Clinical Examination of Wrist Ligaments

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1 Introduction

The wrist was considered to be a single bone up until 1860; over a century and a half with the progress of imaging techniques, it has currently become by far the most complex articulation of the human skeleton.

Imaging is necessary to establish the diagnosis of posttraumatic lesions as well as the choice of their treatment but needs to be guided by a meticulous clinical examination. This clinical examination dictates the choice of complementary investigations as well as which questions these investigations should answer.

2 Conditions of the Examination

Patient and examiner comfort are essential. They should be sitting facing each other separated by an examination table the height of a desk (about 1 m) and a width not exceeding 60 cm; if too wide, it would force the examiner to lean forwards; too narrow would be insufficient to allow the patient to extend the forearm while relaxing both the elbow and the hand simultaneously.

The patient should be sitting at the right height with both forearms bare till above the elbow to allow examination of the contralateral wrist (Fig. 1).

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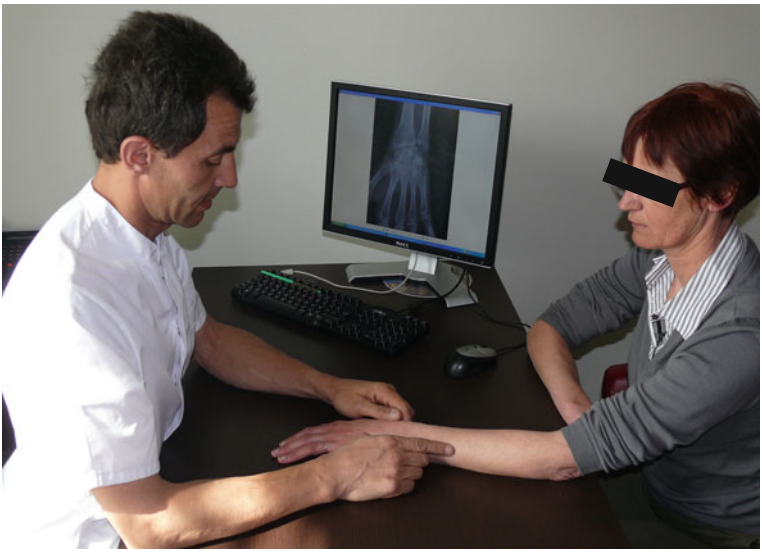

Fig. 1 Examination setup with the examiner and patient facing each other across a table of appropriate height and width

3 History Taking

This is the first part of the examination and is essential to orient the diagnosis. Age of the patient must be noted, the affected and dominant sides, his/her work and hobbies (sports, music, gardening, etc.). General history of the patient is first noted and then any symptoms present before the actual presenting symptoms (reason for consultation) followed by the date and circumstances of the trauma and the consequences. When the examination is conducted much later than the initial trauma, the examiner must strive to determine the main complaint of the patient.

3.1 General History

General history is taken including pathology that can affect treatment results, e.g. diabetes and tobacco.

3.2 Local History

Any ipsilateral upper limb pathology must be noted and considered; this can modify therapeutic indications.

3.3 Circumstances of the Injury

It is important to identify the circumstances of the trauma (fall from height while walking, skiing, car accident…) and specify if it is a low- or high-energy injury and if it is a domestic, sports or work accident and try to describe the mechanism of trauma as precisely as possible: direct or indirect, in forced extension or flexion, with impact on radial, ulnar or median nerves.

Hyperextension injuries, for example, orient towards a diagnosis of scapholunate lesion if the impact is to the thenar eminence and towards a TFCC lesion if it is directed to the hypothenar side, as do injuries in forced rotation 'reverse drill'.

The date of the accident sometimes becomes difficult to determine when it goes back weeks, months or even years before presentation but is directly relevant to the choice of treatment.

4 Pain

This is the most important symptom and several points are important to clarify during examination.

4.1 Site

It is crucial to get the patient to pinpoint the pain even if it is rarely excruciating in wrist ligament injuries.

The patient often just points to the whole wrist declaring 'my wrist is painful'.

The examiner should get the patient to specify whether pain is palmar or dorsal or in the inside of the wrist and then further localize it to the radial, ulnar or middle of the wrist.

It is useful to get the patient to use a finger to actually point out the point of maximal pain intensity. This simple gesture is very useful to guide the rest of the clinical examination.

4.2 Circumstances of Onset

Is the pain permanent, upon intense effort or on certain movements? It may be triggered by simple flexion/extension or by more complex movements such as extension with ulnar inclination or with certain actions such as pressure on the hand to lift oneself out of a chair, open a jar or hold a cooking pan. All these elements specified during the examination will help localize the site of pain and its repercussions on the use of the wrist.

4.3 Pain Intensity

This may be evaluated by the visual analogue scale that gives a numerical measurement reproducible for a series of examinations.

4.4 Functional Disability

It is important that the patient himself specifies the disabling effect of pain on the wrist, both on daily activities – such as opening a door, a jam jar or carrying a bottle of water – as well as professional ones. Validated and accepted questionnaires may be used. A comprehensive list of all the questionnaires is beyond the scope of this book, but the two most used globally are the DASH (disability of the arm, shoulder and hand) (Fig. 2) developed in 1994 by representatives of the Institute for Work and Health (IWH) and the American Academy of Orthopaedic Surgeons (AAOS) and translated from American to French by Dubert et al. [2] and the PRWE (patient-rated wrist evaluation) score developed by MacDermid in 1998 (Fig. 3) [3]. Besides being filled out by the patient far from surgeon' s influence, these are reproducible from one patient to another as well as for the same patient from one consultation to the next.

5 Sounds and Abnormal Phenomena

5.1 Benign Clicks

These are totally painless and fully reproducible at will without apprehension or discomfort. They are pneumatic such as generated upon forced flexion 'cracking' the metacarpophalangeal or proximal phalangeal joints.

5.2 Triggering

This is palpable, audible and sometimes visible. It can be benign in hyperlax wrists, but is most frequently pathological, with pain and sometimes apprehension. In this case it indicates scapholunate, lunotriquetral or midcarpal instability. The examination will attempt to then trace its origin.

