Arthroscopic Thermal Capsular Shrinkage for Palmar Midcarpal Instability

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Abstract

Background Arthroscopic capsular shrinkage has been previously used to stabilize major joints. This is the first series of its use in the wrist for palmar midcarpal instability (PMCI).

Materials and Methods This is a medium-term retrospective review of 13 patients (15 wrists) at an average follow-up of 48 months postoperative. All patients were assessed with a functional questionnaire for instability and a Disabilities of the Arm, Shoulder, and Hand (DASH) score, as well as clinical examination.

Description of Technique Arthroscopic capsular shrinkage was performed to the palmar and dorsal capsules of the radiocarpal and midcarpal joints using a bipolar thermal probe. All wrists were immobilized for 6 weeks post operation.

Results 100% follow-up was achieved. All cases had an improvement in the frequency and severity of instability symptoms. The average DASH score was significantly reduced. There were no complications. The average loss of movement following the procedure was 15%.

Conclusions The medium-term results show that wrist instability due to PMCI can be improved significantly by thermal capsular shrinkage with only a minimal amount of secondary stiffness.

Keywords

- wrist arthroscopy
- midcarpal instability
- capsular shrinkage

Palmar midcarpal instability (PMCI) has previously been treated surgically with partial wrist fusion or tenodesis procedures.¹ These can have the effect of causing significant stiffness that limits the functionality of the wrist.² To try to minimize the trauma of access and functional loss, we have used arthroscopic thermal capsular shrinkage to try to stabilize the wrist joint. PMCI is usually secondary to global ligament laxity, but especially that of the palmar arcuate ligaments of the wrist. The laxity leads to an inability to control the proximal carpal row, often causing a “giving way” or “clunking” sensation. This may be associated with a painful wrist.

Thermal shrinkage has been used in several other joints to improve the stability. The results of this treatment in the shoulder was initially good, but subsequent medium-term results deteriorated with a significant incidence of recur-

rence.³ Postoperative immobilization of the shoulder was limited. We propose that the ability to immobilize the wrist post thermal shrinkage allows sustained and adequate improvement in the stability of the wrist.

Patients and Methods

A retrospective review of 15 wrists in 13 patients has been performed and reported.⁴ All patients had undergone arthroscopic thermal capsular shrinkage of the wrist. This was a single-surgeon (DGH) series, and all patients were independently reviewed by my original coauthor William Mason. Preoperatively all patients were diagnosed as having PMCI by the reproduction of their symptoms on performing the ulnar shift test and the palmar midcarpal drawer test. The ulnar shift test is performed by passively moving the clenched fist

under axial load from radial to ulnar deviation. The test is positive if the patient demonstrates a clunk during this procedure. The palmar midcarpal drawer test is also performed passively. The examining doctor holds the relaxed wrist in slight flexion and ulnar deviation. The base of the third metacarpal is then depressed palmarwards, causing the carpus to translocate. These test are positive only if the translocation or clunk reproduces the feeling of pain and instability that the patient complains of. X-ray images and magnetic resonance imaging (MRI) scans were performed on all patients and excluded other pathology or other cause of instability. There were no cases of static deformity. Fluoroscopic examination of the wrist confirmed a degree of midcarpal laxity and excluded other dissociative types of instability.

The mean age of the patients was 28 years (range 19–50 years). There were 10 female and 3 male patients. Two women had bilateral treatments. Nine of the treated wrists were on the dominant side. Six patients gave a history of previous minor trauma that initiated the symptoms. Symptoms of pain, clunking, or giving way had been present for an average of 5 years. All patients had been previously treated with physiotherapy for 6 months prior to surgery. This included proprioceptive and strengthening regimes. A spinball gyroscope was utilized for strengthening in the improving patient. Splinting was not used preoperatively.

All patients were assessed pre- and postoperatively with Disabilities of the Arm, Shoulder, and Hand (DASH) scores and a structured questionnaire including questions particular to wrist instability. I have previously noted that patients with PMCI have difficulty in pouring from a kettle or jar. Patients often feel able to pick up the jar, but as the wrist pronates to allow pouring, the wrist has a tendency to collapse. Patients were asked to specify the frequency of these symptoms as “Always,” “Often,” “Sometimes,” or “Rarely or Never.”

