Motion Sparing Treatments in the Cervical Spine

Options for Limiting Adjacent Segment Progression

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Disclosures

- None

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Overview

- Indications and Patient Selection
- Devices used
- Approaches
- Techniques
- Levels
- Multiples
- Revisions
- Outcomes

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Indications – FDA IDE Inclusion

- Cervical disc herniation
- Failure of six weeks of conservative therapy
- Progressive cervical radiculopathy
- Off-label distribution not quantified
- Single or two-level pathology

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Contraindications

- Prior posterior laminectomy
- Significant kyphosis
- Significant lateral mass hypertrophy
- Allergy to implants: Primarily the Nickel (1.0% Ni in the cobalt-chrome alloy of the Mobi-C)
  - Alternative materials- Prestige LP is a titanium-ceramic composite
- Cervical instability, spondylolisthesis, scoliosis
- Medical limitations: Osteoporosis, malignancy,
- Active infection

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Device Options – Many Choices

- Constrained
- Unconstrained
- Surface interface
  - Metal-metal (early Prestige, Prodisc-C
  - Metal-poly
  - Hyprid (Move-C)
- Center of rotation fixed or dynamic
- Inherent implant lordosis

Staudt MD, Das K, Duggal N. Does design matter? Cervical disc replacements under review. *Neurosurg Rev.* 2018;41:399–407.

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Patient Selection

- Revision option for prior pseudoarthrosis
  - Limited data to support in US
- Viable for smokers?

Ding D, Shaffrey ME. Cervical disk arthroplasty: patient selection. *Clin Neurosurg.* 2012;59:91–97.

