



Original Research Article

Study of use of sauve- kapandji procedure in treating malunion of distal radius fractures

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ABSTRACT

Malunion is a common delayed complication of distal radial fracture, if acceptable anatomic realignment of the distal end of radius has not been achieved during closed reduction.

This leads to persistent radial shortening which leads to incongruity of the D.R.U.J., and positive ulnar variance.

Dysfunction of the distal radioulnar joint leads to impaired function of the wrist joint.

Various surgical techniques have been developed to treat instability of the DRUJ, including distal ulna resection, partial-resection with interposition arthroplasty, and the Sauve-Kapandji procedure.

Methodology: In this study twenty patients with DRUJ dysfunction with impaired rotation of forearm due to malunion of distal radius fracture with positive ulnar variance were selected. Although the patients had complete union of the fracture, they were still having pain and functional limitations 5-12 months after fracture union.

They were operated using the Sauve Kapandji procedure under aseptic precautions and adequate postop care was given along with physiotherapy.

We studied 20 wrists in 20 patients (15 men and 5 women), with a mean age of 45 years (range, 28 to 65 years) at the time of the operation.

The mean duration of follow-up was 12 months. We studied 7 cases of left and right side in 13 cases.

At the final follow-up, out of 20 patients, 15 had excellent score, 3 had good score, 2 had fair score)

In all patients the pseudoarthrosis gap of the ulna was well preserved and that the stability of the proximal ulnar stump also was preserved.

Conclusion: Distal radius fractures(DRF) are very common in orthopedic practice and are often accompanied by instability of the distal radio ulnar joint (DRUJ).

Before the era of operative surgery closed reduction with splinting was the treatment of choice. Now a variety of treatment options are available ; closed reduction with percutaneous pinning, open reduction internal fixation with plates and screws and external fixation.

Although many procedures have been mentioned for treatment of instability of DRUJ the commonly used ones are Darrach procedure and The Sauve Kapandji procedure.

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1. Introduction

Malunion is a common delayed complication of distal radial fracture, if acceptable anatomic realignment of the distal end of radius has not been achieved during closed reduction.

This leads to persistent radial shortening which leads to incongruity of the D.R.U.J (distal radio-ulnar joint), and

positive ulnar variance. Positive ulnar variance also known as protrusion of ulna distal to its normal articulation with the ulnar notch of the radius leading to consequent impingement on the carpus.

Pain, decreased grip strength and instability of the wrist are important clinical features which indicate impaired function of the DRUJ. In recent years, much controversy has surrounded the treatment of this disorder.

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Distal ulna resection, partial-resection with interposition arthroplasty, and the Sauve-Kapandji procedure are some of the documented techniques for the treatment of instability.¹

Surgical procedures to correct DRUJ dysfunction can be divided into two major categories; surgeries that preserve DRUJ function and surgeries that ablate DRUJ function.

There are three types of ablative procedures: complete ablation of distal ulna (Darrach procedure), partial resection of distal ulna (Bowers and Watson arthroplasties), and distal radio-ulnar joint fusion with proximal ulnar pseudoarthrosis (Sauve-Kapandji procedure).²

The above procedures achieve satisfactory outcomes, however there are some limitations including diminished grip strength, instability of the wrist, rupture of the extensor tendons, and ulnar carpal abutment.

Sauvé and Kapandji and Goncalves found that fusion of the DRUJ combined with the intentional formation of a distal ulnar pseudoarthrosis was effective in resolving a variety of problems at the DRUJ.²

In this study, the aim is to address the Sauve-Kapandji procedure for the treatment of DRUJ dysfunction after distal radius fractures.

In certain many dysfunction of the wrist joint arises as a post-operative complication after surgeries. Over the years, the Sauve-Kapandji procedure has proven to be effective in treating such dysfunction of the DRUJ.

2. Methodology

In this study, twenty patients with DRUJ dysfunction, with impaired rotation of forearm, arising due to malunion of distal radius fracture, with positive ulnar variance were selected between August 5th 2018 and December 30th 2018. These patients had complaints of pain and impaired function at wrist joint, despite fracture union (around 5-12 months after union had taken place)

Table 1:

Characteristics	Number (percentage)
Age	45 Yr (Mean)
Gender	
Male	15(80%)
Female	5(50%)
Side	
Left	7(35%)
Right	13(65%)
Pain	
Moderate	5(20%)
Severe	15(80%)

2.1. Operative technique and post operative management

The procedure was performed with the patient lying down in supine. The affected upper limb was abducted to 90 degree

and placed on the side table. A tourniquet was applied to provide bloodless field and regional anesthesia was given.

