Stabilisation of the distal radio-ulnar joint with a double-breasted slip of the extensor retinaculum

R. K. Gupta,
H. Singh,
V. P. S. Sandhu

*From the
Government Medical
College Hospital,
Chandigarh, India*

We describe a method for stabilising the distal radio-ulnar joint using a double breasted slip of extensor retinaculum.

This is a retrospective series of 30 patients with a painful wrist secondary to instability of the distal radio-ulnar joint. The results were assessed by a modified Mayo Score. The mean follow-up was for 38.1 months (13 months to 8 years).

Twelve patients had excellent, 16 good and 2 fair outcomes. One patient had experienced temporary numbness in the distribution of the dorsal branch of the ulnar nerve. The modified Mayo wrist score increased from a pre-operative mean of 23.89 (10 to 50) to a final mean of 94.4 (85 to 100).

Stabilisation of the distal radio-ulnar joint by the method of using a double breasted slip of the extensor retinaculum gives satisfactory results. The procedure is simple and reproducible.

Disorders of the distal radio-ulnar joint and the triangular fibrocartilaginous complex¹ are an important cause of pain in the wrist. Chronic instability of the distal radio-ulnar joint can be a result of a bony deformity, a ligamentous injury, or a combination of both.^{2,3} Dorsal dislocation is the most common presentation. A number of procedures have been described for the management of chronic problems of the distal radio-ulnar joint, including arthroscopic debridement and repair, stabilisation using a free or split tendon graft, limited excision of the ulnar head, ulnar shortening, and fusion of the distal radio-ulnar joint with distal ulnar pseudoarthrosis.⁴⁻¹¹

We present our experience of treating instability of the distal radio-ulnar joint with a technique of using a double breasted slip of the extensor retinaculum.

Patients and Methods

All 32 patients treated surgically at our institution between 1997 and 2005 for chronic instability of the distal radio-ulnar joint without radiological osteoarthritic changes were included in the study. Patients with rheumatoid arthritis (RA) or connective tissue disorders were excluded, as were those with positive ulnar variance. Two patients were lost to follow-up.

The mean age was 27.4 years (19 to 36), with the dominant wrist involved in 19 cases. The

mean interval between the onset of symptoms and surgery was 22 months (11 to 30). Pre- and post-operative functional evaluation was by use of the modified Mayo wrist score.¹⁰

Surgical technique. The distal radio-ulnar joint is exposed dorsally using a curved longitudinal skin incision. The extensor retinaculum is identified, avoiding the dorsal sensory branch of the ulnar nerve, which is taken ulnarwards in the ulnar flap. An ulnar based flap of extensor retinaculum, approximately 2 cm wide and 3 cm long, is raised. Hypertrophied synovium is excised and the articular cartilage of the facet on the radius and head of the ulna is inspected. Two converging holes, 1.5 cm apart, are drilled from the dorsoulnar surface of the radius with a 2 mm drill bit through the proximal cortex. The holes are connected with each other with the help of a towel clip to facilitate the passage of the curved suture needle. A non-absorbable number 1 polyester suture (Ethibond no. 1; Johnson and Johnson, Mumbai, India) is passed through the holes. The slip of extensor retinaculum is passed under the tendon of extensor carpi ulnaris and the proposed site of attachment to the holes in the radius is assessed by manual reduction of the distal radio-ulnar joint, keeping the forearm in full supination. The two free ends of the suture are then tied over the slip of retinaculum at the marked site. While tying the sutures, the head

■ R. K. Gupta, MS, DNB,
MNAMS, Reader
Department of Orthopaedics
Room 3109, Sector 48D,
Government Medical College
and Hospital, 160047
Chandigarh, India.

■ H. Singh, MS, Senior
Resident
Department of Orthopaedics
Room 2154, Sector 27C,
Government Medical College
and Hospital, 160019
Chandigarh, India.

■ V. P. S. Sandhu, MS, Senior
Resident
Department of Orthopaedics
Room 249, Phase VI, Mohali,
Punjab, Government Medical
College and Hospital, 160055
Chandigarh, India.

Correspondence should be sent
to Dr R. K. Gupta; e-mail:
ravikgupta2000@yahoo.com

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of the ulna is kept reduced manually with the forearm in full supination. The redundant part of the slip is folded back on itself and sutured to give the double breasted strength to the distal radio-ulnar joint.

