Posterior Cervical Foraminotomy

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Disclosure

• Consulting/Speaking
  – Medtronic
  – Amendia
  – Nutech
  – Mazor
  – MIS Device
Case

- 46M c/o severe left arm pain, minimal neck pain for 6 weeks, no relief w/ non-op
- Radiates into elbow, forearm, w/ parasthesias middle and index finger
- Mild subjective triceps weakness
- Neuro intact, +Spurling’s to left
Foraminotomy? ACDF? TDA?
Outline

• Avoid anterior approach related complications
• Avoid hardware complications
• Preserve motion
• Avoid adjacent segment degeneration
  – TDA → still not proven long term
• Minimally invasive- less EBL, pain, outpatient
• Excellent outcomes
• Cost
Anterior Approach Complications

Common

• Dysphagia 5%-35% \(^2,3,13\)

• Recurrent laryngeal nerve injury 0.5%-4\(^\circ\) \(^2,4,10,12,13\)
  – Hoarseness approx 15%.

• Pseudarthrosis
  – 5% for single level fusion
  – 15% in multi-levels. \(^1,6,7,10\)

• Infections 0.3%-3% diskitis or wound infection \(^2,10,11,13\)
Anterior Approach Complications
Rare

- CSF Leak 0.5-2% \(^{2,13}\)
- Wound Hematoma 1.5-2.4% \(^{2,11,13}\)
- Epidural Hematoma 0.9% \(^2\)
- Horner's Syndrome in 0.1-1% \(^{2,13}\)
- Esophageal Injury 0.2%-0.5% \(^{2,6,9,13}\)
- Arterial Injuries \(^6\)
- Damage to the spinal cord or nerves 0.3%-3% \(^7\)
Anterior Approach Complications

- **Hardware complications 8%-20%**
Anterior Approach Complications

References


12) Ullman, J.S., Camins, M.B., Post, K.D. Complications

Posterior complication rates

• Overall a 2-8% complication rate
  – Durotomy and infection being the most common.\(^5\)
• Nerve root injury 0.7%-2.6% \(^3\)
  – often related to positioning or C5 palsy
• Paresthesias or numbness 2-4% \(^2\)
• CSF leak 2-8% \(^2,5\)
• Wound infections 1.5- 2.2% \(^7,8\)
• Spinal cord injury with and without K- wire misplacement- essentially 0.1% \(^1\)

[4] Davis
Adjacent Segment Disease

Hillibrand JBJS 1999

- 374 pts w/ 409 ACDF
- ASD risk:
  - 2.9% per yr
  - 25.6% in 10 yrs

*ACDF increases ASD compared to foraminotomy*
TDA- Motion preserving?

• Adjacent level op
  – ACDF 15% (9/61)
  – ProDisc 3% (2/72)

Theoretically, TDA decreases this ASD risk

• Industry Sponsored
Adjacent Segment Disease

- 59 TDA patients
- 34 ACDF patients
- Median follow-up: 37 months
- 16% TDA developed adj level degeneration
- 18% ACDF developed adj level degeneration
- Lumbar DDD was best predictor of ASD

*Suggests that ASD is natural history of disease and not reduced by TDA*

- Non-Industry Sponsored
TDA?

• Still unproven long term benefit
• Financial conflicts of interest from authors, industry
• Patients- can’t be blinded, leads to response bias
ASD-Posterior Foraminotomy

- 303 pts
  - 1 level foram.
  - median f/u 7 yrs
- 15 (4.9%) developed symptomatic ASD
- 9(2.9%) requiring reoperation
- 10 (3.3%) developed same-segment disease

ASD less with foraminotomy compared to ACDF or TDA
Minimally Invasive

- Less EBL (Ruetten S, et al Spine 2008.)
- Less postop pain
- Outpatient- shorter LOS (Tomaras et al J Neurosurg. 1997)
- Faster return to activity
  - 4.8 wks vs 19.6 wks for ACDF in active duty military (Tumialan et al. Neurosurg Focus 2010)
- No postop immobilization
- Less OR time than ACDF (Ruetten S, et al Spine 2008.)
Excellent outcomes

• Relief of radiculopathy
  – 96% (Caglar et al MI Neurosurg 2007)
  – 93% f/u 3.1 yrs (Witzman et al, Neurosurg 2000)

• Patient reported good to excellent outcomes
  – 95% Odom’s Criteria f/u 9 mos (Kumar et al, J. Brit Neurosurg 1998)
  – 93% f/u 19 mos (Tomaras et al J Neurosurg. 1997)
  – 86% based on Prolo scores f/u 15 yrs (Davis et al, Spine 1996)

• Returned to their preoperative employment and baseline level of physical activity 97% (Adamson et al, J Neurosurg 2004)

• Recurrence rate
  – 6% (Davis et al, Spine 1996)
  – 6.7% reoperation (Kumar et al, J. Brit Neurosurg 1998)
Excellent Outcomes

• 736 consecutive patients treated with laminoforaminotomy
• 96% improvement in arm pain & paresthesia
• 98% resolution of motor deficit
• 91.5% satisfied
Cost

• 1 year Cost/Qualy Ratio (70 pts):
  – Post. Foraminotomy $79,856/QALY
  – ACDF $131,951/QALY
  – Equivalent improvement in quality of life at 1 yr
    (Alvin et al. Neurosurg 2013)

• Direct costs of surgery (38 pts)
  – Post. Foraminotomy $3,570
  – ACDF $10,078
  – Indirect costs also $13,000-$24,000 higher or ACDF
    (Tumialan et al. Neurosurg Focus 2010)
Posterior Cervical Foraminotomy

**Indications**
- Radiculopathy
- Lateral disc herniation or FS
- Minimal neck pain
- +Spurlings

**Contraindications**
- Axial neck pain
- Instability, kyphosis
- Central HNP
Cervical Radiculopathy - Operative Management

- Surgical technique depends on clinical and radiographic findings
  - ACDF
  - Posterior Foraminotomy
  - TDR
Thank You

Minimally Invasive Spine Surgery
Surgical Techniques and Disease Management

Posterior Cervical Foraminotomy Chapter