Aortoenteric Fistula

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SUNY Downstate Grand Rounds
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CASE

• 77M with nonbloody emesis x 2 weeks, dysphagia, anemia, and general malaise
• PMH: HTN, DM, chronic kidney disease, mild dementia
• PSH: emergent, open repair of ruptured AAA with aorto-bi-iliac Dacron graft in 2009
• Meds: HCTZ, losartan, metoprolol, zocor, insulin, donepezil, terazosin
• T=97, BP=128/98, HR=81, RR=18
• Lethargic
• RRR, clear BS
• Abd soft, ND, NT
• Pulses
  2+ radial on L but nonpalpable on R
  2+ femoral b/l
  1+ popliteal, DP, PT on L but nonpalpable on R
Unable to get blood pressure from cuff from anywhere but L arm
• CBC: 9.4 (83% PMN) / 10.7 / 31.1 / 118
  WBC increased to 14 (94% PMN)
• BMP: 139 / 4.7 / 102 / 25 / 24 / 1.4 / 90
• Blood and urine cultures – *Enterococcus faecalis*
• Esophagogram – negative
- **EGD**

Visible prolene; pulsatile mass with extrinsic compression onto 3\textsuperscript{rd}-4\textsuperscript{th} portion of duodenum; Dacron material

- **CT** – periaortic gas
In setting of sepsis and relatively stable patient, plan for staged procedure

1\textsuperscript{st} surgery – extra-anatomic bypass with left axillo-bifemoral PTFE graft
- Resuscitation
- Daptomycin, ertapenem, micafungin
- NPO, PPN
- Echo – EF > 55%
- Vein mapping
- Palliative Care discussion with family on poor prognosis
• 3 days later - 2nd surgery
• Exposure - exploratomy laparotomy, lysis of adhesions, left medial visceral rotation
• OR findings:
  Splenic abscess
  Leakage of bile around aortic graft
  Redundant graft with kinks in aortic and iliac portions
  3rd-4th portion of duodenum with 2 holes in back wall against graft
• Procedure
  – Proximal and distal control of aortic graft
  – Primary repair of duodenum, duodenal exclusion with stapled closure of antrum, lateral draining duodenostomy, gastrojejunostomy
  – Excision of aortic graft
• Intraop development of septic shock requiring levophed and vasopressin
• EBL=1000 ml, 4 units pRBC, 12L crystalloid, UOP=690 ml over 12 hours
• Postoperative day 0-1
  – T=98…95.6, BP=121/35, HR=125
  – pH 7.41 / 34 / 151 / -2.3 …
    6.89 / 28 / 96 / -27…bicarbonate drip…
    7.22 / 32 / 88 / -13.8
  – Renal failure with urine output 5-10 ml/hr
  – WBC = 21.8 x 1000/mm³
  – Multiple hypoglycemic episodes to <20, 44, 33 g/dL
• Family elected for withdrawal of care; patient expired
HISTORY

• First described in 1829 by Sir Astley Paston Cooper

• 1953, Brock reported secondary
• 1954, Zenker performed first repair of primary AEF
• 1958, McKenzie performed first repair of secondary AEF
CLASSIFICATION

• Primary = between native aorta and bowel
  – 0.04-0.07% general population

• Secondary = between aortic graft and bowel
  – More common
  – 0.77-1.60% patients with aortic grafts
  – 20-45% of patients with aortic graft infections

• Type I – direct aortoenteric communication
  – A=no pseudoaneurysm
  – B=pseudoaneurysm
  – At suture line

• Type II – graft enteric erosion; a.k.a. aortoparaprosthetic sinus
  – Along graft

Dachs et al. *Am Fam Physician* 1992
ETIOLOGY

Fixed nature of duodenum
Pulsatile force
Infection
Other
• Fixed nature of duodenum
  – Ligament of Treitz, retroperitoneum
  – 83% AEF occur in 3rd and 4th portions of duodenum

Dachs et al. *Am Fam Physician* 1992
• Pulsatile force
  – Abdominal aortic aneurysm
  – Aortic graft that is noncompliant, bulky, redundant, kinked
  – Aortic graft pseudoaneurysm
  – EVAR graft with angulated neck or endoleak
Infection

