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Arterial Aneurysms: Peripheral Arterial Aneurysms

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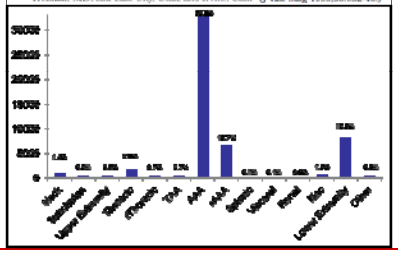
Disclosure

- 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 Gazak, MFA, Latika Bhirangi, MD, Barbara Jones, Kiran Bhirangi, FRCS, Gustavo Oderich, MD, and Gerald Treiman, MD, *Salt Lake City, Utah, and Irvine, Calif.* (J Vasc Surg 1999;30:632-40.)



Carotid Aneurysms

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

R El-Sabrout 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 Hertzer. *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

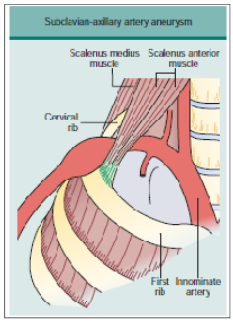
Proximal	**Distal**
• 25%	• 75%
• Degenerative	• Bony Abnormality – Cervical Ribs – Congenital Bands – Prior Clavicle Injury
• Mean age >60 y.o.	• Mean age 47 y.o.

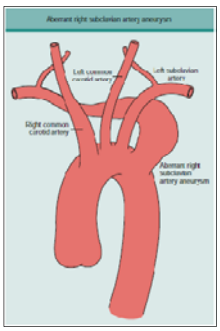
Subclavian-Axillary Aneurysms - Presentation

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

RW Hobson II et al. *Aneurysms* 1982.

Subclavian-Axillary Aneurysms





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)

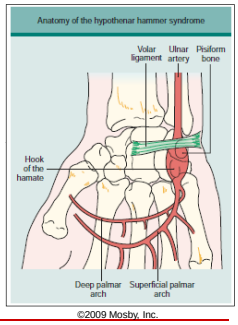
- Thoracic outlet decompression with graft placement
- Axillary vs Supraclavicular Approach
- May need infraclavicular access for axillary involvement

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



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

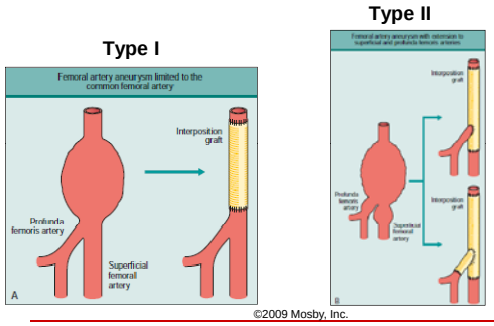
TL Dent et al. *Arch Surg* 1972.
A Diwan et al. *J Vasc Surg* 2000.

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

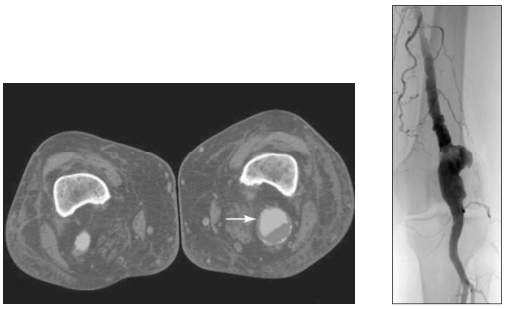


Popliteal Aneurysms

- 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



Popliteal Aneurysms - Etiology

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

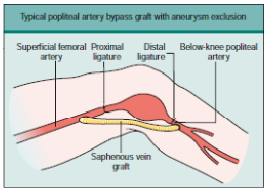
Popliteal Aneurysms - Presentation

- 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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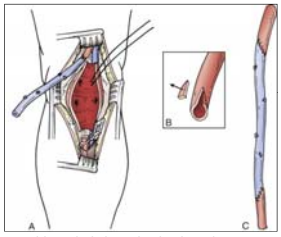
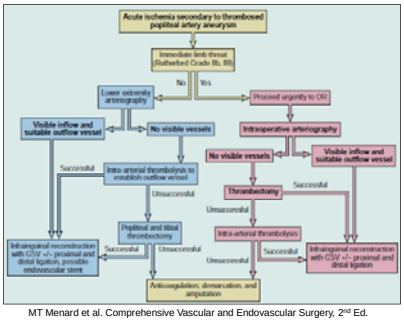
Symptomatic Aneurysms



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)

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 (Fogerty)
- 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.