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ORIGINAL STUDY

Correction of chronic lunotriquetral instability using extensor retinacular split : A retrospective study of 26 patients

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Arthroscopy offers a welcome and reliable supplement to the current tool set for the diagnosis of lunotriquetral (LT) instability. This study reports the findings of LT-lesions during arthroscopy and the clinical results obtained after using dorsal stabilisation in its surgical management using extensor retinacular split. LT-instability of grade I-III was diagnosed in 26 patients. Imaging results were normal, Reagan's ballottement and Watson tests were positive in 47% and 79%, respectively. After arthroscopic diagnosis, the procedure was immediately continued with an open repair utilising an 8-10 mm wide and radial-based extensor retinacular split for dorsal capsular reinforcement. At 39 months (range : 14 to 84) follow-up, 64% had no or only occasional mild pain and 36% had pain with overuse or lifting. Overall scoring encompassing pain, patient satisfaction, range of motion and grip strength, was excellent in 24% and good in 64%. Only three patients had fair results, one after a further injury leading to distal radio-ulnar joint (DRUJ) instability, and two with concurrent DRUJ-stabilisation. One further patient required a secondary procedure. Arthroscopy seems to allow accurate diagnosis of LT-instability and can be continued in the same session using a straightforward reconstruction procedure providing satisfactory results.

Keywords : wrist ; lunotriquetral instability ; extensor retinacular split.

INTRODUCTION

Lunotriquetral (LT) instability may occur as an isolated ligamentous injury of the LT-joint (*7*) or, probably in most cases, together with some other injuries of the ulnar side of the wrist. It causes rest pain and mostly activity-induced pain in grip activities, and leads to giving away sensations. The diagnosis of lunotriquetral instability is based partly on the patient history and the injury mechanism,

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which are often difficult to recall, and proper diagnosis and treatment are therefore delayed (*9*). During the past 20 years, the cornerstones of the correct diagnosis of LT instability have been pain and tenderness over the LT-joint and a positive lunotriquetral ballottement test (*7*). Radiographs may show slight narrowing and cystic changes on both sides of the LT-joint, computerised tomography can further depict the bony structures of the LT-joint, but more recently MRI and especially arthroscopy of the radiocarpal and midcarpal joint have revolutionised the diagnostics (*2*).

Magnetic resonance imaging provides information on the status of the extrinsic and intrinsic ligaments and joint capsule, but it does not allow testing of the instability of the LT-joint. Therefore, arthroscopy offers a welcome and most reliable supplement to the current diagnostic tool set. During normal arthroscopic examination the LT-joint is viewed on both radiocarpal and midcarpal sides, which allows exact visualisation of the location and type of the damage. After arthroscopy has confirmed the diagnosis of lunotriquetral instability, specific site-directed treatment can be provided during the same anaesthesia by converting the diagnostic arthroscopy to an operative procedure. This is very relevant as the diagnosis by itself is not the goal but is only a means for planning an injury-type specific treatment. We used this option and developed a new operative modification for stabilisation of lunotriquetral instability. This is particularly important because many of these patients are young and physically active and, therefore, incapacitated in their hobbies, mostly sports.

This study reports the findings of lunotriquetral lesions during arthroscopy and the clinical results obtained after dorsal stabilisation using extensor retinacular split.

PATIENTS AND METHODS

Patient demographics and injury mechanisms

The first author performed 28 lunotriquetral stabilisation operations on consecutive patients from 1998 to 2003 using the technique described below. Of the 28 patients who had undergone stabilisation surgery for lunotriquetral instability, two were lost to follow-up, and the outcomes were evaluated for 26 patients.

The mean age of the patients at the time of the operation was 35 years (range : 14 to 54). Sixty two percent (n = 16) of the patients were women. The occupations of the patients were as follows :

Office, sales, management	10 (38%)
Student	5 (19%)
Healthcare, childcare, education	4 (15%)
Industrial	2 (8%)
Transportation	2 (8%)
Agricultural	1 (4%)
Sports, physical education	1 (4%)
Unknown	1 (4%)

The injury mechanisms were a fall on the hand in 10 patients (38%), trauma without falling in 11 patients (42%), no acute trauma in 3 patients (12%) and a sequelae of radial fracture in 2 patients (8%). Of those who fell, six did so when walking or performing some other daily activity, such as walking in stairs, and three when performing sports or some equivalent physical activity (cycling, rollerblading and football). One further patient fell two meters from a ladder. Of the traumas not involving a fall, five were related with sports (volleyball, ice hockey, floor hockey, tennis and acrobatics), three involved other activities (usage of tools in two and lifting injury in one) and three were twisting injuries without detailed history. The traumas by falling or without falling involved twisting, hyperextension or supination injuries of the wrists. In addition, two traumas with a fall involved a radius fracture.