- Mycotic aneurysm
- Aortic graft infection
  - Emergency operation, extended OR time, concomitant GI/GU procedure, reoperative vascular procedure
  - Incidence of AEF increases to 40%
• Other
  – Inflammation – aortitis from syphilis or TB, PUD
  – Injury - operative duodenal devascularization
  – Cancer
SIGNS & SYMPTOMS

• “Classic” triad of GI bleed, sepsis, and abdominal pain

• GI bleed
  – Herald bleed – small, brisk, stops
  – Recurrent bleed – temporary seal by thrombus
  – Massive hemorrhage
• Infection
  – Fever, malaise, septic emboli
• Abdominal pain
  – More common with aortoenteric erosion
DIAGNOSTIC WORKUP

• High index of suspicion
  – Only 50% patients with AEF have a definitive diagnosis of AEF before surgery
• If unstable, exploratory laparotomy
• If stable, EGD and CT
• Other tests (aortography, WBC nuclear scan, MRI) – less accurate, take more time
• **EGD**
  
  – Reach 3\textsuperscript{rd} and 4\textsuperscript{th} portions of duodenum
  
  – Pulsation from extrinsic mass
  
  – Ulceration
  
  – Bleeding
  
  – Graft material

  – If dislodge any tamponading thrombus, sudden deterioration and bleed
Raised pulsating ulcer

Clot and Graft

Graft suture

Abernethy et al. *NEJM* 1997
Zachary et al. *NEJM* 1993
**CT**

- Periaortic gas or fluid
- Bowel wall thickening and adherence to graft
- Retroperitoneal inflammation
- Pseudoaneurysm
- Contrast extravasation
Perigraft air

Duodenum adhesed to graft

Contrast extravasation from sigmoid to graft limb

Simon et al. Case Report Med 2011
Koshy et al. J Gastroentero Hepato 2011
Peirce et al. AJR 2005
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Abnormal</th>
<th>No.</th>
<th>%</th>
<th>Diagnostic</th>
<th>No.</th>
<th>%</th>
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<tbody>
<tr>
<td>Esophagogastroduodenoscopy</td>
<td>17</td>
<td>9</td>
<td>52.9</td>
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<td>11.8</td>
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<td>Abdominal/pelvic CT</td>
<td>24</td>
<td>22</td>
<td>91.7</td>
<td>8</td>
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<td>33.3</td>
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<td>Angiography</td>
<td>30</td>
<td>12</td>
<td>40.0</td>
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<td>Sinography</td>
<td>3</td>
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<td>Colonoscopy</td>
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<td>6</td>
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<td>Upper GI series</td>
<td>8</td>
<td>5</td>
<td>62.5</td>
<td>1</td>
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<td>12.5</td>
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<td>Lower GI series</td>
<td>5</td>
<td>2</td>
<td>40.0</td>
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<td>Magnetic resonance scan</td>
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<td>Gallium scan</td>
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<td>Indium WBC scan</td>
<td>7</td>
<td>4</td>
<td>57.1</td>
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<td>Technetium WBC scan</td>
<td>1</td>
<td>0</td>
<td>0.0</td>
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AORTOENTERIC FISTULA

Intro

Etiology

Presentation

Workup

Surgical

Treatment
SURGICAL TREATMENT

• Goals: 1. Save the life
  2. Save the legs

• Principles
  Control the bleed
  Repair the bowel
  Control the infection
  Maintain distal perfusion
• If unstable, emergency surgery with graft excision then extra-anatomic bypass or aortic reconstruction
• If stable, extra-anatomic bypass then graft excision
EMERGENCY SURGERY

• Midline laparotomy
• Proximal control of aorta
• Distal control at iliac arteries
• Aortic resection and reconstruction
  - If infection, extra-anatomic bypass
    If no infection, in situ reconstruction
• Bowel repair
  - Primary transverse closure
    Resection & anastomosis
    Roux-en-Y reconstruction
• Tradeoff: Stop the bleeding quickly to save the life, but aortic clamp time is prolonged with increased risk of limb loss
EXTRA-ANATOMIC BYPASS

