Chronic wrist pain: diagnosis and management.
Development and use of a new algorithm

Richard M van Vugt, Johannes W J Bijlsma, Arno C van Vugt

Abstract
Objective—Chronic wrist pain can be difficult to manage and the differential diagnosis is extensive. To provide guidelines for assessment of the painful wrist an algorithm was developed to encourage a structured approach to the diagnosis and management of these patients.

Methods—A review of the literature on causes of chronic wrist pain was undertaken; history taking, physical examination and imaging studies were evaluated systematically to determine which of the many potential conditions was the cause of the wrist pain. Chronic wrist pain was subdivided into pain of probable intra-articular or extra-articular origin. By means of this classification a clinical algorithm was developed to establish a diagnosis and its clinical usefulness was tested in a prospective study of 84 patients presenting to our outpatient clinic.

Results—A definite diagnosis could be established in 59% (49 of 84) of the cases by careful history taking, extensive physical examination, plain radiographs, ultrasound examination and bone scintigraphy. In 19% of the cases (16 of 84) a probable diagnosis was made resulting in a total figure 78% (65 of 84). Additional imaging studies (arthrography, magnetic resonance imaging and computed tomography) increased the definite diagnoses to 70% (59 of 84).

Conclusion—The algorithm proved easy to use and by the use of careful history taking, thorough physical examination and simple imaging techniques (ultrasonography and scintigraphy) a diagnosis was made in 78% of cases.


Determination of the cause of chronic pain referred in the wrist is frequently a challenge. This is largely because of the anatomical and biomechanical characteristics of the distal radioulnar, radiocarpal and midcarpal joints as well as the complexity of the soft tissue envelope that surrounds them. Within a small area bounded by the distal radius and ulna proximally and the bases of the metacarpals distally, there is a concentration of intimately related structures, each of which can be the site of injury, degeneration or disease and, consequently, the source of pain. The history and physical examination usually lead to early identification of the cause of hand pain. In some cases, however, the aetiology of the pain is not obvious and a diagnostic problem arises. These patients may go from one doctor to the next without finding an explanation for and/or treatment of their symptoms. Management of this chronic wrist pain in the patient with normal radiographs of the wrist without pathognomonic clinical findings can be frustrating for both the patient and the physician. As rheumatologists are encountering this problem with increasing frequency, the objective of this article is to make rheumatologists more aware of the diagnosis and treatment of wrist disorders. As the evaluation of a patient with wrist pain requires an extensive medical history, thorough physical examination and knowledge of the imaging studies available, we assessed the successive steps of the examination. In addition literature on the different causes of pain in the wrist was reviewed.

To provide guidelines for assessment of the painful wrist we developed an algorithm (see fig 2) to encourage a structured approach to the diagnosis and management of these patients. By means of a prospective study we tested the clinical usefulness of this algorithm.

Clinical evaluation

HISTORY

The first step in taking a patient’s history is to listen carefully to their complaints, bearing in mind that most patients with chronic wrist pain have already visited other physicians and may have a preconceived notion of what the physician wants to hear. The patient should be encouraged to describe the location of the pain, how long it has persisted, its intensity, and any activity or wrist motion that aggravates or relieves the pain. Frequently, patients use terms to describe the quality of their pain and tenderness that indicate superficial involvement (suggestive of tendinitis) or deep involvement (suggestive of bone, ligament, or joint involvement). Moreover, the patient’s description of pain may suggest paresthesia rather than underlying point tenderness.

Any traumatic event should be described carefully, in an attempt to determine the exact
mechanism of injury. Questions in the history taking should include past employment, even when the patient does not consider the pain to be work related. For example, patients exposed to vibrating instruments, such as a jackhammer, or those who use the hand and wrist repeatedly and in the same manner during a day's work may develop wrist pain that is directly related to on the job tasks. Overuse syndromes, frequently encountered in competitive athletes or musicians, can produce soft tissue inflammation and/or attrition. Knowledge of the effect of wrist pain on the patient's daily activities, including leisure activities, is essential for therapeutic management.

In addition, a complete medical history, with special attention to metabolic diseases, skin diseases, surgery, and other instances of joint involvement (in the past) must be obtained. A thorough review of the body systems, including all notable systemic illnesses, may reveal additional relevant information.6,7

PHYSICAL EXAMINATION
The physical examination should not be restricted to the wrist; examination of the entire upper extremity including the cervical spine is essential. Neck problems, for example, may play an important part in referred pain in the wrist. Other joints or areas of symptomatology should also be explored. The wrist examination begins with a careful inspection for specific areas of swelling, erythema, warmth, nodules, skin lesions, and obvious deformities or prior surgical incisions. Tenderness is localised to a specific anatomic structure, if possible. In most cases, the tender area can be isolated, enabling the examiner to continue the examination with special manoeuvres (Grind test for osteoarthritis CMC1, Finkelstein's test for Quervain's tendosynovitis, Watson's test for scaphoid pathology, Allen's test for vasculopathy). Active and passive ranges of motion are recorded and the search for “clicks” and crepitus should be diligent.

