


SVS Comprehensive Vascular Review Course
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Arterial Aneurysms: Peripheral Arterial Aneurysms

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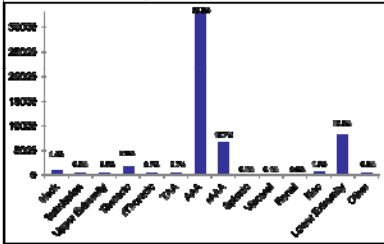
Disclosure

- I have no relationships to disclose.
- I will make reference to unlabeled uses of stent devices in my presentation.




The epidemiology of surgically repaired aneurysms in the United States

Peter F. Lawrence, MD, Christine Gatzik, MFA, Latika Bharangi, MD, Barbara Jones, Kiran Bheerangi, FRCS, Gustavo Oderich, MD, and Gerald Treisman, MD. *Soc Late City, Utah, and Irvine, Calif. J Vasc Surg. 1999;30:632-40.*




Artery Type	Number of Repairs (Approximate)
Aorta	1,200
AAA	32,000
Abdominal Aorta	10,000
Thoracic Aorta	1,500
Iliac	1,000
Femoral	1,000
Popliteal	1,000
Tibial	1,000
Other	1,000



Carotid Aneurysms


- Very rare, less than 4% of peripheral artery aneurysms.
- CCA > ICA > ECA
- Male: Female ratio 2:1
- Average age 62

R El-Sabrou et al. *J Vasc Surg* 2000.



Carotid Artery Aneurysms - Etiology


- **Degenerative**
- Infection
- Fibromuscular Dysplasia
- Trauma
- Previous Carotid Surgery



Carotid Artery Aneurysms - Presentation

- Embolism most common presentation
 - 36% incidence of TIA
 - 12% incidence of CVA
- Cranial nerve compression incidence 15%.
- Rupture occurs in < 4% of carotid aneurysms.

D Radak et al. *Ann Vasc Surg* 2007.



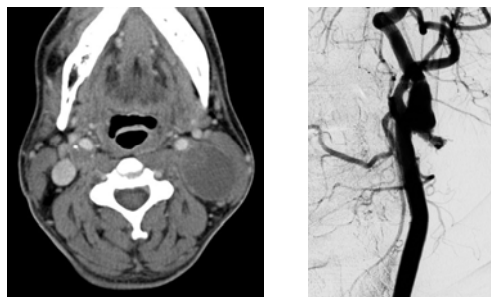
Carotid Artery Aneurysms - Treatment

- Open resection with interposition grafting.
 - Risk of stroke 4%
 - Up to 44% cranial nerve injury
- Small case series suggest good early and intermediate results with endovascular exclusion.
 - High-risk anatomy
 - Severe medical co-morbidities

NR Hertzler. *J Vasc Surg* 2000.
P Szopinski. *Eur J Vasc Endovasc Surg* 2005.



Ruptured Carotid Aneurysm



PJ O' Brien et al. *Vasc Endovasc Surg* 2011.



Subclavian-Axillary Aneurysms

Proximal

- 25%
- Degenerative
- Mean age >60 y.o.

Distal

- 75%
- Bony Abnormality
 - Cervical Ribs
 - Congenital Bands
 - Prior Clavicle Injury
- Mean age 47 y.o.



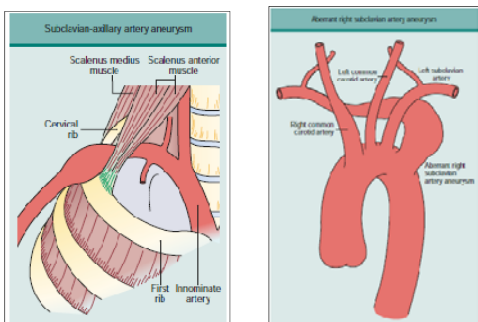
Subclavian-Axillary Aneurysms - Presentation

- 90% of patients are symptomatic.
- Embolization primary complication (68%).
- Thrombosis & rupture rare.

RW Hobson II et al. *Aneurysms* 1982.



