Open Journal of Orthopedics, 2015, 5, 35-40
Published Online March 2015 in SciRes. http://www.scirp.org/journal/ojo
http://dx.doi.org/10.4236/ojo.2015.53005

Results of the Sauvé-Kapandji Procedure for Posttraumatic Disorders of the Distal Radioulnar Joint in Young Patients

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Received 27 January 2015; accepted 9 March 2015; published 13 March 2015

Abstract

The authors report their experience with the Sauvé-Kapandji procedure for the management of posttraumatic disorders of the distal radioulnar joint in 9 younger and active patients. The mean age of our series was 37 years. We operated patients for whom pain in the distal radioulnar joint was more relieved by usual analgesic medical treatment, and those with a limitation of wrist movements. Until the latest follow-up, patients have benefited from antero-posterior and profile radiographs of the wrist. Functional assessment was based on the Modified Mayo Wrist Score whose average value was around 77 points. Postoperatively all patients experienced relief of pain. Rotation of the forearm increased to near normal values. On a professional level, eight of nine employed patients had returned to work. There were no major complications.

Keywords

Posttraumatic Disorders, Distal Radioulnar Joint, Sauvé-Kapandji Procedure

1. Introduction

Malunion fractures of the distal radius may lead to chronic derangement of the distal radioulnar joint resulting in ulnar pain, instability, subluxation, dislocation and reduced grip strength and range of movement. The Sauvé-Kapandji procedure, which has been used in the treatment of rheumatoid arthritis of the wrist and distal radioulnar joint, has demonstrated considerable versatility in addressing a various posttraumatic disorders of the distal radioulnar joint in the younger and active patient. It addresses pain in distal radioulnar joint by solid arthrodesis of the joint, corrects positive radioulnar index by shortening the ulna, and it can restore rotation of the forearm

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How to cite this paper: Abid, H., Shimi, M., El Ibrahimi, A. and El Mrini, A. (2015) Results of the Sauvé-Kapandji Procedure for Posttraumatic Disorders of the Distal Radioulnar Joint in Young Patients. *Open Journal of Orthopedics*, **5**, 35-40.
http://dx.doi.org/10.4236/ojo.2015.53005

by creating a pseudarthrosis. The review of literature shows clearly the positive effect of this intervention in terms of function. Most patients return to their work in the best conditions. It is in this mind that the current authors report a review of the Sauvé-Kapandji procedure for posttraumatic radioulnar derangement in 9 younger patients.

2. Material and Methods

The Sauvé-Kapandji procedure was performed in 9 patients with posttraumatic derangement of the distal radioulnar joint between 2009 and 2013 (**Figure 1(a)**, **Figure 1(b)** and **Figure 1(c)**). The surgery was performed by two senior hand surgeons. There were five men and four women. The mean age was 37 years (range, 19 to 62 years), and the mean duration of follow-up was 24 months. The mean time interval between initial injury and the Sauvé-Kapandji procedure was 36 months. Patients were considered for the Sauvé-Kapandji procedure if medical measures had not relieved pain that was localised to the distal radioulnar joint, and those who progressed to instability and limitation of movement of the wrist and forearm after fractures involving the distal radius and the distal radioulnar joint. At the time of the latest follow-up, all patients underwent full radiographic and clinical examination by the authors. Preoperative data were obtained from hospital records. The assessment of pain, function, range of movement and grip strength was evaluated according to the Mayo Modified Wrist Score (MMWS) (**Table 1**).

