Management of PTFE Seromas

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Disclosure

Speaker name: Larry A. Scher, MD

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Shareholder in a healthcare company
- Owner of a healthcare company
- Other(s)

I do not have any potential conflict of interest
Perigraft seroma formation is related to the synergism of biochemical, mechanical and structural factors.
Postoperative perigraft seroma

vs

immediate ultrafiltration

(‘beads of fluid’ vs ‘opening a faucet’)

www.cacvs.org
Etiology of PTFE graft seromas

- Excess graft porosity (? manufacturing error)
- Exposure of graft to caustic agents
  - Alcohol
  - Povidine iodine
- Immunologic or allergic factors
- Biochemical factors – inhibition of fibroblast growth
- ? Diabetes
- ? Heparin exposure
- ? Nonsheathed tunneler
Bob Gore discovered that rapidly stretching PTFE under the right conditions created a very strong, microporous material. The result, known as GORE® expanded PTFE (ePTFE), exhibits an amazing array of properties.
ePTFE Microstructure and Ultrafiltration

- Nodes and fibrils with void spaces filled with air (80%)
- When the air in the void space is displaced rapidly all ePTFE grafts will persistently leak fluid
- Ideally graft implanted and over 24-48 hours air slowly displaced by body’s fluid and fibroblasts migrate into interstices and deposit collagen
- Pore size same on all ePTFE
Possible causes of immediate ultrafiltration through vascular graft

- Premature wetting of the graft with fat or organic solvents
  - Graft rubbed with fat from dog will leak continuously
- Excessive manipulation of the graft with blood
- Forcing irrigating solutions through the graft wall
- Antibiotic irrigation of the graft
- Genetic trait of the patient
- Low blood viscosity
- Anticoagulation
- 41% increase in leakage through “bent” or kinked segments of grafts has been seen
Graft “Wetting”

- Hydrophobic PTFE graft surface becomes hydrophilic when in contact with blood or body fluid
- Graft seals by deposition of proteins and fibrous tissue attachment externally and neointimal formation internally
- “Wetting” hinders process of graft sealing
- Affected by hemodynamic factors (flow rate > 1 L/min), blood pressure, hematocrit, oncotic pressure, alcohol or povidine-iodine contact of graft, excess graft manipulation with instruments
- No consistent relationship between heparin administration and seroma formation
Potential complications of untreated seromas

- Wound infection
- Wound dehiscence
- Skin necrosis
- Graft thrombosis
- Loss of available cannulation sites
Management options for hemodialysis PTFE graft seromas

- Observation
- Percutaneous drainage
- Surgical evacuation
- Graft removal or replacement
- Topical sealant or microfibrillar collagen
- Covered stent
Recommended standards for reports dealing with arteriovenous hemodialysis accesses

Anton N. Sidawy, MD, Richard Gray, MD, Anatole Besarab, MD, Mitchell Henry, MD, Enrico Ascher, MD, Michael Silva, Jr, MD, Arnold Miller, MD, Larry Scher, MD, Scott Trerotola, MD, Roger T. Gregory, MD, Robert B. Rutherford, MD, and K. Craig Kent, MD, Washington, DC

Table VI. Grading severity of arteriovenous-access complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local access complications</td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td></td>
</tr>
<tr>
<td>Early, postoperative</td>
<td>0, None</td>
</tr>
<tr>
<td>Prolonged bleeding from needle puncture sites</td>
<td>1, Resolves without treatment</td>
</tr>
<tr>
<td>Infection</td>
<td></td>
</tr>
<tr>
<td>Early (&lt;30 days)/late (&gt;30 days)</td>
<td>2, Medical therapy needed to correct coagulation abnormality</td>
</tr>
<tr>
<td>Culture: positive/negative</td>
<td>3, Intervention needed</td>
</tr>
<tr>
<td>Site of infection: anastomosis/mid-AV access/runoff vein</td>
<td></td>
</tr>
<tr>
<td>Infection</td>
<td></td>
</tr>
<tr>
<td>Early (&lt;30 days)/late (&gt;30 days)</td>
<td>0, None</td>
</tr>
<tr>
<td>Culture: positive/negative</td>
<td>1, Resolved with antibiotic treatment</td>
</tr>
<tr>
<td>Site of infection: anastomosis/mid-AV access/runoff vein</td>
<td>2, Loss of AV access because of ligation, removal, and possible bypass</td>
</tr>
<tr>
<td>Site of infection: anastomosis/mid-AV access/runoff vein</td>
<td>3, Loss of limb</td>
</tr>
<tr>
<td>Noninfectious fluid collections</td>
<td></td>
</tr>
<tr>
<td>Hematoma</td>
<td>0, None</td>
</tr>
<tr>
<td>Seroma</td>
<td>1, Observed, resolved</td>
</tr>
<tr>
<td>Lymphocele</td>
<td>2, Aspirated, surgical drainage</td>
</tr>
<tr>
<td></td>
<td>3, Loss of AV access</td>
</tr>
</tbody>
</table>
Management of dialysis access graft seromas