5.3 Pathological Clicking

These are painful without obvious triggering and are provoked by specific movements. Ulnar clicking may denote underlying TFCC rupture.

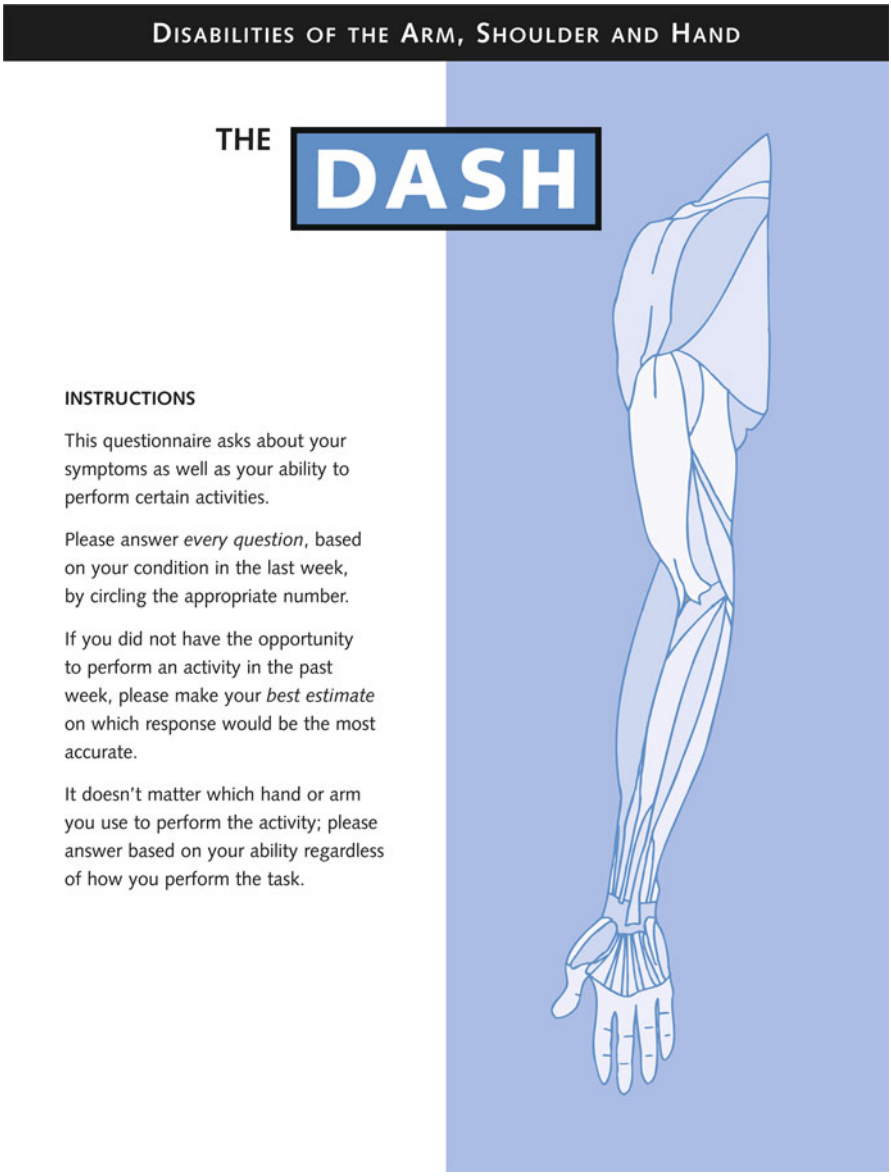

Fig. 2 DASH score (disability of arm, shoulder and hand) [2]

Disabilities of the Arm, Shoulder and Hand

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	1	2	3	4	5
2. Write.	1	2	3	4	5
3. Turn a key.	1	2	3	4	5
4. Prepare a meal.	1	2	3	4	5
5. Push open a heavy door.	1	2	3	4	5
6. Place an object on a shelf above your head.	1	2	3	4	5
7. Do heavy household chores (e.g., wash walls, wash floors).	1	2	3	4	5
8. Garden or do yard work.	1	2	3	4	5
9. Make a bed.	1	2	3	4	5
10. Carry a shopping bag or briefcase.	1	2	3	4	5
11. Carry a heavy object (over 10 lbs).	1	2	3	4	5
12. Change a lightbulb overhead.	1	2	3	4	5
13. Wash or blow dry your hair.	1	2	3	4	5
14. Wash your back.	1	2	3	4	5
15. Put on a pullover sweater.	1	2	3	4	5
16. Use a knife to cut food.	1	2	3	4	5
17. Recreational activities which require little effort (e.g., cardplaying, knitting, etc.).	1	2	3	4	5
18. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	1	2	3	4	5
19. Recreational activities in which you move your arm freely (e.g., playing frisbee, badminton, etc.).	1	2	3	4	5
20. Manage transportation needs (getting from one place to another).	1	2	3	4	5
21. Sexual activities.	1	2	3	4	5

Fig. 2 (continued)

DISABILITIES OF THE ARM, SHOULDER AND HAND

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
22. During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups? *(circle number)*	1	2	3	4	5

	NOT LIMITED AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
23. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem? *(circle number)*	1	2	3	4	5

Please rate the severity of the following symptoms in the last week. *(circle number)*

	NONE	MILD	MODERATE	SEVERE	EXTREME
24. Arm, shoulder or hand pain.	1	2	3	4	5
25. Arm, shoulder or hand pain when you performed any specific activity.	1	2	3	4	5
26. Tingling (pins and needles) in your arm, shoulder or hand.	1	2	3	4	5
27. Weakness in your arm, shoulder or hand.	1	2	3	4	5
28. Stiffness in your arm, shoulder or hand.	1	2	3	4	5

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	SO MUCH DIFFICULTY THAT I CAN'T SLEEP
29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? *(circle number)*	1	2	3	4	5

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem. *(circle number)*	1	2	3	4	5

DASH DISABILITY/SYMPTOM SCORE = $\left[\frac{\text{(sum of n responses)}}{n} - 1\right] \times 25$, where n is equal to the number of completed responses.