3. Surgical Technique and Postoperative Management

Surgery was carried out with the patient in the supine position under regional axillary block with tourniquet control. A dorsoulnar incision of about 6 cm was made over the distal ulna, curving dorsally to the tip of the ulnar head. Care was taken to avoid tension on the dorsal sensory branch of the ulnar nerve. To expose the joint properly, the fifth extensor compartment was opened. The distal ulnar articular surface against the radius was debrided using rongeurs. The distal ulna was stabilized in a neutral or slightly ulnar-minus variance by a Kirschner wire. Osteotomy of the ulna was performed by excision of a 15 mm segment of the distal end of the ulna. The distal ulnar fragment was then fixed to the radius by one or two cannulated 4.5 mm cancellous screws under fluoroscopic guidance. Tenodesis was performed in two patients to address instability of the distal ulnar stump. The capsule was then repaired and the pronator quadratus muscle was interposed into the osteotomy site. Postoperatively the wrist was immobilised in a bulky dressing. After two weeks the dressing and sutures were removed, postoperative radiographs were obtained and a removable wrist orthosis that was used additionally for 6 to 8 weeks. The patients' exercises were supervised in the hand therapist's outpatient clinic.

(a) (b) (c)

Figure 1. (a) Clinical Colles fracture deformity; (b) Preoperative Colles fracture X-ray; (c) Postoperative Colles fracture X-ray (positive ulnar variance).

Table 1. The Mayo Modified Wrist Score.

Category	Score	Findings
Pain (25 points)	25	No pain
	20	Mild pain with vigorous activities
	20	Pain only with weather changes
	15	Moderate pain with vigorous activities
	10	Mild pain with activities of daily living
	5	Moderate pain with activities of daily living
	0	Pain at rest
Satisfaction (25 points)	25	Very satisfied
	20	Moderately satisfied
	10	No satisfied, but working
	0	No satisfied, unable to work
Range of motion (25 points)	25	100% percentage of normal
	15	75% - 99% percentage of normal
	10	50% - 74% percentage of normal
	5	25% - 49% percentage of normal
	0	0% - 24% percentage of normal
Grip strength (25 points)	25	100% percentage of normal
	15	75% - 99% percentage of normal
	10	50% - 74% percentage of normal
	5	25% - 49% percentage of normal
	0	0% - 24% percentage of normal
Final result (total points)	90 - 100	Excellent
	80 - 89	Good
	65 - 79	Fair
	<65	Poor

4. Results

4.1. Clinical Results

Preoperatively, all patients had moderate to severe pain facing the distal radioulnar joint. At the latest follow-up four patients had no pain in the region, five patients had occasional pain with flexion and extension of the wrist. At the latest follow-up grip strength averaged 72%. The mean pronation had improved from 43˚ preoperatively to 90˚. The mean supination had progressed from 55˚ to 90˚ at the latest follow-up examination. Seven of nine patients were very satisfied by the surgery, one patient was satisfied and one was not by the end result. This patient scored a poor result in the Modified Mayo Wrist Score (**Table 2**). Postoperative radiographs in this patient showed a positive ulnar variance.

At the latest follow-up examination, six patients had returned to their original occupation in full capacity. Two patients had returned at 50% of the preinjury capacity. Only one patient had been forced to change his workstation to another that was less physically strenuous. There were no major complications in the series. Two

patients had persistent paresthesia in the territory innervated by the dorsal cutaneous branch of the ulnar nerve.

4.2. Radiological Evaluation

In one case, postoperative radiograph showed a positive ulnar variance of 2.0 mm. In 8 cases the ulnar variance was neutral or slightly negative (**Figure 2**). The ulnar pseudarthrosis was open in all radiologically examined cases, averaging a gap of 11 mm. In one case, there were radiographic signs of non-union of the fusion at the distal radioulnar joint. This patient had moderate pain in rotation and had a poor Modified Mayo Wrist Score (50 points).

5. Discussion

Arthritis of the distal radioulnar joint remains a difficult problem to treat especially in young patients, despite the various advancements in the surgical techniques. Reduced range in the pronation-supination arc of movement of the forearm associated with malunited fractures of the distal radius as a major indication for the

Table 2. Functional results.

