

WRIST STABILISATION

Caveat "For fools rush in where angels fear to tread" (Alexander Pope)

Attitudes Enthusiasm *versus* Pragmatism

Anatomy Intraosseous ligaments
Capsular ligaments

Kinematics The radius and ulna, and distal carpal row form stable platforms. In contrast, the proximal carpal row is an intercalated segment with no muscle insertions whose stability depends entirely on capsular and interosseous ligaments.

Wrist sprain Final diagnosis in 100 consecutive patients with wrist injuries after excluding obvious fractures of the distal radius

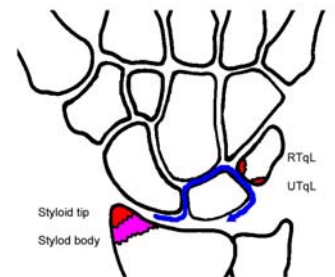
Diagnosis	Number
Fracture of scaphoid waist	3
Fracture of scaphoid proximal pole	1
Flake fracture of triquetrum	3
Fracture of distal radius	12
Fracture of distal radius + scapholunate instability	2
Scapholunate instability	3
Normal	76

Instability Dissociative carpal instability (CID)
Non-dissociative carpal instability (CIND)
Complex carpal instability (CIC)
Adaptive carpal instability (CIA)

ScL instability

Classification (Mayfield)

- I Instability limited to the scapholunate joint.
- II Added instability of the capitolunate joint.
- III Added damage to the triquetrolunate joint.
- IV Dorsal disruption of the radiocarpal ligament, lunate unstable.



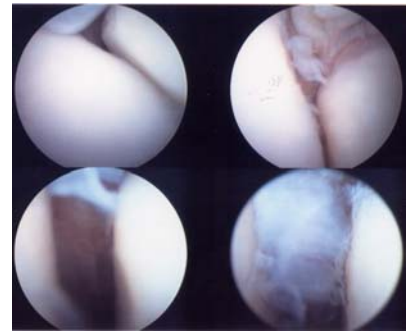
Assessment History
Examination
Radiology
Videofluoroscopy
MRI/CT
Arthroscopy



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Arthroscopy

Definitive diagnosis
 Associated injuries
 State of joint surfaces
 Debridement
 Reduction
 Repair



Classification
 (Stanley & Saffar)

Dynamic I Normal radiograph
 Arthroscopic step-off

Dynamic II Normal unloaded radiograph
 Widened ScL under loading
 Arthroscopic wide step-off

Static Widened ScL unloaded
 Flexed scaphoid >60
 Arthroscopic MCJ/RCJ communication

Dynamic instability

Dorsal ScL tenderness
 Watson test
 Arthroscopy/Arthrogram

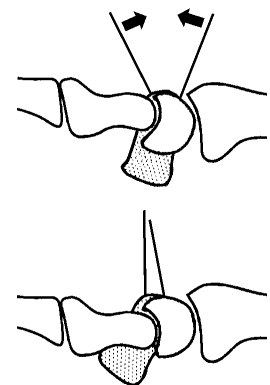


Decision making

Symptoms
 Length of history
 Degree of instability
 Associated injuries
 Degeneration

Treatment options

Closed reduction/cast
 Percutaneous reduction/pinning
 Arthroscopic assisted reduction
 Open repair
 Capsulodesis
 Tenodesis
 Ligament reconstruction
 Limited arthrodesis

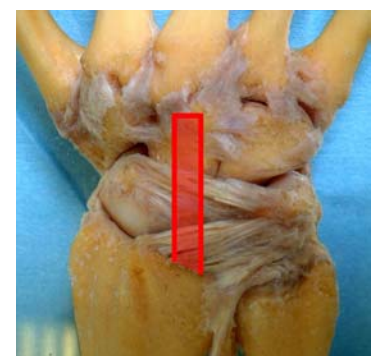


Principles

Reduce
 Hold
 Repair
 Stabilise
 Protect
 Rehabilitate

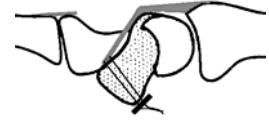
Blatt

A longitudinal dorsoradial incision is used with the wrist joint exposed through the fourth extensor compartment. A longitudinal incision through the dorsal wrist capsule exposes the scaphoid. A 1 cm broad flap of the capsule is developed from the ulnar side of the capsular incision. This flap is freed from its distal end. The nature of the SL ligamentous injury is visually confirmed. A K-wire is passed into the dorsum of the lunate and used as a joystick to reduce any DISI. The flexed