A DASH score may not be calculated if there are greater than 3 missing items.

Fig. 2 (continued)

DISABILITIES OF THE ARM, SHOULDER AND HAND

WORK MODULE (OPTIONAL)

The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including home-making if that is your main work role).

Please indicate what your job/work is:_____

❒ I do not work. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week. Did you have any difficulty:

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for your work?	1	2	3	4	5
2. doing your usual work because of arm, shoulder or hand pain?	1	2	3	4	5
3. doing your work as well as you would like?	1	2	3	4	5
4. spending your usual amount of time doing your work?	1	2	3	4	5

SPORTS/PERFORMING ARTS MODULE (OPTIONAL)

The following questions relate to the impact of your arm, shoulder or hand problem on playing *your musical instrument or sport or both*. If you play more than one sport or instrument (or play both), please answer with respect to that activity which is most important to you.

Please indicate the sport or instrument which is most important to you:_____

❒ I do not play a sport or an instrument. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week. Did you have any difficulty:

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for playing your instrument or sport?	1	2	3	4	5
2. playing your musical instrument or sport because of arm, shoulder or hand pain?	1	2	3	4	5
3. playing your musical instrument or sport as well as you would like?	1	2	3	4	5
4. spending your usual amount of time practising or playing your instrument or sport?	1	2	3	4	5

SCORING THE OPTIONAL MODULES: Add up assigned values for each response; divide by 4 (number of items); subtract 1; multiply by 25.
An optional module score may not be calculated if there are any missing items.

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Fig. 2 (continued)

PATIENT-RATED WRIST EVALUATION

Name _____ Date _____

*The questions below will help or understand how much difficulty you have had with your wrist in the past week. You will be describing your **average** wrist symptoms **over the past week** on a scale of 0 to 10.* **Please provide an answer for ALL questions. If you did not perform an activity, please ESTIMATE the pain or difficulty you would expect.** If you have **never** performed an activity, you may leave it blank.

I. PAIN

Rate the average amount of pain in your wrist over the past week by circling the number that best describes your pain on a scale from 0 to 10, A zero (0) means that you did not have any pain and a ten (10) means that you had the worst pain you have ever experienced or that you could not do the activity because of pain.

Sample scale:	0 No pain	1	2	3	4	5	6	7	8	9	10 Worst ever
RATE YOUR PAIN:											
At rest	0	1	2	3	4	5	6	7	8	9	10
When doing a task with a repeated wrist movement	0	1	2	3	4	5	6	7	8	9	10
When lifting a heavy object	0	1	2	3	4	5	6	7	8	9	10
When it is at its worst	0	1	2	3	4	5	6	7	8	9	10
How often do you have pain?	0 Never	1	2	3	4	5	6	7	8	9	10 Always

2. FUNCTION

A. SPECIFIC ACTIVITIES

*Rate the **amount of difficulty** you experienced performing each of the items listed below, over the past week, by circling the number that describes your difficulty on a scale of 0 to 10. A zero (0) means you did not experience any difficulty and a ten (10) means it was so difficult you were unable to do it at all.*

Sample scale:	0 No difficulty	1	2	3	4	5	6	7	8	9	10 Unable to do
Turn a door knob using my affected hand	0	1	2	3	4	5	6	7	8	9	10
Cut meat using a knife with my affected hand	0	1	2	3	4	5	6	7	8	9	10
Fasten buttons on my shirt	0	1	2	3	4	5	6	7	8	9	10
Use my affected hand to push up from a chair	0	1	2	3	4	5	6	7	8	9	10
Carry a 10-pound object in my affected hand	0	1	2	3	4	5	6	7	8	9	10
Use bathroom tissue with my affected hand	0	1	2	3	4	5	6	7	8	9	10

B. USUAL ACTIVITIES

*Rate the **amount of difficulty** you experienced performing your usual activities on each of the areas listed below over the past week, by circling the number that best describes your difficulty on a scale of 0 to 10. By "usual activities," we mean the activities you performed before you started having a problem with your wrist. A zero (0) means that you did not experience any difficulty and a ten (10) means it was so difficult you were unable to do any of your usual activities.*

Personal care activities (dressing, washing)	0	1	2	3	4	5	6	7	8	9	10
Household work (cleaning, maintenance)	0	1	2	3	4	5	6	7	8	9	10
Work (your job or usual everyday work)	0	1	2	3	4	5	6	7	8	9	10
Recreational activities	0	1	2	3	4	5	6	7	8	9	10

Fig. 3 PRWE score (patient-rated wrist evaluation) developed by MacDermid et al. [3]

5.4 Other Presentations

These are usually associated with primary complaints discussed previously, and the examiner needs to help the patient accurately describe them. A frequent presentation is stiffness usually in flexion-extension or pronosupination and rarely in radial or ulnar inclination. Another is decreased force – usually secondary to pain.

5.5 Inspection

This is usually normal in chronic or subacute (more than 6 weeks) ligament injuries. A dorsal subluxation of the ulnar head may sometimes indicate distal radioulnar dislocation. In recent injuries, diffuse oedema is usual and adds little to the examination.

6 Clinical Measurements

6.1 Mobility

Active and passive mobility is compared to the contralateral side.

Flexion-extension:

The patient sits facing the examiner with the elbow on the table, the forearm vertical. The goniometer is placed on the dorsal aspect of the hand, wrist and forearm in flexion and palmarly in extension (Fig. 4). Normal values are approximately 80° and 70°, respectively [1].

6.2 Pronosupination

It is measured with elbow to trunk, flexed at 90°, and forearm horizontal. It is more difficult than flexion-extension and approximate measures should be avoided. A limb of the goniometer placed vertically in the axis of the arm and the other in the plane of the hand with the eye of the examiner at patient's hand level gives more precise readings (Fig. 5). Normal values of pronation and supination are 70–85° and 90°, respectively [1].

