

Rheumatoid hand

Practical approach to assessment and management

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SUMMARY

Rheumatoid arthritis is a systemic inflammatory disease with a predilection for the synovial tissues. Its diverse involvement can be demonstrated in the hand, where several anatomical structures can be affected simultaneously. Proper management requires attention to this principle, and a complete diagnostic evaluation will help to identify correctly the cause of the patient's functional limitation and pain. We present a practical approach to managing rheumatoid arthritis in the hand.

RÉSUMÉ

L'arthrite rhumatoïde est une maladie inflammatoire systémique qui touche particulièrement le tissu synovial. La main peut servir de démonstration de ses diverses atteintes qui peuvent toucher simultanément plusieurs structures anatomiques. La ligne de conduite appropriée doit tenir compte de ce principe. Une évaluation diagnostique complète contribuera à identifier correctement la cause de la douleur et de la limitation fonctionnelle chez le patient. Les auteurs présentent une approche pratique au traitement de l'arthrite rhumatoïde de la main.

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RHEUMATOID ARTHRITIS (RA) IS A SYSTEMIC inflammatory disease that preferentially affects the synovial tissues. Synovial tissue is found within diarthrodial (synovial) joints and in the lining of tendons. Rheumatoid arthritis commonly involves the small peripheral synovial joints of the hands and feet.

Patients typically develop a symmetrical arthritis affecting the proximal interphalangeal (PIP), metacarpophalangeal (MCP), and wrist joints. It is important to realize, however, that RA can affect many other critical structures in the hand, apart from the joints, leading to functional limitation and disability. This review illustrates the extent to which RA can affect the hand and provides guidelines for therapy, using a simplified guide.

Clinical features

Rheumatoid arthritis can affect six anatomical structures in the hands: skin, muscles, nerves, joints, tendons, and blood vessels.^{1,2} Involvement of one site or any combination of sites

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can lead to functional handicap for RA patients.

Skin. Rheumatoid nodules tend to develop in areas of increased pressure and friction and are usually painless. They are an index of disease severity and usually affect patients who test positive for rheumatoid factor. Only about 25% of patients with RA will develop nodules. Nodules are commonly scattered over the back of the hand. Surgical management is reserved for cases in which nodules lead to functional limitation. Nodule breakdown with secondary infection is another indication for surgery.

Other skin findings include palmar erythema and thin, shiny, atrophic skin, especially over chronically inflamed joints. Small-vessel vasculitis can cause nail fold infarcts, splinter hemorrhages, and poor capillary refill.

Muscles. Atrophy of the intrinsic hand muscles is common in advanced RA and is secondary to a combination of disuse atrophy and to the inflammatory process itself. Atrophy tends to be bilateral and symmetrical, and is best seen as wasting of the interossei on the back of the hands. Asymmetrical muscle atrophy should prompt consideration of another pathogenic mechanism,

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such as a compressive neuropathy or a cervical myelopathy. Wasting of the thenar eminence can occur from median nerve compression, whereas wasting of the hypothenar eminence can occur from ulnar nerve compression. Reflex muscle spasm acts to protect the inflamed joints, but can be quite painful.

Nerves. Compressive neuropathy can involve the median nerve in the carpal

tunnel or the ulnar nerve either in the cubital tunnel at the elbow or in Guyan's canal at the wrist. Typical symptoms are pain and paresthesias in the distribution of the affected nerve. The examination sometimes reveals muscle weakness and atrophy with altered sensation. In carpal tunnel syndrome, tapping over the median nerve on the volar aspect of the wrist could reproduce sensory symptoms (Tinel's sign). Sustained flexion

Figure 1. Patient with active, recent onset rheumatoid arthritis: A) Bilateral MCP synovitis with subluxation, early Z-shaped thumb deformity on the right, developing boutonniere deformity of the right third digit, and bilateral ulnar drift are apparent. B) Palmar view shows bilateral ulnar drift, palmar flexor tenosynovitis at the base of the right third digit that is not clearly visible, and intrinsic muscle atrophy.



A



B

of both wrists for up to 1 minute can also reproduce symptoms of numbness and paresthesias in the first three fingers (Phalen's sign). Nerve conduction studies should be ordered so that surgical decompression can be considered. Flexor tenosynovitis at the wrist is a common cause of carpal tunnel syndrome in RA.