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scaphoid is reduced using thumb pressure on the scaphoid tubercle and by deviating the wrist ulnarwards. The scaphoid is then transfixed to the capitate using another K-wire. The dorsal surface of the scaphoid just distal to the centre of rotation, normally devoid of cartilage, is identified and roughened using a burr. A drill hole is made from this area exiting on the palmar aspect of the distal tubercle. The capsular flap is inserted into the distal half of the scaphoid with a 4/0 stainless steel pull-out stitch tied over a button on the tubercle of the scaphoid. Alternatively, the capsular flap is anchored to the distal pole of the scaphoid with an Acuflex TAG (Acuflex, Boston, USA) without a tie-over button. A thumb spica is applied for a period of 2 months. The K-wires are removed at 8 weeks, a removable splint is given and gentle active movements started under a physiotherapist's supervision. Forceful movements are not allowed for 6 months (Deshmukh et al.)



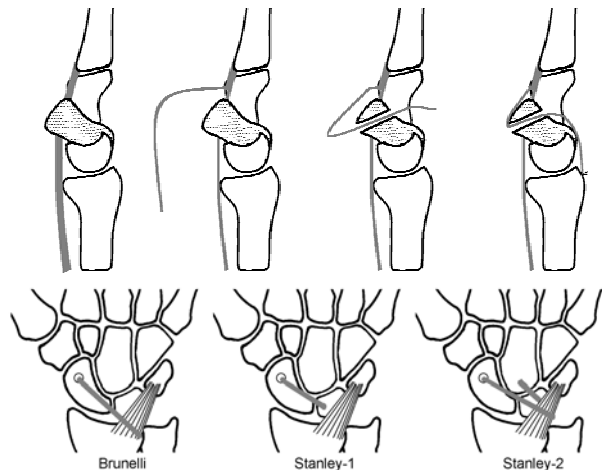
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Decreased flexion
No alteration in carpal anatomy
Variable outcome reported
Row kinetics more suitable?

Brunelli

A palmar incision is made over the scaphoid tubercle to expose the distal pole of the scaphoid and the sheath of the flexor carpi radialis (FCR) tendon. The sheath is then incised and a tendon grasping forceps is passed in this sheath about 10cm proximally along the FCR within the sheath. A second proximal palmar incision is then made over the grasping forceps and a strip about one-third of the FCR tendon is then detached from the main body of the tendon on its anterior surface and stripped from proximal to distal, delivering the tendon strip in the distal tubercle incision.

A dorsal 5cm transverse incision is then made at the level of the scapholunate joint. The scapholunate joint is exposed as well as the scapho-trapezotrapezoidal (STT) joint. Scar tissue is excised from both joints. The rotatory subluxation of the scaphoid is reduced if necessary by the technique of "joy-sticking" using temporary K-wires in the scaphoid and lunate to manipulate the bones into a reduced position (extending the scaphoid and flexing the lunate). A K-wire is then drilled from the front of the scaphoid tubercle to the posterior bare area to confirm the right direction of the tunnel through which the FCR tendon slip will run. A cannulated AO 3.5mm drill is then passed over the correctly positioned K-wire. Check radiographs may be taken to ensure accurate placement of the guide. Next the FCR-tendon slip is passed through this tunnel. The slip is tightened to ensure the scaphoid is reduced.



The tendon slip was attached to the lunate with an Acuflex tag in 13 cases. In nine patients the slip was passed under the dorsal radiolunotriquetral ligament which is a capsular thickening. The slip was pulled through this ligament close to the dorso-ulnar border of the radius. After adequate tension was achieved the tendon was sutured back on itself.

