


## POPLITEAL ARTERY ANEURYSMS


### BACK TO BASICS AND PRESENT CHALLENGES

#### FAILED EPAR – HYBRID REPAIR AS ALTERNATIVE

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VEITH Annual Meeting , November 2024, New York

## POPLITEAL ARTERY ANEURYSMS - CHALLENGES

### CONFLICTS OF INTEREST

NONE

NO DISCLOSURES

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## POPLITEAL ARTERY ANEURYSMS

### WHAT IS KNOWN

#### INDICATIONS FOR TREATMENT


Size >2.0cm / intrasac thrombus / ischemic symptoms and rupture

#### INDICATIONS FOR ENDO REPAIR:

Asymptomatic / elderly patients / higher surgical risk  
Favorable anatomy:  
Landing zones / compatibility endograft-artery / absence of tortuosity  
No coverage of distal popliteal artery  
Adequate run-off (2/3)

#### EPAR vs OPAR

Durability: early benefit not present at longer follow-up  
Higher MALE's / Surveillance programs / Reintervention  
Comparable late survival and major amputation rates



### NATIONAL REGISTRY

Results After Open and Endovascular Repair of Popliteal Aneurysms: A Matched Comparison Within a Population Based Cohort

Anna Corradi<sup>1,2,3</sup>, Stefan Amini<sup>4</sup>, Roberto Padegani<sup>5,6</sup>, Ghazi Salek<sup>7</sup>, Martin Böhm<sup>8,9</sup>, Miriam Fahlberg<sup>10</sup>

	Open		TEVAR		EVAR	
	OR	ER	OR	ER	OR	ER
Number	104	104	104	104	104	104
Median age (IQR)	67 (52-77)	67 (52-77)	67 (52-77)	67 (52-77)	67 (52-77)	67 (52-77)
Female	2	2	2	2	2	2
Primary	2	2	2	2	2	2
Secondary	2	2	2	2	2	2
Primary	2	2	2	2	2	2
Secondary	2	2	2	2	2	2
Open	104	104	104	104	104	104
TEVAR	104	104	104	104	104	104
EVAR	104	104	104	104	104	104

Eur J Vasc Endovasc Surg (2021) 61, 988-997

- CLINICAL PRESENTATION / ANATOMICAL FEATURES**
  - Tortuosity and elongation of popliteal arteries
  - Small vessel diameter / Poor run-off
  - Coverage of distal popliteal artery
  - Inadequate compatibility endograft / artery
- KINKING DURING KNEE FLEXION** (control angio mandatory)
- MORE OCCLUSIONS w/ ENDOREPAIR COMPARED TO OR**
- MORE REINTERVENTIONS / CONVERSIONS TO BYPASS**
- REDUCED SURVIVAL / NO DIFFERENCE ON MAJOR AMPUTATION RATE**

## POPLITEAL ARTERY ANEURYSMS

97 patients – 140 PAA: 95 ♂ / 2 ♀ Age: 64 (42 -83)

### OPAR 73 PATIENTS / 111 ANEURYSMS 79.2%

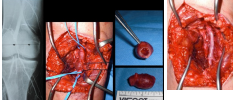
71 ♂ / 2 ♀ Mean Age - 64 anos (42-78)

#### Clinical Presentation

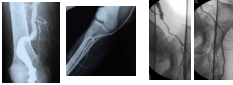
- Asymptomatic 50 (49.5%)
- Claudication 10 (9.9%)
- Acute / Critical Ischemia 39 (38,6%)
- Edema (foot/leg) 5 (4.9%)
- Rupture 7 (6.9%)

#### Run-off crural:

- 3/3 42
- 2/3 18
- 1/3 41 **46%**
- 0/3 10



RESECTION / VEIN GRAFT INTERPOSITION: 11 (posterior approach)



HUNTERIAN LIGATION / BYPASS (medial approach) popliteal / crural 78 / 22

## POPLITEAL ARTERY ANEURYSMS

### EPAR

24 patients / 29 aneurysms 20.7%

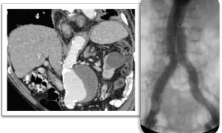
24 males

#### Symptomatic: 11 / 29 (38%)

#### Asymptomatic: 18 / 29 (62%)

- Claudication 8/29 (27%)
- Acute ischemia 2/11 (4.8%)
- Compression 1/29 (3.4%)
- Association with AAA – 5/24 (19.5%)
- Anastomatic aneurysms – 2/29 (6.8%) (previous AIK F-Pop bypass)


Popliteal Runoff	
3/3	18
2/3	7
1/3	4



### POPLITEAL ARTERY ANEURYSMS

	EARLY		LATE		
	EPAR (20.7%)	OPAR (79.2%)		EPAR 46mo (32-100)	OPAR 51mo (24-108)
Technical success	100%	100%	◊ 1 <sup>st</sup> Patency	82.8%	72.1%
Hospital mortality	0%	1.3%	◊ 2 <sup>nd</sup> Patency	94.1%	82.2%
Morbidity	0%	4.9%	◊ Reinterventions	17%	4.2%
Amputations (major)	0%	4.7%	◊ Limb Salvage	95%	90.1%
			◊ Survival	89%	70.1%

