Outpatient Endovascular Repair of Popliteal Artery Aneurysms with Bare Metal Stents

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Disclosures

Vascular Management Associates, Founder and CEO
- Sets up and manages OBLs
- VascuNote

Ahn Surgical Innovations, Inc., Founder and CEO
- AhnTray

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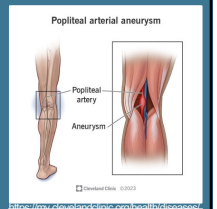
Popliteal Artery Aneurysm (PAA)

- Cumulative complication risk ~68% after 5 years* when untreated
- Thrombus formation → limb ischemia and/or gangrene ⇒ amputation (~40%)*
- Rupture and uncontrolled bleeding (rare)



*Tielliu et al. https://doi.org/10.1016/j.jvs.2004.12.055

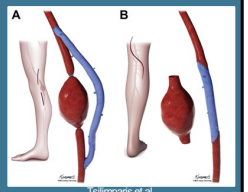
Open Surgical Repair

- Traditional gold standard treatment of choice

A. Medial approach
- Bypass above to below-knee

B. Posterior approach
- Reconstruction with interposition vein/prosthetic graft

- Hospitalization required



T.Silimparis et al.
https://doi.org/10.1016/j.avsg.2012.01.007

Endovascular Repair

- Minimally invasive
- Femoral artery cut down
- Covered stent graft inserted
- Prevents aneurysm thromboemboli and rupture

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Open Surgical vs. Endovascular Repair (< 30d)

Outcome Parameters	Open Repair			Endovascular		
	Range	Average		Range	Average	
Cardiac Complications	0 – 5%	**2%**	39/1670	0 – 11%	**2%**	1/42
Respiratory Complications	0 – 5%	**2%**	14/845	-	**NA**	
Wound Infection	0 – 14%	**4%**	50/1411	-	**0%**	0/90
Lymphocele/leak	0 – 10%	**2%**	7/287	0 – 7%	**1%**	2/135
Early endoleak	-	**NA**	-	0 – 17%	**5%**	9/165
Graft Thrombosis	0 – 17%	**5%**	116/2201	6 – 33%	**11%**	22/196

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Open Surgical vs. Endovascular Repair (< 30d)

Outcome Parameters	Open Repair			Endovascular		
	Range	Average		Range	Average	
Peripheral Embolism	-	**0%**	0/500	0 – 11%	**1%**	1/69
Pseudoaneurysm	0 – 12%	**1%**	14/1199	0 – 3%	**0.6%**	1/159
Minor amputation	0 – 19%	**3%**	17/513	-	**NA**	
Major amputation	0 – 24%	**4%**	105/2855	0	**0%**	0/237
Early mortality (<30d)	0 – 14%	**2%**	60/2838	0 – 11%	**0.4%**	1/237

Tsilimparis et al. https://doi.org/10.1016/j.avsg.2012.01.007

Open Surgical vs. Endovascular Repair (> 30d)

Outcome Parameters	Open Repair			Endovascular		
	Range	Average		Range	Average	
Endoleak	0 – 38%	**9%**	49/524	0 – 20%	**7%**	17/245
Aneurysm growth	0 – 36%	**7%**	55/784	0 – 17%	**3%**	2/65
1-year mortality	0 – 13%	**7%**	82/1214	2 – 11%	**3%**	4/114
3-year mortality	4 – 23%	**12%**	84/679	3 – 5%	**4%**	4/90
1-year amputation	0 – 11%	**7%**	163/2227	0 – 3%	**2%**	1/42
3-year amputation	0 – 22%	**4%**	62/1429	3 – 4%	**3%**	3/90

Tsilimparis et al. https://doi.org/10.1016/j.avsg.2012.01.007

Open Surgical vs. Endovascular Repair (> 30d)

