Why Do We Still Need Open Surgery for Some Popliteal Aneurysms: What are the Indications - Relative and Absolute

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POPLITEAL ARTERY ANEURYSMS
NATURAL HISTORY

EXPANSION (SLOW)
EMBOLIZATION (SILENT)
SEVERE LOWER LIMB ISCHEMIA
Acute thrombosis
Critical limb ischemia
RUPTURE

Even if PAA is fairly common, no single surgeon or institution has enough patients to study this disease with appropriate scientific methods, and consequently, its management remains controversial. Hans Ravn (2007)

POPLITEAL ARTERY ANEURYSMS
TREATMENT

ASYMPTOMATIC: >2.0-2.5cm
SYMPTOMATIC:
PAIN
NERVE/VENOUS COMPRESSION
SEVERE ISCHEMIA
DISTAL EMBOLIZATION
INTRASACULAR THROMBUS (SMALL ANEURYSM)
RUPTURE

POPLITEAL ARTERY ANEURYSMS
REQUIREMENTS FOR ENDOVASCULAR TREATMENT

1. PROXIMAL AND DISTAL ADEQUATE LANDING ZONES (1.0 CM)
2. PATENCY OF DISTAL POPLITEAL ARTERY
3. ADEQUATE RUN-OFF
4. COMPATIBILITY GRAFT/ARTERY

Open Surgery - Gold Standard Treatment

• Hunterian Ligation / Resection + Popliteal or Distal Bypass (Median Approach)
• Resection + Graft Interposition (Posterior Approach)
• Endovascular Management

Endovascular Management

Very low incidence of reported fractures (< 0.01%)
Capable of longitudinal compression with little residual force
Flexibility
POPLITEAL ARTERY ANEURYSMS

87 patients - 128 PAA:
85♂ 2♀

Age: 64 (42 - 83)

Asymptomatic 55 (42.9%)
Symptomatic 69 (53.9)

Claudication 18
Acute/Critical Ischemia: 39
Rupture 7
Edema 5

False - Aneurysms: 4 (3.1%)

POPLITEAL ARTERY ANEURYSMS

OPEN SURGICAL REPAIR

73 patients / 111 aneurysms 86%

Mean Age - 64 anos (42-78).

Clinical Presentation:
- Asymptomatic 50 (49.5%)
- Claudication 10 (9.9%)
- Acute / Critical Ischemia 39 (35.6%)
- Edema (foot/leg) 5 (4.9%)
- Rupture 7 (6.9%)

Run-off crural:
- 3/3 42
- 2/3 18
- 1/3 41
- 0/3 50 46%

RESSECTION / GRAFT INTERPOSITION 11 (antero-medial)

POPLITEAL ARTERY ANEURYSMS

ENDOVASCULAR TREATMENT

14 men 17 PAA 14%

Age : 67 yrs (33 - 82)

Claudication 8
Asymptomatic (AAA) 5
False - Aneurysms 4

POPLITEAL run – off :
3/3 7
2/3 5
1/3 4
0/3 1 29.4%

Decision:
- Favourable anatomy
- Absence of saphenous vein
- EVAR
- Informed choice by the patient

POPLITEAL ARTERY ANEURYSMS

EARLY RESULTS

Endo - PAA OR - PAA

Technical success 100% 100%
In-hospital mortality 0% 1.3%
In-hospital morbidity 0% Morbidity 4.9%
Amputations (major) 0% Amputations major 2.7%

POPLITEAL ARTERY ANEURYSMS

LATE RESULTS

Endo-AP O-AP
Follow-up - 20 meses (2-72) Follow-up - 49 meses (1-96)

Technical success 100% 100%
In-hospital mortality 0% 1.3%
In-hospital morbidity 0% Morbidity 4.9%
Amputations (major) 0% Amputations major 2.7%

Occlusion 17.6%
Femoro-Doppler bypass 1
Transluminal - PTA/patient 99%
Proximal/ distal landing zones 2
Renovation of endograft

1ª Patency 83.4%
2ª Patency 94.1%
Limb Preservation 100%
Survival 70.1%
J.A.B.G. male, 83 yrs

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:
ER: 2 Viahaban endografts – uneventful Discharge at 3rd day
Dual anti-platelet therapy

4/11/2016:
Acute ischemia – thrombosed endograft
Hybrid approach:
• Popliteal/crural thrombectomy + popliteal patch angioplasty
• Proximal/distal stent relining
• Oral anticoagulation

Treatment of Popliteal Aneurysm by Open and Endovascular Surgery: A Contemporary Study of 592 Procedures in Sweden
A. Cervin a,b, J. Tjarnström a,b, H. Ravn a,c, S. Acosta d, R. Hultgren e, M. Welander f, M. Björck a,*

RESULTS (II)
• OUTCOME FAVOURS OPEN REPAIR - ACUTE ISCHEMIA / SYMPTOMATIC
• LSV GRAFT KEY TO SUCCESSFUL AND DURABILITY OF OR
• NO COMPARISON BETWEEN ENDO VS OPEN WITH PROSTHETIC GRAFTS

Endo Repair of PAA provides
• Aneurysm sac exclusion
• Long-term patency rates of 80%
• Excellent Survival and Limb Salvage

Long-term Outcomes and Sac Volume Shrinkage after Endovascular Popliteal Artery Aneurysm Repair
M. Piazza a,*, M. Menegolo a, A. Ferrari a, S. Bonvini a, J.J. Ricotta b, P. Frigatti c, F. Grego a, M. Antonello a

