		IP Grade 1	<ul style="list-style-type: none"> <li>Focal stenosis of tibial artery &lt; 3cm</li> </ul>	
FP Grade 2	<ul style="list-style-type: none"> <li>Total length SFA disease 1/3-2/3 (10-20 cm)</li> <li>May include CTO totaling &lt; 1/3 (10 cm) but not flush occlusion</li> <li>Focal popliteal artery stenosis &lt; 2 cm, not involving trifurcation</li> </ul>		IP Grade 2	<ul style="list-style-type: none"> <li>Stenosis involving 1/3 total vessel length</li> <li>May include focal CTO (&lt; 3 cm)</li> <li>Not including TP trunk or tibial vessel origin</li> </ul>	
FP Grade 3	<ul style="list-style-type: none"> <li>Total length SFA disease &gt; 2/3 (&gt; 20 cm) length</li> <li>May include any flush occlusion &lt; 20 cm or non-flush CTO 10-20 cm long</li> <li>Short popliteal stenosis 2-5 cm, not involving trifurcation</li> </ul>		IP Grade 3	<ul style="list-style-type: none"> <li>Disease up to 2/3 vessel length</li> <li>CTO up to 1/3 length (may include tibial vessel origin but not tibioperoneal trunk)</li> </ul>	
FP Grade 4	<ul style="list-style-type: none"> <li>Total length SFA occlusion &gt; 20 cm (&gt; 20 cm) length</li> <li>Popliteal disease &gt; 5 cm or extending into trifurcation</li> <li>Any popliteal CTO</li> </ul>		IP Grade 4	<ul style="list-style-type: none"> <li>Diffuse stenosis &gt; 2/3 total vessel length</li> <li>CTO &gt; 1/3 vessel length (may include vessel origin)</li> <li>Any CTO of tibioperoneal trunk if AT is not the target artery</li> </ul>	

# Bypass is best with a venous conduit as 1<sup>st</sup> choice

A systematic review and meta-analysis of revascularization outcomes of infra-inguinal chronic limb-threatening ischemia *Almasri J et al. JVS 2019*

**Vein is superior compared to non-autogenous graft for PRIMARY AND SECONDARY PATENCY, LIMB LOSS AND MORTALITY**



# Does frailty and physiological fitness matter?



Review Article

VASCULAR  
MEDICINE

## Frailty scoring in vascular and endovascular surgery: A systematic review

Bernard JQW Koh<sup>1,2\*</sup>, Quincy Lee<sup>1,3,4\*</sup> , Ian JY Wee<sup>1,2</sup>,  
Nicholas Syn<sup>1,2</sup>, Keng Siang Lee<sup>1,5</sup> , Jun Jie Ng<sup>1,6,7,8</sup>,  
Audrey LA Wong<sup>1,9,10</sup>, John TY Soong<sup>1,9,10</sup>  
and Andrew MTL Choong<sup>1,6,7,8</sup> 

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DOI: 10.1177/1358863X221093400  
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Systematic review of 16 studies and 8 frailty scores in vascular and endovascular surgery

Significant association between frailty and mortality, morbidity, non-home discharge, requiring care after discharge, adverse events, failure to rescue and limb loss. ( $p < 0.05$ )

**30-day mortality increased from 1.4 to 13.7 times in frail patients compared to non frail patients**

Patient selection for fitness for intervention, the potential impact of interventional options and the utilisation of prehabilitation measures and early postoperative rescue therapies.

**SURGICAL BYPASS SHOULD BE CONSIDERED FOR THE FITTER WITH ENDOVASCULAR THERAPY FOR FRAILER PATIENTS**

# Evidence from the Clinical Trials awaited

## We need the data!

- BASIL trial showed that for those who survived for at least 2 years after randomisation, bypass surgery was associated with a significant increase in overall survival and a trend toward amputation free survival.

*Adam DJ et al. 2005 Lancet*

*Bradbury AW et al. 2010 JVS*

- BASIL 2 trial\* – recruitment finalised in 2020 and results awaited

*Popplewell MA et al. 2016 Trials* \* *infra-popliteal disease and severe limb ischaemia*

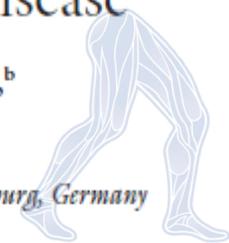
- BEST-CLI trial\* – final patient randomised in 2019 and results likely to be reported at AHA meeting in November 2022

*Menard MT et al. 2014 Semin Vasc Surg* \* *critical limb ischaemia*

# Despite the paucity of level 1 Trial evidence what can a meta-analysis tell us about the utility of surgical bypass versus endovascular therapy in femoropopliteal PAD?