The right wrist was injured in 14 of the patients (54%) and the left in 12 (46%). Twelve patients injured their dominant hand, and twelve injured their non-dominant hand. For two patients the information of handedness was missing. The mean time from injury to operation was 19 months (range : 1 to 120).

Clinical tests

Clinical tests

Preoperative lunotriquetral ballottement test results were available for 17 patients, of which 8 (47%) had a positive and 9 (53%) a negative result. Of the 19 patients with available information on the preoperative Watson test, 15 (79%) had a positive result and 4 (21%) had a negative result. All those fifteen patients (58%), who were tested using midcarpal provocation test, had a negative test result ; 11 (42%) patients had not been tested using this test.

Arthroscopy

Wrist arthroscopy was performed using five routine portals of which three had a radiocarpal location and two a midcarpal location. Finger traction was usually applied to the second and fourth fingers using 3-6 kgf, depending on the weight of the patient. Counter-traction was applied to the upper arm.

Arthroscopy was performed in operation room facilities under general anaesthesia and using a tourniquet. If lunotriquetral instability was diagnosed in arthroscopy, the operation described below was performed in an open manner with the patient's arm lying on the table and without counter-traction.

Lunotriquetral stabilisation

A dorsal operative approach was used. A lazy S- or Z-type skin incision was performed depending on the arthroscopic portals used. The extensor retinaculum was exposed and depending on its width and strength, an 8-10 mm wide and radial-based strip was harvested distally from the extensor retinaculum (fig 1). The dorsal surfaces of both lunatum and triquetrum were exposed by dividing the capsule obliquely. A fixing anchor (Mitek mini anchor, DePuy Mitek Inc., Norwood, MA, or Arthrex Small Bone FasTak titanium anchor, Arthrex Inc., Naples, FL) was inserted into both bones (fig 2). With the wrist in a neutral position in flexion-extension, the strip was turned over the lunotriquetral joint and fixed to the anchor threads with proper tension. Using the same threads, the capsule was closed above the strip. The wound was closed and the pneumatic tourniquet was released.

The operation was followed by a six-week immobilisation, following which an active wrist mobilisation program was started, and gradually increased loading was permitted 8 weeks after the operation.

Additional procedures were performed in eight patients : seven had a distal radioulnar joint stabilisation and one had an arthroscopic wafer osteotomy of the ulnar head.

Assessment of results

The mean time from the operation to the follow-up visit referred to in the present study was 39 months (range : 14 to 84). Results were determined by assessment of pain, range of motion (ROM/flexion-extension, percentage of normal), grip strength (compared with the uninvolved wrist), patient satisfaction and overall scoring of the parameters mentioned above. In addition, any new injuries to the wrist during convalescence and the level of physical activity were recorded after the operation (table I). All post-operative evaluations were done by the second author.

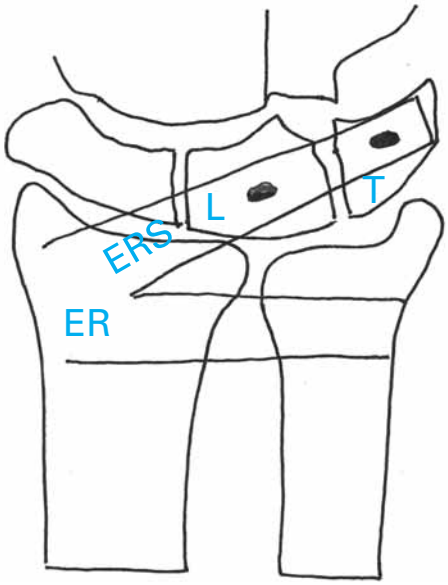

Fig. 1. — Lunotriquetral stabilisation using a dorsal operative approach. Extensor retinaculum is exposed and depending on its used width and strength, an 8-10 mm wide and radial-based split (ERS)is harvested distally from the extensor retinaculum (ER).