Rheumatoid arthritis can also lead to a polyneuropathy in a glove and stocking distribution with primarily sensory involvement. This is believed to be from a small-vessel vasculitis. An abruptly developing wrist-drop could be part of a mononeuritis multiplex involving the radial nerve. Cervical myelopathy secondary to rheumatoid neck disease can lead to a radiculopathy in the upper extremities. A careful neurological examination with flexion and extension x-rays of the cervical spine are mandatory. Nerve conduction studies are useful for documenting the exact site of nerve compression.

Joints. As mentioned previously, RA has a predilection for symmetrical involvement of the PIP, MCP, and wrist joints. Involvement of the distal interphalangeal joints suggests an alternate diagnosis: for example, psoriatic arthropathy. Physical findings are those of joint inflammation: pain, warmth, boggy soft tissue swelling, effusion, and painful limitation of motion. A symptom reflecting disease activity is the duration and intensity of morning stiffness. Duration of more than 1 hour suggests joint inflammation. Joint swelling is the most specific sign of joint inflammation, and pain on gentle stretching is the most sensitive sign (stress pain). Stress pain is defined as joint pain experienced at the extreme of restricted movement. A simple but sensitive test of rheumatoid hand function is assessment of grip strength.

Wrist involvement can affect not only the radiocarpal and intercarpal joints, but also the distal radioulnar joint (DRUJ). Synovitis in the wrist

joint, the radiocarpal joint, is best appreciated as a filling in of the normal hollows at the joint line distal to the ulna and radius. A proliferative synovitis develops and overlying tendons become involved through flexor and extensor tenosynovitis. Involvement of the DRUJ is best appreciated as a domed swelling over the ulnar head and between the distal radius and ulna where the synovial reflection forms the sacciform recess. Subluxation of the DRUJ secondary to weakening of the distal radioulnar ligament leads to dorsal migration of the ulnar head. On examination, the ulnar head often is unusually prominent, and differential movement between the distal radius and ulna could appear.

Radiographically, one sees osteopenia and diffuse loss of joint spaces, marginal erosions, and symmetric soft tissue swelling. The loss of bone mass leads to a shortening of the carpus, which can be quantified by the carpal to metacarpal ratio (length of the carpus to the length of the third metacarpal).

Deformities of the hand that are typical but not exclusive for RA include swan-neck deformity, boutonnière deformity, Z-shaped thumb, mallet deformity of the distal phalanx, ulnar deviation of the fingers, and subluxation of the MCP joints and wrist (*Figures 1 and 2*).

In the early stages, these deformities could be reversible, and this is when rehabilitation therapies should be emphasized, including splinting and hand exercise programs.³ These slow, but do not stop, the progression of rheumatoid hand deformity. The mechanisms for the development of the RA deformities are complex and multifactorial.⁴ They result from a loss of capsuloligamentous support at the inflamed joints. A dynamic process of deformation depends on both the direction of muscular forces and bony configuration. Each articulation is considered as part of an interdependent functional chain, which means that

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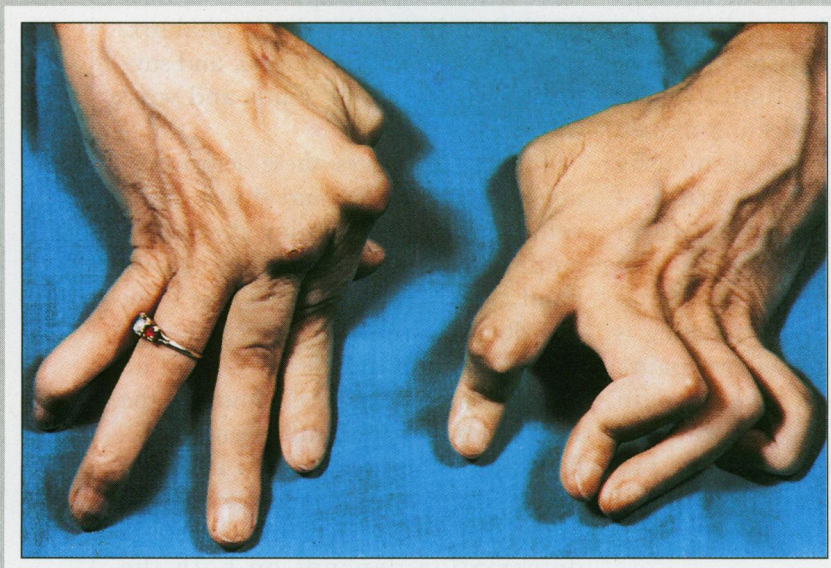
neighboring joints influence deformity development at closely related joints. For example, one reason for ulnar deviation at the MCP joints in RA is radial deviation of the carpal bones. Ulnar deviation then occurs in response to keep the tendons in line with the fingers.