A complete neurovascular examination is performed. When the patient is evaluated for carpal tunnel syndrome, the Tinel and Phalen tests should be performed. The physical examination of patients with chronic wrist pain should also include separate testing of each muscle-tendon unit crossing the wrist.

In some cases, a thorough history and a complete and meticulously performed physical examination will result in a clear diagnosis. If not, a suspected diagnosis can almost always be categorised as intra-articular or extra-articular, with further evaluations planned to pinpoint the diagnosis.

RADIOGRAPHIC EXAMINATION
After history taking and the physical examination, the conventional radiographic study is the next step in the evaluation of wrist disease. Unless otherwise indicated by clinical findings, the initial radiographic examination should consist of three views.8,9

Standard radiographs include the posteroanterior (PA), oblique (PA oblique or AP oblique) and lateral views. The findings of the patient's history and physical examination will dictate the oblique views needed for evaluation of the radial (PA oblique) or ulnar part (AP oblique) of the wrist. The conventional radiographs are examined for bony abnormalities (fractures, cortical interruption, degree and pattern of mineralisation) and the width and symmetry of joint spaces. The ligamentous architecture is assessed by determining whether the three carpal arcs of the wrist and parallelism of the joints are maintained.4 The arcs join the proximal and distal articular surfaces of the scaphoid, lunate, and triquetrum and the proximal articular surface of the capitate and hamate. A broken arc usually indicates disruption of joint integrity at that site. The PA radiograph should also include the entire length of the third metacarpal because this allows later measurement of carpal height and carpal-ulnar distance ratios, if needed. The lateral view is extremely important for evaluation of radiolunocapitate alignment and assessment of radioscaphoid, lunoscaphoid, and capitoscaphoid relations. In the normal wrist, the radius, lunate, and capitate are collinear. In case of “zigzag” alignment of the radiolunocapitate link, carpal instability must be suspected.9 If the long axis of the capitate is aligned palmar or dorsal (because of volar or dorsal rotation of the "intercalated segment" or the lunate) to the radius, the terms VISI (volar intercalated segment instability) and DISI (dorsal intercalated segment instability) are used, respectively.

Supplemental views of the wrist should be dictated by the findings of the clinical examination, such as the carpal tunnel view to evaluate the bony tubercles and soft tissue structures of the carpal tunnel, “clenched-fist” radiographs for enhancing detection of scapholunate dislocations and spot films or tangential films of the painful region for patients with pain isolated at one site.9

When routine radiographs reveal abnormalities, they are often diagnostic, especially for patients with osteoarthritic problems and fractures. If the findings on these radiographs are normal, additional evaluation should be guided by the findings of the physical examination. A seeming myriad of imaging studies is available, including scintigraphy, ultrasonography, arthrography, magnetic resonance imaging, and computed tomography. When clinical examination suggests superficial involvement and extra-articular pathology is suspected, an ultrasound examination should be the next step.

Musculoskeletal ultrasound is a quick and easy method of obtaining diagnostic information from dynamic studies and bilateral comparisons with low patient discomfort. It not only demonstrates abnormalities but also provides the opportunity to compress that region accurately to see if this reproduces or accentuates the patient’s characteristic symptoms—that is, ultrasonography can be considered an extension of the physical examination. Recent improvements in resolution and sensitivity have led to better understanding and definition of anatomical structures and disease states as well as new applications, such as the
Chronic wrist pain

