Rheumatoid Arthritis of the Cervical Spine

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Rheumatoid arthritis (RA) is a chronic multisystemic disease of unknown cause.

Characteristic feature: *inflammatory synovitis*
- peripheral joints / symmetrical distribution
- cartilage destruction / bone erosion
- joint deformity

*After the metacarpophalangeal joints,*

*the most common region to be involved in RA is the cervical spine.*

History: 1890, *Garrod reported that 36% of his pts with RA had c-spine involvement.*

Introduction

Radiographic signs: 43-86%

*Pellicci et al (5 yrs study / 106 RA pts)

radiological evidence of c-spine involvement: 43% of pts / baseline

86% of pts / follow-up

**Mikulowski et al: fatal cord compresion 10% in pts with RA

Introduction

✓ Risk factors for c-spine involvement:
  - Males
  - RF
  - Rheumatoid nodules
  - Peripheral activity
  - Vasculitis
  - Corticosteroid use

✓ Clinical signs:
  - Neck pain 40 to 88%
  - Neurologic compromise 7 to 34%

RA & C-Spine Imaging

- **Atlanto-axial subluxation** (65% of all cervical subluxations)
  - majority anterior
  - 20% lateral
  - 7% posterior
  - rotatory rare

- **Superior migration of the odontoid**
  - second most common deformity
  - 20% of pts
  - odontoid erosions

- **Subaxial c-spine involvement**
  - Subaxial subluxation: 15% of pts
  - Apophyseal joint ankylosis

RA & C-Spine Imaging

aAAS  AAI  pAAS  IAAS  
rotatory AAS  NRRHT  SAS  apophyseal joint ankylosis
RA & C-Spine Imaging

Radiography

✓ Anterior atlantoaxial subluxation
✓ Vertical subluxation
✓ Subaxial spinal involvement
  - Subaxial subluxation

Magnetic Resonance Imaging

✓ Pannus
✓ Spinal cord
Anterior atlantoaxial subluxation (AAS)

- AAS: 50% of pts symptomatic

The role of plain radiography is to establish whether there are risk factors for cord compression.
AAS

- Anterior atlantodental interval (AADI)

AADI > 3-6 mm: early instability
  transverse lig.

AADI > 6 mm
  transverse & alar lig.

AADI > 9 mm
  surgical stabilization.

AADI: yellow line
AADI : yellow line

AAS

Neutral

Flexion
AAS
- Posterior atlantodental interval (PADI)

All cervical spinal levels
- cord: 10 mm
- CSF: 2 mm
- dura: 2 mm

- PADI > 14 mm
  (avoid cord compression)

- spinal canal: 17-29 mm at C1
✓ AAS

Neutral

Flexion

PADI: red line
✓ Vertical subluxation
✓ Vertical subluxation

McGregor´s line - Odontoid tip > 4.5 mm
✓ Vertical subluxation

Ranawat method (♂ > 15 mm & ♀ > 13 mm)
✓ Vertical subluxation

Clark’s stations
✓ Vertical subluxation

cervicomedullary angle
(normal range: 135° to 175°)
✓ Odontoid erosions
✓ Odontoid erosions
✓ Subaxial subluxation

Subluxation > 1mm
> 3.5 mm !!!

Cervical Height Index (CHI)

- subluxations at multiple levels
- loss of disk height
- bony collapse

- CHI < 2 (neurologic compromise)
Subaxial subluxation

✓ Sudaxial spinal involvement

- Apophyseal joints (erosions - ankylosis)
- Intervertebral disk - space narrowing
- Irregularity of the subchondral margins of the vertebral bodies
- Erosion and sclerosis
- Corticosteroid - ischemic necrosis of bone - vertebral collapse
Magnetic Resonance Imaging

Major indications for c-spine MRI in RA:
- abnormal measurements on plain radiographs
- unremitting suboccipital /cervical pain
- progressive / severe subluxations
- symptoms of cord/brainstem/vert. art. compression

MRI: evaluation of the spinal cord and neural elements

- Presence and effect of pannus on the spinal cord
- Spinal cord signal can be assessed
  (edematous spinal cord changes: poor clinical status, poor prognosis & poor postoperative outcome)
AAS

“pannus”
Odontoid erosions - “pannus”
Odontoid erosions - “pannus”

Subaxial subluxation

AAS

Subaxial subluxations
Brainstem compression - myelopathy
Plain radiography: Flexion / extension views
- the level of involvement
- evidence of instability

AADI > 9 mm or PADI < 14 mm
Vertical subluxation
Subaxial subluxation > 3.5 mm

Further imaging with MRI: pannus & spinal cord

The major role for MRI: pre & after operative assessment
** 165 RA pts (143♀ / 22♂)
mean age: 59,6 ± 12,5 yrs
disease duration: 12,3 ± 7,9 yrs
RF (+) : 63,6%

Radiological findings: 146 pts
- AAS: 20,6%
- Odontoid erosions: 2,4%
- Sudaxial subluxations: 43,6%
- Disk space narrowing: 66,1%
- Vertebral plate erosions - sclerosis: 43,6%

C - spine involvement: frequent finding
mild severity

** 51 RA pts (42♀ / 9♂)
mean age: 56,5 ± 10,4 yrs
disease duration: 12,4 ± 8,5 yrs
RF (+) : 64,7%
clinical signs: c-pain & stiffness 30%

Rx / MR findings: 40 / 44 pts
- Peridental pannus: 88%
- Odontoid erosions: 23,5%
- AAS: 13,7%
- Brainstem compression: 5,9%
- Sudaxial subluxations: 10%

Peridental pannus correlated (p<0,05) with:
- DAS-28
- RF(+)
- Erosive changes hand-wrist
  (Larsen criteria)