Tendons. Dorsal tenosynovitis at the wrist is common in RA and can be the initial presentation. A soft, nontender mass is seen along any of the six synovial compartments. Most commonly involved are the compartments of the ulnar extensor muscle of the wrist and the extensor muscle of the fingers.⁵ Normally the synovial compartments on the dorsum of the wrist commence just proximally and end just distally to the dorsal carpal ligament. On examination, the swollen tenosynovium will be seen to move with the extensor tendons during active finger flexion and extension. This helps to differentiate dorsal

tenosynovitis from wrist joint synovitis. Wrist tenosynovitis in conjunction with wrist pain indicates concomitant synovitis of the wrist or DRUJ.

Dorsal tenosynovitis can lead to tendon rupture, but what percentage of patients with dorsal tenosynovitis will rupture their tendons is unknown. Risk factors for this complication include continued progression of the inflammatory process despite therapy, a history of tendon rupture, and a rapidly enlarging synovial mass.⁶ Mechanisms of tendon rupture include inflammatory infiltration within the tendon from the overlying synovial inflammatory tissue (pannus) and attrition (the sustained mechanical trauma to the tendon resulting from passing over a roughened bony surface). The ulnar styloid process and Lister's tubercle on the dorsal radius are two important bony surfaces that are eroded in the rheumatoid hand, which can lead to attrition of the overlying tendons. The result can then be tendon weakening

Figure 2. Rheumatoid arthritis: Hands show bilateral ulnar drift, MCP subluxation, bilateral intrinsic muscle atrophy, fixed hyperextension deformities of the right second to fourth PIPs with developing swan-neck deformity of the fourth and fifth digits, and fixed flexion deformities of the left PIPs (second to fifth), with fully developed boutonniere deformity of the left second to fifth digits.



and rupture. The most common extensor tendons to rupture are the extensors to the fourth and fifth digits and the extensor muscle of the thumb.⁶ The following clinical principles concern extensor tendon ruptures.⁷

- Single extensor tendon ruptures could cause only a slight extension lag because of the connections between tendons. This lag can delay their clinical recognition; thus, the extensor tendons should be tested independently. Rupture of two or more tendons is easily appreciated, as there is an obvious extension lag.
- A single rupture is usually followed by additional ruptures.
- Results of tendon transfer surgery are inversely related to the number of ruptures and to the condition of the hand joints.

Medical management of rheumatoid tenosynovitis involves the use of systemic anti-inflammatory drugs, rest and exercise, and local corticosteroid injections. Surgery, however, is safe and quite effective.⁶ Recurrence following tenosynovectomy is infrequent. In order to prevent tendon ruptures, tenosynovectomy is recommended by many authorities for persistent tenosynovitis that has not responded to medical therapy within 4 to 6 months.⁷ This is an example of the important role prophylactic surgery has in preserving rheumatoid hand function. Rehabilitation following tenosynovectomy is clearly much simpler than it is following surgery for tendon rupture. Patients at risk for tendon rupture and loss of full digital extension should obtain a surgical opinion. Tendon rupture requires early surgery, preferably within 2 weeks, for the reasons mentioned above.

Flexor tenosynovitis can occur at three sites: wrist, palm, and digits.^{7,8} Early surgery is advisable for persistent inflammation,⁵ particularly at the wrist where swelling could lead to carpal tunnel syndrome. Thick fascia at the

volar wrist makes synovial swelling less apparent. Signs to look for are fullness, loss of skin wrinkling, thenar atrophy, and loss of the venous markings. Millender and Nalebuff⁶ state that carpal tunnel syndrome with a difference in active and passive ranges of motion is diagnostic of flexor tenosynovitis at the wrist.

Involvement of the palmar flexor synovium produces a palpable crepitus with tendon motion, and one might feel a nodule that interferes with tendon function. This can cause the trigger finger to become locked in flexion, requiring passive extension to overcome the blockage. A characteristic feature of tendon disease on examination is the discrepancy between active and passive ranges of motion, where active motion is affected more than passive motion. This is unlike the pattern for joint synovitis in which both ranges of motion are reduced globally.

Digital palmar flexor tenosynovitis results in overgrowth of the tenosynovium lining the digital flexor tendon sheath. Once again, there could be a discrepancy between active and passive range of motion. Fullness on the volar aspect of the digit can also be detected.