Ultrasound guided synovial biopsy or injection therapy. If intra-articular pathology is suspected or the findings on ultrasound examination are normal, a bone scan should be made. Although bone scans are non-specific, they yield information that helps the physician plan additional examinations and tests. A three phase study consists of an “arteriographic” phase, a “blood pool/soft tissue” phase, and a “bone” or delayed phase. However, some acute and sub-acute soft tissue injuries, such as ligamentous damage, can cause mildly to moderately increased uptake in both bones spanned by the ligament. For patients with abnormal findings on the bone scan spot films, computed tomoscopy (CT) or magnetic resonance imaging (MRI) is recommended. If the bone scan is negative, the physician’s options are to stop further investigations (based on clinical impression), consider an arthrogram or a diagnostic arthroscopy. In some instances, a negative bone scan may reinforce an impression of malingering. If the history and physical examination (clicking or snapping) suggest that the patient’s problems stem from ligamentous injuries or injuries of the triangular fibrocartilage complex, cineradiography (an active motion study for picking up instability patterns) or an (three compartment) arthrogram under fluoroscopic control must be done. In cineradiography the wrist is moved through a full range of motion, with specific attempts to recreate the stresses and positions known by the patient to cause the click or pop. Subsequent examination is arthrography, which serves to establish the integrity of the capsular structures and intrasynovial inter-osseous ligaments, especially the scapholunate and lunotriquetral ligaments and the triangular fibrocartilage. It may also show abnormal infolding of the synovium or the corrugated appearance consistent with localised synovitis. Arthograms are diagnostic when they show an abnormal leak of opaque material between the radiocarpal and midcarpal or distal radioulnar spaces. To be sure of the diagnosis, the flow of dye across these articulations is viewed directly by fluoroscopy. This finding must be evaluated carefully, however, in relation to the patient’s age, complaints, and clinical findings. Communication between the different compartments of the wrist is not necessarily the result of trauma or disease. The cineradiographic study may be combined with arthrography for greater efficiency and convenience. Often, abnormalities found on the arthrogram enable the examiner to pinpoint a diagnosis.

Good quality MRI can occasionally visualise the ligamentous and cartilaginous structures of the wrist, particularly the triangular fibrocartilage complex, and can reveal the presence or absence of occult ganglia and tendinitis. As MRI has only proved useful in a limited number of pathological conditions ultrasonography and radionuclide imaging are generally performed first because they are much less expensive and more readily available.

Finally arthroscopy of the wrist can be used for assessment of the intra-articular pathology (especially ligaments and the articular cartilage) of the radiocarpal, mediocarpal and distal radioulnar joints. It is one of the more useful tools available to the physician, being both diagnostic and therapeutic. Arthroscopy causes minimal invasion, hence patients rehabilitate quickly with fewer complications. Differential diagnosis

Although most causes of chronic wrist pain require further evaluation, some can readily be diagnosed during routine history taking and physical examination, for example, distal radioulnar joint and extensor carpi ulnaris tendon subluxation or evident manifestations of inflammatory arthropathy (tables 1 and 2). A fall onto an outstretched hand with subsequent tenderness in the anatomical snuff box is the classic mechanism of a scaphoid fracture. The scaphoid fracture is one of the most common carpal fractures in the wrist. Several factors contribute to the scaphoid’s deserved reputation as a source of frequent complications. The scaphoid is difficult to visualise on radiographs: regardless of the view scaphoid fractures are invisible in as many as 20% of the cases. In addition, because of mobility, unstable fractures tend to angulate dorsally, which leads to an increased incidence of malunion, carpal instability and avascular necrosis.

Fractures of the other carpal bones are less common. They can remain unnoticed for some time and require special views for visualisation, for instance a carpal tunnel view for fracture of the hook of the hamate.

The ligaments are intended to ensure carpal stability. Carpal instability, which can be secondary to attenuation or a partial or complete rupture, can be static or dynamic.

