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Hand Rheumatoid Arthritis*Leo M. Rozmaryn, MD***Synonyms**

Rheumatoid arthritis
 Rheumatism
 Inflammatory arthritis

ICD-9 Code

714.0
 Rheumatoid arthritis

Definition

Rheumatoid arthritis is a systemic autoimmune disorder of unknown etiology. It is a slowly progressive disorder that affects virtually any joint in the body and can have a profound effect on the hand. Rheumatoid synovitis in the hand releases lytic substances that destroy articular cartilage as well as joint capsule, bone, or tendon sheath. Understanding these patterns will dictate the timing and indication for surgical and non-surgical treatment. The disease can take three forms: *monocyclic*, *polycyclic*, and *progressive*, and it is often difficult to predict which pattern the patient will follow. Although primary treatment for the condition is medical, surgery is reserved for cases of progressive deformity and failure of medical treatment to stem the synovitis or impending tendon rupture.

Symptoms

The chief complaints are finger joint pain, stiffness, swelling, erythema, and progressive deformity. Pain is usually worse at night, and morning stiffness is common. The swelling may either be localized and modular or diffuse.

Physical Examination

The evaluation of a rheumatoid arthritic hand should include the following:

1. Joint pathology and joint stability
2. Joint pain and inflammation
3. Limitations in active and passive range of motion for grip and pinch strength deficits
4. Limitations in hand dexterity
5. The degree of disability with respect to self-care, and vocational and recreational activities

The examination of a rheumatoid hand is complex and varies with the stage of the disease. Early in the process, joints are usually stiff, painful, swollen, and red as a tense synovitis predominates. There may be large tenosynovitis on the dorsum of the hand and wrist. There also may be triggering of the digits secondary to flexor tenosynovitis, but the swelling on the volar side is less apparent than on the dorsum. As the disease progresses, the joints may become very loose and frail as they are destroyed. This is common in the



FIGURE 1. Rheumatoid hand. Note the multiple presentations in one hand.

1. Ulnar drift at the metacarpophalangeal joints.
2. Swan neck deformities of the third and fourth fingers.
3. Boutonniere deformity of the fifth finger.
4. Volar subluxation at the metacarpophalangeal joint.
5. Radial rotation of the metacarpals.

interphalangeal joints of the fingers and the thumb and is due to complete destruction of the articular surface of the joint and destruction of the collateral ligaments. Either boutonniere deformities (with flexion deformities of the proximal interphalangeal joint and extension deformities of the distal interphalangeal joint of the digits) or swan neck deformities (with hyperextension of the proximal interphalangeal joint with flexion of the distal interphalangeal joint) may predominate, and one can see varying patterns on the fingers of one hand (Fig. 1).

The thumb undergoes similar deformity. The metacarpal phalangeal joints may exhibit full or partial subluxation of the proximal phalanges on the metacarpal heads with the decided ulnar drift. Later in the disease, there may not be any synovitis because it may have burned itself out, and left joint destruction in its wake. In the thumb, typically the carpal metacarpal joint is dislocated with an abduction deformity of the metacarpal, causing a swan neck deformity. There may be an inability to extend one or more digits or the thumb secondary to rupture of the extensor tendons from dorsal tenosynovitis or inability to flex the fingers secondary to attritional rupture of a flexor tendon or locking of a tight trigger digit. With subluxation of the extensor tendons, the metacarpal phalangeal joints may appear in a flexion deformity without rupture of the extensor tendons.

Functional Limitations

Functional limitations in these patients may progress very slowly, and because of this, patients may remain fully functional for an extended period of time and may be able to continue activities of daily living, fine motor coordination, and gross grasping and gripping functions until severe deformities predominate. However, during acute exacerbations, activities of daily living and the ability to grip grossly and perform fine manipulations may be severely curtailed.

Diagnostic Studies

The plain x-ray remains the "gold standard" for diagnostic imaging. A diffuse osteopenia, especially in the periarticular regions, and joint space narrowing may predominate early, before deformities develop. A zigzag deformity with radial deviation of the metacarpals and ulnar deviation of the proximal phalanges at the metacarpophalangeal joint is typical. As lysosomal enzymatic degradation of the articular surfaces and the subchondral bone progresses, all architecture of the fine interphalangeal and metacarpophalangeal joints and the basal joints of the thumb may be destroyed. One can easily see the presence of boutonniere's and swan neck deformities on x rays.

Laboratory tests include testing for rheumatoid factor.

