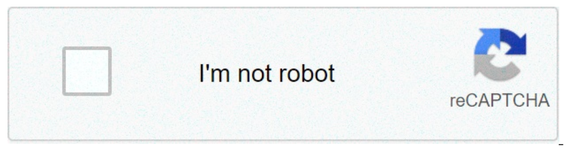

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Midcarpal instability treatment

Midcarpal instability is a complex condition that can present in various forms, from mild pain to debilitating subluxation. Once diagnosed, treatment guidelines for hand therapy are limited by the scarcity of high-level evidence. Evidence does exist for use of proprioceptive awareness and neuromuscular rehabilitation for instability of the knee, shoulder and ankle joint, but studies of similar programmes for the wrist joint have not been published. The purpose of this review is to examine the evidence supporting current concepts in the non-operative management of midcarpal instability, and to provide recommendations for the management of this condition with hand therapy. Keywords: Midcarpal instability; carpal instability; conservative management; proprioceptive rehabilitation; therapeutic management. Carpal/Wrist instability is the result of a large variety of conditions. Any alteration of the shape of the wrist bones or the connections between them can affect the dynamic balance of forces and the wrists unique multi-plane movements.Sensorimotor function is a term used to describe sensory, motor and central processes pertaining to joint stability. Wrist joint proprioception and sensorimotor function provides a platform for neuromuscular joint stability.Afferent information from nerve endings affects the neuromuscular control of the wrist joint.An understanding of these systems as well as the biomechanics of the wrist is critical in its rehabilitation, particularly given the complexity and number of articulations and ligaments within this complex joint.Mechanoreceptors are sensory end organs reactive to joint pressure, motion and velocity. Ruffini Ending, Pacini Corpuscle and Golgi tendon organs are different mechanoreceptors.Ruffini ending is the predominant mechanoreceptor type found in wrist ligaments. They are slowly adapting, low threshold receptor, which are constantly reactive during joint motion. They react to axial loading and tensile strain in the ligament, but not to ‘weight bearing’ type compressive joint forces. Therefore they signal joint position and rotation.The Golgi tendon organ has only been identified in the large dorsal wrist ligaments, the dorsal radiocarpal and dorsal intercarpal which transvers both the radiocarpal and midcarpal joints. This receptor is important in monitoring tensile strain in the ligament during end range. The DIC ligament is important in maintain stability of the proximal carpal row as well as indirect stability of dorsal midcarpal joint spaceThe Pacini Corpuscle are rapidly adapting, high threshold receptors sensitive to joint acceleration/deceleration and compressive but not tensile forces. Unlike the ankle, where they are found in abundance, they have minor importance in the wrist where they are less prevalent.The receptors are most pronounced in the dorsal and triquetral wrist ligaments - DRC, DIC, SL, Palmar Lunotriquetral and triquetrocapitate/hamate ligaments.The arrangements of the wrist ligaments are unique in that the ligaments of the radial column are dense, designed to with stand axial loads given 80% of axial force is transmitted through this side. The dorsal and triquetral ligaments are sensory important structures, and since they traverse both the radiocarpal and midcarpal joints signal throughout wrist joint motion.Proprioceptive reflexes between wrist ligaments and forearm muscles have recently been demonstrated particularly in the antagonist muscles in each wrist position, indicating a joints protective function. Ongoing global stability of the wrist joint is evident in later reactions, which initiate simultaneous co-activation of the wrist flexors and extensors. This delicate balance of co-contraction is also believed important in maintaining smooth and even joint motions.After a wrist injury or wrist surgery, most patients have been immobilized during the posttraumatic or postoperative period. Therefore all of the afferent kinesthetic information from the wrist joint, the skin, and muscle spindles has been lost. Complete with the reduced visual feedback a patient’s total conscious awareness is diminished. Furthermore after ligament injury periarticular muscles are frequently weak, which will result in a neuromuscular imbalance during concentric contractions. Early sensorimotor feedback including mirror therapy. Dynamic stabilization to compensate for compromised ligaments Promotion of motion/strength in muscles that are joint protective. Re-establish the kinematic balance between muscles, ligaments and their mechanoreceptors. Reactive muscle activation exercises. Isometric exercises Eccentric exercise patterns with a focus of the co-activation stabilising forces of the antagonist