- Incidence 0.48 % to 4.2 % (most near arterial anastomosis)
- Complication of prosthetic access
- Almost never seen with autogenous access or biologic grafts
- No clearly preferable choice of management among
  - Aspiration
  - Closed suction drainage
  - Graft replacement
  - Capsule debridement
Incidence and management of seroma after arteriovenous graft placement

- 535 PTFE AV grafts in 427 patients (preattached plastic sheath and tip)
- 10 patients (1.7%) presented with seroma and underwent surgical treatment
- No difference in incidence based on gender, age, diabetes
- No difference upper vs lower extremity
- No difference forearm loop vs straight forearm graft
- Statistically significant difference between upper arm and forearm grafts ($p=.0007$)
Incidence and management of seroma after arteriovenous graft placement

- Surgical intervention in 10 patients at mean of 83 (28-144) days
- Types of surgical intervention
  - Bypass (0 / 5 recurrence)
  - Evacuation (2/4 recurrence)
  - Graft excision
- Recommendation – excise seroma capsule, bypass involved graft segment
- Controversies – new anatomic route?, new graft material?
Management of PTFE graft seroma with covered stent

- Two cases (additional 2 cases since report)
- Seroma at arterial end of tapered 4-7 mm PTFE graft
- Successful treatment with 8 x 50 mm Wallgraft
- Retrograde deployment “bareback’ precisely at arterial anastomosis
- Drainage of seroma cavity
- Successful treatment of AV graft pseudoaneurysms with covered stents
- Potential to access through stent for hemodialysis
- Potential use of Viabahn or Fluency covered stents
Use of covered stent for treatment of hemodialysis PTFE graft seromas

Deployment of Wallgraft precisely at arterial anastomosis

Completion fistulagram demonstrating AV graft patency
Management options for intraoperative serous ultrafiltration through graft wall

- Fibrin glue or topical thrombin to induce ‘clotting’
- Wrapping graft in collagen fleece soaked with fibrin glue
- Replace graft at ultrafiltrating site with same or different material
- Replace entire graft with same or different material
- Wait for ultrafiltration to cease – and wait – and wait …..
Management options for postoperative serous ultrafiltration (seroma) through graft wall

- Monitoring without intervention
- Replace graft at ultrafiltrating site with same or different material
- Replace graft with same or different material in new tunnel
- Aspiration of serum or plasma
- Drainage of perigraft fluid
- Pseudocapsule resection
- Fibrin glue or topical thrombin to induce ‘clotting’
- Deployment of covered stent
Alternative Graft Materials

Figure 1. This is a scanning EM of the GORE ACUSEAL Graft demonstrating the three layers of the graft. The middle elastomer layer provides the “low-bleed” state of the graft.

Acuseal

Flixene
• 20 / 98 (20.4%) PTFE aortic grafts, 0 / 13 dacron grafts
• Factors associated with development of perigraft seroma
  – Diabetes
  – Smoking
  – Anticoagulation
  – Bifurcated grafts
  – Left retroperitoneal approach
• Treatment required in 4 / 20 patients for expansion or limb ischemia secondary to graft compression
  – Open exploration and graft replacement (3)
  – Thrombolysis and stenting (1)
Merci Beaucoup