MANAGEMENT OF THE PAINFUL ACUTE GERIATRIC ODONTOID FRACTURE

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ODONTOID FRACTURES

- 10-18% of all cervical fx's
- 60% of all C2 fx's
- Neuro deficit: 18-26%
- Most patients are older

Disclosures

- Research
  - NIH
  - Medtronic
- Fellowship Support
  - NREF
  - Globus
- Consultant
  - Medtronic
- Royalties
  - Medtronic

ODONTOID FRACTURES CLASSIFICATION

- Anderson, D’Alonzo
- 3 fracture types
- Anatomically simple
- Guides treatment
- Predicts outcome
ODONTOID FRACTURES

TYPE II

- Fx at base of odontoid
- 65-70% of odontoid fxs
- 35-85% nonunion rate with external orthosis
- Vascular supply
- Inadequate immobilization

Type II Odontoid Fractures

- No Treatment
- Collar
- Halo
- Anterior Screw Fixation
  - Brooks
  - Screw fixation
    - Transarticular
    - C1 – C2 pars/pedicle
    - C1 – C2 laminar

Type II Odontoid Fractures

- No Treatment
  - 18 patients - 100% nonunion

Type II Odontoid Fractures

- Collar
- Halo
  - 0 – 79% success
  - Patients > 50 years 21 times more likely to fail halo than those less than 50.
Risk Factors for Nonunion of Type II Odontoid Fractures treated with a Halo

- Age > 50
- Displacement greater than 6 mm
- Comminution of fracture
- Posterior displacement

Type II Odontoid Fracture in the Elderly

Immobilization
- Low fusion rate - 22%
- Complications – 52%
- Mortality (in hospital) – 35%

Frangenet et al. J Trauma 2007

Anterior Screw Fixation

  - 127 patients with recent fractures (Type II and III)
  - 88% fusion rate
  - 10% hardware complications, 1 death

Anterior fixation of odontoid fractures in an elderly population

Clinical article

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Object: Fractures of the odontoid process are the most common fractures of the cervical spine in patients over the age of 70 years. The incidence of odontoid fracture in this population has been estimated to be 20-fold greater than that in patients under the age of 50 years of surgical stabilization is not used. Anterior and posterior approaches have both been advocated, with excellent results reported, but surgeons should understand the drawbacks of the various approaches. We reviewed a series of 127 consecutive patients, 63 with recent fractures (Type II and III) treated with direct anterior screw fixation, and 64 with remote fractures (Type IV), treated with posterior approaches.

Methods: A retrospective review was undertaken to identify patients who had direct fixation of an odontoid fracture at a single institution from 1991 to 2000. Patients were followed up using interval computed tomography, and instability was evaluated in both initial, follow-up, or revision. Patients with bone or screw union were classified as stable. In addition, the incidence of procedure- and implant-related complications was extracted from the medical record.

Results: Of the 57 patients over age 70 who underwent placement of an odontoid screw, 42 underwent follow-up from 3 to 62 months (mean 15 months). Stability was sustained in 81% of these patients. In patients with fixation using 2 screws, 96% demonstrated stability on radiograph at final follow-up. Only 36% of patients with fixation using 2 screws demonstrated radiographic stability at final follow-up. Only 36% of patients required a feeding tube and 19% had aspiration pneumonia that required antibiotic treatment. Complications: Direct fixation of Type II odontoid fractures showed stability rates > 80% in this challenging population. Significantly higher stabilization rates were achieved when 2 screws were placed. The anterior approach was associated with a relatively high dysphagia rate, and patients must be counseled about this risk before surgery.

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Key Words: elderly • fracture • odontoid process • odontoid screw
Anterior Fixation of Odontoid Fractures in the Elderly

- 57 patients overall
- 42 patients >70; mean 15 month f/u
  - Fusion 57%
  - Stable fibrous union 24%
  - Nonunion 19%
- Single screw
  - 56% stability
- Two screws
  - 96% stability

Dysphagia
- 35% early postoperative period
- 25% feeding tube
  - 2 days – 4 months

Pneumonia
- 19%

Perioperative MI
- 5%

Anterior Screw Fixation

- “We conclude that anterior screw fixation according to Bohler is associated with an unacceptably high rate of problems in the elderly. Probable causes may be osteoporosis with comminution at the fracture site, or stiffness of the cervical spine preventing ideal positioning of the screws. As non-operative treatment also often fails, the method of choice seems to be posterior C1-C2 fusion.”

Anterior Screw Fixation in the Elderly

- Fusion rate 57 – 77%
- Complication rate 10 – 35%
- Preservation of normal C1-C2 rotation - unproven
**Posterior Fixation**

- Brooks Fusion
- 35 – 92% success


**Transarticular Screw Fixation**

- 98% fusion
- 5 DVT, one deep wound infection

**Transarticular Screw Fixation**

- 96% fusion
- 2 wound infections

**Atlantal-Axial Fusion**

- 2002 65 consecutive patients with 2 year followup
- 20% unilateral screw
- One nonunion in each group
  - Bilateral
  - Unilateral
C1-C2 Screw Fixation

- 100% fusion
- “No neurological, vascular, or infective complications.”

Harms, Melcher: Posterior C1C2 fusion with polyaxial screw and rod fixation. Spine 2001

100% fusion
no neural or vascular injuries

Geriatric Odontoid Fractures

- 68 consecutively operated patients older than 65 years
  - Mean 78.5 (65 – 93) (27 female, 41 male)
- Follow up
  - 3 deaths
    - Quadraplegic, PE, pulmonary insufficiency did not want vent
  - Less than 4 months - 8 patients (some recent)
  - 57 patients
  - 18 months mean follow up

Geriatric Odontoid Fractures

- Treatments
  - Transarticular screws 24
  - C1 – pars/pedicle 20
  - C1 – laminar 16
  - Hybrid 8
  - Rib autograft, cable C12 when possible
- Postoperative Immobilization
  - 17 none
  - MJ Mean 7.5 weeks (4 – 12)

Geriatric Odontoid Fractures

- C1 fractures
  - Posterior arch 7
  - Jefferson 7
- Misc injuries
  - Long bone, facial fractures, single head injury
- Expected comorbidities
  - HTN (26), cardiac (21), COPD (7), diabetes (5), cancer, dementia, Parkinson, COPD, CVA

Geriatric Odontoid Fractures

- 80% had preop pain
  - Mean VAS
    - Preop 4.1, Postop 1.0
- 11 treated 6 months post injury
  - Significant instability, Pain
  - Mean VAS
    - Preop 4.7, Postop 0.5
Geriatric Odontoid Fractures

- Complication Rate 18%
  - Pneumonia (5), wound infection (3, only 1 subfascial), pulmonary edema, MI, PE, ARDS
- Dysphagia 12% (3 with short term Dobhoff)
- Neurological decline 8%
  - All C2 hypesthesia
    - Pars/Pedicle (4), Laminar (1)
- Mean Nurick Pre – 0.8 (0 – 5); Post 0.5 (0 – 5)

Nonunion Rate 9%, 2 reoperated
- Transarticular 1
- C1 lateral mass/C2 translaminar 4/16 (25%)
Geriatric Odontoid Fractures

- Posterior fusion morbidity and mortality is acceptable
- Dysphagia and nonunion rates much less than with anterior procedure
- C1 – C2 translaminar technique only if no other option