6.3 Radial and Ulnar Inclination

The hand is in supination with the goniometer placed on the dorsum of the forearm, wrist and hand, one limb along the third finger and the other in the axis of the midforearm (Fig. 6). Ulnar inclination is usually up to 40°, while radially it rarely exceeds 20°.

Fig. 4 Measurement of flexion (**a**) and extension (**b**) using the goniometer

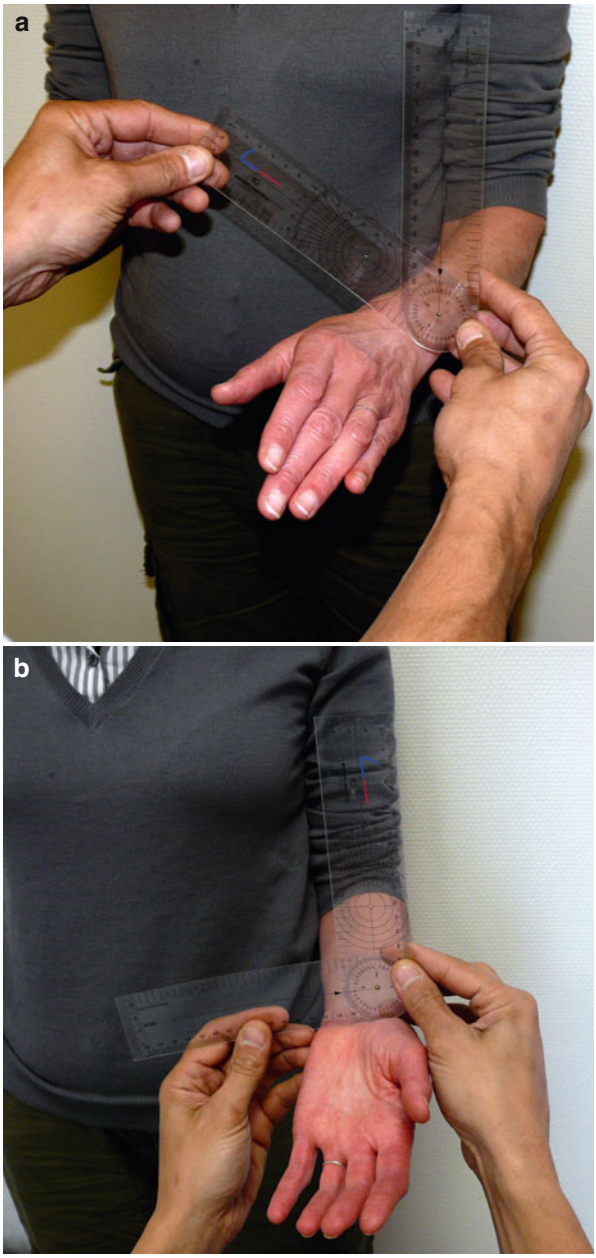

Fig. 5 Measurement of pronation (**a**) and supination (**b**) using the goniometer

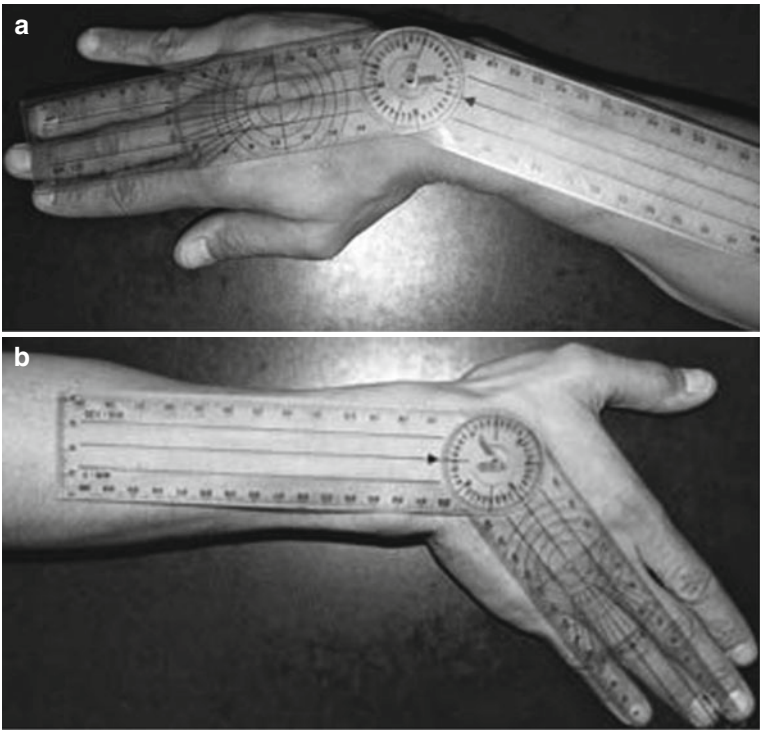

Fig. 6 Measurement of radial (**a**) and ulnar (**b**) inclination using the goniometer

7 Force

7.1 Grip Strength

Strength is measured using a dynamometer 'grip strength' (Fig. 7).

When a mechanical Jamar dynamometer is used, it should neither be too large nor too narrow and should be adjusted to the second spacing as shown by a study on 288 patients – 89 % of whom attained maximum force in this position [4]. The elbow is placed on the table, without resting the forearm, wrist or hand (Fig. 8).

Three measurements are taken for each side alternating rapidly between pathological and contralateral sides to detect potential malingerers. The patient is asked to grip strongly, maximally and briefly. This attitude seems the most logical and widely accepted; however, Haider et al. – in a study on 100 healthy volunteers – showed that the maximum values noted in a single measurement and the average of three measurements showed the same variation (about ±8 kg) and showed no

Fig. 7 Jamar dynamometer for grip strength measurement and pinch gauge dynamometer for pinch grip measurement

statistically significant difference [5]. In 2008, Gunther et al. studied 769 adult Caucasians (403 men and 366 women) aged 20–95 [6].