- Axillo-bifemoral bypass

• For presence of infection
• If contamination by femoral vessels
  – Bilateral uniaxillo-femoral graft
  – Composite graft
• Staged procedure =
  Preliminary extra-anatomic bypass
  1-3 days later, graft excision
  – Goal: reduce physiological stress upon the patient
• Staged procedure
  – Decreased mortality from 43% to 26%
  – Decreased aortic stump blowout from 30% to 9%
  – Decreased reinfection from 46% to 16%
  – Decreased amputation rate from 43% to 16%
  – 18% bypass failure

IN SITU AORTIC RECONSTRUCTION

• Careful patient selection
  – Only for no or minimal infection

• Conduits
  – Deep vein of lower extremity
  – Cryopreserved allograft
  – Rifampin-soaked prosthetic graft
• Advantage: no aortic stump blowout
• Disadvantage:
  – Time consuming
  – Possible re-infection
Table 42-1 Results of Surgical Treatment of Secondary Aortoenteric Fistula

<table>
<thead>
<tr>
<th>Series</th>
<th>Year</th>
<th>Number of Patients</th>
<th>Operative Mortality</th>
<th>Amputation</th>
<th>Long-term Survival</th>
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<tr>
<td></td>
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<tr>
<td>O'Hara et al. 27</td>
<td>1986</td>
<td>33</td>
<td>51</td>
<td>27</td>
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<td>Moulton et al. 26</td>
<td>1986</td>
<td>25</td>
<td>40</td>
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<td>Thomas and Baird 26</td>
<td>1986</td>
<td>8</td>
<td>25</td>
<td>NR</td>
<td>75</td>
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<td>Walker et al. 29</td>
<td>1987</td>
<td>23</td>
<td>22</td>
<td>0</td>
<td>65</td>
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<td>Harris et al. 99</td>
<td>1987</td>
<td>14</td>
<td>58</td>
<td>NR</td>
<td>36</td>
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<tr>
<td>Vollmar and Kogel 19</td>
<td>1987</td>
<td>15 (4 with primary AEF)</td>
<td>47</td>
<td>7</td>
<td>53</td>
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<tr>
<td>Yeager et al. 100</td>
<td>1990</td>
<td>15</td>
<td>33</td>
<td>NR</td>
<td>NR</td>
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<tr>
<td>Higgins et al. 101</td>
<td>1990</td>
<td>15</td>
<td>33</td>
<td>7</td>
<td>53</td>
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<tr>
<td>McCann et al. 102</td>
<td>1993</td>
<td>17</td>
<td>35</td>
<td>23</td>
<td>18</td>
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<tr>
<td>Kuestner et al. 55</td>
<td>1995</td>
<td>33</td>
<td>18</td>
<td>9</td>
<td>71</td>
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<tr>
<td>van Baalen et al. 103</td>
<td>1996</td>
<td>27</td>
<td>41</td>
<td>NR</td>
<td>37</td>
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<tr>
<td>Bergquist et al. 104</td>
<td>1996</td>
<td>27</td>
<td>28</td>
<td>NR</td>
<td>42</td>
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<tr>
<td>Nevelsteen et al. 105</td>
<td>1998</td>
<td>7</td>
<td>86</td>
<td>NR</td>
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<tr>
<td>Young et al. 89</td>
<td>1999</td>
<td>15</td>
<td>13</td>
<td>0</td>
<td>NR</td>
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<tr>
<td>Seeger et al. 77</td>
<td>1999</td>
<td>10</td>
<td>40</td>
<td>10</td>
<td>NR</td>
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<tr>
<td>Reilly 85</td>
<td>2002</td>
<td>81</td>
<td>28</td>
<td>10.5</td>
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<tr>
<td>Sierra et al. 97</td>
<td>2003</td>
<td>9</td>
<td>44</td>
<td>0</td>
<td>NR</td>
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</tbody>
</table>

NR, not reported or results commingled with those of patients treated for other conditions, including graft infection without aortoenteric fistula.