muscle. Co-activation exercises, simultaneous contraction of agonist and antagonist muscles, to promote global wrist stability a balanced wrist motion. Reestablishing unconscious activation of muscles by restoring the neuromuscular reflex pattern or reactive muscle activation (RMA). Incorporation of nerve gliding with dynamic stabilisation. Slosh pipes Powerball/Rollerball (gyroscope) Weighted balls Flex bars Sand bags Mirror therapy Interx therapy incorporated into exercise regime I will cover the specific types of exercises that address the scientific basis of this programme that have been found to be clinically successful and outline the scope of poor performance and pitfalls. Feinstein WK, Lichtman DM, Noble PC et al (1999) Quantitative assessment of the midcarpal shift test. J Hand Surg Am 24:977–983CrossRefPubMedGoogle ScholarGarcia-Elias M (2008) The non-dissociative clunking wrist: a personal view. J Hand Surg Eur Vol 33E(6):698–711Google ScholarGarcia-Elias M (2010) Carpal instability. In: Wolfe K (ed) Green’s operative hand surgery, vol 1, 6th edn. Elsevier, Philadelphia, pp 465–522Google ScholarHalikis MN, Colello-Abraham K, Taleisnik J (1997) Radio-lunate fusion: the forgotten partial arthrodesis. Clin Orthop Relat Res 341:30–35CrossRefPubMedGoogle ScholarLevy O, Wilson M, Williams H et al (2001) Thermal capsular shrinkage for shoulder instability. J Bone Joint Surg Br 5:640–645CrossRefGoogle ScholarLichtman DM, Schneider JR, Swafford AR et al (1981) Ulnar midcarpal instability – clinical and laboratory analysis. J Hand Surg 16A:515–523Google ScholarLichtman DM, Bruckner JD, Culp RW et al (1993) Palmar midcarpal instability: results of surgical reconstruction. J Hand Surg 18A:307–315Google ScholarMason WT, Hargreaves DG (2007) Arthroscopic thermal capsulorrhaphy for palmar midcarpal instability. J Hand Surg Eur Vol 32:411–416CrossRefPubMedGoogle ScholarNagle D (2005) Lasers and electrothermal devices. In: Geissler W (ed) Wrist arthroscopy. Springer, New York, pp 22–30CrossRefGoogle ScholarSalva-Coll G, Garcia-Elias M, Leon-Lopez M et al (2011) Effects of forearm muscles on carpal instability. J Hand Surg Eur Vol 36(7):553–559CrossRefPubMedGoogle ScholarSotereanos D, Darlis NA, Kokkalis Z et al (2009) Effects of radiofrequency probe application on irrigation fluid temperature in the wrist joint. J Hand Surg 34(10):1832–1837CrossRefGoogle ScholarWright TW, Dobyns JH, Linscheid RL et al (1994) Carpal instability non-dissociative. J Hand Surg (Br) 19:763–773CrossRefGoogle Scholar Social Sharing Lisa Turner AHTA Accredited Hand Therapist Midcarpal instability is a condition that affects your wrist. The symptoms can vary from pain and weakness through to a click or clunk when you move your wrist in certain directions, usually towards the little finger side of your hand. It most commonly arises from joint laxity or weakened ligaments, whether that occurs from a previous injury such as a sprain, or happens with repetitive heavy use of your hand. It can also occur in people who have very hypermobile joints (laxity). The symptoms of pain and instability are not explained by other causes such as a fracture. Signs of midcarpal instability are: Pain in your wristA click when you move your wrist from side to sideWeakness in gripA more noticeable bone (ulna styloid process) on the little finger side of your wrist Your doctor or therapist may do a special test of your wrist to see if the diagnosis is correct. This involves bending your wrist and holding your arm a certain way to check the integrity of the ligaments. What causes the click?Some clicks as you move are normal and everybody usually has a joint that clicks. If you haven’t moved for a while, gas bubbles can build up in your joint and as you move they pop. This is normal. If, however, your wrist clicks every time you move it a certain way and is painful it may be that the ligaments are weakened allowing the bones to move a bit more than normal and this causes the click or clunk. Recently there have been some new ideas in treating this condition that involve attending hand therapy and working with your therapist on a particular set of exercises to help stop your pain and control the clicking. How can hand therapy help? Splinting is sometimes used for a short period to manage pain and permit strengtheningActivity modification – teaching you to avoid positions that cause the click or clunkExercises to help to stabilise and strengthen the muscles to support the area of weakness. This may include isometric, eccentric, co-activation and reactive muscle activation exercises and sometimes using mirror therapy or retraining reflexes can help regain control. Contact your local practitioner of hand therapy today to arrange a consultation to discuss mid carpal instability in further detail. Wrist Instability or carpal