Outcome Parameters	Open Repair			Endovascular		
	Range	Average		Range	Average	
Primary Assisted Patency						
1 year	54 – 100%	**87%**	627/719	44 – 100%	**74%**	125/169
3 years	72 – 96%	**86%**	507/585	77 – 88%	**87%**	159/195
Secondary Patency						
1 year	68 – 100%	**90%**	760/845	67 – 100%	**87%**	111/167
3 years	61 – 100%	**81%**	636/785	82 – 100%	**85%**	87/102

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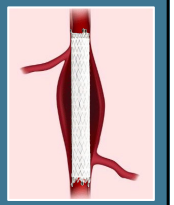
Disadvantages of Covered Stent Grafts

1. Require a large puncture
   a. 12 French sheaths with open cut down*
2. Have significant thrombosis rate
   a. 12/57 (21%) occluded, average 7.75 months*
3. Genicular branch collaterals are covered & lost



*Tielliu et al. https://doi.org/10.1016/j.jvs.2014.12.057

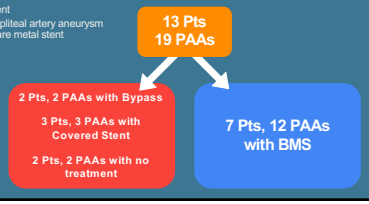
Advantages of Bare Metal Stents

1. Outpatient procedure
2. Can be delivered through a 6 French Sheath percutaneously
3. Preserve geniculate collaterals
4. Can restore laminar flow and prevent thromboemboli

Methods

Retrospective study, 3 centers, 2015 – 2024

Pt = Patient
PAA = Popliteal artery aneurysm
BMS = bare metal stent



Methods

- All patients treated in outpatient office-based lab
- All percutaneous
  - Femoral or Pedal access w/ 6 French sheaths
  - Closed using 6 French Angioseal for femoral, manual pressure for pedal

Methods

- Overlapping bare metal Nitinol self-expanding stents to create double-layer coverage of the aneurysm
  - Lifestar in 11 legs
  - Lifestar with Pulsar-18 in 1

Methods

- 7 patients, 12 legs with popliteal artery aneurysms
  - 6 left, 6 right
  - All 7 male
  - Age range 73 – 81 years
  - Average 78 years

Methods

- Maximum outer wall diameter of aneurysm:
  - Range: 14 to 50 mm
  - Average: 28.09 mm
- All aneurysms pre-operatively had thrombus within aneurysm sac
  - 2 had completely occluded popliteal artery

Methods

- Follow-up
  - Range 1-98 months
  - Average 27 months
  - Median 6.5 months
- Kaplan-Meier Life Curve to show patency rates

Results

- Technical and clinical success 100%
- All patients went home the same day
- Thromboemboli, limb loss – Zero
- 1 complication
  - Pseudoaneurysm at posterior tibial artery puncture site
  - Treated with ultrasound-guided thrombin injection with resolution

Results

- Post-op duplex scans showed patent stents in all 12 legs
  - 9 had thrombosed aneurysm sac
  - 3 had persistent non-laminar flow outside the stent
    - All 3 underwent coil embolization of the aneurysm sac with resolution

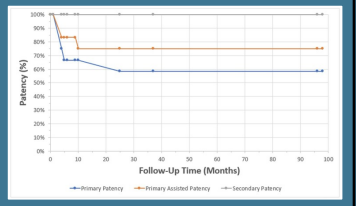
Results

- Follow-up duplex scans showed stent thrombosis in 3 legs at 4, 4, and 10 months, respectively
- All 3 were treated endovascularly and reopened successfully
- 1 patient died 9 months post-op from unrelated causes, but with patent stent

Kaplan-Meier Life Curve

At 27 months:

- Primary Patency: 58%
- Primary Assisted: 75%
- Secondary: 100%



Conclusions

- Outpatient percutaneous bare metal stents are a viable treatment option for popliteal artery aneurysms
- Bare metal stents seem as effective as covered stents, but with less trauma and complications
- Results are preliminary and small in number, but promising
- Further studies are warranted