Sex/age	Pre operative		Post operative		Strength	MMWS	Satisfaction
	Ext/flex	Pro/sup	Ext/flex	Pro/sup			
f/25y	60/45	45/45	60/80	90/90	80%	75	Very satisfied
f/44y	50/60	60/60	60/75	90/90	67%	80	Very satisfied
f/34y	45/40	30/60	60/60	90/90	74%	85	Very satisfied
f/35y	45/50	20/60	60/65	90/90	58%	50	Not satisfied
m/36y	50/55	45/50	50/70	90/90	72%	90	Very satisfied
m/42y	40/40	45/60	55/70	90/90	74%	75	Very satisfied
m/44y	55/50	35/40	55/60	90/90	57%	75	Satisfied
m/39y	60/65	65/60	90/90	90/90	77%	90	Very satisfied
m/40y	55/55	50/60	80/90	90/90	75%	90	Very satisfied

Figure 2. Anteroposterior radiograph made two years after the operation (Sauvé-Kapandji procedure).

Sauvé-Kapandji procedure [1]. It addresses pain arising from the distal radioulnar joint by solid arthrodesis of the joint, corrects excessive positive ulnar variance by shortening of the ulna, and it can restore rotation of the forearm by creating a pseudarthrosis [2]. Most of authors agree that the Sauvé-Kapandji procedure provides satisfactory results in young patients [3]-[5]. In the series reported by Carter [3] of 41 patients with posttraumatic disorders of the distal radioulnar joint, two-thirds of the employed patients were able to return to work in full capacity. In Jacobsen's series [6], eighteen of 19 patients were very satisfied or satisfied by the result after a mean duration of follow-up of 76 months. Postoperatively, no patients complained of severe and disabling pain in the region [6]. In the current authors' experience, the Sauvé-Kapandji procedure had relieved effectively pain in the majority of patients and forearm rotation was restored to a near normal range of movement. This procedure is impossible to perform in patients with poor bone quality in the distal part of the ulna. For this reason, Satoru Fujita [7] has modified the technique to create a sufficient osseous shelf. The modified procedure involves resecting the distal part of the ulna, making a drill-hole in the ulnar cortex of the distal part of the radius, rotating the resected portion of the ulna 90˚, inserting it into the distal part of the radius, and fixing it at that site with use of an AO cancellous-bone screw. This operation was performed in fifty-six patients (sixty-six wrists) with rheumatoid arthritis. Wrist pain was resolved or decreased in all patients and osseous union was achieved in all cases [7]. In our series, we were not obliged to adopt this technique to young patients with a preserved osseous capital. A study of ulnar wrist pain after Colles fractures from Tsukazaki [8], showed that ulnar pain is correlated with the final dorsal angulation of the radius. The deformity usually becomes symptomatic when the angulation of the distal articular surface of the radius is more than 25˚ to 30˚ in the sagittal or frontal plane and when there is a significant discrepancy between the lengths of the radius and ulna compared with the other side. This is particularly evident when the patient is young and manually active. Therefor Tsukazaki *et al*. combined in 12 cases of Colles fractures, who presented preoperatively an average dorsal tilt of 27˚, a radial osteotomy with the Sauvé-Kapandji procedure. The association of both techniques gives a better cosmetic appearance and prevents further carpal deterioration [8]. In our context, we were not brought to perform the radial osteotomy because the angulation of the radio carpal joint was minimal and significantly lower in the range determined by Tsukazaki. In an article of luchetti [9], the Sauvé-Kapandji procedure can be carried out under arthroscopic control. For the author, the arthrodesis of the distal radioulnar joint can be performed safely and successfully, without being obliged to open the fifth and sixth extensor compartments. In addition, assisted arthroscopic arthrodesis of the distal radioulnar joint offers the advantage of faster rehabilitation and a better cosmesis [9]. However, this is a demanding technique and should only be used by surgeons having a good experience in wrist arthroscopy.

6. Conclusion

We believe that the Sauvé-Kapandji procedure is a good solution for posttraumatic disorders of the distal radioulnar joint in the younger and active patients. The procedure itself has no major complications and remains the procedure of choice in our department when other measures have failed.

Conflict of Interests

No benefits or funds were received in support of this study. The authors report no conflict of interests.

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