An incision was made on the dorsal aspect of the wrist along ulnar border and a plane was made between extensor carpi ulnaris and extensor digiti minimi.

The extensor retinaculum was opened forming a proximal flap based laterally (radially) and a distal flap based medially (ulnar ward).

The radial and ulnar articular surfaces of the DRUJ were decorticated. About 2-3 cm proximal to the DRUJ, an ulnar osteotomy was performed using drill holes and Gigli saw wire.

After a thorough DRUJ synovectomy, the ulnar notch of the radius and the ulnar head were decorticated and bone graft (removed segment of ulna) was used to fill the gap created due to removal of the bony segment

A 2 mm K wire was inserted transversely into the ulnar head 0.5cm proximal to DRUJ almost parallel to the DRUJ and across the distal radius till it pierced the radial cortex of the radius.

Postoperatively the limb was immobilized in a long arm cast for 4 weeks with the forearm in complete neutral position.

Subsequently a short arm splint was applied until the fusion site had healed. Serial radiographs were taken.

Proper post-operative physiotherapy was advised and strict follow-up was done. The patients were instructed to perform functional exercise of wrist joint early in the postoperative period, and were encouraged to gradually exercise independently 4–6 weeks postoperatively.

3. Results

We studied twenty patients with DRUJ dysfunction with impaired rotation of forearm due to malunion of distal radius fracture, with positive ulnar variance were selected between August 5th 2018 and December 30th 2018. We studied 20 wrists in 20 patients (15 men and 5 women), with a mean age of 45 years (range, 28 to 65 years) at the time of the operation.

The mean duration of follow-up was 12 months. We studied 7 cases of left and right side in 13 cases.

All the study participants experienced varying degrees of wrist symptoms: pain, decreased grip strength and instability of the wrist.

All patients were subjected radiographic, imaging and clinical examination before the operation and at the final follow-up.

The evaluation of the outcome of the procedure was done using the standard Modified Mayo Wrist score

According to the evaluation done at the final follow-up, out of 20 patients, 15 had excellent score, 3 had good score, and 2 had fair score.

At the latest follow-up, 15 patients had no pain in the region of the DRUJ and only one patient had mild pain.

With regard to range of motion (ROM), pronation improved from a preoperative mean of 45° to a postoperative mean of 88°. Two patients had infection at the surgical site, which was treated by wound debridement and administration of antibiotics. No other complications were noted.

The degree of supination increased from a preoperative mean of 47% to a postoperative mean of 85°.

In all patients the pseudoarthrosis gap of the ulna was well preserved and proximal ulnar stump stability was also well preserved.

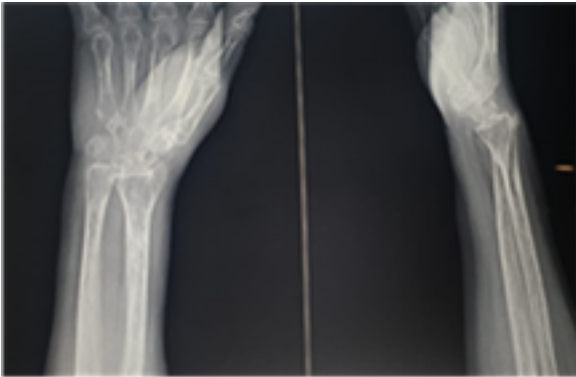


Fig. 1: Pre-Op x-ray: Malunited colles fracture with positive ulnar variance



Fig. 2: Pre-op: Deformity at wrist joint due to Malunited Colles fracture

4. Discussion

Distal radius fractures (DRF) are very common in orthopedic practice and are often accompanied by instability of the distal radio ulnar joint (DRUJ)

A study done by Macintyre et al showed that in young age adults these fractures were mostly due to playing/outdoor activities and motor vehicle accidents whereas in older adults, it was due to low-energy trauma (such as fall from standing height).³ Inadequately



Fig. 3: Intra- op: Skin incision over dorsal aspect

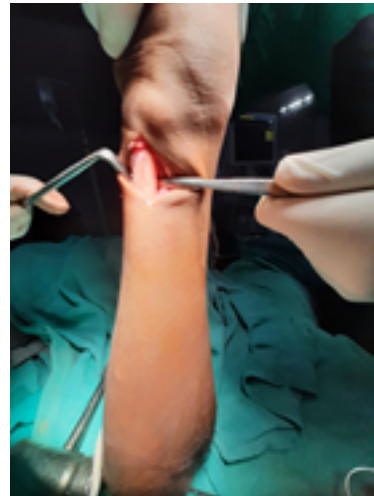


Fig. 4: Intra- Op: Ulna exposed for osteotomy

treated fractures lead to pain, deformity as well as instability of DRUJ.³

One of the main functions of DRUJ is pronation-supination and load transmission across the wrist joint.