### Table 1 Differential diagnosis of chronic wrist pain

<table>
<thead>
<tr>
<th>Intra-capsular</th>
<th>Extra-capsular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture</td>
<td>Neuraprphy</td>
</tr>
<tr>
<td>Ligament tear</td>
<td>median nerve (carpal tunnel)</td>
</tr>
<tr>
<td>static instability pattern</td>
<td>ulnar nerve (Guyon’s canal)</td>
</tr>
<tr>
<td>dynamic instability pattern</td>
<td>distal posterior interosseous nerve syndrome</td>
</tr>
<tr>
<td>triangular fibrocartilage complex tear</td>
<td>thoracic outlet compression syndrome</td>
</tr>
<tr>
<td>Distal radioulnar joint subluxation</td>
<td>neurama</td>
</tr>
<tr>
<td>Arthritis</td>
<td>Tendinopathy</td>
</tr>
<tr>
<td>rheumatoid arthritis</td>
<td>extensor carpi ulnaris tendon subluxation</td>
</tr>
<tr>
<td>other connective tissue diseases</td>
<td>tendovaginitis (De Quervain’s)</td>
</tr>
<tr>
<td>psoriasis</td>
<td>rheumatoid arthritis</td>
</tr>
<tr>
<td>metabolic diseases (gout/pseudogout/ hyperparathyroidism)</td>
<td>infectious diseases (common/atypical agent)</td>
</tr>
<tr>
<td>infectious diseases (common/atypical agent)</td>
<td>Osteoarthritis</td>
</tr>
<tr>
<td>primary (CMC 1, STT joint)</td>
<td>primary (CMC 1, STT joint)</td>
</tr>
<tr>
<td>secondary (SLAC)</td>
<td>secondary (SLAC)</td>
</tr>
<tr>
<td>Neoplasm</td>
<td>Neoplasm</td>
</tr>
<tr>
<td>enchondroma</td>
<td>enchondroma</td>
</tr>
<tr>
<td>osteoid ostema</td>
<td>osteoid ostema</td>
</tr>
<tr>
<td>pigmented villonodular synovitis</td>
<td>pigmented villonodular synovitis</td>
</tr>
<tr>
<td>other (giant cell tumour)</td>
<td>other (giant cell tumour)</td>
</tr>
<tr>
<td>Ganglia (extra-osseous/intra-osseous/occult)</td>
<td>Ganglia (extra-osseous/intra-osseous/occult)</td>
</tr>
<tr>
<td>Avascular necrosis</td>
<td>Avascular necrosis</td>
</tr>
<tr>
<td>lunare (Kienbock’s)</td>
<td>lunare (Kienbock’s)</td>
</tr>
<tr>
<td>scaphoid (Freiser’s)</td>
<td>scaphoid (Freiser’s)</td>
</tr>
<tr>
<td>Other (osteochondromatosis/carpal boss/carpal coalition)</td>
<td>Other (osteochondromatosis/carpal boss/carpal coalition)</td>
</tr>
<tr>
<td>Extra-capsular</td>
<td>Other (osteochondromatosis/carpal boss/carpal coalition)</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>Other (osteochondromatosis/carpal boss/carpal coalition)</td>
</tr>
<tr>
<td>median nerve (carpal tunnel)</td>
<td>other (giant cell tumour)</td>
</tr>
<tr>
<td>ulnar nerve (Guyon’s canal)</td>
<td>infectious diseases (common/atypical agent)</td>
</tr>
<tr>
<td>distal posterior interosseous nerve syndrome</td>
<td>multisystemic disease</td>
</tr>
<tr>
<td>thoracic outlet compression syndrome</td>
<td>infectious</td>
</tr>
<tr>
<td>neurama</td>
<td>infectious</td>
</tr>
<tr>
<td>Tendinopathy</td>
<td>infectious</td>
</tr>
<tr>
<td>extensor carpi ulnaris tendon subluxation</td>
<td>infectious</td>
</tr>
<tr>
<td>tendovaginitis (De Quervain’s)</td>
<td>infectious</td>
</tr>
<tr>
<td>rheumatoid arthritis</td>
<td>infectious</td>
</tr>
<tr>
<td>infectious diseases (common/atypical agent)</td>
<td>infectious</td>
</tr>
</tbody>
</table>

---

This article is protected by copyright. All rights reserved.
The scapholunate dissociation is the most common form of carpal instability. It is secondary to the loss of support of both the ligamentum radioscapholunatum and the interosseous scapholunate ligament leading to scapholunate diastasis, palmar flexion of the scaphoid and dorsal flexion of the lunate. This condition is present when the scaphoid is foreshortened on the PA view (cortical ring sign) and the scapholunate interval exceeds 3 mm (fig 1).

![Figure 1 Scapholunate dissociation with scapholunate diastasis, “ring sign” (arrow) and foreshortened appearance of the scaphoid.](https://example.com/image.png)