### FAILED EPAR – WHAT TO DO?



**ASYMPTOMATIC OR MILD SYMPTOMS**

- Conservative treatment / Oral Anticoagulation

**SEVERE ISCHEMIC SYNDROME**

**1. Interventional Repair:**

- Thrombolysis (systemic / regional)
- Relining of the endograft
- Correction of underlying disorder

**2. Open Revascularization (Femoro- distal bypass)**

Suitable vein conduit

**3. Hybrid Approach**


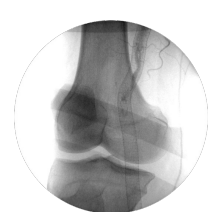
Retrieve a functioning endograft

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### J.A.B.G. male, 83 yrs

2012:  
EVAR + Bilateral E-PAR  
Moderate Heart Failure (medically controlled)

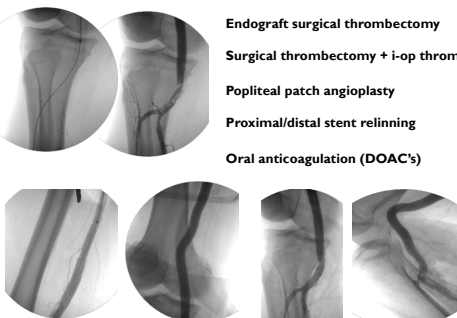
2015:  
Severe claudication on R Lower Limb  
Rest Pain  
Occluded EPAR

### J.A.B.G. male, 83 yrs

**HYBRID APPROACH:**


- Endograft surgical thrombectomy
- Surgical thrombectomy + i-op thrombolysis
- Popliteal patch angioplasty
- Proximal/distal stent relining
- Oral anticoagulation (DOAC's)



### A.A.M., male, 77 yrs

27 yrs ago:  
PAA resection + vein graft (posterior approach)

9/2016 – Routine visit  
Asymptomatic proximal PAA: 5.0cm



12/10/2016: OPERATION  
ER: 2 Viahaban endografts – uneventful  
Discharge at 3rd day  
Dual anti-platelet therapy

### A.A.M., male, 77 yrs

4/11/2016 (1-month later):  
Acute ischemia – thrombosed endograft

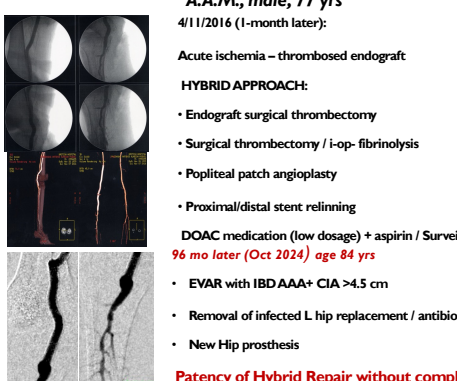
**HYBRID APPROACH:**

- Endograft surgical thrombectomy
- Surgical thrombectomy / i-op- fibrinolysis
- Popliteal patch angioplasty
- Proximal/distal stent relining

DOAC medication (low dosage) + aspirin / Surveillance  
96 mo later (Oct 2024) age 84 yrs

- EVAR with IBD AAA+ CIA >4.5 cm
- Removal of infected L hip replacement / antibiotherapy
- New Hip prosthesis

**Patency of Hybrid Repair without complications**



## POPLITEAL ARTERY ANEURYSMS

### EPAR OCCLUSIONS

- ❖ **Occlusion (1 / 6 / 12 / 32 / 48 mo) 5 / 29**
- Femoro-Popliteal bypass 1 (lymphoma under control)*
- ❖ **Hybrid Approach 4<sup>s</sup> (2 acute, 2 severe claudication / rest pain)**
- ❖ **EVAR 7yrs / anastomotic aneurysms 12yrs after A/K F-P bypass**

**Conversion to Bypass - 10.3%**

- ❖ **Technical Success 4/4 100%**
- F-up: 17 – 76 mo*
- Patency 2 Re-Occlusion 2 (2 – 3 yrs)*
- F-Distal Bypass 2*
- BK Amputation - 1*
- (MOF following occlusion of EVAR left iliac branch and open repair)*

### Long-term outcome of endovascular popliteal artery aneurysm repair

Bahar Golchehr, MD, PhD<sup>1</sup>, Clark J. Zeebregts, MD, PhD<sup>2</sup>, Michel M. P. J. Reijnen, MD, PhD<sup>1</sup> and Ignace F. J. Theilme, MD, PhD<sup>2</sup>, Coauthors and Authors: The Netherlands. *In J Vasc Surg 2018;67:1797-804*