instability occurs when takes wrist is damaged by trauma, chronic inflammation or anatomical alterations like ulnar variance and neoplasms. Injuries to the ligaments of the wrist represent a broad spectrum of pathology.There are a number of ligaments of the wrist maintaining a complex articulation of carpal bones. Ligament injuries are often implied by gross radiographic alterations but wrist instability patterns frequently present only after some time has elapsed.Wrist instability or wrist ligament injuries are classified by radiographic pattern, behavior, and chronicity. The patterns of instability are changes produced within the carpus by ligamentous or bony disruptions.A wrist is considered stable when the modifications brought about by the various forces acting on it are restored when the said forces stop to act.In contrast, the alteration of one or more of the structures responsible for stability lead to preclusion of the restoration of the order and leads to misalignment and a decrease in performance of the organ. This happens when takes wrist is damaged by trauma, chronic inflammation or anatomical alterations like ulnar variance and neoplasms.Relevant AnatomyAnatomy of WristTypes of Wrist InstabilityWrist instability can be due to various causes and depending upon its behavior. Wrist instability can be of many types.Classification of Wrist Instability has been approached by various authors.Dynamic and Static InstabilityTaleisnik introduced the concept of static and dynamic instability.Carpal instability often depends on capsular integrity and on the interosseous ligaments. It can beDynamic instability – This occurs in incomplete injury. The wrist maintains normal alignment at rest but will collapse under applied load.Static Instability – This occurs in complete injury to the structure involved. This kind would show abnormal intercarpal alignment on static radiographs.The static deformity is always present irrespective of whether the wrist is in the neutral position or under some stress.With a dynamic instability, x-rays reveal abnormal carpal ligament only one stress is applied or when the wrist is in a non-standard position. Dynamic and static instability can be thought of as different stages in a clinical spectrum of partial or complete ligament injury.Frequently, but, not exclusively, nondissociative instabilities are static. [see below]Volar and Dorsal Intercalated Segment Instability or VISIVolar and Dorsal Intercalated Segment Instability are instabilities of an intercalated segment of the wrist. The intercalated segment is the proximal carpal row.As the name suggests, volar intercalated segment instability or VISI is opposite of dorsal intercalated segment instability or DISI.Volar Intercalated Segment InstabilityVISI is said to be present when there is volar flexion of the lunate>15 degrees [in relation to the longitudinal axis of the radius and capitate] when the wrist is in a neutral position. This occurs because of loss of ulnar support from the triquetrum and the lunate has a tendency to flex.VISI is found inLunotriquetral dissociationNondissociative carpal instabilityCarpal instability complexDorsal Intercalated Ligament Instability or DISIDorsal intercalated segment instability is said to occur when the lunate slips into fixed extension >10 degrees. This occurs when radial ligamentous stability is broken.MRI of DISIThe condition is also termed as dorsal instability.Massive ligament disruption at the time of injury, as may occur in perilunate or lunate dislocations, or gradual attrition of the secondary extrinsic stabilizers leads to an abnormal extension of the lunate and carpal collapse after scapholunate dissociation.The combined effects of an extension moment and dorsal translation of the capitate force puts the lunate into extension and exacerbate the abnormal posture of the scapholunate joint.Capsular contracture may serve to fix the deformity.So all these means is that in DISI, the lunate is angulated dorsally. The relative alignment of the scaphoid to the lunate forms angle of 45 degrees. When the scapholunate angle is more than 70 degrees, ligaments between the scaphoid and lunate become nonfunctional. In such situations, the lunate becomes extended and maintains the position even during radial deviation.This does not allow normal rotation and the spatial adaptability of the proximal row. A DISI deformity is seen inScaphoid fracturesScapho-lunate dissociationPerilunate dislocationInstability Based on Motion PatternsPatterns of the instability can be further described based on the normal patterns of motion. Both the proximal and distal carpal rows have particular patterns of motion within the rows (ie, relationship of the scaphiod relative to the lunate).This normal motion has been termed “associative.”A disruption of the normal kinematic