Table 2  Differential diagnosis of chronic wrist pain with most discriminating features in the history, examination and imaging for each diagnosis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>History</th>
<th>Examination</th>
<th>Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture</td>
<td>traumatic event</td>
<td>point tenderness</td>
<td>SR, SV (carpal tunnel) or CT</td>
</tr>
<tr>
<td>Ligament tear</td>
<td>clicking, (unnoticed) traumatic event</td>
<td>point tenderness</td>
<td>SR: malalignment (lateral “zigzag”) or dissociation carpal bones</td>
</tr>
<tr>
<td>DPLI subluxation</td>
<td>painful pronation and supination</td>
<td>prominent ulnar head</td>
<td>CT: axial view</td>
</tr>
<tr>
<td>Arthritis</td>
<td>spontaneous swelling, symptomology other joints or systemic complaints</td>
<td>swelling, warmth, erythema, decreased painful range of movement</td>
<td>SV: decreased mineralisation, cortical interruption or crystal deposits</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>(gradually) progressive pain and stiffness</td>
<td>decreased passive range of movement, crepitus</td>
<td>US: hydrops or synovial proliferation</td>
</tr>
<tr>
<td>Neoplasms (osteoid osteoma)</td>
<td>(pain at night, relief of salicylates)</td>
<td>ST: (signiform) Grind test</td>
<td>US function/biopsy</td>
</tr>
<tr>
<td>Ganglia</td>
<td>localised painful swelling</td>
<td>tense discrete subcutaneous swelling</td>
<td>SR: with PA oblique (CMC-I, STT) or AP oblique (pisotriquetral)</td>
</tr>
<tr>
<td>Avascular necrosis</td>
<td>pain without swelling</td>
<td>decreased painful range of movement</td>
<td>CT/CT: determination extent lesion and effect on surrounding neurovascular structures (SR-CT: nidus with radiolucent or sclerotic centre) US: anesthetic cyst area MRI: occult or intraosseous</td>
</tr>
<tr>
<td>Other</td>
<td>(swelling base 2nd or 3rd metacarpal)</td>
<td>(tender bony prominence)</td>
<td>MRI: abnormal</td>
</tr>
<tr>
<td>Extra-capsular Neuropathy</td>
<td>paresthesia, nocturnal exacerbation of symptoms, metabolic disease</td>
<td>atrophy</td>
<td>SR: PA view</td>
</tr>
<tr>
<td>Tendinopathy</td>
<td>burning pain, highly repetitive and forceful motions</td>
<td>swelling, crepitus, snapping, ST: isometric function tests, forced stretching (Finkelstein's test)</td>
<td>SV: carpal tunnel view</td>
</tr>
</tbody>
</table>

Chronic wrist pain

669

Careful palpation and inspection will establish.6 Careful palpation and inspection will offer true evidence of the exact site of the lesion and information about the intra-articular associated causes of ulnar wrist pain such as chondromalacia or synovitis. An added benefit is that many of the pathologies seen can be treated using arthroscopic techniques.19 20

The finding must be carefully evaluated, however, in relation to the patient's age, complaints, and clinical findings. While central perforations are likely to be degenerative and begin after the third decade, peripheral (next to the ulnar styloid) tears are more typical of traumatic avulsions.7

Chondromalacia of the ulnar head is usually seen in young patients after a fall on the dorsiflexed wrist with the impact predominantly hypotenar or repeated episodes of stressful pronation and supination (work or leisure activity). The pain is localised to the dorsal distal pronation and supination (work or leisure activity) of the wrist and hand. Other (multisystemic) connective tissue diseases (systemic lupus erythematosus, scleroderma) can also present in the initial phase with arthralgia and arthritis. Pain and stiffness are more common than objective abnormalities, although transient joint swelling and effusions can occur.5 Psoriatic arthritis can affect any of the joints, including the wrists. Psoriatic arthritis, except for arthritis mutilans, tends to cause less pain and disability than RA; destruction and stiffness are the characteristic findings rather than the typical instability seen in RA. Furthermore, spontaneous wrist fusion is common.6

Gouty arthritis and pseudogout are metabolic joint diseases caused by deposition of sodium urate or calcium pyrophosphate crystals in the joint, leading to arthritis. In pseudogout the wrists are the second most commonly affected joint after the knees. Radiographs demonstrate crystal deposits in articular fibrocartilage of the wrist.5 24 Septic arthritis of the wrist can cause destruction of joint cartilage and bony structures. Generally, the diagnosis of acute infection is not problematic, but differentiation between pure soft tissue infection and infection involving the bony structures can be complicated. Furthermore, identification of a chronic infection as the cause of chronic wrist pain may be difficult.25 26 If there is a clinical suspicion an (ultrasound guided) needle aspiration or synovial biopsy should be taken. The new generation of ultrasonography has proved to be a valuable technique, with a high success rate, for obtaining synovial fluid or membrane samples for pathological and bacteriological examinations.10

Osteoarthritis is the most common joint disease. This condition can be primary or secondary, depending on the presence of a pre-existing condition. While primary osteoarthritis commonly involves the trapeziometacarpal (CMC-I) or sometimes the trapezioscaphoid (STT) joint, it is uncommon in other parts of the hand. Secondary osteoarthritis of the wrist attributable to an old trauma or infection is very common. In cases of malalignment of the scaphoid, degenerative arthritis will progress according to a very specific pattern that leads to an SLAC (scapho-lunate advanced collapse) wrist. Degeneration occurs between the radius and the scaphoid and then between the lunate and capitate. The radiolunate joint is almost never involved. Finally, a scapholunate diastasis develops and the capitate slides in between the lunate and scaphoid.27

