POSTERIOR CERVICAL SCREW CLASSIFICATION

NORTH AMERICAN SPINE SOCIETY
HISTORY OF POSTERIOR CERVICAL FIXATION

Spinous process wiring for Pott’s Disease
Hadra BE, Transactions of AOA 1891: 4, 206.

Sublaminar wiring for atlantoaxial instability

Contoured metal loop/wiring for occipitocervical instability

Posterior lower cervical screw/plate for traumatic spine injury

Contoured plate/screw fixation for occipitocervical instability
POSTERIOR CERVICAL BONE SCREWS

- More than three decades of surgical experience
  - Described in 1980’s by Roy-Camille and Magerl
  - Initially applied to treatment of traumatic cervical spine injury
  - Biomechanically similar or superior to available alternatives
    - Gill K et al, Spine 1988: 13, 813. Wiring, clamping, 2 lat mass screw fixation techniques in cadavers Plate/bicortical screw fixation stiffest
    - Mihara H et al, Spine 2001: 26, 1662. 3 Wiring, 1 lat mass screw fixation technique compared in cadavers Similar restoration of biomechanical stability
    - Richter M et al, Spine 2002: 27, 1724. 1 Wiring, 3 transarticular screw, 1 isthmic screw, 1 lat mass screw in C1C2 Transarticular screw fixation best, isthmic and lat mass screw good biomechanical alternatives
POSTERIOR CERVICAL BONE SCREWS

• More versatile than available alternatives
  • Cervical bone screws offer more options compared with wiring
    • Applicable when spinous process/laminar fractures/defects present
    • Allows for sparing of motion segments
  • Cervical bone screws replace inadequate alternatives
    • Methylmethacrylate fixation
    • Several hook techniques
DORSAL CERVICAL FIXATION TECHNIQUES

- Wiring Techniques
  - Interspinous
  - Facet
  - Triple Wire
POSTERIOR CERVICAL WIRING LIMITATIONS

- Tension band resists flexion
- Poorly resists rotation
- Doesn’t resist extension
CERVICAL CLAMP TECHNIQUES

LIMITATIONS

- Biomechanics of clamps similar to that of wiring techniques: Tension band only
- Does NOT intrinsically resist translation or rotation
POSTERIOR CERVICAL BONE SCREWS

- Commonly applied and commonly reported
  - Pubmed search “posterior cervical bone screw”: 1530 references
  - Pubmed search “lateral mass screw”: 564 references
  - Other posterior cervical screw applications include:
    - Transarticular screws (across C1-2)
    - Pars interarticularis screws (at C2)
    - Pedicle screws (typically at C2 or C7)
Figure 6. Technique for lateral mass screw placement for the (A) Roy-Camille, (B) Magerl, (C) Anderson, (D) An. (Reprinted with permission.)
POSTERIOR CERVICAL LATERAL MASS ANATOMY
C7 PEDICLE SCREWS
C1 LATERAL MASS C2 PEDICLE SCREW

• C1-2 Instability
  • Strength of construct similar to that of transarticular screws
  • Easier to apply
  • Provides alternative avenue of fixation
SAFE AND EFFECTIVE TECHNIQUE

• Neurovascular injuries are infrequent
  • Unusual with lateral mass screws
      654 facet screws in 78 patients
      No vertebral artery injury, 0.6% nerve root injury
    • Sekhon LH, J Spinal Disord Tech 2005: 18, 297.
      1026 consecutive facet screws in 143 patients
      No vascular/ neurological injuries
      457 facet screws in 97 patients
      No serious vascular/ neurological injuries

• 1-4% with C1-C2 transarticular screws
• 1-5% with subaxial pedicle screws (C3-6 insertion infrequent in US)
SAFE AND EFFECTIVE TECHNIQUE

- Arthrodesis (fusion) rates very high
  - 85-100% at C1-2
  - 90-100% subaxial spine (C3-C7)
POSTERIOR CERVICAL SCREW FIXATION

- Safe and Effective
  - Low rate of neurovascular injury in lat mass and pedicle fixation
- Comparable to other pedicle screw applications
  - Similar to Class II thoracolumbar pedicle screw fixation
- Studied in a variety of clinical conditions:
  - Trauma, neoplasm, degenerative disease, myelopathy
- Application when other techniques not feasible
  - Laminar/spinous process fracture, laminectomy
- Class II designation (from unclassified) clinically justified
  - Cervical screw fixation is as safe and effective as predicate