Visceral Artery Aneurysms: Endovascular vs. Open?

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Disclosures

- None relevant

Open vs. Endo: Who uses open anymore?

Visceral artery aneurysms: Overview

- Etiology and incidence
- Distribution of common VAA's
- Case examples
- Literature review
- Recommendations (beware!)
Visceral Artery Aneurysms (VAAs)

- Incidence: 0.1%-1%
- Most are found incidentally
- 22% present emergently: Rupture or GI bleeding, abdominal apoplexy
- Mortality after rupture depends on location

<table>
<thead>
<tr>
<th>Class</th>
<th>Rupture Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatic Artery</td>
<td>60 - 80%</td>
</tr>
<tr>
<td>Superior Mesenteric Artery</td>
<td>38%</td>
</tr>
<tr>
<td>Celiac Artery</td>
<td>7%</td>
</tr>
<tr>
<td>Pancreaticoduodenal Artery</td>
<td>68%</td>
</tr>
<tr>
<td>Gastrointestinal Artery</td>
<td>56%</td>
</tr>
<tr>
<td>Gastroepiploic Artery</td>
<td>90%</td>
</tr>
</tbody>
</table>

Splenic Artery Aneurysms

- Most common VAA: 60%
- Most are asymptomatic: incidentally found in 1% of angiograms, CTA
- Female predominance (4x)
- Risk factors: FMD, portal HTN, pregnancy/multiparous, AS, Liver tx
- Etiology: unknown, secondary to trauma, pancreatitis, collagen vascular
- Morphology: 72% true aneurysms/28% PSA
  - Saccular>fusiform, occur at bifurcations
- Rupture risk
  - Overall 2%, pregnancy 50% (66% in third trimester)
  - Mortality: maternal 70%, fetal 90%, surgical 40%


Splenic Artery Aneurysms

- Presentation
  - Asymptomatic
  - Abdominal pain, apoplexy
  - “Double-rupture” phenomena (rupture into lesser sac)
- Indications for treatment
  - Size >2cm
  - Rapid enlargement
  - Symptomatic
  - Women of child-bearing age
  - Non-operative treatment: low risk groups

Splenic Artery Aneurysm treatment

- Open Surgical Repair
  - Splenectomy (distal/infrasplenic)
  - Proximal & distal ligation (proximal/splenic preservation)
  - Aneurysm exclusion with arterial reconstruction
- Endovascular Repair
  - Coil embolization
    - Occlusion or with uncovered stent
  - Cyanoacrolate glue
  - Covered Stent

55 year old asymptomatic woman
Undergoing experimental chemotherapy for lymphoma
Incidentally found 2.5cm inflammatory aneurysm found on CT scan
Superior Mesenteric Artery Aneurysms

- 5.5% of visceral artery aneurysms
- Incidence 1 in 12,000 to 1 in 19,000
- Most commonly infectious etiology (septic embolus)
  - Bacterial endocarditis and IVDU
  - Medial degeneration, arterial dissection
  - PSA: connective tissue disease, pancreatitis, trauma
- Mostly symptomatic: colicky pain, intestinal angina, weight loss in 70-90%
- Rupture rate 38% to 50%, Mortality 30-90%
- Treatment: symptomatic, infection, >2cm

Celiac Artery Aneurysms

- 4% of VAA (incidence 1 in 8000)
- Associated with atherosclerosis, other VAA (40% concordance)
- 10-20% rupture rate, 50% mortality rate
- No size threshold correlated with rupture
- Repair all sizes recommended
  - Open: aneurysm resection with reconstruction (interposition, EA, re-implantation)
  - Endovascular: covered stent, coil

SMA aneurysms treatment

- Open repair
  - Interposition, EA reconstruction, re-implantation
  - Infection, involvement of branch vessels, acute ischemia (trauma)
- Endovascular
  - Stent graft of SMA origin
  - Coiling of minor branches
Hepatic Artery Aneurysms

