

# THE SAUVÉ-KAPANDJI PROCEDURE FOR NONRHEUMATIC DISORDERS OF THE DISTAL RADIOULNAR JOINT

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**The Sauvé-Kapandji procedure has received little attention until recently. Follow-up survey was performed of 31 wrists with nonrheumatic disorders. The wrists were evaluated with the Cooney score. A satisfactory result with good pain relief was obtained in 87% of the patients. The most frequent complication, reossification of the gap that is created, can be avoided with correct operative technique.**

**Keywords :** wrist ; distal radioulnar joint ; Sauvé-Kapandji operation.

**Mots-Clés :** poignet ; articulation radio-cubitale inférieure ; technique de Sauvé-Kapandji.

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## INTRODUCTION

Problems of the distal radioulnar joint (DRUJ) are more important causes of wrist pain than thought in the past and different disorders can be responsible for disturbance of this joint : a minimally displaced distal radial fracture can cause persistent pain on pronation-supination (1), and massive perforation of the triangular fibrocartilage complex (TFCC) can provoke distal radioulnar joint instability with secondary pain (9, 16). Madelung's disorders can also cause pain in the distal radioulnar joint (7, 21) ; radial head resection and radial shortening can provoke painful DRUJ incongruity (13).

Although the Sauvé-Kapandji procedure was proposed a long time ago, it is not yet used routinely (10, 11, 12, 19), perhaps because problems of the distal radioulnar joint are underestimated. Since other procedures (2, 3), such as Bowers arthroplasty and the Darrach procedure, have not always fulfilled the desired perspectives,

we preferred this procedure for distal radioulnar joint problems. We present the results of 31 procedures performed for painful incongruity of the distal radioulnar joint with limitation of pronation-supination in non-rheumatic wrists.

## SURGICAL TECHNIQUE

Through a dorsoulnar incision (6), the extensor retinaculum is opened with a two-flap technique (fig. 1 a, b). The extensor carpi ulnaris is isolated and the capsule of the DRUJ is opened. The distal end of the ulna is freed extraperiostially. This last step is important to avoid ectopic ossification. All cartilage of the DRUJ is removed and it is temporarily (fig. 1 d) fixed with a K-wire. At 10 mm from the distal end of the ulna, a sleeve of 15 mm is removed extraperiostially (fig. 1 c). In case of a positive ulnar variance the distal end of the ulna must be brought proximally. After radiographic confirmation the 3.5 mm cancellous AO screw is placed through the DRUJ, and the K-wire is removed (fig. 1 e). If the ulnar head has been brought proximally an additional slice is removed from the ulna so that the gap remains 15 mm (fig. 2).

The pronator quadratus is interposed in the defect to avoid reossification (fig. 1 f). The day after the operation the patient starts to mobilize the wrist.

