Endovascular Management of IVC Injuries

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Overview

• Challenges associated with IVC injuries
• Approach to treatment
• Endovascular options
• Cases

Traumatic IVC Injuries

• Mortality rate of patients that reach the hospital between 20% and 57%\(^1\)
• Injuries often made worse with surgical dissection
• The two most important factors for postoperative survival \(^3\)
  • Hemodynamic condition on arrival
  • Anatomic location of the injury

Anatomic Considerations

- (1) Infrarenal: 23% Mortality
- (2) Suprarenal: 75% Mortality
- (3) Retrohepatic: 66% Mortality

Iatrogenic IVC Injuries

- Rare Events
  - Study looking at 231 attempts at filter retrieval over 10 years¹
    - Only 2 IVC injuries resulting in bleeding
      - Both were treated with venoplasty alone
      - Both occurred with advanced retrieval techniques

Endovascular Treatment

- Management goals of patients with IVC injuries¹
  - Minimize duration of shock
  - Rapid control of active hemorrhage
- The main advantages of the endovascular approach ²
  - Speed
  - Remote access
  - Minimal additional trauma

Diagnosis

- CT
  - Active extravasation
  - Hematoma
  - Defined contrast gradient in IVC can signify an AVF
- Venography
  - Often difficult to visualize actually defect
- IVUS
  - Often more useful than venography

References:
Question

Which of the following represents an absolute contraindication to endovascular repair of an IVC Injury

A. Injury at the level of the renal veins
B. Injury at the level of the hepatic veins
C. Hemodynamic instability
D. IVC filter in place that can NOT be removed
E. All of the above
F. None of the above

Minimally Invasive Treatment Options

- Medical Therapy
- Venoplasty
  - Restoring favorable pressure dynamics can result in injury resolution
- Placement of a Covered Stent
  - Thoracic endograft
  - Aortic cuff
- NO off the shelf venous specific devices available
- Fenestrated Grafts
  - Case report for retro-hepatic injuries

Case One

- 28 year old man presenting after a motorcycle collision
  - Arrived with stable vital signs
  - Mild abdominal and flank pain
  - CT scan identified IVC injury
Case 2

- 19 year old female pedestrian vs auto
- Multiple traumatic injuries including grade 4 liver laceration
- Head trauma
- Fluid responsive hemodynamic changes
- Supraregional IVC dissection and pseudoaneurysm identified on CT

Two week follow-up
2 weeks later
Case 3 Endovascular Management

- IVC filter retrieval
- Advanced methods employed
Endovascular Management

- After filter manipulated BP suddenly dropped to 54/30

Cava was not in continuity
- Transfemoral and transjugular balloon control achieved
- Wire from above snared from below
- Attempted Aortic cuff x 2
- Ultimately repaired with 10cm thoracic endograft
Available device options

- No large diameter covered stents FDA approved for venous use
- Aortic Cuffs
  - Available in 3.3 cm length and longer
- Thoracic Devices
  - Three major manufacturers make endografts that are ~10cm in length
Case 4

- 52 y/o with multiple prior abdominal surgeries undergoing routine lap cholecystectomy.

Case 4

- Massive Intra-op bleeding
- IVC repaired
- Nephrectomy
- Significant bloody output from intrabdominal drain on POD 2
Fenestrated Repair

- 62 y/o man identified to have retro-hepatic caval injury after traffic accident
- Hemodynamically Unstable on Hospital Day 2
- Fenestrated Repair attempted
  - Graft modified on back table
  - Deployed from below
  - Hepatic veins marked with wires from above
  - Completed in 2002!
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