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Care is taken not to damage the posterior interosseous nerve. Skin closure is done with a subcuticular 3/0 Prolene suture. A supportive bandage and a palmar plaster of Paris slab, which includes the thumb, is applied. A scaphoid plaster is applied three days later. The stitches are removed two weeks postoperatively and another scaphoid plaster is then applied for four weeks. Six weeks postoperatively gentle range of motion exercises are started and a splint is worn for another six weeks. After 12 weeks grip strengthening exercises are started. (Van den Abbeele et al.)

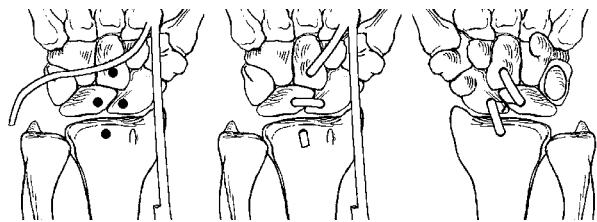
Brunelli

Recent innovation
Improved pain in short-term
No change in kinematics
Unchanged power
Unchanged function score
Anterior scar tenderness
No long-term studies

Reconstruction

A straight dorsal incision overlying the fourth dorsal compartment is used. The extensor retinaculum is reflected radially from the fifth compartment extending to the third dorsal compartment. The retinaculum is left attached on the radial side. The dorsal interosseous nerve is divided proximal to the wrist joint, and the wrist capsule is then opened longitudinally exposing the scaphoid, lunate, and capitate. The carpus is inspected to determine the amount of scapholunate tear and signs of articular loss. A palmar incision similar to a carpal tunnel incision is also made with a zigzag extension several centimeters proximal to the palmar wrist crease. Small drill holes are then placed, dorsal to palmar, in the proximal neck of the capitate, the nonarticular surface of the lunate, and the nonarticular proximal pole of the scaphoid, 5 to 7 mm from the proximal surface. The palmar capsule is penetrated but not stripped. The rotatory subluxation of the scaphoid must be reduced before passing the drill through the palmar capsule. If the surgeon is unsure of the placement of the hole, a small Kirschner (K-)wire can be used as a guide.

The small drill holes are enlarged to about 3.5 mm with a larger drill or hand bur. The dorsal wrist incision is then extended proximally along the course of the radial wrist extensor tendons. One half of the carpi radialis brevis tendon is severed at the musculotendinous junction and then stripped distally to its insertion (Fig 4). After stripping the tendon distally, a locking zigzag suture is passed through the tip of the tendon leaving the suture protruding distally. At this



point the scaphoid and lunate are reduced by means of a 22-gauge stainless steel wire that is passed through the two holes. A wire tightener is used to tighten the wire dorsally reducing the scaphoid and lunate firmly together. To facilitate weaving the tendon, a 22-gauge wire loop is passed palmarly through the capitate to retrieve the suture attached to the tendon. The tendon is then passed back through the capitate, dorsal to palmar, exiting through the capsule on the floor of the carpal canal. The drill holes must be large enough to accept the tendon graft easily; frustrating delays and shredding of the tendon graft can occur if the holes are too small. The tendon is threaded in a similar manner from the palmar surface of the wrist, dorsally through the lunate over to the scaphoid, and palmarly again through the proximal pole of the scaphoid. It exits on the palmar surface of the scaphoid. The palmar exit is outside of the capsule of the wrist, and the capsule is not stripped. The surgeon should note the position of the exit of the tendon from

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the scaphoid on the radial side of the carpal canal. A considerable portion of the distal volar radius should be exposed. This should not be adjacent to the exit hole of the scaphoid but more ulnarward to tether the proximal pole of the scaphoid in that direction. The hole in the radius is drilled on the exposed palmar surface, exiting dorsally in the fourth compartment; the tendon is then passed through the radius to the dorsal surface. The tendon is pulled as tightly as possible through this radial drill hole and sutured dorsally to the periosteum and/or capsule and then palmarly to the capsule with nonabsorbable suture. The dorsal capsule and retinaculum are then closed (Alquist et al.).

Reconstruction

Technically very demanding
Extensive exposure
Drill hole problems
Variable reliability



References

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