The normal values obtained are shown in Table 1. The authors noted a ratio of 95 % between right and left sides and that grip strength increases till the age of 35 when it slowly starts decreasing.

The force is directly correlated to several parameters such as the size of the hand or the girth of the forearm but is not significantly related to body mass index, work or dominant hand. Only one study, however, reports this conclusion, the others noting a correlation between dominance and grip strength [8–10].

Fig. 8 Positioning for grip (**a**) and pinch (**b**) strength measurements

Table 1 Normal values of grip and pinch strength in kilograms according to Günther et al. [7, 10]

	Man ($n=403$)		Woman ($n=366$)	
Side	Right	Left	Right	Left
Grip strength (kg)	49	47	29	27
Pinch grip (kg)	10.4	9.7	6.6	6.1

7.2 Pinch Strength

The key pinch is measured using the pinch dynamometer held between thumb and index with the ulnar border of the hand, the wrist and forearm resting on the table (Fig. 5). The same recommendations for grip strength measurement apply (bilateral, rapid alternation, repetition). Normal values as reported by Günther et al. [10] are shown in Table 1.

8 The Anatomic Landmarks of the Normal Wrist

Wrist examination requires thorough knowledge of the anatomy and the surface landmarks. A systematic approach is advised without precipitation to the problem area so as not to miss another clinically significant point. The tour of the wrist is made ending at the starting point. Ideally the examination ends with the problem point designated by the patient. The bony dorsal and palmar landmarks are identified during this examination.

8.1 The Dorsal Bony Landmarks (Fig. 9)

From radial to palmar, the radial styloid can be easily palpated at the proximal wrist followed by the tubercle of Lister, the depression preceding the ulnar head corresponding to the distal radioulnar interval, the ulnar head (projecting in pronation, less obvious in supination) and the ulnar styloid (dorsal in pronation and ulnopalmar

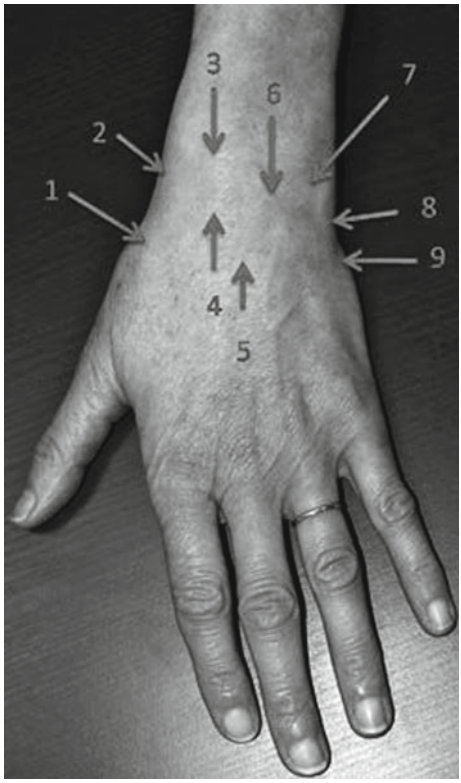

Fig. 9 Dorsal bony landmarks of the wrist: *1* snuff box and scaphoid, *2* radial styloid, *3* Lister's tubercle, *4* scapho-lunate space, *5* capitate's head, *6* distal radio-ulnar space, *7* ulnar head, *8* ulnar styloid, 9 ulnar snuff box and TFCC

in supination) [1]. Distally, the carpal bones can be palpated from radial to ulnar; the scaphoid body in the anatomical snuffbox while the proximal pole is made prominent by flexion and ulnar inclination of the wrist, about 2 cm distal to the tubercle of Lister. Immediately ulnar, still in flexion, is the scapholunate interval/ligament. The lunotriquetral interval is more readily palpable in flexion with radial deviation. Between these two points slightly distally is the depression dubbed the 'crucifixion fossa', which corresponds to the head of the capitate. Finally, the medial border of the wrist is the ulnar snuffbox between flexor carpi ulnaris and extensor carpi ulnaris denoting the TFCC.

8.2 The Palmar Bony Landmarks (Fig. 10)

It is important to carry out the examination in a circular and systematic manner [1] from the ulnar palmar border of the wrist. The ulnar head is palpated, then the pisiform distal to the flexion crease of the hypothenar eminence, and 1 cm distally and radially – the hamate and its hook. More radially, the anterior aspect of the radial styloid is palpated, more distally the tubercle of the scaphoid and the scaphotrapezial joint and finally the crest of trapezium at the base of the thenar eminence, and the base of the first metacarpal.

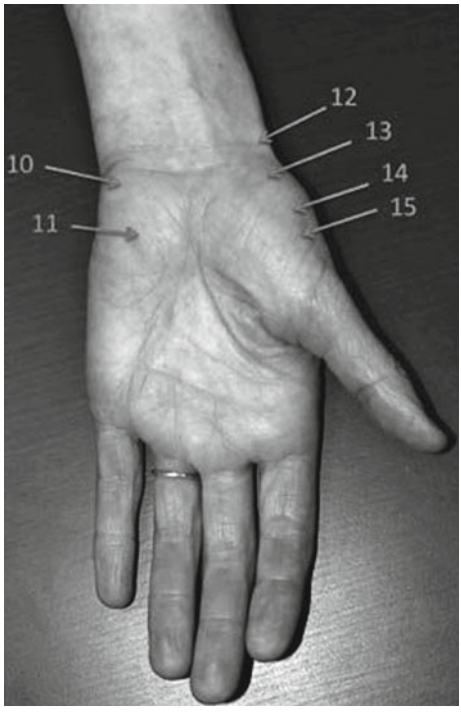

Fig. 10 Palmar bony landmarks of the wrist from ulnar to radial. *10* pisiform, *11* hook of hamate, *12* radial styloid, *13* scaphoid tubercle, *14* anterior crest of the trapezium and *15* first metacarpal