Differential Diagnosis

Septic arthritis	Psoriatic arthritis
Lyme's disease	Gout
Systemic lupus erythematosus	Pyrophosphate deposition disease

Treatment

Initial

Nonsteroidal anti-inflammatory drugs (NSAIDs), including cyclooxygenase-2 (COX-2) inhibitors, may decrease pain and inflammation but will not inhibit synovial proliferation. The effectiveness of NSAIDs is related to the prevention of prostaglandin synthesis. Low dose corticosteroids are often beneficial in treating symptoms of inflammatory joints. Remittive agents, including antimalarial drugs, sulfasalazine, methotrexate, gold, D-penicillamine, immunosuppressive agents (azathioprine and cyclophosphamide) and cyclosporine, are used regularly.

Rehabilitation

Rehabilitation of the rheumatoid hand involves resting the involved joints, modification of activities that stress the joints, joint protection and work simplification instructions (refer to Table 1 on page 171), splinting regimens, heat modalities followed by gentle active range-of-motion exercise, and resistive exercise (see also Chapters 28 and 29).

Extensor Tendon Postoperative Rehabilitation

Within 5 days after surgical reconstruction of the extensor tendons, patients are placed into dynamic extension-assist orthotics for a program of flexion and passive extension exercises, under rubber band protection that allows for movement of the extensor mechanism without undue tension across the suture sites. After 6 weeks, the splints are discontinued and full active and passive range-of-motion exercises are commenced with a strengthening program.

Flexor Tendon Postoperative Rehabilitation

Within 5 days after operative repair of flexor tendons, the patient is placed in a flexion-assist orthotic, allowing active extension and passive flexion, under rubber band control that allows full gliding of flexor tendons without undue tension across the suture sites. Then under the supervision of a hand therapist, after 6 weeks, all splinting is discontinued, and full active and passive range-of-motion exercises are commenced, and a slow, progressive strengthening program is begun.

Metacarpophalangeal Postoperative Rehabilitation

After introduction of metacarpophalangeal silastic implants, several methods of postoperative rehabilitation can be used; however, the classic method is to immobilize for a period of 10 to 14 days and then begin gentle, slow active and passive range-of-motion exercise.

A more recently advocated treatment protocol is either immediate use of a passive motion machine, allowing full range of motion at the metacarpophalangeal joint, or early intervention with a hand therapist utilizing extension-assist orthotics under light tension of all four palmar digital metacarpophalangeal joints, allowing full flexion of the metacarpophalangeal joints in the extension-assist device. Full range of motion of the metacarpophalangeal joints and the interphalangeal joints is achieved with the help of a hand therapist. In about 4½ weeks, all splinting is discontinued and a full strengthening program of the metacarpophalangeal joints is commenced.

Interphalangeal Joint Postoperative Rehabilitation

After an interphalangeal joint arthrodesis, pins are kept in place for 8 weeks, and the splint is protected in a Thermanplast orthosis to obtain the position of the arthrodesis, at the same time mobilizing the adjacent joints to prevent contractures. After 8 weeks, the pins are removed, and once it has been ascertained that fusion has taken place, strengthening exercises can begin.

After an implant arthroplasty, gentle active and passive full range of motion of the proximal interphalangeal joint is begun under supervision of a hand therapist. Flexion is achieved utilizing active, active assist, passive, and joint blocking techniques. At 5 weeks, formal strengthening is begun.

Procedures

Injection of intra-articular steroids may halt progression of the synovitis in a given joint. A good rule of thumb is no more than three injections spaced at least 3 months apart (refer to page 172 for procedure details).

Surgery

Priorities for managing patients with rheumatoid disease of the hand are pain relief, restoration or improvement of function, prevention of deformities, and lastly, the appearance of the hand. The presence of a deformity is not in of itself an indication for surgery. If similar deformities exist in both hands and present a functional problem, one hand should be corrected to facilitate large object grasp; the contralateral hand may be left undisturbed to provide small object grasp and power. It is important to evaluate the stage of the disease of any particular deformity because the management of deformities vary from stage to stage. In general, stage II deformity is usually flexible, stage III exhibits limited movement, and stage IV present with a formation of fixed joint contractures.

Frequently the wrist needs to be addressed before finger deformities are addressed so that hand rehabilitation can proceed in an orderly fashion. In general, proximal joints such as the shoulder and elbow should be operated on before the distal ones (hand and wrist). Metacarpophalangeal joints should be reconstructed before proximal interphalangeal joints. Arthrodesis of the wrist and thumb metacarpophalangeal joint arthrodesis can be accomplished simultaneously; however, combining these with metacarpophalangeal implant arthroplasties that require prompt remobilization may compromise the end result.¹

Extensor Tendon Surgery (see also Chapter 28)

Extensor tenosynovitis presents with a painless dorsal wrist mass distal to the retinaculum of the wrist. A tenosynovectomy is indicated for persistent tenosynovitis unresponsive to medical treatment, a tenosynovial mass increasing in size, or rupture of an extensor tendon.