within a row is a dissociative instability. Dissociative carpal instabilities any result from a disruption of any of the bony or ligaments components of the wrist.Disruption between rows, while the alignment within each row remains normal, is a nondissociative instability.Nondissociative carpal instability [CIND]Carpal instability, nondissociative (CIND), includes instability patterns that occur between a carpal row and the adjacent transverse osseous structures.It is defined as an alteration in the articular relationship between the two carpal rows, while the individual joints between the skeletal elements of each row are maintained.In these patterns, there is no dissociation within the carpal rows (ie, competent interosseous ligaments). These instability patterns includeMidcarpal instabilitiesUlnar translocations [the carpus moves ulnar wards. Seen in Rheumatoid arthritis and Madelung deformity.]Capitolunate instability – Palmar subluxation of the capitate on the lunate.Proximal carpal row instabilities.Midcarpal InstabilityType I- Palmar midcarpal instabilitySecondary to an injury to the palmar midcarpal ligaments [Scaphotrapeziotrapezoid, triquetrohamate and triquetrocapitate ligamentsPalmar subluxationType II- Dorsal Midcarpal instabilityType I instability+ injury to the radioscaphocapitate ligament. Dorsal subluxation is dorsal.Type IIIHyperlaxity of midcarpal and radiocarpal ligaments.Dorsal or palmar subluxationType IV – Extrinsic midcarpal instabilityOften due to malunited radiusDorsal angulationProgressive stretching of the radiocapitate ligaments.Dorsal subluxationCIND can occur secondary to fractures, disruption or laxity of extrinsic ligaments, or both.The most frequent reasons for nondissociative carpal instability are the collapse of the capsule and that of the intercarpal ligaments mostly following rheumatoid arthritis. Trauma is another cause.Dissociative Carpal InstabilityDissociative carpal instability is present when there is instability between individual bones of a carpal row.Most common causes are fracture or ligament disruption.Dorsal intercalated segment instability and Volar intercalated segment instability are included in dissociative instability. This is because there is disruption of the ligament bond or the bone structure between the lunate and one or both of the adjacent carpal bones.Examples of dissociative carpal instability areScapholunate instabilityLunotriquetral dissociationComplex Carpal Instability[CIC]Carpal instability, combined or complex (CIC), is a combination of two or more specific CID or CIND patterns. Example of the complex instability includes perilunate dislocations, radiocarpal instability with axial instability, and scapholunate dissociation with ulnar translocation.Adaptive Carpal Instability [CIA]The instability does not reside in the carpus but is due to sequelae of radial fractures with dorsal displacement in the epiphyseal region.Adaptive carpal instability results from the repositioning of the carpus in response to a change into bony architecture.One of the more common etiologies of an adaptive instability is the dorsally angulated distal radius malunion, which result in a compensatory DISI of the secondary to scaphoid nonunions, lunate malunions, or Madelung’s deformity.Clinical Presentation and Evaluation of Wrist InstabilityThe history of presentation would range from high-energy polytrauma to low-energy mechanisms that cause mild, protracted symptoms. Wrist ligament injuries can range from subtle instability patterns as the result of attrition to acute and chronic injuries. Evaluation for wrist ligament injuries and resultant instability is mandatory in all patients with wrist symptoms, whether or not a recent traumatic event is identified.Even gross carpal malalignment may be overlooked or misdiagnosed at the time of initial injury and radiographic examination.The most devastating of these injuries, lunate or perilunate dislocations, comprise only 10% of all carpal injuries and usually occur as a result of high-energy injuries. of these, transscaphiod perilunate fracture-dislocations are the most common, representing 61% of all perilunate dislocations in one study.The patient may present with pain and/or clunking Some patients present quite late with deformity already present. Most of the patients present with painful clunking on the ulnar side of the wrist during activities that involve active ulnar deviation.There would be a history of asymptomatic wrist clunking for many years. There could be a history of hyperextensive injury or there could be the absence of any significant trauma.Ligamentous laxity and a hypermobility should be ruled out.Being subtle the deformity patterns may be difficult to detect in early stages.The examination should ascertain hand dominance, loss of motion, prior hand or