Subclavian-Axillary Aneurysms



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Subclavian-Axillary Aneurysms – Treatment (Proximal)

- Open resection with prosthetic graft
 - Supraclavicular approach common
 - May need median sternotomy or thoracotomy for proximal control
 - Must know status of both vertebral arteries
 - Significant morbidity & mortality in an older, sicker population
- High-risk Patients
 - Ligation with ax-ax bypass
 - Endografts



Subclavian-Axillary Aneurysms – Treatment (Proximal)

Endografts

- Brachial or Femoral approach
- Initial data promising (80-100% patency at 7-29 months) but is primarily from small series involving acute injuries.
- Compression, fracture, and occlusion have also been described and may limit utility of this therapy.

M Schoder et al. J Endovasc Ther 2003.



Subclavian-Axillary Aneurysms – Treatment (Distal)

- Thoracic outlet decompression with graft placement
- Axillary vs Supraclavicular Approach
- May need infraclavicular access for axillary involvement



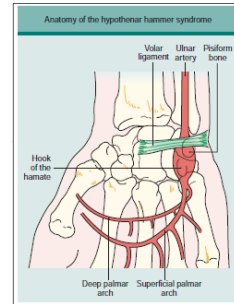
Brachial-Radial-Ulnar Aneurysms

- Rare
- Vast majority trauma-related
- Symptoms include pain or nerve-compression; can see thrombosis or embolization with subsequent hand ischemia



Hypothenar Hammer Syndrome

- Medial degeneration from repetitive trauma
- May cause secondary Raynaud's phenomenon
- Causes painful ulnar nerve compression
- Microresection with reconstruction optimal treatment



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Femoral Aneurysms

- 2nd most common peripheral aneurysm; femoral & popliteal account for 90%
- Mean age 65, smokers, HTN
- Male:Female ratio 30:1



Femoral Aneurysms - Classification


- Type I: CFA only (44%)
- Type II: involves profunda (56%)

BS Cutler, RC Darling. Surgery 1977.



Femoral Aneurysms - Etiology


- **Degenerative**
- Trauma
- Behçet' s Syndrome
- Acromegaly
- Arteriomegaly



Femoral Aneurysms - Etiology

- Patients with femoral aneurysm:
 - 95% have a second aneurysm
 - 92% have aortoiliac aneurysm
 - 59% have bilateral femoral aneurysms
- Patients with AAA & lower extremity aneurysm all men


TL Dent et al. Arch Surg 1972.
A Diwan et al. J Vasc Surg 2000.



Femoral Aneurysms - Presentation

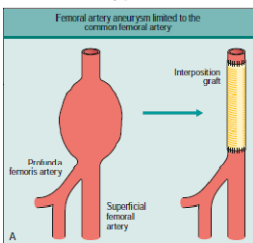
- 30% asymptomatic pulsatile mass
- 20% isolated pain from femoral nerve compression
- 50% with major complication at presentation, usually manifest as ischemia
 - 32% thrombosis
 - 10% rupture
 - 5-10% embolism

LM Graham et al. Arch Surg 1980.



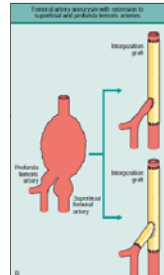
Femoral Aneurysms - Treatment

Type I




Femoral artery aneurysm limited to the common femoral artery

Type II



Femoral artery aneurysm with extension to superficial and profunda femoral arteries


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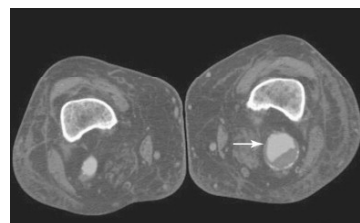
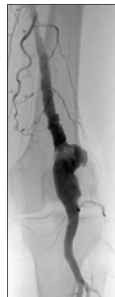
Popliteal Aneurysms

- Most common peripheral aneurysm
- 97% male, usually 5th-6th decade
- 54% bilateral
- 51% with have or develop AAA


Y Huang et al. J Vasc Surg 2007.



Popliteal Aneurysms





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Popliteal Aneurysms - Etiology


- **Degenerative**
- Trauma
- Cystic Degeneration
- Entrapment
- Infection



Popliteal Aneurysms - Presentation

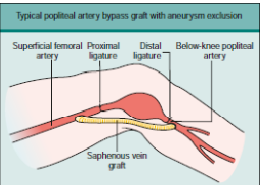
- 40% asymptomatic
 - No pulses: 86% develop symptoms in next 3 years
 - Pulses: 34% develop symptoms in next 3 years
- 39% chronic ischemia
- 21% acute ischemia
- Mean 2.9 cm diameter

Y Huang et al. J Vasc Surg 2007.
I Dawson et al. Br J Surg 1994.



