Venous TOS (Paget-Schroetter Syndrome): Workup, Early, and Definitive Management

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Disclosures

• No Financial Relationships
• No Commercial Interests
Objective

The purpose of this study is to assess the role of routine postoperative venography in patients who have undergone FRRS for subclavian vein thromboses by evaluating long-term vein patency using imaging by duplex scan.
Methods

- Patients treated with FRRS for subclavian vein thrombosis undergo **routine venography** postoperatively at **2 weeks**.
- The subclavian vein is **dilated** if there is a >50% **stenosis** and those patients are anticoagulated.
- If **no stenosis** is seen, anticoagulation is **stopped**.
- If the vein is **occluded**, anticoagulation is continued for **6 months** or until the vein **recanalizes**.
Results

Demographics

• **84 patients** (42M & 42F)
• FRRS between 12/03 and 11/09
• Average age: **32** years old (16-71 y.o.)
• Average time from thrombosis to FRRS: **6 months** (1 week – 2 years)
Results

Patent Veins

- 21 patients had widely patent veins by venography
- All remained patent in postoperative period and long-term follow-up
- Follow-up: 18 months (2-57 months)
Venogram of a Patent Vein
Results

Stenotic Veins

• 47 patients underwent dilatation.
• 3 had acute thrombus and were lysed.
• 2 thrombosed after venogram and were anticoagulated.
• Average period of anticoagulation: 2 months (1-5 months)
• Follow-up: **18 months** (2-29 months)
Venogram with Stenosis
Venogram with dilatation of subclavian vein stenosis
Venogram Post-Dilatation
Results

Occluded Veins

- 16 patients had chronically occluded veins by venogram.
- All 16 received anticoagulation.
- Average period of anticoagulation: 3 months (1-8 months)
- 14 recanalized in first 6 months.
- Follow-up: 15 months (2-25 months)
Venogram of an Occluded Vein
Duplex Scan: Recanalization of an Occluded Vein
Hypercoaguable Patients

- **33 patients** (39%) received testing for thrombophilia

- **10 patients** (12%) had hypercoagulable disorders
  - 5 Factor V Leiden
  - 2 Protein C deficiency
  - 1 Protein S deficiency
  - 1 Factor II deficiency
  - 1 PAI-1 deficiency
Results

- Symptomatic restenosis seen in 3 patients at 27, 34, 54 months
  - All 3 patients received venoplasty

- 2 patients had late occlusions
  - 1 symptomatic at 23 months
  - 1 asymptomatic at 63 months

- All 5 were in the dilated group
Kaplan Meier Curve

Subclavian Vein Occlusion

Vein Patency (%)

Follow-up (months)

85 90 95 100

0 5 10 15 20 25 30 35 40 45 50 55 60 65

Chronically Occluded
Dilated
Conclusions

• Routine venography directs individual treatment plans for the patient which includes vein **dilatation, anticoagulation** and **duplex scanning** only within the first year.

• Long term patency was achieved in nearly all patients (>90%) using this protocol.
Methods

- Retrospective review of a prospectively maintained database from 2003-11
- 423 patients underwent surgical intervention for TOS
- TOS diagnosed by UE Duplex and/or Venogram
- 171 Patients presented with Venous TOS (VTOS)
- 19 (11%) VTOS patients with intermittent arm swelling
UE Duplex Scan on adduction/abduction
Results

Patient Characteristics:

- Average length of symptoms: 22 months (4-72)
- Average age: 26 years (10-44)
- 13 females, 6 males
- All patients had a history of chronic or repetitive use of the upper extremity
  - Ex: Swimming, Lacrosse, Weight Lifting, Computer Work
Results

- Duplex scan revealed chronic thrombus in 3 patients
- 1 patient had bilateral symptoms
- 10 showed significant compression of the subclavian vein on abduction as seen by recording velocities on duplex scan
Conclusions

• FRRS alone was effective in relieving symptoms in 13/15 (87%) patients with McCleery’s Syndrome.

• Post-operative venogram is unnecessary unless symptoms persist and dilation resulted in improvement in 2 additional patients.

• Patients can present with intermittent compression if an acute episode of subclavian vein thrombosis is not aggressively treated.