Neoplasms of the carpal bones themselves are extremely unusual. Enchondromas are occasionally seen in the metacarpals as giant cell tumours have a preference for the distal radius.28 Osteoid osteoma is a benign osteoblastic lesion characterised by a nidus that may either be purely radiolucent or have a sclerotic centre. It is often surrounded by a zone of reactive bone formation. The most important clinical symptom is pain that is severest at night and is relieved dramatically by salicylates. Most radiolucent carpal lesions are carpal cysts that have no clinical consequences.1

Ganglia are thin walled cysts containing mucoid hyaluronic acid that develop over a joint capsule or tendon sheath. They present as a tense discrete subcutaneous swelling and may be single or multiple. An unusual form is the intraosseous ganglion that appears on radiographs as a radiolucent area in the carpal bones. They may occur spontaneously or in association with such systemic diseases as arthritis. There is often an association with trauma.29 30

Osteonecrosis of the carpal bones, which is uncommon, usually involves the proximal scaphoid after a fracture. “Idiopathic” osteonecrosis develops most commonly in the lunate, the so called lunate malacia or Kienböck’s disease (or Preiser in case of scaphoid malacia). Plain radiographs may show only a
Figure 2 Algorithm for chronic wrist pain.

Overuse syndromes are a common cause of tendinitis, particularly in the “weekend warrior”. As a rule the tendons of the musculus abductor pollicis longus and musculus extensor pollicis brevis (De Quervain’s) are involved. Pain is experienced on the radial side of the wrist, sometimes with local swelling along the radial tendons. A positive Finkelstein’s test (pain over the radial styloid when the patient’s thumb is grasped and the hand abducted ulnarward) is the most pathognomonic sign. There are, however, some uncommon locations and types of tendinitis. The flexor carpi radialis tunnel syndrome is an often unrecognised type of tendinitis, as is the flexor carpi ulnaris syndrome. Both syndromes occasionally present with calcification on roentgenograms.29 There has been a marked increase in reports of the so called repetitive strain injury of the upper extremity. One of the difficulties in evaluating this disorder is the establishment of a diagnosis in the absence of objective physical findings or confirmatory diagnostic images or laboratory data. These issues become more complicated when insurers and attorneys ask physicians to establish a causal relation between the job and the complaints.30 Tenosynovitis is frequently seen in inflammatory rheumatic diseases, diabetes mellitus or hypothyroid conditions. Ultrasound examination appears to be a useful method for evaluation as it reveals involvement of the sheaths and tendons in the simplest, most complete and least expensive manner. If a non-infected tenosynovitis is likely, corticosteroid injections can easily be administered under ultrasound guidance.

As physicians, our primary responsibility is to rule out an anatomic lesion before establishing a non-organic cause of the patient’s pain. Many patients who are classified as such may have an organic component to their pain, but the overlying non-medical issues confuse the picture and make it impossible to establish a definitive diagnosis. Some patients have unreasonable subjective symptoms and on physical examination, the findings can include a wide gamut of possibilities. These patients have the chronic pain syndrome and should be told they are no longer eligible for medical treatment. In less severe cases psychological consultation, behaviour-based treatment, and employee assistance programmes can be helpful.31

Clinical algorithm

Based on the aspects of history, physical examination and imaging techniques described above and in line with the range of differential diagnoses we developed a practical algorithm (fig 2) for our patients with chronic wrist pain. In the following section our experience with this algorithm will be described.

METHODS

Between June 1993 and May 1996, 84 patients with chronic wrist pain were referred to our clinic. In accordance with our suggested algorithm a careful history of the wrist condition was recorded, especially location, duration, intensity, aggravating or relieving factors, and the effects of various therapeutic modalities already applied. History taking
Chronic wrist pain

671

contour of the lunate and triquetrum (arrows).

Figure 3 Ulnocarpal impingement syndrome with ulna-plus variance and cystic changes along the proximal
carpedal contour (arrows).

