Fractures of the upper cervical spine
Atlas fractures
Treatment:
1. Conservative
2. Post. Op stabilisation
Axis fractures

**Incidence:** 17 - 18% of c. spine injuries

**Classification:**
- 55% odontoid
- 23% hangman type
- 22% miscellaneous
Odontoid process fractures

**Incidence:** 10% of c. spine injuries, 55% C2

**Classification:** Anderson and D´Alonzo (1974)

**Therapy:** surgical in type II. and some III.

**Remark:** non-union rate in type II.
conservative treatment 26-100%

I.  
II.  
III.
Reduced after trauma

One month after - in halo
Surgical technique
real-time double rectangular fluoroscopy
Approach
Incidence: 4% of c. spine injuries, 23% C2
Classification: Effendi (1981)
Therapy: conservative, surgical
First description: Haughton (1866)
J.J. Marshall - M submental knot (1888)
F. Wood-Jones hangman´s fracture (1913)
Schneider - in other trauma (1965)
Classification (Effendi 81)

1. Amount of translation (3.0 - 3.5 mm)
2. Amount of angulation (11°)
3. Injury biomechanics

Final status of disc, ligaments and joint capsule is crucial!
Classification (Effendi 81)

Type I.
- Translation < 3.5mm
- Angulation 0
- Disc not destroyed

To distinguish Type II dynamic picture is necessary!
Classification (Effendi 81)

Type II.
- Translation > 3.5mm
- Angulation yes
- Disc destroyed

Flex.
Extens.
Tract.
Type III.
Translation signif
Angulation yes
Facet dislocation
Disc destroyed

Classification (Effendi 81)
Conservative treatment

- Prolonged traction
- Halo-related problems
- Not optimal reduction
- Sagittal balance
- Acceleration of deg.
- Artritic pain
- No long-term studies
- FDA approval
- No surgical risk
- 95% fusion rate
- Acceptable results
- Price in US
Type I. - fracture gap < 3 mm

Type I. - fracture gap > 3 mm
Non-dislocated fracture - posterior approach (Judet)

Reasons for (CT) guided surgery

1. danger of great vessels tear
2. danger of spinal cord damage
3. danger of visceral trauma
4. atypical anatomy
Type II.

Type III.

Posterior approach

Combined approach
**Miscellaneous fractures**

**Incidence:** 4% of C spine injuries, 22% C2

**Classification:** Hadley (1985), Benzel (1994)

**Therapy:** conservative x surgical

**First description:** ignored until Hadley (1985)

Type of treatment is determined by type of instability (most conserv.)
Unstable comminution of C2 (M 57y) - refused halo vest
Unstable comminuted C2 (26y male) on ventilator, unstable chest., halo impossible
Combined C1-2 fractures - up to 40%
Combined C1-2 fractures - individual approach
Traumatic atlanto-axial instability

**Etiology**
- fresh trauma
- chronic posttraumatic
  - rheumatoid arthritis
  - degenerative arthrosis
  - tumor
  - iatrogenic
  - developmental

**Radiology**
- dynamic lateral
  - adult 3 mm
  - child 4.5 mm
Surgery of atlanto-axial instability

**Posterior approach**

1. silk loop - Mixter and Osgood (1910)
2. wire loop and H graft Gallie (1939)
3. modifications Brooks and Sontag
4. interlaminar clamps - Halifax, Apofix
5. transarticular C2/1 fusion - Magerl (1979)

**Anterior approach**

1. anterior transarticular C2/1 fusion

From Principles of Spine Surgery
**Transarticular C2/1 fusion - Magerl (1979)**

**Advantages**
- immediate stability
- rotational fixation
- early mobilisation
- soft collar (No halo)
- high fusion rate

**Disadvantages**
- risk of vertebral artery tear
- fluoroscopy mandatory
Scoliosis (5)

M. Scheuermann (17)

Spondylosis, spondylarthrosis (27)

Trauma C1 - 2

subaxial C (51)

T - L

Specific + non-specific inflammation (24, 26)