**75 PAAs in 64 patients age: 68.1± 9.4 yrs, 97% males  
Follow-up 58 mo (1-187)**

Time (yrs)	1	5	10 yrs	
1 <sup>st</sup> Patency	84%	60%	51%	
2 <sup>nd</sup> Patency	89%	71%	60%	
	<30d	1- 12 mo	1-3 yrs	>3yrs. Total
Endograft occlusions	2	6	9	10 27 (36%)

Asymptomatic	14	51%	
Acute Ischemia	13	49%	

Total No. of cases		RE (n=6)
Thrombolysis	7 (9)	4: Reocclusion
Reintervention	4 (5)	3: Surgical bypass
Surgical thrombolysis	3 (3)	
Stent graft extension	1 (1)	0 Amputation
PTA	1 (1)	
Surgical bypass	3 (3)	

**Conversion rate to OPAR: 4%**

## POPLITEAL ARTERY ANEURYSMS

### Endovascular repair

Journal of Vascular Surgery  
Open repair versus endovascular treatment for asymptomatic popliteal artery aneurysms: Results of a prospective randomized study

Outcomes of endovascular and contemporary open surgical repairs of popliteal artery aneurysm

Yang Wang, MD, PhD<sup>1</sup>, Peter Chivukula, MD<sup>2</sup>, Vincent A. Okada, MD<sup>3</sup>, Anshu A. Datta, MD<sup>4</sup>, Brian Kark, MD<sup>5</sup>, Mark W. Shroyer, MD<sup>6</sup>, Willem A. Dierckx, MD<sup>7</sup>, Cori Sherman, MD<sup>8</sup>, Robert S. Weiss

*In J Vasc Surg 2014;60:631-8*

**Only asymptomatic aneurysms**

**Small number of patients**

Variable	HR (95% CI)	P value	Overall P value
<b>Type of aneurysm</b>			
Elective OR	1.0 (reference)		
Emergency OR	1.68 (0.88-3.21)	.12	
Elective EPAR	2.08 (0.98-4.46)	.06	
Emergency EPAR	2.13 (1.03-4.39)	.05	
<b>Repair</b>			
Open	1.0 (reference)		.009
EVAR	1.53 (0.88-2.69)	.14	
OR or EPAR	2.97 (1.43-6.11)	.003	

CI, Confidence interval; OR, open repair; EVAR, endovascular repair; OR, hazard ratio; OR, open repair.

- **No superiority of EPAR vs OPAR**
- **For emergent repairs:**
- **MAEs frequent in both treatments**
- **EPAR did not show improvement in the severe prognosis**
- **EPAR for older patients w/adequate anatomy**

## POPLITEAL ARTERY ANEURYSMS

### CONCLUSIONS

- ❖ **OPEN CONVENTIONAL SURGERY IS STILL FIRST CHOICE**
- Presence of a suitable vein conduit*
- Acute ischemic symptoms*
- ❖ **ENDOASCULAR REPAIR INDICATED FOR:**
- Higher surgical risk patients
- Absence of acute ischemia
- Patent distal popliteal artery / adequate run-off
- Compatibility between endograft and artery
- Absence of suitable vein conduit (EPAR better prosthetic grafts)*
- ❖ **EPAR OCCLUSION**
- HYBRID TREATMENT / Functional lower limb in 75% (3/4)*
- Anti-coagulation (DOAC's)

### Elective Surgical Repair of Popliteal Artery Aneurysms with Posterior Approach vs. Endovascular Exclusion: Early and Long Term Outcomes of Multicenter PAKADEE Study

Wahid Nadeem, MD, PhD<sup>1</sup>, Gaurav Arora, MD<sup>2</sup>, Prashant K. Gupta, MD<sup>3</sup>, Anshu A. Datta, MD<sup>4</sup>, Robert S. Weiss, MD<sup>5</sup>, Michael J. Bellotti, MD<sup>6</sup>, William A. Dierckx, MD<sup>7</sup>, Cori Sherman, MD<sup>8</sup>, Robert S. Weiss, MD<sup>9</sup>, Ignace F. J. Theilme, MD, PhD<sup>10</sup>, Clark J. Zeebregts, MD, PhD<sup>11</sup>, Michel M. P. J. Reijnen, MD, PhD<sup>12</sup>, Bahar Golchehr, MD, PhD<sup>13</sup>, Peter Chivukula, MD<sup>14</sup>, Vincent A. Okada, MD<sup>15</sup>, Anshu A. Datta, MD<sup>16</sup>, Brian Kark, MD<sup>17</sup>, Mark W. Shroyer, MD<sup>18</sup>, Willem A. Dierckx, MD<sup>19</sup>, Cori Sherman, MD<sup>20</sup>, Robert S. Weiss, MD<sup>21</sup>

<https://doi.org/10.1016/j.jvs.2024.08.011>

**Asymptomatic / < 6.0 cm length**

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