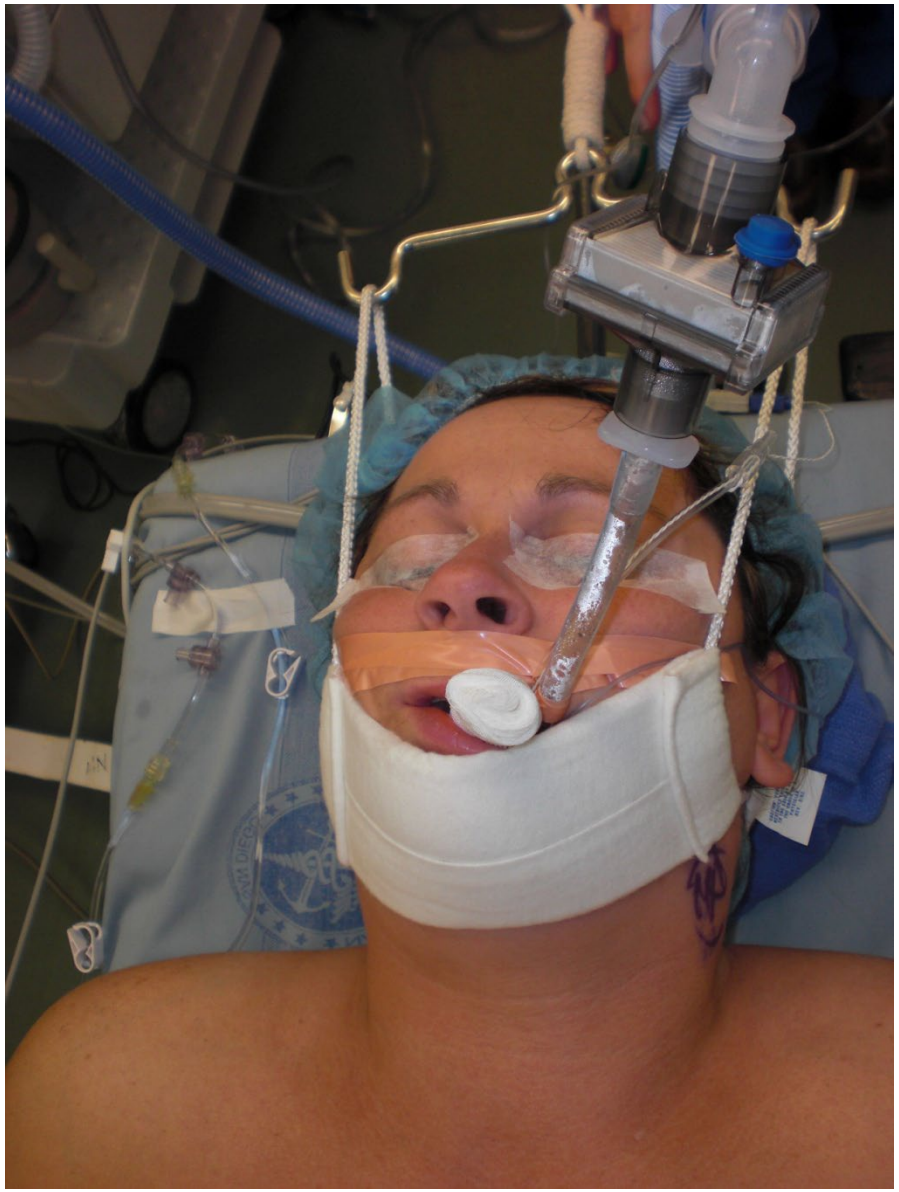
Approach

- Standard anterior cervical approach and dissection
- Distraction +/-
  - Invasive – Gardner-Wells tongs
  - Pins – integrated system
  - Noninvasive – Holter traction strap /c bite block
- Fluoroscopy for placement
  - What to do with the shoulders
- Nondisruptive level confirmation – How do you do it

Nassr A, Lee JY, Bashir RS, Rihn JA, Eck JC, Kang JD, Lim MR. Does incorrect level needle localization during anterior cervical discectomy and fusion lead to accelerated disc degeneration? Spine (Phila Pa 1976). 2009 Jan 15;34(2):189-92. doi: 10.1097/BRS.0b013e3181913872. PMID: 19139670.

Positioning

- Distraction +/-
  - Invasive – Gardner-Wells tongs
  - Pins – integrated system
  - Noninvasive – Holter traction strap /c bite block