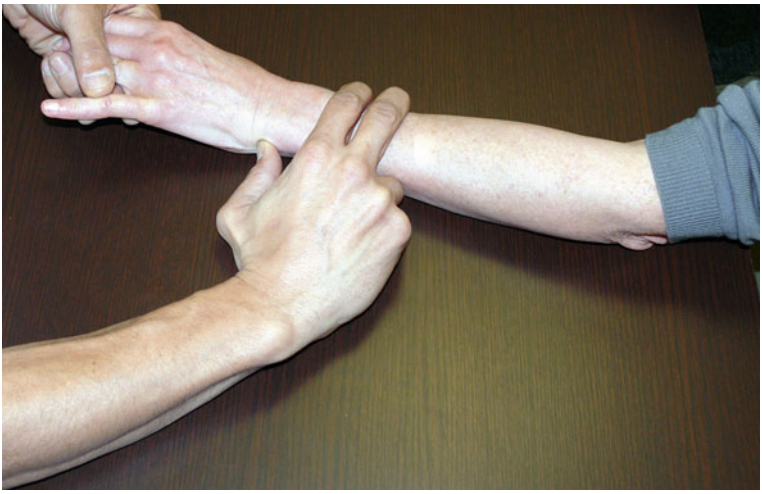

Fig. 11 Pressure on the ulnar styloid eliciting pain and denoting TFCC lesion

9 Palpation

According to Young et al. [11], there are three principles for palpation of the painful wrist:

- The exact point of pain is the site of pathology.
- If the exact point of pain is known, thus the anatomical structure is determined, then the diagnosis is made.
- The association of the positive and negative findings of the examination makes up the diagnosis.

As in the history, the examination, palpation, positional tests and dynamic tests allow precise localization of the pain. Correlated with the anatomy, a clinical diagnosis can be reached – to be confirmed by investigations.

The painful points in search of ligament pathology are on the dorsal and ulnar aspects.

The lunotriquetral interval – 2 cm distal to the tubercle of Lister in the radiocarpal depression – is difficult to palpate as it is situated at the ulnar border of the 4th extensor compartment (sometimes the 5th) and masked by the extensors. At the ulnar border of the wrist, pressure between the ulnar styloid and the triquetrum eliciting pain evokes a TFCC lesion [1, 11, 12] (Fig. 11).

10 Positional Tests

The examiner places the patient's wrist in the specific position triggering the pain and maintains it (pain, deformity).

Distal radioulnar instability can be evidenced by a pathognomonic dimple sign [1, 11, 12], where a depression immediately distal to the head of the ulna is observed on pressure by the examiner's thumb on the neck of the ulna (Fig. 12a) or spontaneously (Fig. 12b).

A TFCC lesion is suspected if pain is elicited by grinding this ligament between the carpal side of the ulnar head and the triquetrum. The examiner places the patient's wrist in pronation and slight extension and applies a forced ulnar inclination (Fig. 13). It is also possible to intensify the test by applying small pronation-supination movements in this position to elicit what Linscheid termed the 'grinding sign' [12].

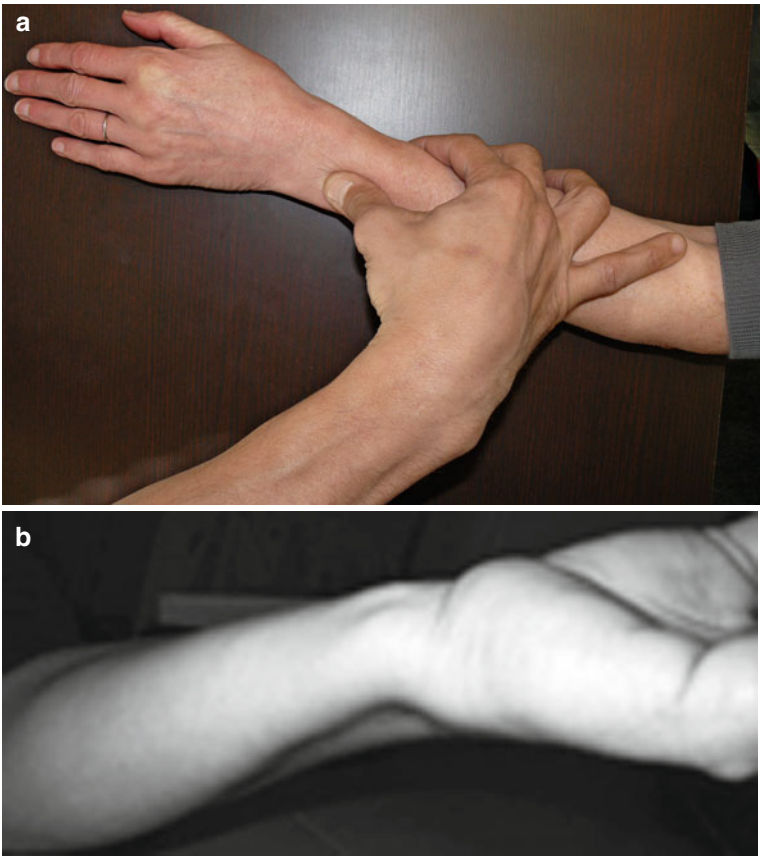

Fig. 12 The dimple sign is pathognomonic of distal radioulnar instability where the depression may be provoked by the examiner pressing on the ulnar neck (**a**) or spontaneously (**b**) (Photo by E. Camus)

Fig. 13 A TFCC lesion is suspected if pain on the ulnar border of the wrist is elicited by grinding this ligament between the carpal side of the ulnar head and the triquetrum

11 Dynamic Tests

They differ from positional tests in that it is the movement from one position to another rather than maintaining a certain fixed position that triggers the pain thus giving a positive test. From proximal to distal, the following tests are used:

11.1 Dynamic Test of Distal Radioulnar Instability

11.1.1 Distal Radioulnar Ballottement (Fig. 14)

The forearm vertical as for scapholunate and lunotriquetral tests, the examiner stabilizes the radius between thumb and index and uses the other hand to move the ulnar head from palmar to dorsal direction in search of dorsal instability (more common) or from back to front for anterior instability (rarer).

A positive result denotes complete rupture of the stabilizing elements of the distal radioulnar joint especially the TFCC or the ECU sheath.