Contemporary outcomes of open and endovascular popliteal artery aneurysm repair

ENDO REPAIR - 16.7% (2.7%)
OPEN REPAIR - 83.3%
POPLITEAL ARTERY ANEURYSMS

DETERMINANTS OF DECISION

• **AGE**

• **CLINICAL PRESENTATION / ANATOMY:**
  - OR (open repair) first choice / better clinical outcomes in symptomatic / ischemic PAA
  - Poor crural run-off more common in OR

• **CLINICAL OUTCOMES**
  - Primary Patency worse in OR but 2nd Patency / clinical outcomes are comparable between OR vs ER
  - Reinterventions higher with OR 10% vs 5% for OR

• **AVAILABILITY OF LSV FAVOURS OPEN REPAIR:**
  - Long-term patency: 80% for vein vs 57% for prosthetic grafts

• **SAC EXPANSION:**
  - More frequent after OR (median approach) than with ER (100% vs 2% at 3 yrs)

• **EXPERIENCE FAVORS EXPERTISE AND REDUCES COMPLICATION RATES w/ ER**

POPLITEAL ARTERY ANEURYSMS

CONCLUSIONS

OPEN CONVENTIONAL SURGERY IS STILL FIRST CHOICE IN PATIENTS WITH:

- Acute / severe lower limb ischemia
- Distal embolization
- Concomitant occlusion of crural vessels
- Presence of adequate vein conduit

ABSOLUTE INDICATION FOR OPEN REPAIR

ENDOVASCULAR REPAIR SHOULD BE INDICATED IN PATIENTS WITH:

- Favorable anatomy
- Patent distal popliteal artery + good run-off
- Elective conditions
- No adequate vein conduit

DUAL ANTI-PLATELET vs. ANTI-COAGULATION

Mid-term outcomes of endovascular popliteal artery aneurysm repair

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<tr>
<th>Table 1: Mid-term outcomes of endovascular popliteal artery aneurysm repair</th>
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<td>Surgical intervention (%)</td>
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<td>Operating time (min)</td>
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<td>Hospital stay (days)</td>
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<td>complication rate (%)</td>
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<th>Table 2: Patellar index and recovery</th>
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<tr>
<td>Patellar index (%)</td>
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<td>Recovery time (days)</td>
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POPLITEAL ARTERY ANEURYSMS

**CONCLUSIONS**

POPLITEAL ARTERY ANEURYSMS ARE RARE, FREQUENTLY ASSOCIATED WITH MULTI-SEGMENTAL ANEURYSMAL DISEASE WITH A COMPLICATION RATE OF 3.9%/YR. DISTAL EMBOLIZATION, COMPRESSION OR RUPTURE.

TREATMENT IS INDICATED FOR ANEURYSMS > 2.5 CM, PRESENCE OF INTRA-SACULAR THROMBUS AND WITH SYMPTOMS.

CONSERVATIVE TREATMENT IS RECOMMENDED FOR ASYMPTOMATIC PAA < 2.5 CM, INCLUDING SURVEILLANCE AND BRAT (ANTI-PLATELET + STATINS).

OPEN REPAIR THROUGH MEDIAL APPROACH IS RECOMMENDED FOR MORE EXTENSIVE PAA (TYPE I) AND IN THE PRESENCE OF ASSOCIATED OCCLUSIVE DISEASE REQUIRING DISTAL REVASCULARIZATION.

POSTERIOR APPROACH IS INDICATED FOR TYPE II PAAs INVOLVING THE MIDDLE 1/3 OF THE ARTERY NOT EXTENDING PROXIMALLY TO THE HUNTER CANAL.

LONG TERM OUTCOMES IN TERMS OF SURVIVAL, LIMB SAVAGE AND PATENCY ARE EXCELLENT.

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<th>Type</th>
<th>Description</th>
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<tr>
<td>I</td>
<td>Fusiform with full artery involvement</td>
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<tr>
<td>II</td>
<td>Middle 1/3 artery, sacular ou fusiform</td>
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<td>III</td>
<td>Diffuse, multisegmental aneurysmal disease</td>
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POPLITEAL ARTERY ANEURYSMS

**RESULTS (I)**

- Technical success 94%
- Embolization 1/16 6.25%
- Distal flow 2/18 11.1%
- Patency (1yr) 6/6 100%

POPLITEAL ARTERY ANEURYSMS

**RESULTS (II)**

- Type of repair (n=96)
- Technical success 94%
- Embolization 1/18 5.5%
- Endoleak 2/18 11%
- Patency (1yr) (14 / 6 mo)

**ASYMPTOMATIC**

- Rupture 5% / Acute thrombosis 2%
- 94% had 2 or 3 vessel popliteal run-off

- 93% elective repair / 58% asymptomatic

**ENDOVASCULAR TREATMENT OF POPLITEAL ARTERY ANEURYSMS**

- Technical success 94%
- Embolization 1/18 5.5%
- Distal flow 2/18 11%
- Patency (1yr) 6/6 100%
POPLITEAL ARTERY ANEURYSMS

• Emergency repair of PAAA is associated with higher mortality: 13% for OR and 18% for endovascular intervention
• Higher risk of graft failure at 30 days with endo repair 28% vs 8% for OR
• Higher early patency rates (6 months) following OR 82% vs 68% for endovascular
• Higher rate of reinterventions in endovascular 43% vs 25% for OR
• High occlusion rate following endovascular in patients treated because of acute ischemia
• Endovascular repair w/thrombolysis has not improved outcomes after acute ischemia
• Reduced rates of wound infection and limb swelling after endo repair

From 11 selected studies (223 patients) – Courtesy from J.B. Ricco (SVS, 2014)