Before the era of operative surgery closed reduction with splinting was the treatment of choice. Now a variety of treatment options are available; closed reduction with percutaneous pinning, open reduction internal fixation with plates and screws and external fixation.

Although many procedures have been mentioned for treatment of instability of DRUJ the commonly used ones are Darrach procedure and The Sauve- Kapandji procedure.



Fig. 5: Pre-Op image: showing impairment of supination



Fig. 6: Post op image: showing improvement in supination

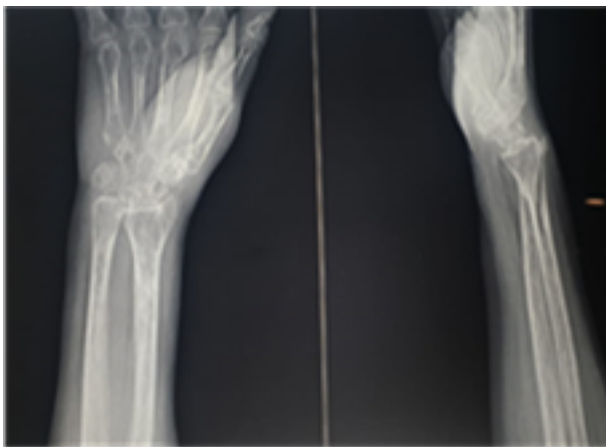


Fig. 7: Pre-Op x ray: Malunited Colles fracture with positive ulnar variance



Fig. 8: Post Op x-ray: After the procedure, showing correction of excessive positive ulnar variance

A study conducted by Nakamura et al described that Darrach procedure can lead to ulnar stump instability which leads to pain, loss of grip strength, radio-ulnar impingement at DRUJ.

The Sauve-Kapandji procedure allows fusion at the joint thus decreasing ulnar instability as well as stabilizing the surrounding soft tissue support to the joint.⁴ Here the ulnar head is left intact and minimizes the potential for some of the complications that can follow its excision. The most commonly arising complication is the proximal stump instability. Different methods of stabilization have been proposed which are beyond the scope of this study.

The Sauve-Kapandji procedure is usually useful for treating various pathologic conditions that alter normal function of the DRUJ.⁵

Deformities caused by different conditions at the DRUJ which can impair the normal function of the DRUJ can be treated by the Sauve-Kapandji procedure.⁵

A study done by Minami A et al has shown a combination of Sauve-Kapandji procedure along with extensor carpi ulna tenodesis helps reduce the incidence of instability of the proximal stump.⁶

Mohamed et al,⁷ mentioned that patients with chronic post-traumatic derangement of DRUJ were treated by a modified Sauve-Kapandji operation and the post-operative results were acceptable to the patients.

Sauve-Kapandji procedure also has been used for wrist arthrodesis reconstruction after en bloc resection of giant cell tumor of distal radius. A study was conducted and the procedure was deemed efficient for the treatment of distal radius giant cell tumor.⁸

A study done by Ota N et al⁹ reported that patients with severe RA with poor bone quality were treated using a combination of extensor carpi ulnaris tenodesis and Sauve Kapandji procedure. This same combination was used another study which comprised of patients with rheumatoid arthritis.

All patients achieved osseous union, with decrease in wrist pain and increase in the mean rotation of the forearm.^{10,11}

Kawabata A et al¹² performed a modified Sauve-Kapandji procedure for treating disorders of DRUJ in RA patients. After operation, the wrist pain reduced and ROM increased significantly with regard to pronation and supination. Hence they concluded this procedure could be applied for DRUJ disorders in RA patients.

5. Conclusion

In our study all the patients demonstrated marked pain reduction and improvement in forearm rotation. The procedure maintains the integrity of the DRUJ by preserving the soft tissue complex around the wrist joint (TFCC, ligaments) which in turn helps in transmission of forces across the wrist joint, and most importantly maintains the extensor carpi ulnaris tendon in its compartment.

Hence this procedure is a very useful and should be kept in mind when treating complications which give rise to DRUJ dysfunction. Additional use of extensor carpi ulnaris tenodesis along with Sauve- Kapandji procedure is a very useful procedure for treating various conditions of wrist joint and is now an established treatment option for symptomatic DRUJ dysfunction.

6. Source of Funding

None.

7. Conflict of Interest

None.

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