- Incidence < 0.4% in general population autopsy studies
- 20% of VAA’s
- Male predominance, 6th decade
- Etiology: AS, Medial degeneration, trauma, mycotic, PAN
- 80% extrahepatic, 20% intrahepatic
- Rupture rate (unknown) 60-80%; mortality 35%
- Majority asymptomatic
  - Quincke’s triad: RUQ pain, obstructive jaundice, hemobilia
  - Treatment recommendations: >2cm, symptomatic, infected PSA, PAN

Hepatic artery aneurysm treatment

- Common hepatic (proximal to GDA)
  - Open ligation/reconstruction
  - Endovascular coiling/stent
- Proper hepatic (distal to GDA)
  - Open bypass
  - Endovascular stent
- Intrahepatic
  - Open partial hepatectomy
  - Endovascular coils (minor branch)
  - Infectious: resection +/- reconstruction

Hepatic artery aneurysm

85 year old man with 6.2 cm asymptomatic hepatic artery aneurysm
- Incidentally found on outside CT scan
- No jaundice, abdominal pain, hematochezia
- PMH: smoking, COPD, hyperlipidemia
- PSH: open cholecystectomy 35 year ago
Literature review: Endo or Open?

"C'mon, c'mon—it's either one or the other."

Contemporary outcomes of intact and ruptured visceral artery aneurysms

- 2003 – 2013
- 261 patients 181 VAA: 77 ruptured, 104 intact

<table>
<thead>
<tr>
<th>Table II. Total visceral artery aneurysms (VAA)s and percentage of pseudoaneurysms (PAA) by arterial bed</th>
<th>Table III. Average aneurysm size based on arterial bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>(VAA)s (% PAA)</td>
<td>VAA, mm</td>
</tr>
<tr>
<td>Splanchnic</td>
<td>47 (36.1)</td>
</tr>
<tr>
<td>Hepatic</td>
<td>26 (60)</td>
</tr>
<tr>
<td>IMA</td>
<td>5 (13.5)</td>
</tr>
<tr>
<td>PAA</td>
<td>32 (8.6)</td>
</tr>
<tr>
<td>Celiac</td>
<td>5 (60)</td>
</tr>
<tr>
<td>Renal</td>
<td>16 (6)</td>
</tr>
<tr>
<td>Other</td>
<td>—</td>
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<tr>
<td>(VAA)s, intact VAA; PAA, pseudoaneurysms; rVAA, ruptured VAA; IMA, inferior mesenteric artery.</td>
<td></td>
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<tr>
<td>Splanchnic</td>
<td>27.8</td>
</tr>
<tr>
<td>Hepatic</td>
<td>31.3</td>
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<tr>
<td>IMA</td>
<td>26.5</td>
</tr>
<tr>
<td>PAA</td>
<td>28.5</td>
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<tr>
<td>Celiac</td>
<td>32.3</td>
</tr>
<tr>
<td>Renal</td>
<td>20.4</td>
</tr>
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<td>Other</td>
<td>—</td>
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Shukla et al.

- Intact visceral artery aneurysms have equivalent survival when treated with endovascular or open techniques.
- Ruptured visceral artery aneurysms have improved overall and aneurysm-related survival when treated with endovascular approach.

Summary

- Visceral artery aneurysms are a rare clinical entity (0.1-1%).
- Diverse distribution (splenic > hepatic > SMA > celiac > other).
- Often asymptomatic, found incidentally.
- Rupture risk and mortality depend on location and clinical presentation.
- Open surgery remains the goal standard of treatment.
  - Aneurysm resection, ligation, +/- arterial reconstruction.
  - Preferred method for infection, involvement of branch vessels.
- Endovascular techniques have become more widespread in treatment.
  - Stent grafts, open cell with coils, embolization, glue.
  - Equivalent durability for intact aneurysm repair.
  - Improved survival for ruptured VAA (selection bias?).