Flexor tendon ruptures are not as common as extensor ruptures, and therapy is generally not as effective.^{7,8} Ruptures are most common at the wrist level and involve the long flexor muscle of the thumb, deep flexor muscles of the fingers, and superficial flexor muscle of the index finger.⁹ The likely mechanism is attrition, in which an irregular bony surface on the volar aspect of the scaphoid leads to ongoing mechanical trauma to the tendon leading to its weakening and rupture.⁷ Flexor tendon ruptures are not common at the palm or digits. At these sites, the likely mechanism of rupture is infiltrative tenosynovitis rather than attrition.

Blood vessels. The cutaneous vessels can be involved with a small-vessel

vasculitis. Physical manifestations include splinter hemorrhages, nail fold infarcts, and poor capillary refill following local pressure. These changes do not necessarily imply a more generalized vasculitis involving larger vessels and suggesting a much poorer overall prognosis.

General principles and management

Assessing hand function requires examination of the entire upper limb, particularly the elbow and shoulder. Both upper limbs need to be assessed, as disability of one upper limb could be compensated for by a more functional opposite upper limb. The most important aspect is how the hand functions in activities of daily living and in the workplace. Marked deformity could cause little functional difficulty, whereas seemingly minimal deformity could be a great handicap.

Therapy. Treatment is either medical or surgical, although they are complementary. Medical therapy is an ongoing process throughout the course of the disease. Anti-inflammatory therapy is essential because suppression of the synovitis is likely to improve long-term outcome. This therapy can involve nonsteroidal anti-inflammatory drugs, systemic corticosteroids, or second-line disease-modifying antirheumatic drugs (for example, methotrexate, gold, hydroxychloroquine).

Local corticosteroid injections into areas of persistent tenosynovitis are especially useful and can prevent or delay the need for surgery. The greatest risk from local steroids is tendon rupture. It is advisable to inject into the tenosynovium and not directly into the tendon itself. This is especially important on the extensor surface, where the tendons are particularly fragile.

Joint protection and patient education are critical in RA management. An experienced physiotherapist is invaluable and can provide a hand

exercise program.^{3,10} Splinting has a definite role in management to relieve symptoms and improve function, but it is not known to change the long-term outcome of the disease.^{11,12}

Surgery. Surgery for the RA hand has the following four objectives (listed in order of importance)⁴:

- treat pain,
- improve function,
- prevent destruction, and
- correct deformity.

Because RA is usually a progressive disease, surgery is not curative. The presence of deformity itself is not an indication for surgery. Definite indications for surgery include⁷ tendon rupture or persistent tenosynovitis, carpal tunnel syndrome, and nodules that interfere with function. The role of surgery is individualized for each patient. One must ask two key questions^{4,7}: What role does the deformity play in the daily use of the hand? and How much pain is there? Answers to these questions will guide physicians considering hand surgery for RA patients.

Types of surgical intervention include synovectomy of both tendon sheaths and joints, arthroplasty, and arthrodesis. Although synovectomy of tendon sheaths is an established surgical procedure, synovectomy of joints is not, mainly because joint synovectomy has not been shown to change the long-term outcome of the disease. Reconstructive joint surgery is of two main types: fusion and arthroplasty. In order for this type of surgery to be effective, it is critical to ensure that the tendon apparatus is functional and balanced before surgery. In general, arthroplasty is favoured at the MCP level whereas fusion is favoured at the distal interphalangeal level. Either procedure could be carried out at the PIP level.

Surgery for reconstructive reasons should be delayed as long as possible if the patient is functional with a tolerable level of discomfort.

When to refer to a rheumatologist. A patient presenting with polyarthritis involving the hand and wrist can be a diagnostic challenge. Differential diagnosis could include a seronegative arthritis, such as psoriatic arthritis; an infection-related arthritis; or a crystal-mediated arthritis, such as gout or pseudogout. Often the patient's history, in particular any extra-articular involvement, offers a clue to the likely diagnosis. The primary care physician thus should refer any patient with new onset polyarthritis for whom the diagnosis is not readily apparent.

A patient presenting with previously documented RA who fails to respond to conservative management and displays progressive synovitis resulting in functional handicap should also be referred to a rheumatologist.

When to refer to an orthopedic or hand surgeon. In consultation with a rheumatologist, referral to a hand surgeon should be considered primarily for functional problems that could improve with hand surgery. Examples are stabilization (arthrodesis) of the thumb's MCP joint to permit an effective pinch unit; a clean out of the wrist with resection of the ulnar styloid process, especially when extensor tendon rupture is threatened; and carpal tunnel syndrome that has not responded to conservative management. The appropriateness of an arthroplasty or arthrodesis at other joints of the hand is a more complicated issue that usually requires concomitant assessment by both a rheumatologist and an orthopedic surgeon. ■

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