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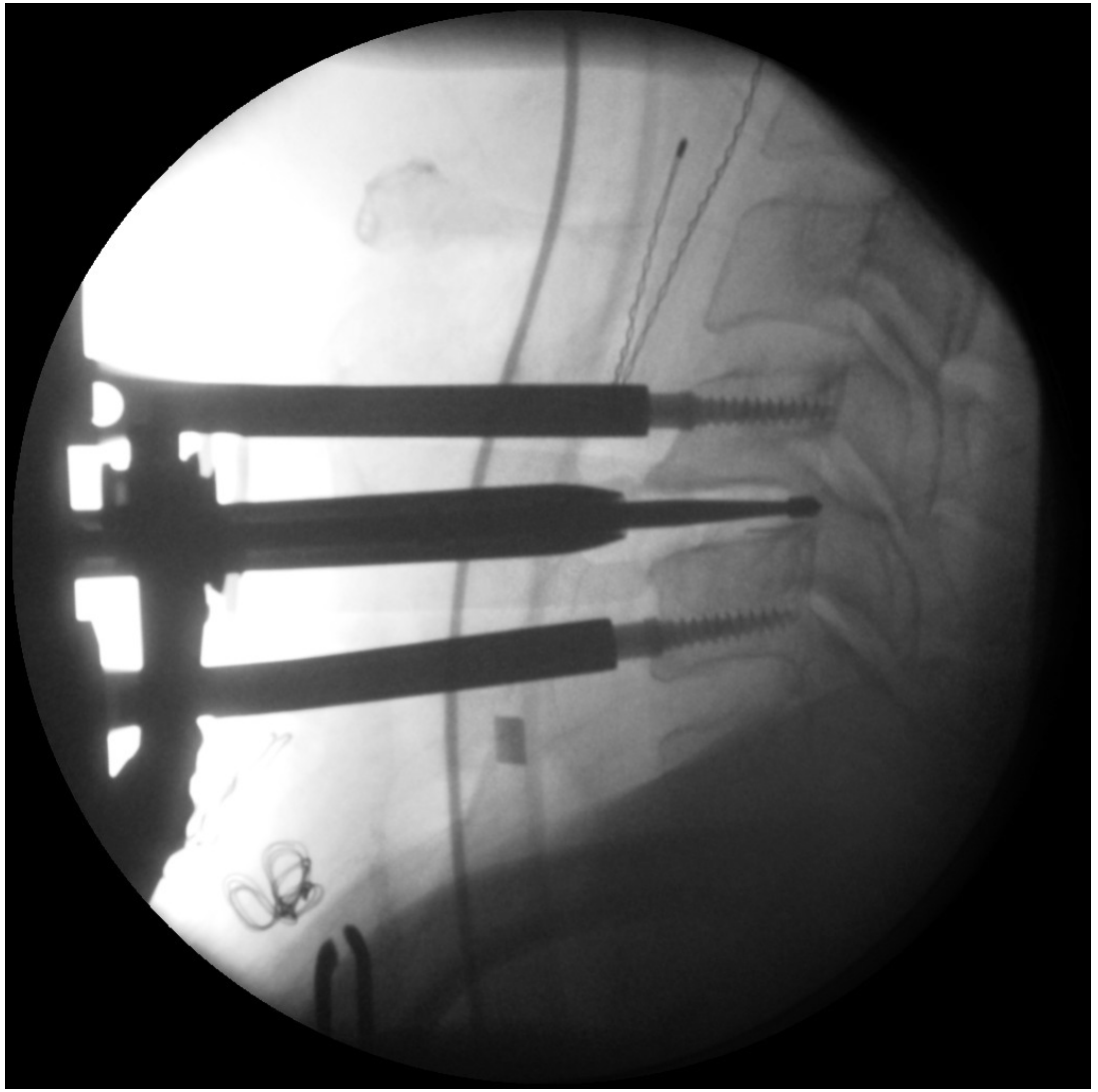
Levels

- Single – initial indication
- Dual – Contiguous
- Dual – noncontiguous
- Three or more
  - Off label, but certainly being don't out of the US
- Hybrid – limited clinical series to show good evidence, and used primarily when there was no two level FDA approval



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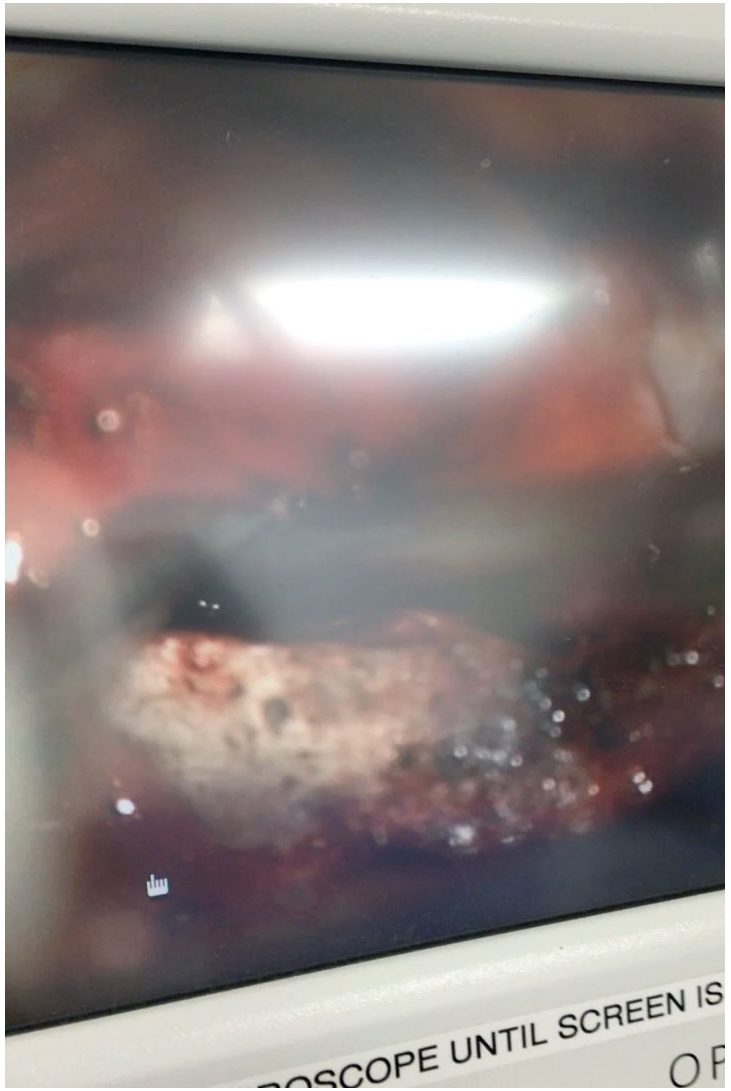
Multiples