wrist conditions, and past medical history.These components would affect treatment decisions.In the acute high-energy injury, physical examination may reveal gross deformity, swelling, ecchymosis, or lacerations. The carpal injury may be overlooked or considered a low priority in this setting because of the presence of other more demanding injuries. Median nerve examination should be particularly done as up to 25% of the cases of acute carpal tunnel syndrome.Palpation for specific sites of tenderness, and a careful neurologic/vascular examination, especially with sensory testing, are mandatory.Point tenderness over specific carpal ligaments, such as the scapholunate interosseous ligament or the lunotriquetral interosseous ligament may represent injuries to those ligaments.Patients with injuries caused by subacute or chronic processes may present with pain, popping catching, or symptoms of secondary degenerative changes.In these patients, a more detailed examination of the carpus is performed. The active and passive range of motion is assessed and recorded. Direct palpation over the scapholunate, lunotriquetral, triangular fibrocartilage complex and midcarpal joints may greatly narrow the differential diagnosis.Specific maneuvers or Special TestsThese are done to check for ligamentous disruption of the wrist may also help determine the extent of the injury. These should be done in sytematic way, beginning on radial side Watson’s scaphoid shift test, followed by the midcarpal shuck test and the lunotriquetral ballottement test.Watson Scaphoid Shift Test for Scapholunate InstabilityWatson test or Scaphoid shift test is a wrist provocative stress test done for Scapholunate instability.The examiner’s thumb is placed on the scaphoid tuberosity of the volar aspect of the wrist. Pressure is applied to the tuberosity as the wrist is passively brought from ulnar to radial deviation. This pressure attempts to block normal scaphoid flexion.A combination of pain and a palpable clunk when the wrist is brought from ulnar deviation into radial deviation while pressure is applied to the palmar aspect of the scaphoid tubercle.[In theory, it indicates torn a scapholunate ligament and scapholunate instability which leads to the proximal scaphoid subluxating over the rim of the radius. A painful clunk indicates a reduction of scaphoid into the radial scaphoid fossa.]A false positive result can also be obtained in individuals with lax ligaments.Here is a video demonstration of the testFor lunatotriquetral instabilityShuck Test or Ballottement TestShuck test or Shear test, also called Ballottement test is done for lunatotriquetral instability.The examiner’s thumb and index finger grasp the whole pisotriquetral unit. The contralateral thumb and index finger hold the lunate. The test is performed by applying a dorsally directed pressure to the pisiform and a palmarly directed pressure to the lunate [Lunate can be palpated beyond dorsal and ulnar corner of the radius.]The maneuver results in a shearing stress on lunatotriquetral joints and vector across the lunotriquetral joint. A crepitation or clicking associated with reproduction of pain is indicative of lunotriquetral dissociation.The triquetrum is displaced dorsally and palmarly on the lunate. The test may be false negative in cases of ligamentous laxity.Here is a nice demonstration of Shuck test.The diagnosis is aided by the midcarpal stress test which is performed by applying an axial load to a pronated and slightly flexed wrist, which then is brought into ulnar deviation. A painful clunk is a sign of instability [50% of patients with MCI may also have a clunk in the normal contralateral wrist and should always be examined]Linscheid Compression TestThe examiner uses a thumb to apply a load in the radial direction at the ulnar border of the triquetrum. The loading results in a compression force across the lunotriquetral joint. If this results in pain, the result is considered positive.For Midcarpal InstabilityLichtman’s Pivot Shift TestIt is done for midcarpal instability. This test is a combination of ulnar deviation, axial compression, and pronation of the wrist. A positive result is obtained when this maneuver results in a painful wrist click.Dorsal-displacement stress testUnder fluoroscopic control, a positive result is obtained when the capitate subluxates dorsally on dorsal stress as compared with the lunate and when the patient experiences a painful snap or click. Indicates capitolunate instability.Without fluoroscopy, apprehension is taken as a positive sign.ImagingX-rays are the basic investigations. These are most helpful when there is bony injury fractures or diagnosing ligament disruption with associated fractures. The use of other modalities must be based on the particular clinical scenario.Plain XraysGilula ArcsRadiographic