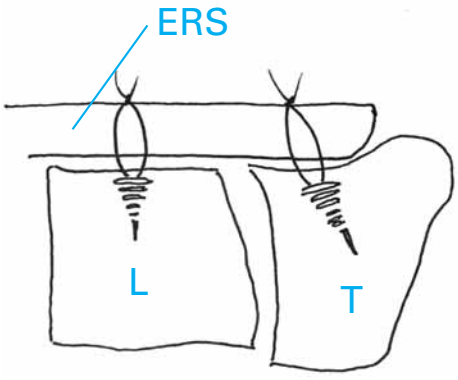

Fig. 2. — Lunotriquetral stabilisation using a dorsal operative approach : a screw anchor is inserted into both lunatum (L) and triquetrum (T) for fixation of the extensor retinaculum split (ERS).

Table I. — The form used for the assessment of patient results at the follow-up visit

Assessment	Grading	Points
Pain	no pain occasional mild pain, no interference with activity pain with overuse or lifting ; not severe enough to decrease activity pain with overuse or lifting ; severe enough to decrease activity severe debilitating pain or rest pain	4 3 2 1 0
Range of motion (% of normal)	100% 75% to 100% 50% to 75% 25% to 50% 0% to 25%	4 3 2 1 0
Grip strength (compared with the uninvolved wrist)	100% 75% to 100% 50% to 75% 25% to 50% 0% to 25%	4 3 2 1 0
Patient satisfaction	excellent good fair poor failure	4 3 2 1 0
Overall scoring	excellent good fair poor	15 to 16 11 to 14 7 to 10 < 7
Assessment of any new injury to the wrist during convalescence	no/yes (description)	
Level of activity after the operation	as before the operation/altered (description)	

RESULTS

Preoperative findings in arthroscopy

None of the patients had a normal lunotriquetral space. Seven (27%) had space only for the thin tip of the 2 mm probe (grade I), 18 (69%) had space for the 2 mm probe itself (grade II) and one (4%) had space for the scope itself (grade III). Coexistent arthroscopic findings were : other instability (n = 15, 58%), chondral lesions (n = 12, 46%), triangular fibrocartilage complex rupture/avulsion (n = 11, 42%), synovitis (n = 14, 54%) and scapho-trapezio-trapezoid arthrosis (n = 1, 4%). The other instabilities involved scapholunate in nine patients (35%), capitohamate in four patients (15%) and distal radio-ulnar joint in three patients (12%).

Results at follow-up visit

At the follow-up visit, seven patients (28%) had no pain whatsoever. Nine (36%) had occasional mild pain which did not interfere with activity. Nine patients (36%) experienced pain with overuse or lifting. In six of these cases, the pain was not severe enough to decrease activity, while in three cases it was. No patient had severe debilitating pain or rest pain.

The range of motion was 100% of the normal in ten patients (40%). In all of the rest, it was 75% to

100%. The grip strength was 100% of the normal in 13 patients (52%), 75% to 100% in 11 patients (44%) and 50% to 75% in one patient (4%).

Patient satisfaction was excellent in nine (36%), good in 12 (48%), fair in four (16%) and poor in none. Overall scoring was excellent in six (24%), good in 16 (64%), fair in three (12%) and poor in none. The follow-up data of one patient were to some points incomplete and the outcome for this patient was poor so he was reoperated.

The level of activity after the operation was as before the operation in 23 patients (88%). Of these patients, 16 had no problems with the wrist whatsoever, and seven had some symptoms, such as tenderness during or after heavy loading, which however did not affect the level of activity. The level of activity was somewhat altered in one patient (4%) ; this patient had to give up climbing as a free-time activity, but could continue dancing on a professional level as well as teaching in physical education. The level of activity was significantly altered in two patients (8%) ; one patient, who had worked as a sales clerk, had to get a new, less straining job and the other, mentioned above, had to undergo a new operation due to problems with the wrist.

DISCUSSION

LT-instability can be either dynamic or static in nature. If the strongest palmar part of the LT-ligament complex totally disrupts it may lead to advanced (static) instability with VISI (volar intercalated segmental instability) position of the lunatum (*4, 8*). In advanced LT-instability, radiography may reveal more information in addition to clinical examination. In this series, all radiographs and MRI were normal as far as LT-joint was concerned and did not provide any additional value.

Our treatment protocol enables first confirmation or exclusion of the diagnosis of LT-instability in arthroscopy, which can then directly be continued by performing dorsal repair of LT-instability. Although swelling due to arthroscopy and portal openings, which penetrate through the extensor retinaculum, cause relative inconvenience during harvesting the strip, this caused no major difficulty for open LT-reconstruction in the same session. For the ratepayer be it the patient or an insurance company, it means lower costs, shortened over-all recovery and shorter sick leaves as everything is performed in one session.