- Single level – are we preventing the dreaded adjacent level degeneration
- Hybrid – is this shielding the next level
- Contiguous
- Discontiguous/Skip levels

Hilibrand AS, Yoo JU, Carlson GD, Bohlman HH. The success of anterior cervical arthrodesis adjacent to a previous fusion. *Spine.* 1997;22:1574–1579. doi: 10.1097/00007632-199707150-00009

Failures

- Adjacent levels
- Adverse reactions
- Augments
- Revision
- Removal
- Ossification
- Bone resorbtion
- Heterotopic Ossification



Park JB, Chang H, Yeom JS, Suk KS, Lee DH, Lee JC. Revision surgeries following artificial disc replacement of cervical spine. *Acta Orthop Traumatol Turc.* 2016;50:610–618.

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Outcomes

- Is CDA better than ACDF?
  - Higher long term functional outcome measures
  - Lower rate of adjacent segment disease
    - CDA had a significantly lower rate of total secondary surgery, secondary surgery at the adjacent level, and secondary surgery at the index level
  - No fewer adverse events
  - More revision surgeries
    - Fewer patients with the Bryan disc required surgery for symptomatic ASD

Wang QL, Tu ZM, Hu P, Kontos F, Li YW, Li L, Dai YL, Lv GH, Wang B. Long-term Results Comparing Cervical Disc Arthroplasty to Anterior Cervical Discectomy and Fusion: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Orthop Surg. 2020 Feb;12(1):16-30.

Outcomes

- Persistence or recurrence of clinical symptoms within 2 years
- Patient selection was primary cause (81%)
- Surgical technique
  - Insufficient decompression
  - Device malpositioning
    - Eccentric position
    - Subsidence

Park JB, Chang H, Yeom JS, Suk KS, Lee DH, Lee JC. Revision surgeries following artificial disc replacement of cervical spine. *Acta Orthop Traumatol Turc.* 2016;50:610–618.

Cost Advantages of CDA vs ACDF

- Clear advantage over ACDF in the long term

McAnany SJ, Overley S, Baird EO, et al. The 5-year cost-effectiveness of anterior cervical discectomy and fusion and cervical disc replacement: a Markov analysis. *Spine (Phila Pa 1976)* 2014;39:1924–1933.