examination of the wrist is mandatory for all suspected wrist ligament injuries and instabilities.Posteroanterior (PA) view in neutral rotation, as well as lateral views, should be enough to evaluate static deformities.A comparison with the opposite wrist should be done for better assessment.For evaluating dynamic stability, additional radiographs (eg, PA grip, PA maximum radial deviation, PA maximum ulnar deviation, and lateral maximum flexion, and lateral maximum extension views) can be obtained..On PA view, disruption of one of the Gilula arcs suggests either a fracture or subluxation from a ligamentous injury.Increased distance between the scaphoid and lunate may indicate scapholunate interosseous ligament disruption.In patients with acute, gross malalignment of the carpus, a PA radiograph with 5 to 10 Ib of traction frequently aids in the assessment of intracarpal ligament disruptions or fractures.Lateral radiographs should be carefully evaluated to make sure that the capitate reduces in the lunate and the lunate is reduced in the fossa of the radius.Many patterns of instability can be identified.In many acute carpal ligament disruptions, the initial plain radiographs are normal, with instability patterns recognized only as a late finding.Specific instability views may be indicated to accentuate more can subtle instabilities.For example, a PA clenched fist view can demonstrate dynamic scapholunate widening.Fluoroscopy examination with provocative motion or maneuvers can demonstrate dynamic instability.X-ray MeasurementsScapholunate AngleCapitolunate AngleRadiolunate AngleFollowing angles should be measuredRadiolunate angle- 15 degree palmar to 15 degrees dorsalCapitolunate angle- 300 dorsal to 300 palmar)Scapholunate angle – 380 – 600Lunotriquetral angles – 14 degrees dorsal[In scapholunate instability, the scaphoid tends to assume a volarly flexed posture and scapholunate angle is> 70º.Conversely, in lunotriquetral instability, the lunate is usually palmarly flexed, and the scapholunate angle can be less than 30º.DISI and VISI can be defined by these values (see the classification)Scapholunate gap can be measured on PA and PA grip radiographs. [> 3 mm. is generally considered pathologic but comparison with opposite wrist should be done.]Determine ulnar translocation on PA x-ray – The distance between the center of the capitate and a line extending from the intermedullary axis of the ulna is divided by the length of the third metacarpal. [Normal is 0.30±0.03]ArthroscopyArthroscopy remains the standard for diagnosing specific ligament injuries in the wrist. Both radiocarpal and midcarpal joints should be evaluated.Arthroscopy is a very sensitive diagnostic test, and frequently clinically silent lesions may be detectedComputed TomographyCT provides more detailed evaluation and may be indicated for subtle intra-articular fractures, to assess the degree of displacement, or to check for union of a fracture. Dynamic 4D CT imaging technique generates images with high spatial and temporal resolution and could be deployed to assess joint instability using this technique.Bone ScintigraphyThese studies may be helpful to identify radiographically occult fractures, most commonly those of the scaphoid..ArthrographyArthrography has historically been the gold standard diagnostic test. Contrast medium is injected into the radiocarpal, midcarpal, and radiolunate compartments, with dye flow between any two indicating a tear.Arthrography lacks specificity and is an invasive procedure.Its most common use tends to be for evaluation of subacute or chronic wrist symptoms.MRIMRI has gained has the potential to provide diagnostic evaluation of intrinsic and extrinsic carpal ligaments as it has the advantage of provides better soft tissue images.Treatment of Wrist InstabilityMilder forms of instabilities in not so active patients can be considered as well to for nonoperative management.Conservative measures that can be taken areExternal supportMusculotendinous exercisesAnalgesicsSteroid InjectionsChange or modification of profession/employmentFailure of conservative treatment can be considered for the cases where conservative treatment has failed.To simplify the discussion, treatment is summarized below under the headings of the following specific types of instabilities:Scapholunate instabilityPartial tears of the scapholunate interosseous ligament (SLIL) are thought to represent occult or predynamic instability. For these injuries, most recommend an initial trial of splinting, casting, or both.Arthroscopic debridement with or without pinning can be an option in these patients in whom initial conservative treatment is unsuccessful.With complete scapholunate tears, options areDirect repair with or without dorsal capsulodesisArthroscopic debridement, reduction, and pinningIn acute cases (