Clinical Outcomes of a Diagnostic and Management Protocol for Popliteal Artery Entrapment Syndrome at a Large Referral Center

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Strandness Symposium
Hyatt Regency Maui Resort and Spa, Maui, Hawaii
March 20th, 2022
Disclosures

• No Financial Disclosures
Popliteal Artery Entrapment Syndrome (PAES)

- **PAES:**
  - Compression of popliteal artery from embryologic derangements (Types I-V) or calf muscle hypertrophy (Type VI)
  - Patients present with disabling claudication in the second to third decade of life
  - Treatment involves surgical release of popliteal artery with lysis of fibrous bands, +/- myomectomy, +/- surgical bypass

- **Diagnosis delays and misdiagnosis are common**
  - Rare condition with more common etiologies of calf pain
    - Shin Splints, Stress Fractures, Chronic Exertional Compartment Syndrome

PAES Diagnostic Concerns

• Diagnosis delays and misdiagnosis may be related to lack of a standardized clinical algorithm
Study Objective

• The aim of this study was to report the clinical outcomes of the University of Washington algorithm for diagnosis and management of PAES at our large referral center.
Patient with Suspected PAES

**Patient History:**
- Active patient
- Exercise induced leg pain
- Not consistent with atherosclerosis

**Physical Exam:**
- Bilateral pedal pulse exam with and without provocative maneuvers

**Non-invasive studies**
- Bilateral lower extremity duplex with and without provocative maneuvers
- Treadmill ABI testing

**High suspicion for PAES**
- Consistent with PAES
- Bilateral lower extremity angiogram with active provocative maneuvers, +/- Intravascular Ultrasound
- Confirmed PAES
- Popliteal artery release with intraoperative completion duplex
Popliteal Artery Release
Type VI PAES: Muscular Resection
Post-Operative Management

- Overnight Admission
- Ice-packs behind the knee for pain control, minimal narcotics
- Drain removal during morning rounds
- Crutch training with physical therapy
- Discharge POD#1
- 2 week and 3 month follow up in clinic
Results

• Patient Characteristics
  – 35 extremities in 23 patients (2013-2021)
  – Mean age 28 years (range = 14-50)
  – Female Sex: 79%

• Initial Clinic Visit
  – Prior fasciotomies for presumed Chronic Exertional Compartment Syndrome: 7/35 (20%)
  – CTA or MRA performed previously: 9 extremities
    • 7 out of 9 falsely negative (78%)
**Results**

- **Duplex Ultrasound**
  - Popliteal Peak Systolic Velocity (PSV) ~ doubled with provocative maneuvers
    - Mean PSV at rest: 78 cm/sec
    - Mean PSV with provocation: 175 cm/sec
    - Complete loss of flow: 12 extremities
    - 2 patients with no significant PSV difference with provocation

- **Treadmill Testing**
  - Mean Ankle-Brachial Index (ABI) drop post-exercise: 0.28
    - Mean Pre-Exercise ABI: 1.12 → Mean Post-Exercise ABI: 0.84
  - Mean Ankle Pressure Drop: 11 mm Hg
    - Mean Pre-Exercise Ankle Pressure: 130 mm Hg
    - Mean Post-Exercise Ankle Pressure: 119 mm Hg
Results

- **Dynamic Angiography**
  - Well-developed geniculate/sural collaterals at rest: 100%
  - Complete effacement of artery with maneuvers: 100%
  - No access site complications
  - IVUS in 14/35 extremities
  - Mean Contrast Administration: 58 cc
Results

• **Intraoperative Results**
  – Type III PAES Type: 31/35 (89%)
    • Two extremities with Type 5, one extremity with Type 2
  – Requiring arterial reconstruction: 2 (interposition GSV graft)
  – Median operative time: 87 min (IQR 79.5 - 97)
  – Mean EBL: 27 cc

• **Post-Operative Results**
  – 22/23 (96%) patients discharged POD#1
  – Wound healing complications: 4 extremities (two hypertrophic scars, two seroma)
  – Symptomatic Relief: 100% (median follow up 4 months)
Conclusion

• We report 100% technical and clinical success in patients with PAES diagnosed and managed using our algorithm.

• Cross-sectional imaging is not necessary for diagnosis.
  – High false negative rates: difficult visualization of fibrous bands, compliance with maneuvers, static images

• Dynamic angiography confirms diagnosis
  – Allows surgeon to ensure that provocative maneuvers are performed correctly during image acquisition to directly assess flow changes and compression
  – Appreciation of collaterals, IVUS utilization

• Intraoperative duplex confirms complete surgical release of the popliteal artery and is essential for successful clinical outcome.
Thank you

Questions or Comments? Email: Amirgh@uw.edu