Rheumatoid arthritis

- Chronic autoimmune multisystemic inflammatory disease that affects many organs but predominantly attacks the syno
- Onset is generally in adulthood, peaking in the 4th and 5th decades. The pediatric condition, juvenile rheumatoid arthritis, is discussed separately.vial tissues and joints.
- **Risk factors**
  - smoking (seropositive RA)
  - obesity
  - low socioeconomic status
- Articular features generally develop prior to extra-articular features.
- Articular features include a symmetrical deforming peripheral polyarthropathy that classically affects the fingers and hands, but also commonly involves the feet and can involve multiple other joints

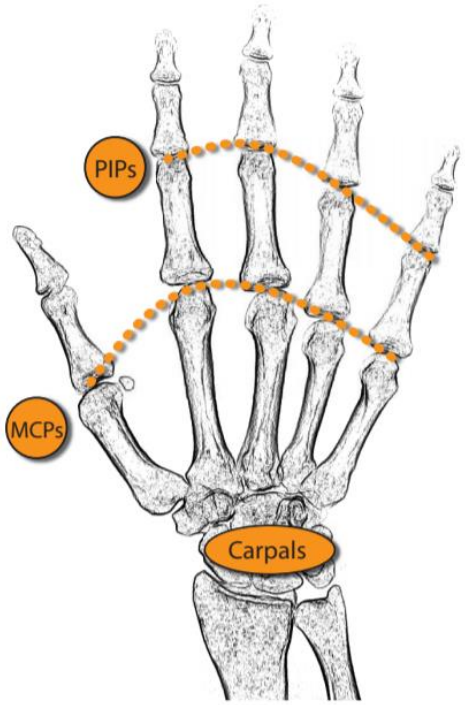
Rheumatoid arthritis

- The inflammatory response leads to pannus formation.
- Pannus is an edematous thickened hyperplastic synovium infiltrated by lymphocytes T and B, plasmocytes, macrophages, and osteoclasts.
- Pannus will gradually erode bare areas initially, followed by the articular cartilage.
- It causes fibrous ankylosis which eventually ossifies.

Radiograph and CT findings	*MRI findings*
Marginal erosions, which first occur at the intracapsular articular margins in the "bare area." The bare area is a region of exposed bone just within the joint capsule that is not covered by thick cartilage. **Soft-tissue swelling**. **Diffuse, symmetric joint space narrowing**. **Periarticular osteopenia**. **Joint subluxations**.	**Marginal erosions,** which are fluid signal intensity and enhance. **Synovitis,** with thickened and early enhancing synovium. **Subchondral edema**, due to inflammatory and reactive changes. **Joint subluxations**.

Rheumatoid arthritis in the hand and wrist

- The hands are commonly affected in patients with RA.
- Typical joints involved are the MCPs, PIPs, and the carpal articulations. The DIPs are usually spared.
- The earliest radiographic changes of RA are soft-tissue swelling and periarticular osteopenia, reflecting synovitis and hyperemia.
- Erosions occur early in disease, typically of the radial aspects of the second and third metacarpal heads, the radial and ulnar aspects of the bases of the proximal phalanges, and the ulnar styloid.
- Joint subluxations are present in more advanced disease, which typically are not reducible and lead to several common deformities, including:
  - *Boutonnière* deformity (PIP flexion and DIP hyperextension).
  - *Swan neck* deformity (PIP hyperextension and DIP flexion).
  - Ulnar subluxation of the fingers at the MCPs.



Rheumatoid arthritis in the spine

- The cervical spine is involved in up to 70% of patients. Involvement is increased with more severe and long-standing disease.
- The general pattern of rheumatoid arthritis in the cervical spine includes subluxation at multiple levels, osteopenia, and erosions of the odontoid, facet joints, vertebral endplates, and spinous processes. Unlike osteoarthritis, there is no bone production.
- A characteristic finding of rheumatoid arthritis is **atlantoaxial (C1–C2) subluxation**. Atlantoaxial subluxation may occur in multiple directions, including anterior (most common), posterior, vertical (atlantoaxial impaction), rotatory, and lateral.
- **Anterior atlantoaxial subluxation** is caused by inflammation and resultant laxity of the transverse ligament, which normally functions to stabilize the atlantoaxial joint.

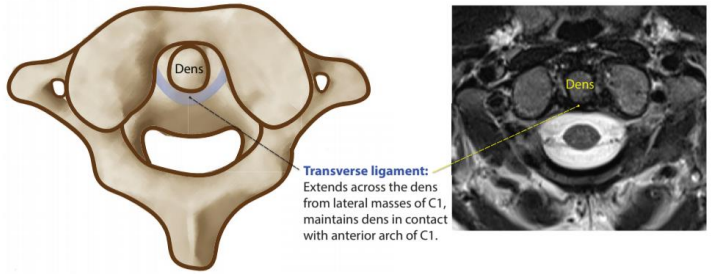


Illustration and T2-weighted axial MRI demonstrating the transverse ligament, which stabilizes the atlantoaxial (C1–C2) articulation between the dens (C2) and C1.

Anterior atlantoaxial subluxation may not be apparent if flexion radiographs are not obtained.

Anterior atlantoaxial subluxation is present if the atlanto-dental interval (ADI) is >2.5 mm (>5 mm in children). The atlanto-dental interval is the distance between the anterior aspect of the dens and the posterior aspect of the anterior ring of C1.

Lateral radiograph of the cervical spine in extension demonstrates the atlanto-dental interval (calipers) measuring less than 2.5 mm.

Lateral radiograph of the same patient in flexion demonstrates marked widening of the atlanto-dental interval (calipers), indicating atlanto-axial instability.

- **Vertical atlantoaxial subluxation** (also called atlantoaxial impaction) results from C1–C2 facet erosion and collapse, leading to protrusion of the odontoid through the foramen magnum. This may compress the midbrain.

  Direct visualization of the odontoid is usually not possible on a lateral radiograph, but impaction may cause the anterior arch of C1 (normally in-line with the odontoid) to sink to the level of the body of C2.

- In the setting of RA, **posterior atlantoaxial subluxation** is usually due to odontoid erosion. It may also be caused by odontoid fracture.

Clinical Issues

- RA in 1% of worldwide population
  - 5% in some Native American populations
- F > M (3:1)
- Proximal: carpus, MCPs, PIPs
- MCPs involved in 85% of patients with RA
- Carpus involved in 80% of patients with RA
- Hand PIP involved in 75% of patients with RA

Location

- Symmetry of disease is classic
  - Early in disease, may be unilateral/asymmetric
- Proximal distribution
  - MCP or PIP
  - Distal radioulnar joint (DRUJ), ulnar styloid
  - Radiocarpal (RC) joint
  - Intercarpal joints
    - » Early findings better appreciated on MR than radiography
- DIPs not involved until end stage

Diagnostic Checklist

- Earliest RA may be monostotic or asymmetric
  - » Must differentiate from septic arthritis
- Use sites of focal soft tissue swelling to guide you to subtle bone findings on radiography
- Assess for cortex indistinctness and dot-dash pattern for earliest radiographic signs of erosion