After operation, the forearm is immobilised in full supination for two weeks, followed by two weeks in the mid-prone position. Gentle mobilisation and use of the hand for activities of daily living are started at this time. Active sports and heavy manual activities are only allowed after six months.

Results

Of the 30 patients, 13 had received massage and manipulation from local bone setters before our treatment. The mean follow-up was for 38.1 months (13 months to 8 years). The mean modified Mayo wrist score increased from 23.89 (10 to 50) pre-operatively to 94.4 (85 to 100) at the final follow-up. There were 12 excellent, 16 good and 2 fair results. None of the patients had poor results.

One patient experienced transient numbness in the distribution of the dorsal branch of the ulnar nerve. There was no post-operative infection. A full range of pronation/supination and dorsiflexion/palmar flexion was present after operation.

Discussion

Post-traumatic instability of the distal radio-ulnar joint may be caused by rupture of either the triangular fibrocartilaginous complex, the volar or dorsal ligaments or bony avulsion of the styloid process.^{2,3} The initial treatment of these injuries, especially when there is no radiological abnormality, is often conservative or the diagnosis is missed. There was a mean delay of 22 months between the injury and surgery in our patients. Delay in treatment results in attenuation of the ligaments and capsule, and therefore anatomical restoration of the ruptured triangular fibrocartilaginous complex is not possible.

Various soft-tissue reconstructive procedures have been for radio-ulnar instability.⁴⁻¹¹ Hui and Linscheid¹² recreated a portion of the triangular fibrocartilaginous complex using flexor carpi ulnaris. Of the eight patients described by them, all had some limitation of pronation while three had slight residual joint laxity. Tsai and Stilwell¹³ used the flexor carpi ulnaris tendon but relied on the interosseous membrane and the extensor carpi ulnaris to aid stabilisation. Scheker et al¹⁴ employed a free tendon graft anchored to the radius and ulna with good results. Blatt and Ashworth¹⁵ designed a procedure which used a distally based flap of the palmar aspect of the capsule of the wrist joint. Breen and Jupiter¹⁶ utilised strips of both the extensor and the flexor carpi ulnaris. All these procedures are based on the concept that a new ligament can be reconstructed to stabilise the ulna passively. Johnson¹⁷ described a technique of advancing pronator quadratus, allowing it to act as a dynamic stabiliser of the distal radio-ulnar joint. The majority of the soft-tissue procedures give adequate stability but the kinetics of the distal radio-ulnar joint are not fully restored. Adams¹⁸ used a free tendon graft and

reconstructed the anterior and posterior limbs of the distal radio-ulnar joint ligament by drilling holes in the radius and ulna. Gofton et al,¹⁹ in a biomechanical study, demonstrated that of the procedures which are commonly used for reconstruction, only capsular repair was closest to the actual kinematics of a normal distal radio-ulnar joint. We believe that in chronic cases the capsule is already attenuated and in most cases not separately identifiable. Our technique, we believe, allows a more anatomical reconstruction of the joint.

The extensor retinaculum is attached laterally to the anterior border of the radius and medially to the triquetrum and pisiform bones.²⁰ Raising an ulnar strip relies on the attachment of the triquetrum and pisiform medially, while on the lateral side it is attached to the medial border of the radius, thus creating dorsal support for the distal radio-ulnar joint. The extensor retinaculum appears to relatively weak compared with the other structures used for distal radio-ulnar joint reconstruction. Double breasting the slip is important in providing adequate initial strength. Immobilisation for four weeks and restricting sport and heavy activity for six months, gives time for the reconstruction to gain strength. We believe that the stimulus of activities of daily living, which we allow at four weeks after operation, facilitates the laying down of more connective tissue on the newly reconstructed ligament apart from orienting the connective tissue along the lines of forces. All our patients returned to their original occupation and sports.

One of the limitations of this procedure is that it can only be used for dorsal instability. Although, the majority of the patients with instability of the distal radio-ulnar joint have dorsal displacement, we believe that for the cases with volar or global instability, procedures relying on a tenodesis effect are more appropriate. We do not recommend this operation for patients who have obvious osteoarthritic changes in the distal radio-ulnar joint. The radiological evidence of degeneration is unreliable and careful per-operative inspection of the cartilage is required. If the articular surface is damaged, we change to the modified Kapandji procedure.²¹

Our procedure is a reliable method of managing dorsal instability of the distal radio-ulnar joint.

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