The most serious complication of untreated dorsal tenosynovitis is tendon rupture. Patients present with a sudden loss of finger extension. Treatment usually involves transfer of the distal end of the ruptured tendon to an adjacent tendon. In the event of multiple tendon ruptures, tendon transfer from the volar side may be indicated. When both wrist extensor tendons are ruptured on the radial side, arthrodesis is required.²

Flexor Tendon Surgery (see also Chapter 29)

Flexor tenosynovitis can contribute to a rheumatoid patient's complaints of weak grasp, morning stiffness, volar swelling, and median nerve compression. A tenosynovitis may be diffuse or create discrete nodules that can limit tendon excursion. At the wrist, tenosynovial biopsy is indicated for median nerve compression, a painful tenosynovial mass, or tendon rupture. The tendon most commonly ruptured is the flexor pollicis longus. A tendon bridge graft, a two-stage flexor graft, or a tendon transfer can be performed to reconstruct the rupture. A ruptured profundus tendon is sutured to an adjacent intact tendon. The presence of one tendon rupture is an indication to promptly perform surgery to prevent further tendon damage.³

The palm is the most common location of flexor tenosynovitis. Indications for flexor tenosynovectomy in the palm include pain with use, triggering, tendon rupture, and passive flexion of the fingers that is greater than active flexion. For tendon rupture within a digit, a distal interphalangeal joint fusion should be considered. When both tendons are ruptured in the digit, consideration should be given to a stage tendon graft or fusion of both the PIP and the distal interphalangeal (DIP) joints.

Metacarpophalangeal Joint Surgery

The most common deformities of the metacarpophalangeal joint are palmar dislocation of the proximal phalanx and ulnar deviation of the fingers. As the inflammatory process disrupts the digit stabilizers, anatomic forces during use of the hand propel the digits into ulnar deviation. Metacarpophalangeal synovectomy is indicated for the painful, persistent metacarpophalangeal joint synovitis that has not responded to medical treatment and demonstrates minimal cartilage destruction on inspection or radiographically. Silicone implant arthroplasty is indicated in patients with diminished range of motion, marked flexion contractures, poor functional position, severe ulnar drift, and loss of function. Long-term studies have shown mild loss of motion over time and some recurrent deformity in patients whose disease course is progressive, but in general, the results are excellent.

Interphalangeal Joint Surgery

There are two types of proximal interphalangeal joint deformities, the boutonnière deformity and the swan neck deformity. Surgical intervention, such as flexor sublimis tenodesis or oblique retinacular ligament reconstruction, is designed to prevent hyperextension. Occasionally there is a mallet of the distal interphalangeal joint that can be corrected by partial extension.⁴ In later disease, intrinsic tightness requires release. In late swan neck deformity with loss of PIP movement, PIP implant arthroplasty is required, as well as sufficient soft tissue immobilization and release to achieve movement in flexion once again.⁵ In late deformities, especially in the index and middle fingers, arthrodesis may be required. Implant arthroplasties are recommended for the PIP joints of the ring and small finger joints.

In early boutonnière deformity, proximal interphalangeal (PIP) synovectomy may be performed, accompanied by postoperative splinting or joint injection. In distal extensor, tenotomy can gain distal interphalangeal joint flexion. In late disease, fixed flexion contracture with inability to passively extend the PIP joint may be present. Restoration of the extensor tendon function by itself will be unsuccessful. Treatment options are PIP arthrodesis or arthroplasty with a silastic implant. Long-term results reveal significant loss of range of motion of the PIP joint, but the deformity and pain level are markedly improved.

The thumb presents with two types of deformities. One is the boutonnière deformity with flexion of the MP joint and the extension of the interphalangeal joint. The other is the swan neck deformity with abduction subluxation of the base of the thumb metacarpal, hyperextension of the metacarpophalangeal joint, and flexion deformity of the interphalangeal joint of the thumb. This once again is caused by synovitis, and synovectomy and tendon reconstruction in early deformity may be quite helpful. For more severe swan neck deformity, carpometacarpal arthrodesis or arthroplasty may be necessary. There are many more complex deformities that can be discussed, but they are beyond the scope of this chapter.

Potential Disease Complications

Complications of rheumatoid disease in the hand include severe loss of function with complete joint destruction, severe flexion and ulnar deviation deformities of the digits, and severe swan neck and boutonnière deformities. Chronic intractable pain is also a common complication of the disease.

Potential Treatment Complications

Complications of treatment include infection, hardware breakage, non-union, silastic implant breakage, silicone synovitis, and progression of deformity. All of these would eventually lead to loss of function of the hand. Analgesics, NSAIDs, and COX-2 inhibitors have well-known side effects that most commonly affect the gastric, hepatic, and renal systems.

References

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