Normally the whole procedure lasts between 1-1.5 hours. The aim is to maintain as much movement as possible in the wrist joint after surgery and to avoid long immobilisation periods. For these reasons, and possibly due to lack of experience, LT-arthrodesis with more or less unpredictable results (*5, 6*) has not been so popular in our unit. Instead, if combined traumatic scapholunar and lunotriquetral instability is found in arthroscopy, e.g. four-corner arthrodesis has been usually performed with promising results (IAP and JH, unpublished data) quite comparable to those reported by others (*10*).

Although lunotriquetral instability is not an unusual injury, scapholunar instability is a more common one. In general physician's practice, it is difficult to exactly characterise and localise the pain and other symptoms due to lunotriquetral joint instability. This causes delay both in diagnosis and proper operative treatment. Most patients in our series were referred to Orto-Lääkärit Medical Center relatively late which caused a delay in the treatment between one to 120 months (mean : 19 months) after the injury. Therefore, all cases except one were chronic in nature. Especially among chronic cases the symptoms of the ulnar side of the wrist vary and concomitant lesions (distal radio-ulnar joint injuries, chondral lesions of the ulnar side of the wrist, triangular fibrocartilage complex injuries or sequaelae of fractures) make the diagnosis and treatment challenging. In seven patients an additional distal radio-ulnar joint stabilisation was also performed. This did not seem to affect the final outcome as one had excellent, four good and two fair overall results.

Clinically, palpation and tenderness over the LT-joint are considered reliable tests. In our series, however, Reagan's ballottement test (*7*) was positive only in 47% of the cases. The sensitivity of this test was lower than the preoperative Watson test (*11*), which was positive in 79% in the present study. Although the Watson test is considered more specific for scapholunar instability, we have

noticed among our 450 clinically examined and subsequently arthroscopied patients that the specificity of the Watson test for scapholunar instability seems to be relatively low.

Radiographs and the MRI did not disclose any pathology in the LT-joint in the present patient cases. Although high field MRI was used at that time, intra-articular contrast medium was not used but its use has since then become more common.

Our patients were evaluated postoperatively using a grading system originally reported by Glickel and Millender (*3*). It consists of four parts, namely pain, range of motion (compared with the uninvolved wrist in per cent), grip strength (compared with the contralateral hand) and patient satisfaction, each of which is graded from 0 (failure) to 4 (excellent result). The overall score represents the sum of these, with 16 being the maximum score. Only three patients had fair results. One of these patients had subsequently had a new injury which caused distal radio-ulnar joint instability, which had been treated operatively. The remaining two patients with only fair results had, in addition to LT stabilisation, also had a distal radio-ulnar joint stabilisation performed in the same session.

The operative method used, i.e. dorsal "tightening", may in some cases interfere with the volar flexion of the wrist, which leads to only three out of four points in the range of motion without causing any symptoms for the patient (60% of the cases had grade 3 ROM, with none having lower ROM grades). In the dominant hand the grip strength is normally stronger compared with the non-dominant hand. In our series the injured hand was dominant in half of the cases. Therefore, this compensates the possible error due to the dominance of the affected hand.

Patient satisfaction and the overall scores correlated well in our 26 patients, with 21 patients (81%) having either excellent (n = 9) or good (n = 12) subjective results, whereas the overall scores were either excellent (n = 6) or good (n = 16) in 22 (85%) of cases.

The operative treatment of lunotriquetral injuries is not evidence-based and the gold standard for isolated LT injuries does not exist yet. Results of arthrodesis of the LT-joint have been validated in the literature, but the numbers of reports on ligamentous repair in chronic LT-joint instability are scarce. De Smet *et al* (*1*) reported 13 patients, who had been operated using a somewhat similar dorsal capsular reinforcement with a retinacular flap with five poor, five moderate and three excellent outcomes after a mean follow-up of 3.2 years. In another study of 46 patients tenodesis of extensor carpi ulnaris tendon was used to repair LT-instability (*9*). In that series the results were excellent in 19, good in ten, satisfactory in eleven and poor in six. In both series, complications led to reoperations in three cases. In our series only one reoperation was performed due to failure. The immobilisation time used in the latter study (*9*) was 12 weeks, i.e. two times longer than in our study.

In our opinion repair using extensor retinacular split is an easy and satisfactory procedure for the treatment of chronic isolated lunotriquetral instability. It can also be safely performed in the same session after arthroscopy without fear of complications.

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