Table 3 Characteristics of patients with chronic wrist pain

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>Patient characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=84)</td>
<td></td>
</tr>
</tbody>
</table>

History

Sex: 21 men / 63 women

Age (y) mean 32.4 (16–78)

Dominant hand affected n=67

Pain only during activity n=20

Paresthesia n=12

Burning pain n=24

History of trauma n=8

History of swelling n=48

Investigation

ESR increased n=6

ANA positivity n=1

Rheumatoid factor n=1

Examination

Swelling n=11

Tenderness n=49

Restricted range of movement n=22

Isometric function tests n=34

Painful forced radial or ulnar deviation n=20

Clicking n=10

included any past trauma, work and leisure
activities. All patients underwent routine radiography and standard laboratory tests (erythro-
cyte sedimentation rate, complete blood count,
thyroid profile and, if clinically indicated, rheu-
amatoid factor, antinuclear antibodies, vitamin
B12, folate and uric acid levels). If the routine
radiological examination was normal the pa-
tients were separated into two categories on the
basis of the findings of history and physical
examination: probable intra-articular pathol-
ogy and probable extra-articular pathology. If
extra-articular pathology was suspected a high
resolution ultrasound examination was done
next. If pathology was observed, depending on the findings, subsequent ultrasound guided
puncture, biopsy or corticosteroid injection
was carried out. In case of complaints of
paresthesia, an electromyogram and addi-
tional radiographic studies of the carpal tunnel
or cervical spine were performed. If the results
were negative the choice was either to proceed
with conservative treatment or to continue the
examination as for intra-articular pathology.

When intra-articular pathology was suspected a
bone scan was performed. If the bone scan was
positive, further radiographic studies (MRI or
CT) focused on the “hot spot”. In case of diffuse
involvement synovitis was suspected and an
ultrasound guided biopsy was taken. If the bone
scan was negative, the choice was to stop further
investigation (based on the clinical impression)
or, especially in the case of “clicking” or
“popping”, to perform an arthrogram under
fluoroscopic control or arthroscopy. Arthro-
scopy was performed through the standard
three/four radiocarpal portal and the central
mid-carpal portal on an outpatient basis.

RESULTS

Eighty four patients, 21 men and 63 women, 16
to 78 years (mean 32.4) were seen (table 3).
The duration of symptoms ranged from 2 to 72
months, with an average of 13.4 months. The
dominant hand was affected in 67 cases,
reflecting a predominance of dominant arm
problems. The pain was described as nagging
without interruption by 40 patients, burning by
24 patients; 12 patients also reported paresthe-
sia. Twenty patients had symptoms only during
periods of activity such as work, sports, or
playing a musical instrument; however during
periods of rest, they were still aware that the
wrist was different from the contralateral wrist,
even though it was not acutely painful. Eight
patients related symptom onset to a possible
traumatic event, usually forced twisting. Forty
five patients had a past history of a bump or
swelling on the dorsum of the wrist.

At examination subtle swelling was present
on the dorsoular side in four cases, on the
dorsoradial side in five cases and the volar side
in two cases. Tenderness to palpation without
swelling was evident in 49 patients. In 22
patients wrist motion was slightly restricted by
pain at the extremes of either flexion/extension
or radial and ulnar deviation. Isometric func-
tion tests were painful in 34 patients and forced
radial or ulnar deviation increased pain in 20
patients. “Clicking” of the wrist was observed
in 10 patients.

Laboratory results did not reveal any abnor-
malities apart from an increased erythrocyte
sedimentation rate in six patients, a positive
rheumatoid factor in three patients, and a pos-
tive antinuclear antibody (ANA 1:400) in
another patient.

Thirty three patients who had been seen
before by other specialists had normal plain
radiographs, 25 of them had already been
treated with splinting, cortisone injections, or
anti-inflammatory drugs, which did not seem
to change the eventual course of the disease in
any of the cases. Routine radiographs were
diagnostic for nine patients. Osteoarthritis
(among others, of the scapho-
trapezio/trapezoidal or STT joint) was found in
four cases, scapholunate dissociation in one (fig
1), chondrocalcinosis in two, ulnocarpal
impingement in one (fig 3) and Kienbock’s
disease in another patient.
Of the remaining patients with normal standard hand radiographs, 53 were categorised as having probable extra-articular pathology and 22 as having probable intra-articular pathology. For four of the 53 patients carpal tunnel syndrome was suspected; electromyograms confirmed this diagnosis in three cases. The rest of this group (50 patients) with probable extra-capsular pathology underwent ultrasound examination. The diagnoses obtained are shown in figure 4.