<table>
<thead>
<tr>
<th>Mortality</th>
<th>ISR N = 25 (%)</th>
<th>EAR N = 9 (%)</th>
<th>p value</th>
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<tbody>
<tr>
<td>-30day</td>
<td>12 (48)</td>
<td>3 (33)</td>
<td>0.08</td>
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<td>- procedure-related(^a)</td>
<td>14 (56)</td>
<td>5 (56)</td>
<td>1.00</td>
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<td>Length of hospital stay (days)</td>
<td>21 ± 6</td>
<td>20 ± 8</td>
<td>0.09</td>
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<td>Surgical complications:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Acute limb ischemia</td>
<td>2 (8)</td>
<td>1 (11)</td>
<td>0.93</td>
</tr>
<tr>
<td>- Graft occlusion</td>
<td>0</td>
<td>1 (11)</td>
<td>-</td>
</tr>
<tr>
<td>- Femoro-popliteal occlusion</td>
<td>2 (8)</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>- Wound complications</td>
<td>6 (24)</td>
<td>1 (11)</td>
<td>0.075</td>
</tr>
<tr>
<td>- Colonic infarction</td>
<td>1 (4)</td>
<td>2 (22)</td>
<td>0.056</td>
</tr>
<tr>
<td>- Duodenal leakage</td>
<td>0</td>
<td>1 (11)</td>
<td>-</td>
</tr>
<tr>
<td>- Graft disruption</td>
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<tr>
<td>Femoral</td>
<td>1 (4)</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Aortic</td>
<td>4 (16)</td>
<td>0</td>
<td>-</td>
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<tr>
<td>- Aortic leakage</td>
<td>0</td>
<td>1 (11)</td>
<td>-</td>
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<tr>
<td>Medical complications</td>
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<tr>
<td>- Pulmonary</td>
<td>4 (16)</td>
<td>2 (22)</td>
<td>0.086</td>
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<tr>
<td>- Acute renal failure</td>
<td>2 (8)</td>
<td>1 (11)</td>
<td>0.93</td>
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<tr>
<td>- Colonic ischaemia</td>
<td>2 (8)</td>
<td>1 (11)</td>
<td>0.93</td>
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<tr>
<td>- Myocardial infarction</td>
<td>7 (8)</td>
<td>0</td>
<td>-</td>
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<tr>
<td>- Coagulopathy</td>
<td>1 (4)</td>
<td>1 (11)</td>
<td>0.07</td>
</tr>
</tbody>
</table>

ISR: In situ reconstruction; EAR: extra-anatomic reconstruction.

\(^a\) Procedure-related mortality includes deaths after 30 days. Some patients died as a result of the operation later in the hospital course.

ENDOVASCULAR

• Balloon occlusion catheter or stent graft for initial control of bleeding from aorta
• Less stress, transfusion, operative time
• Despite lifelong antibiotics, reinfection or recurrent AEF occurs in 60%
• “Bridge to surgery”

Danneels et al. Eur J Vasc Endovasc Surg 2006
TECHNIQUES FOR PREVENTION

• Aseptic technique, broad spectrum antibiotics
• Gentle treatment of bowel
• Coverage of graft to separate it from duodenum
  Aneurysm sac, retroperitoneal tissue, omentum
SUMMARY

- Fixed duodenum, pulsation and infection contribute to formation of AEF
- High index of suspicion is necessary for identification
- Patient stability and presence of infection influences surgical strategy and outcome
QUESTIONS

1. Least important for diagnosing AEF is

   a. CT
   b. Aortography
   c. Endoscopy
   d. Suspicion of it
2. Patient with AAA repair 5 years ago has fever and +blood cx. Which are true?

a. CT is preferred initial imaging for suspected graft infection
b. Mortality after surgery for infected aortic graft is 5-10%
c. Graft infections within 4 months of AAA repair are more virulent than later ones
d. Staph. epidermis is the most common infecting pathogen
e. Upper GI bleed is the most common initial presentation of an infected abdominal aortic graft
3. 75M with AAA repair 5 years ago has malaise, abdominal pain, WBC 19, CT showing fluid collection by psoas, graft, and air by graft. Which is true?

a. Treatment will require ostomy formation
b. Negative upper endoscopy eliminates the need for operation
c. Graft excision and extra-anatomic reconstruction should be performed
d. Systemic antibiotics should be started immediately
e. Percutaneous drainage is adequate therapy
That’s all, folks.
Thank you!