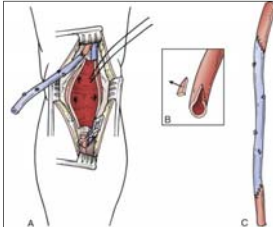
Popliteal Aneurysms – Elective Treatment

Most Aneurysms




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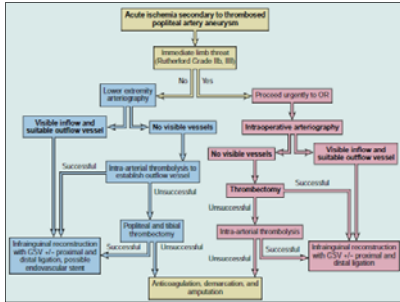
Symptomatic Aneurysms




Ouriel K, Rutherford RB, eds. Atlas of Vascular Surgery. Philadelphia, PA: WB Saunders; 1998)



Popliteal Aneurysms – Urgent Treatment




MT Menard et al. Comprehensive Vascular and Endovascular Surgery, 2nd Ed.



Popliteal Aneurysms – Open Outcomes


	Asymptomatic	CLI	ALI	Overall
Mortality	0	0	4%	1%
Early Limb Loss	0	0	8%	2%
Morbidity	2%	7%	19%	8%
1 yr Patency	100%*		69%	
5 yr Patency				76% 87%
	GSV			85%* 94%*
	PTFE			50% 63%
5 yr Limb Salvage	100%	99%	85%	93% GSV* 66% PTFE
5 yr Survival				75%

Y Huang et al. J Vasc Surg 2007.
CK Shortell et al. J Vasc Surg 1991.



Endovascular Repair (EPAR)

- Best for focal aneurysms in high-risk patients
- Larger sheath sizes require adequate access arteries
- Screening essential; inability to follow-up considered relative contraindication



Endovascular Repair (EPAR)



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Endovascular Repair (EPAR) - Results

- No long-term data available
- Lovegrove et al meta-analysis:
 - Decreased overall length of stay
 - 30-day graft thrombosis (OR 5.05) and reintervention (OR 18.8) more likely with EPAR
- Antonello et al: only prospective RCT to date.
 - 1 Yr patency: 100% open, 86.7% endo.
 - 4 Yr patency: 80% open, 80% endo.
 - Small sample, excluded unfavorable anatomy & poor runoff.

RE Lovegrove et al. *Eur J Vasc Endovasc Surg* 2008.
M Antonello et al. *J Vasc Surg* 2005.



Tibial Aneurysms

- Majority are related to trauma
 - Injuries
 - Catheter-based injury (Fogarty)
- Most asymptomatic
 - Pain or calf swelling most common
- Poor runoff – consider vein bypass
- Quality runoff – surgical ligation vs embolization



Mycotic Aneurysms

- Occur in all peripheral arteries, usually traumatic or iatrogenic
- Infection-mediated destruction of arterial wall
- *Streptococcus*, *Staphylococcus*, *Salmonella*, *E. coli*, *Mycobacterium*
- Mainstay of treatment is antibiotics and surgical excision +/- revascularization



Location	% of Peripheral Aneurysms	Etiology	Indication for Repair	Common Modality
Carotid	3-4%	Degenerative	Discovery	Open Resection
Subclavian - Axillary	1%	25% Degenerative 75% TOS	Discovery Symptomatic	Decompression
Distal Arm	Unknown	Trauma	Discovery Symptomatic	Vein Bypass
Femoral	20%	Degenerative	>2.5 cm Symptomatic	Open Interposition or Bypass
Popliteal	70%	Degenerative	Discovery	Vein Bypass
Distal Leg	Unknown	Trauma	Symptomatic	Embolization Vein Bypass
Mycotic	Unknown	Trauma Endocarditis	Discovery	Excision



Summary

- Central aneurysms typically degenerative, peripheral aneurysms likely secondary to trauma
- Lower extremity aneurysms are a disease of men
- Early intervention is better, especially in the lower extremity.