• Routine venography following FRRS at 2 weeks is indicated in patients presenting with chronic thrombus.
The Hopkins Algorithm

- Johns Hopkins protocol
  - Thrombolysis (typically done prior to referral)
  - Systemic anticoagulation
  - First rib resection and scalenectomy
    - Restart Lovenox POD #3
  - Two week follow-up venogram (+/- PTA)
    - Discontinue Lovenox if vein widely patent
  - Four week clinic follow up with Duplex exam
    - Anticoagulation duration based on symptoms and duplex findings
Question

• Given the success with FRRS, anticoagulation, and post-operative venogram/venoplasty, what role does invasive pre-operative intervention have on axillosubclavian vein patency?

• We hypothesized that preoperative endovascular intervention with thrombolysis with or without venoplasty does not improve patency following operative decompression with FRRS
Methods

- Retrospective review of prospectively maintained TOS database from 2003-2009
- Venous TOS separated from neurogenic patients
- Patient demographics, antecedent injury, hypercoagulable state, prior imaging recorded
- Utilization of anticoagulation, duration of therapy, pre-operative use of thrombolysis without or without venoplasty recorded
Results

- 100 patients identified with venous TOS
- 110 FRRS were performed
  - 53 men, 50 women
  - 7 patients had contralateral venous TOS
- Average age 31 years (range 16-54)
- Eight (8%) documented hypercoagulable states
  - Factor V Leiden in 3 patients
Results

• Overall, 45 (41%) patients had a preoperative endovascular intervention prior to FRRS at our institution.

• 65 (59%) of the total cohort were managed with anticoagulation alone prior to FRRS.
## Results

<table>
<thead>
<tr>
<th>Pre-Operative Intervention (n=45)</th>
<th>Anticoagulation Alone (n=65)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-operative lysis alone</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>Pre-operative lysis and venoplasty</strong></td>
<td>20</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>– Male (total 53)</td>
<td>29</td>
</tr>
<tr>
<td>– Female (total 50)</td>
<td>16</td>
</tr>
<tr>
<td><strong>Average age (mean 31)</strong></td>
<td>32.8</td>
</tr>
<tr>
<td><strong>Antecedent Injury:</strong></td>
<td></td>
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<tr>
<td>– Sports injury</td>
<td>20</td>
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<tr>
<td>– Occupational</td>
<td>12</td>
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<tr>
<td>– MVC/fall</td>
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<tr>
<td>– Musician</td>
<td>2</td>
</tr>
<tr>
<td>– Cervical rib</td>
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<tr>
<td>– Unknown</td>
<td>9</td>
</tr>
<tr>
<td><strong>Mean time to FRRS</strong></td>
<td></td>
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<tr>
<td><strong>Limb threat/Emergent Lysis</strong></td>
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</tbody>
</table>
110 FRRS for Effort Thrombosis

45 Pre-operative Interventions

F

FRRS

65 No Pre-operative Interventions

2 No Follow-up Venograms

43 Post-Op Venograms

21 PTA/Venoplasty

15 Patent at Venogram

7 Occluded

1 No Follow-up

5 Patent on f/u Duplex

1 Remains Occluded

4 No Follow-up Venograms

61 Post-Op Venograms

36 PTA/Venoplasty

15 Patent at Venogram

10 Occluded

8 Patent on f/u Duplex

2 Remain Occluded
Results

• Following FRRS:
  – 43 patients completing treatment that underwent pre-operative endovascular intervention:
    • 41 are patent and without symptoms (91%)
    • 1 remains occluded
    • 1 lost to follow up
  – 61 patients maintained on anticoagulation alone prior to FRRS and completing treatment
    • 59 are patent and without symptoms (91%)
    • 2 remain occluded
Results

• Comparing need for venoplasty after FRRS:
  – 21 of 43 (49%) in the pre-op endovascular intervention group required venoplasty at two week follow up study
  – 36 of 61 (59%) in anticoagulation group required venoplasty

• Pre-operative thrombolysis did not have a meaningful impact on the need for further venoplasty s/p FRRS
Summary

- Pre-operative endovascular intervention offered no benefit over anticoagulation alone prior to FRRS since the use of thrombolysis before elective operative decompression, regardless of need for post-op venoplasty, had little impact on overall rates of patency and patient symptom relief.
Summary

• The optimal treatment may be anticoagulation alone prior to operative decompression via FRRS and post-op endovascular intervention

• A cost savings may be realized as the expense of lytic therapy may be circumvented in favor of anticoagulation prior to FRRS

• Multicenter, randomized trials will be needed to validate this potential change in treatment