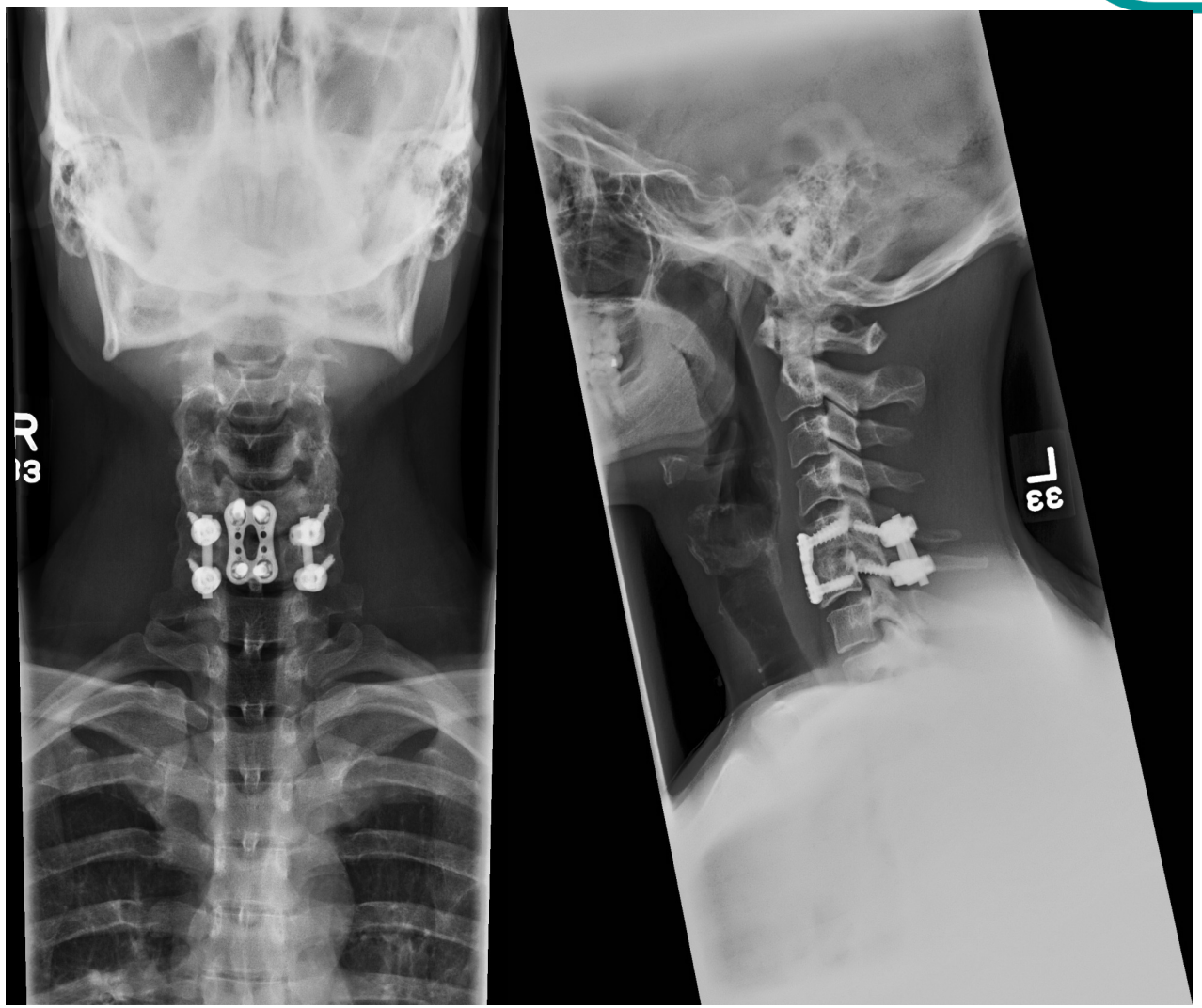
Postop Kyphosis

- Mobi-C patient with postop iatrogenic kyphosis
  - Similar improvements
  - No difference in clinical outcomes

Hisey M, Davis R, Hoffman G, et al. *Sagittal Alignment of One-Level TDR and ACDF Patients: An Analysis of Patient Outcomes From a Randomized, Prospective, Clinical Trial.* Miami, FL: International Society for the Advancement of Spine Surgery;; 2014.

Revision Strategies

- Patient characteristics critical in analysis
- Metal allergy base revision
- Removal with fusion for stability.



Skovrlj B, Lee DH, Caridi JM, Cho SK. Reoperations following cervical disc replacement. *Asian Spine J.* 2015;9(3):471–482.

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