Geriatric Odontoid Fractures – What should we do about them?
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1. A very common problem that needs an answer
   a. Odontoid fractures are the most common cervical fractures in those > 70
      i. Odontoid fractures are the most common spine fracture in those > 80
   b. Type II fractures are the most common in this age group

2. A high risk problem
   a. Nonunions
      i. With nonoperative care, nonunions may occur up to 85%
   b. Mortality is high regardless of treatment method
      i. 30 day (Chapman et al, AO Spine NA geriatric odontoid fracture study, Spine 38(13), 2013): 14% (46/322)
         1. Nonoperative 22% (35/157)
         2. Operative 7% (11/165)
   c. Surgical complication rate is high
      i. Major medical 27% (death, neurologic worsening, CSF leak, tracheostomy, prolonged swallowing difficulty) (Molinari, Functional Outcomes, Morbidity, Mortality, and Fracture Healing in 26 Consecutive Geriatric Odontoid Fracture Patients Treated With Posterior Fusion, J Spinal Disord Tech 26(3) 2013)
         1. N=26 treated with C12 PSF, age 79 with > 50% dens displacement
         2. Mortality 19% at 13 month FU (3 mo to 4 years)

3. But, the outcomes of treatment are unclear
   a. Is chronic nonunion likely to lead to symptomatic myelopathy?
      Possible, but unclear how likely and over what time frame
      i. Yes
            a. N=16, age 44 (18-84, only 3 aged 60 or more)
         2. Kirankumar (Kirankumar MV. Surgical management of remote, isolated type II odontoid fractures with atlantoaxial dislocation causing cervical compressive myelopathy. Neurosurgery 2005; 56: 1004–12)
            a. N=16, Age 34 (10-68) with dens nonunions and myelopathy
ii. No – delayed myelopathy is rare
      a. 5 non-myelopathic pts with chronic, unstable nonunions of dens observed over 4.5 years (range 16 months to 7 years)
      b. none developed myelopathy or worsening instability
      c. due to limited activity and life span, risks of surgery may outweigh benefits

b. Is there a correlation between fracture healing and clinical outcomes?
   Probably, but this has not been proven or to what extent
   i. Yes
      1. Significantly better SF36 and NDI with operative care
         a. Vaccaro A, Functional and Quality-of-Life Outcomes in Geriatric Patients with Type-II Dens Fracture, JBJS 95, 2013

ii. No
      a. N=34, age 84 (71-99), type 2 fractures displaced < 50%
      b. Rigid orthosis 24 hours per day
      c. At 15 mo FU (3 mo to 4 years): 6% healed, 70% mobile nonunion (avg 2.5 mm)
      d. NDI: mild disability
      e. Pain scores: low (avg 1 on 1 to 10 scale)
      f. None developed myelopathy
      g. Mortality 12%

4. In the face of these unknowns, how to decide what to do: The answer is a risk/benefit calculation based on numerous patient factors
   a. Mental status
      i. Severe dementia: treat with benign neglect (no orthosis, mobilize as tolerated)
   b. Medical status
      i. Prohibitive medical comorbidities: orthosis 3 months
   c. Non/minimally displaced: bias towards orthosis
   d. Myelopathy: bias towards surgery
   e. “Youthful” but elderly: bias towards surgery
   f. Significant instability: bias towards surgery

5. Case discussions