Venous Stent Fracture: Predisposing Factors & Acceptable Rates

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Venous Stents
- The application of stents in the treatment of venous disease is increasing.
- Recognition of the role obstructive lesions in CVI (10%-30% of patients with symptomatic CVI have outflow obstruction)
- Increasing role of catheter-based therapies in DVT (~50% undergo placement of stents after de-clot procedures)
- Many aspects of venous stent performance like fracture rates & implications of fx not well studied

Stress Factors
- Fem-pop segment: Elongation/compression/bending induced by hip & knee flexion
- Carotids: Repetitive bending & change in axial dimension induced by swallowing
- Renals: Repetitive bending & change in axial dimension induced by breathing
- Brachiophalic: Repetitive bending & change in axial dimension during cardiac

Predisposing Factors to Stent Fracture: Lessons from the Arterial Experience
- Biomechanical forces exerted on stent during body motion
  - Segmental bending during activity
  - Axial compression & elongation during body motion
  - Axial elongation during stent deployment
  - Radial compression
- Stent material & design
- Stented length & degree of overlap
- Surface finish

Disclosures
- For the 12 months preceding this CME activity, I disclose the following types of financial relationships:
  - Research, clinical trial, or study funds received from: Boston Scientific Inc., Bard Periph Vasc., Mercator, Spectranetics, National Institutes of Health, Veniti
Finite Element Analysis of Cyclic Bending

Finite Element Analysis of Cyclic Focal Compression

No waste left behind
Gap between CFV & Os Pubis: An Anatomic Predisposing Factor?

Would a reduced gap lead to higher stent deformation?

### Acceptable Rate of Stent Failure Based on Performance Goals

- **30-day Thrombosis rate:**
  - Acute thrombotic: 6.5%
  - Chronic post thrombotic: 6.8%

- **12-month patency:**
  - Acute thrombotic: 70%-75%
  - Chronic post thrombotic: 66%-71%

**Razavi M, et al Circ Cardiovasc Interv. 2015:**

### Conclusion

- More data points needed to confirm risk factors for stent fx in veins
- Consequences of fracture need to be better identified

### Biomechanical Forces During Hip Flexion & Knee Bending

- Shortening and bending are the major changes

**Courtesy: Bob Smouse MD & Alex Nikaranov, MD**