Surgical Technique

Wrist arthroscopy was performed under a general anesthetic with standard radiocarpal (3/4 and 6R) and midcarpal radial (MCR) and midcarpal ulnar (MCU) portals. The hand was suspended using a traction tower. After careful visual examination and exclusion of other pathology, capsular shrinkage was performed using a bipolar 2.3-mm VAPR end-effect probe (Mitek, Depuy, Leeds, UK). The settings of the probe were reduced to “60.” Cauterization mode was exclusively used. The probe was used very sparingly in a “spotting” type of technique. The probe was activated for ~1 second at each episode. The probe was moved to a different site prior to reactivation of the probe. This allowed approximately a 5-second gap prior to reactivation. The tissue was expected to change visually with the treatment. Shrinkage could be seen. Necrosis of the tissue was avoided. If “caramelization” of the tissue was seen, the probe setting was reduced further. The same site was never re-treated. The ligaments of the volar capsule that were treated from within the radiocarpal joint included the radioscapocapitate (RSC), the long and short radiolunate, and the ulnotriquetral. From the midcarpal joint

Fig. 1 The areas on the palmar wrist ligaments that are treated with the thermal probe.

the distal end of the RSC ligament and the triquetrocipitate ligaments were treated (► **Fig. 1**). Treating the dorsum of the radiocarpal capsule allows shrinkage of the proximal part of the dorsal radiocarpal (DRC) ligament. Treating the dorsal

Fig. 2 The area of the dorsal capsule that is treated with the heat probe.

Fig. 3 The number of patients experiencing instability symptoms either pre- or postoperatively.

capsule of the midcarpal joint affects the dorsal intercarpal (DIC) ligament (►Fig. 2). It is common to exchange the working portals to allow maximal access to the specific areas required. The dorsal capsule sometimes required activation outside the arc of arthroscopic view. Performing shrinkage blindly required particular care to prevent inadvertent injury. The intrinsic scapholunate and lunotriquetral ligaments were avoided. The portals were sutured and the wrist immobilized for 6 weeks postoperatively with either a plaster cast or a removable wrist splint.

After 6 weeks of continuous immobilization, gentle mobilization is started. Patients were advised to avoid extremes of range. Patients were able to return to light manual work at 6 weeks and heavy manual work after 10 weeks. The patients did not routinely receive physiotherapy.

Results

12 patients (14 wrists) were assessed by clinical examination and questionnaires. One patient who had emigrated was assessed by telephone questionnaire alone. All patients were included in the follow-up assessment. The mean follow up time was 42 months (range 14–67 months).

An improvement in symptoms was noted in all cases. The average DASH score had statistically significantly improved from 34 preoperatively to 12 postoperatively (Wilcoxon matched pairs test, $p = 0.0034$). The subjective grading of instability symptoms is shown on ►Fig. 3.

Objective assessment with clinical examination revealed that 12 of the 14 wrists had a negative ulnar shift test. The arc of movement was compared with the unaffected side in 9 wrists. The mean difference in maximal flexion between the treated and untreated wrists was –16 degrees (range –32 to +4 degrees, SD 12 degrees). The mean difference in maximal extension was –10 degrees (range –18 to 0 degrees, SD 6 degrees). The mean reduction of overall range was 8 degrees (15%). There were no complications. There were no cases of thermal injury to adjacent structures. No patients have required further surgery, although some patients have no-

ticed some minor symptoms of instability of the wrist during the follow-up period.

Discussion

Carpal instability, nondissociative (CIND), is an area of wrist surgery that still holds significant controversy. There is no agreed best treatment for PMCI, because there is relative paucity of original research on this subject. Not only is the condition relatively rare, but it is also not easy to confirm a diagnosis. We therefore find our “kettle sign” to be a useful addition to the clinical assessment. The kettle sign is not specific for midcarpal instability, so overreliance on this should be avoided.

In our experience, nonoperative treatments with biofeedback exercises and proprioceptive control can be helpful. The use of splintage (ulnar boost splint) helps only in the acutely painful wrist and rarely helps to resolve the feeling of instability. We start by performing exercises in supination and then slowly rotate the wrist as confidence of control proceeds.

One of the main advantages of this procedure is the fact that patients maintain their wrist range of motion. Although no complications were occurred in this series, it does not mean that complications cannot occur. I am aware of some severe injuries that have occurred with inadvertent use of thermal probes. Structures that can get injured have included the ulnar nerve (by excess use of the probe and subsequent penetration of heat) and extensor tendons adjacent to the portals (by accidentally allowing the active part of the heat probe to come out of the joint). Great care and caution are therefore required when using these thermal probes.

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Conflict of Interest
None

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