Tenosynovitis or tendinitis was observed in 21 patients. In these cases the thickened tendon could be seen embedded in hypoechoic thickening of the tendon sheath or an anechoic peritendinous effusion. One patient had tenosynovitis attributable to an until then unnoticed foreign body. Echo guided surgical exploration showed a thorn in granulomatous tissue (fig 5). Another patient, a tropical fish merchant, had tenosynovitis attributable to infection with myco-bacterium marinum. For 16 patients a non-infected tenosynovitis was considered probable and an ultrasound guided injection of corticosteroids mixed with lidocaine was given. The corticosteroid crystals could be seen spreading diffusely around the tendon. Thirteen of the 16 patients were cured at the follow up clinical examination. Two patients showed intra-articular synovial proliferation. Three patients had an anechoic cystic area compatible with ganglia; two were successfully aspirated and corticosteroids were injected. One required surgical excision.

In three cases the images were compatible with neuropathy: one had a neuroma of the median nerve and two the carpal tunnel syndrome (ultrasonic swelling of the median nerve, increased palmar bowing of the flexor retinaculum). The electromyogram confirmed this suspicion.

Sixteen patients experienced tenderness at compression with the transducer along tendons without ultrasonic abnormalities. As repetitive strain injury was suspected, these patients were treated conservatively with splinting or immobilisation in a cast (six weeks) and anti-inflammatory drugs.

All 22 patients with probable intra-articular pathology and the remaining five patients without ultrasonic abnormalities underwent a bone scan. Six patients showed diffuse increased uptake compatible with synovitis. In four cases an ultrasound guided synovial biopsy confirmed the diagnosis. As the other two patients developed arthritis of one of the finger joints during follow up, RA was believed to be the cause of the synovitis. Five patients showed markedly increased uptake in the wrist (fig 6). Additional spot films, CT and MRI demonstrated pisotriquetral osteoarthritis, a fracture of hook of the hamate, Kienbock's disease in two cases and carpal boss. In three cases mildly increased uptake was indicative of soft tissue injury. The remaining 13 patients had a negative scan.

Arthrography under fluoroscopy of two of the patients with a positive bone scan and nine patients (six patients with and three patients without “clicking” of the wrist) with a negative bone scan was performed. Ligamentous disruption (one scapholunate articulation, one triquetrolunate articulation) and associated instability patterns were diagnosed for two patients. Tears of the TFCC were demonstrated in three other patients (fig 5). Two teenage patients had dysynchronous carpal motion, diagnosed by fluoroscopy without arthrographically documented ligament tears.

Arthroscopy was performed in seven cases: five patients with suspected tears after arthrography, one with clicking of the wrist but...
normal diagnostic studies and one with nondiagnostic calcifications on plain radiographs. Rupture of an interosseous ligament was diagnosed arthroscopically in five cases; in all cases the diagnosis had already been indicated by arthography. The patient with normal diagnostic studies was found to have a scapholunate tear. The calcified tumors were attributable to osteochondromatosis (fig 7).

A definite diagnosis could be established in 59% (49 of 84) of the cases by careful history taking, extensive physical examination, plain radiographs, ultrasound examination and bone scintigraphy (fig 2). In 19% of the cases (16 of 84) a probable diagnosis was made, resulting in a total figure of 78% (65 of 84). Additional imaging studies (arthrography, MRI and CT) increased the definite diagnoses to 70% (59 of 84).

Conclusion
As the wrist can be affected by a multitude of local and general disorders it is often difficult to make an accurate diagnosis. In the literature wrist pain is generally subdivided into pain of traumatic and pain of non-traumatic origin. Nevertheless trauma may go unnoticed for some time or the patient may not consider the incident to be relevant to the wrist pain. Several complicated algorithms have been proposed for the assessment of chronic wrist pain, adding another level of complexity to the evaluation of this already difficult diagnostic problem. The development of our algorithm was prompted by the need for a clearly defined and easily applied method for identifying the more common causes of wrist pain without having to resort to specialised procedures such as arthroscopy. Our classification of chronic wrist pain as pain of intra-articular or extra-articular origin appeared to be pragmatic and helpful in the examination of chronic wrist pain. By means of this classification a clinical algorithm was developed to establish a diagnosis. The algorithm proved easy to use; by means of careful history taking, thorough physical examination and simple imaging techniques (plain radiographs, ultrasonography and scintigraphy) a diagnosis was made in 78% of the cases.

Although this algorithm seems promising for establishing a diagnosis in chronic wrist pain following it will be dependent of the imaging techniques available in each rheumatology unit.

We believe that application of the algorithm described in this paper will vastly increase the rheumatologist’s ability to diagnose and treat chronic wrist disorders. This algorithm is by no means exhaustive or complete. Instead it should be viewed as a guide to assist the physician in his management of this difficult problem.
35 Elliot BG. Finkelstein’s test; a descriptive error that can produce a false positive. J Hand Surg 1992;17b:481–2.