## A meta-analysis of endovascular versus surgical reconstruction of femoropopliteal arterial disease

George A. Antoniou, MD, PhD,<sup>a</sup> Nicholas Chalmers, FRCR,<sup>a</sup> George S. Georgiadis, MD,<sup>b</sup> Miltos K. Lazarides, MD, EBSQvasc,<sup>b</sup> Stavros A. Antoniou, MD,<sup>c</sup> Ferdinand Serracino-Inglott, MD, MSc, FRCS,<sup>a</sup> J. Vincent Smyth, ChM, FCRS,<sup>a</sup> and David Murray, MD, FRCS,<sup>a</sup> Manchester, United Kingdom; Alexandroupolis, Greece; and Marburg, Germany



**Background:** Controversy exists as to the relative merits of surgical and endovascular treatment of femoropopliteal arterial disease.

**Methods:** A systematic review of the literature was undertaken to identify studies comparing open surgical and percutaneous transluminal methods for the treatment of femoropopliteal arterial disease. Outcome data were pooled and combined overall effect sizes were calculated using fixed or random effects models.

**Results:** Four randomized controlled trials and six observational studies reporting on a total of 2817 patients (1387 open, 1430 endovascular) were included. Endovascular treatment was accompanied by lower 30-day morbidity (odds ratio [OR], 2.93; 95% confidence interval [CI], 1.34-6.41) and higher technical failure (OR, 0.10; 95% CI, 0.05-0.22) than bypass surgery, whereas no differences in 30-day mortality between the two groups were identified (OR, 0.92; 95% CI, 0.55-1.51). Higher primary patency in the surgical treatment arm was found at 1 (OR, 2.42; 95% CI, 1.37-4.28), 2 (OR, 2.03; 95% CI, 1.20-3.45), and 3 (OR, 1.48; 95% CI, 1.12-1.97) years of intervention. Progression to amputation was found to occur more commonly in the endovascular group at the end of the second (OR, 0.60; 95% CI, 0.42-0.86) and third (OR, 0.55; 95% CI, 0.39-0.77) year of intervention. Higher amputation-free and overall survival rates were found in the bypass group at 4 years (OR, 1.31; 95% CI, 1.07-1.61 and OR, 1.29; 95% CI, 1.04-1.61, respectively).

**Conclusions:** High-level evidence demonstrating the superiority of one method over the other is lacking. An endovascular-first approach may be advisable in patients with significant comorbidity, whereas for fit patients with a longer-term perspective a bypass procedure may be offered as a first-line interventional treatment. (J Vasc Surg 2013;57:242-53.)

**Antoniou GA et al 2013 JVS**

**EVT higher technical failure**  
**EVT lower 30-day morbidity**  
**EVT worse progression to amputation in 2<sup>nd</sup> and 3<sup>rd</sup> year**

**SB better amputation free survival**  
**SB better overall survival**  
**SB better primary patency up to 3 years**

# Evidence from Vascular Registries

## Largest real world analysis to date

**Outcomes of Endovascular-First versus Bypass-First Approach for patients with chronic limb threatening ischaemia using a Medicare linked database**

*Mathlouthi A et al. 2022 Annals of Vascular Surgery*

US Vascular Quality Initiative Medicare Linked Database

5166 Bypass First (BF) vs. 12061 Endovascular First (EVF) patients

UNADJUSTED CLINICAL OUTCOMES SHOWED **BYPASS FIRST IS SUPERIOR TO ENDOVASCULAR FIRST**

Limb Salvage BF 86.4% vs EF 82.1%  $P < 0.001$

Freedom from reintervention 72% v 68%  $P < 0.001$

Amputation Free Survival 66.9% v 56.3%  $P < 0.001$

Freedom from All Cause Mortality 75.7% v 66.1%  $P < 0.001$

**“After adjustment for potential confounders, EVF was non-inferior to BF strategy.”**

It is not about an endovascular first versus a bypass first debate but rather about how a multidisciplinary vascular team can best help the patient regain function safely



### **HYBRID**

**Combined open with endovascular revascularisation (COVER) procedures**

### **CFEA with Fem-Pop EVT**

- Frailer patient
- Less extensive FP anatomical disease
- Good IP runoff
- Patient choice with shared decision making

### **CFEA with Fem-Pop Bypass**

- Fitter patient
- Suitable venous conduit
- More extensive FP anatomical disease
- Patient choice with shared decision making



# Summary

Surgical Bypass remains the **gold standard for clinical outcomes and durability** for the treatment of GLASS stage III femoro-popliteal PAD, advanced limb threat e.g. Wifl stage 4 and significant perfusion deficit with ischaemia grade 2 or 3 or for rescuing failed endovascular therapy or failed surgical bypass

MDT discussion and shared decision making should take into account a patient's **physiological fitness/frailty plus PAD distribution and morphological features plus vascular team capabilities**

St Thomas' Advanced Revascularisation Symposium

Clinicians should advocate for the publication of **lower limb revascularisation registry data** by the ICVR (International Consortium of Vascular Registries) and affiliated national registries.

Until the dissemination of **Level 1 evidence from trials such as BEST-CLI and BASIL-2**, we must be circumspect about abandoning surgical bypass wholesale to embrace an endovascular first approach in all circumstances in the treatment of femoro-popliteal segment PAD.



SAVE THE DATE

Friday 3<sup>rd</sup>  
November 2023

St Thomas' Advanced Revascularisation Symposium

Tri-Counties  
Diabetic Foot  
Symposium