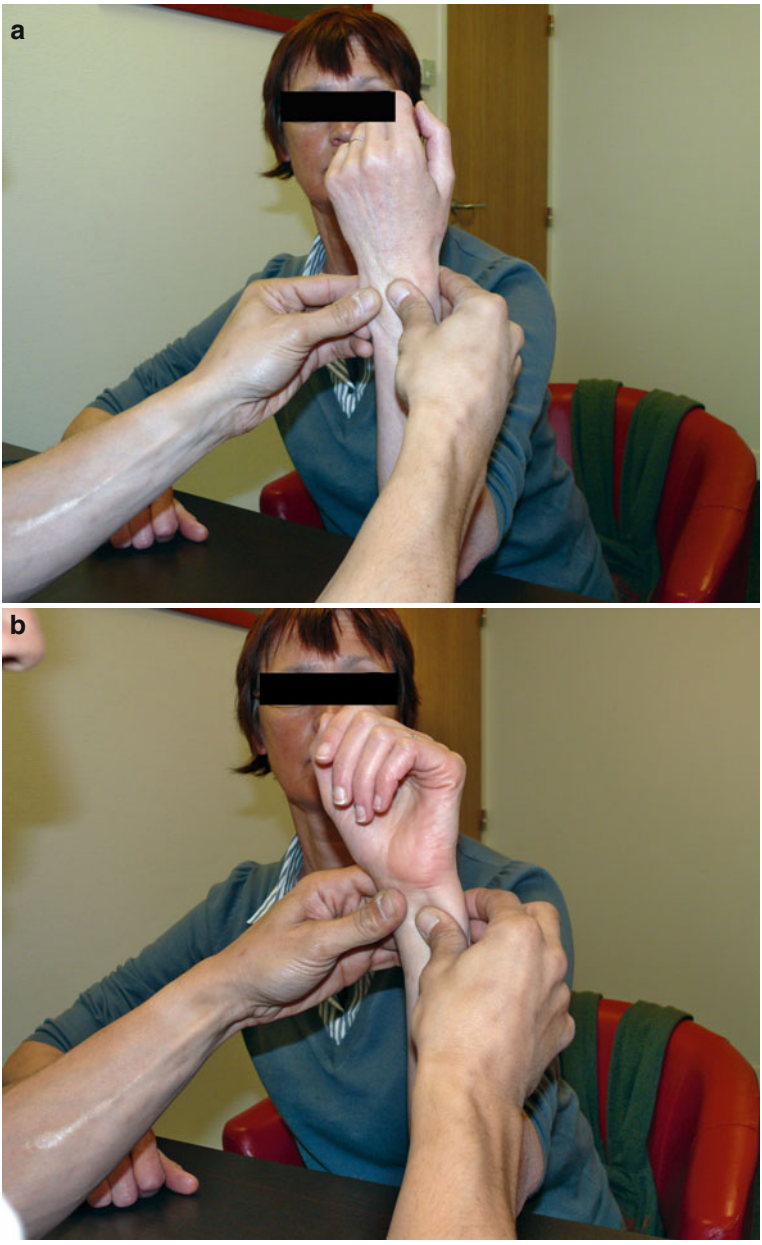

Fig. 14 Distal radioulnar ballottement detecting instability; it should be done in supination (**a**) and in pronation (**b**)

Fig. 15 The test for radiocarpal instability. From ulnar inclination, the examiner combines movement towards radial inclination and a posterior drawer – a painful click/triggering is a sign of instability

11.2 The Dynamic Test of Radiocarpal Instability: Forced Flexion of the First Carpal Row (Fig. 15)

The examiner holds the distal forearm with one hand and carpus between thumb and index of the other hand applying 10° of ulnar inclination. Simultaneous progressive radial inclination is then applied with posterior drawer. A triggering is then produced which may be physiologic and painless in hyperlax wrists but must be considered pathologic if painful [1].

11.3 Dynamic Tests of the Scapholunate Ligament SLL

11.3.1 Scaphoid Shift Test of Watson (Fig. 16)

Described in the mid-1980s by Watson et al. [13, 14], the scaphoid shift test is done by provoking dorsal dislocation of the scaphoid. The examiner places the thumb on the tubercle of the scaphoid and index on its posterior aspect and presses forcibly with the thumb. The wrist is placed in ulnar inclination and the scaphoid is thus maintained vertical (in extension). Bringing the wrist gently to radial inclination, the pressure exerted on the scaphoid prevents it from flexing and puts tension on the SLL. If the SLL is ruptured (even without visible radiological diastasis on static or dynamic views), this manoeuvre triggers acutely painful clicking. It is worthy of note that a non-pathological click may exist in young or hyperlax wrists.

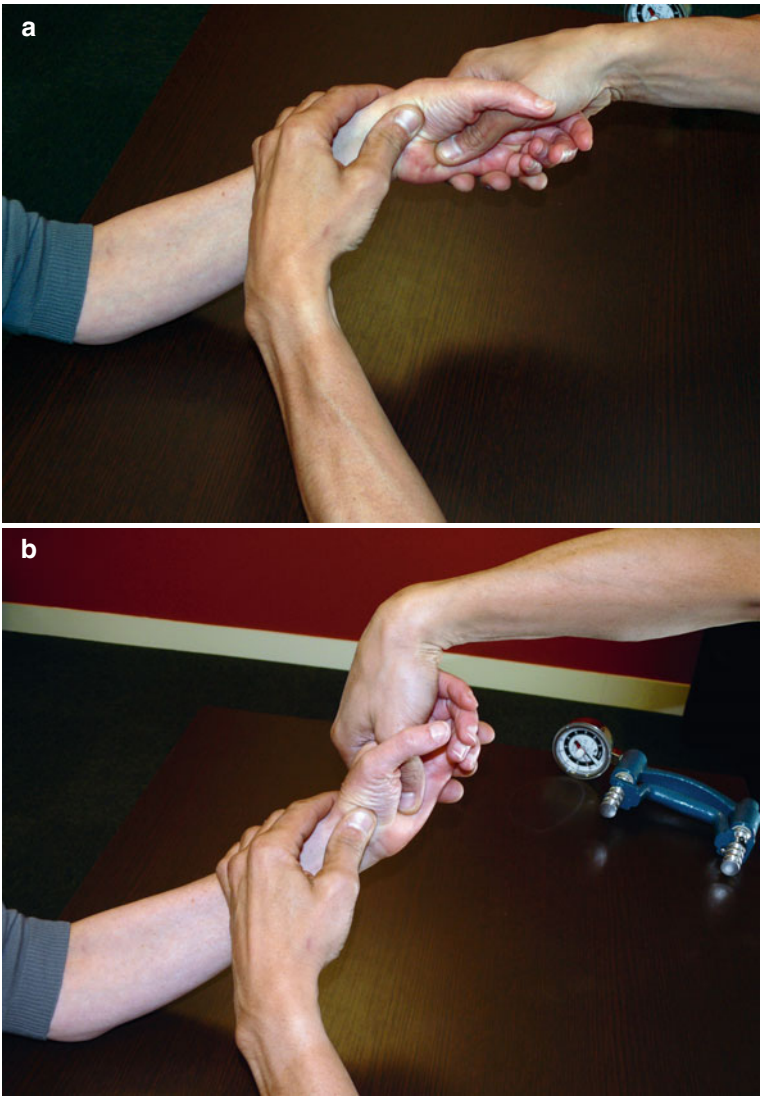

Fig. 16 Watson shift test. The thumb maintains pressure on the scaphoid tubercle. The passage from ulnar (**a**) to radial (**b**) inclination triggers pain

In the years that followed the description of this test by Kirk Watson, many studies evaluated its reliability [15–19], especially radiologically. Most of these studies advocated doing this test under radiological control showing non-pathological clicking in 14–36 % of patients with consensus that pain is necessary and sufficient to declare a positive test. This accentuates the necessity of bilateral comparative examinations especially if a click is found. In partial rupture especially with an intact

posterior part (mechanically more competent), the test may produce pain without clicking which is still a positive test indicating SLL lesion.

In 1995, La Stayo et al. [20], compared clinical and arthroscopic findings in 50 painful wrists showing a 69 % sensitivity and 46 % specificity for the test, 48 %positive predictive value (PPV) and 78 % negative predictive value (NPV). Two years after, another methodologically identical study on 37 patients showed better values, 91 % sensitivity, 77 % specificity and 62 % PPV [21]. Both conclude that this test (as the scapholunate test described previously) is important for the examiner to determine the necessity for further investigations.

In our daily practice, this test is performed at the end of the clinical examination because if positive, it triggers intense pain as well a significant click disagreeable to the patient making him/her more apprehensive for the rest of the examination.

11.3.2 The Scaphoid Lift Test of Dobyns (Fig. 17)

The scaphoid lift test or the scapholunate ballottement test is a variant of the Watson test also indicating SLL lesion [11]. The patient places the elbow on the table, the forearm vertical and the hand and wrist in complete supination. The examiner seizes the scaphoid between thumb and index and the lunate in the other hand. A scissoring movement is applied between the two bones from front to back in relation to the wrist axis and high to low in relation to the table axis – hence the name 'lift'. This movement is repeated fixing one bone and moving the other. A certain amount of mobility can be found in the scapholunate joint, and only a painful test is a positive one even without significant hypermobility. The test may be done with a horizontal forearm in pronation. The same study previously cited for the Watson test states that the sensitivity of this test is 64 % with 44 % specificity, a PPV of 24 % and NPV of 81 % [20].

11.3.3 The Scaphoid Thrust Test of Lane

In 1993, Lane described a modification of Watson's test which he compared to the anteroposterior drawer test of the knee [22] – the scaphoid thrust test. The examiner holds the scaphoid between index and thumb but without applying pressure.

To avoid reflex muscular contractions and defensive tensioning, slow small flexion-extension and radioulnar inclination movements are applied. At an instant of neutral wrist position, a sudden strong pressure on the thumb ray onto the tubercle of the scaphoid from front to back is then applied in an attempt to dislocate the scaphoid posteriorly. According to the author, this test can detect moderate even minimal instability by controlling the amplitude of thrusting. This is not possible in the Watson test, which provokes a sudden brutal uncontrollable click. We have found only two publications [11, 19] mentioning this test with no radiological or arthroscopic evaluation having been conducted.

Fig. 17 Scapholunate ballottement test of Dobyns

11.4 Dynamic Lunotriquetral Ligament Test (LTL): Reagan's Test (Fig. 18)

Described in 1984, this is a test of lunotriquetral ballottement as for scapholunate ballottement, seizing the lunate between two fingers and the triquetrum in the other hand. As before, it is the pain and not the mobility that concludes a positive test [23].

11.5 Dynamic Capitolunate Instability Test (Fig. 19)

Ballottement between capitate and lunate is provoked as previously. In neutral wrist position, the lunatum is hidden in the concavity of the radius articular surface and cannot be seized between two fingers. The forearm is therefore laid horizontal in pronation, and the examiner holds the distal forearm with one hand, the capitate with the other and

Fig. 18 Lunotriquetral ballottement test of Reagan

attempts ballottement as previously described. Pain indicates a positive test and suspicion of radiocarpal instability due to an anterior radioscaphocapitate lesion [1].

11.6 Dynamic Midcarpal Instability Test: The Forced Extension Manoeuvre (Fig. 20)

Resembling the forced flexion manoeuvre, but starting from neutral position to attain 20° ulnar inclination, a block is reached that 'gives way' suddenly with a painful click and sensation of posterior translation of the carpus. This phenomenon corresponds to the passage of the first carpal row from palmar flexion in neutral position to dorsal flexion in ulnar inclination [1].

Fig. 19 Capitolunate instability test

Fig. 20 Midcarpal instability test. From radial inclination, the examiner applies ulnar inclination. After a block that suddenly gives way, a painful click is produced with posterior carpal translation

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