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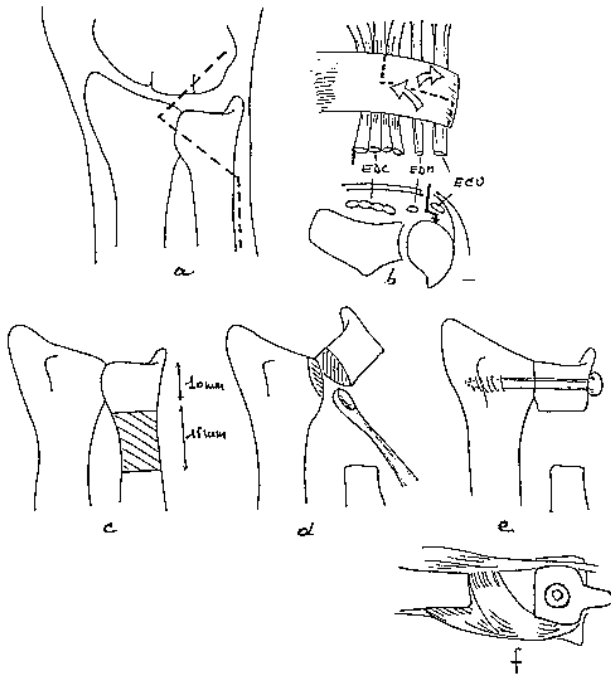
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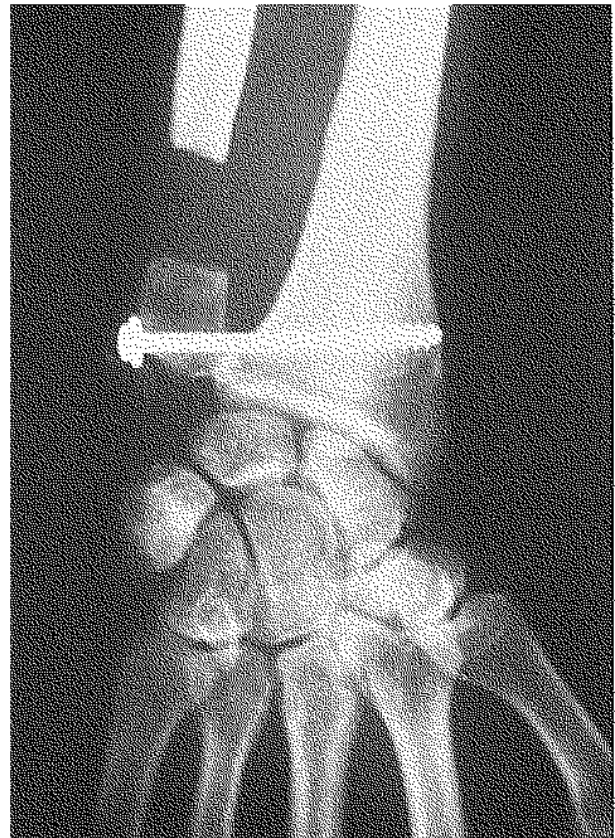
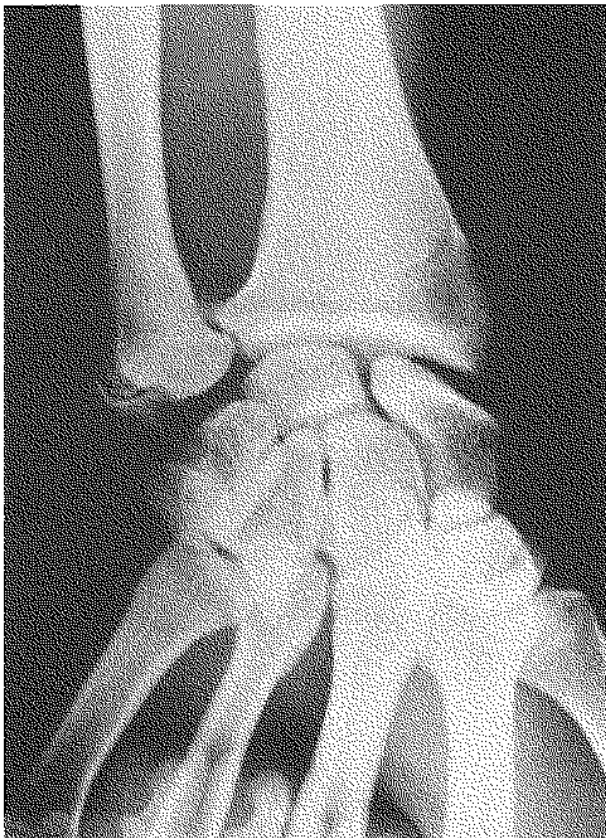
**MATERIALS AND METHODS**

Fifty Sauvé-Kapandji operations were performed by one of the senior surgeons or under his direct supervision (LDS). Patients considering themselves as cured and those with a minimal follow-up of 1 year were reviewed (N = 31). The Cooney score (table 1) (5) was used. For the item on mobility, prosupination was included. Patient satisfaction was also recorded.

All 31 patients were reviewed : 18 men, 13 women. The mean age at operation was 33.8 years (range 17-62 years). The mean follow-up was 17.9 months (range 3-48 months). In 25 patients only a Sauvé-Kapandji procedure was performed ; in 6 patients a Sauvé-Kapandji procedure was combined with another procedure.



*Fig. 1.* — Operative technique of the Sauvé-Kapandji procedure. a : ulnar incision ; b : two-flap technique ; c : resection of a slice of the ulna ; d : removal of cartilage of the distal radioulnar joint ; e : screw fixation of the distal radioulnar joint ; f : interposition of the pronator quadratus in the defect.



*Fig. 2a*

*Fig. 2b*

*Fig. 2.* — a : A posttraumatic deformity ; b : Postoperative x ray : the ulnar head is brought more proximally.

Table I. — Cooney scoring chart

1. Pain	25	No pain
	20	Mild occasional pain
	15	Moderate, tolerable pain
	0	Severe to intolerable pain
2. Functional status		
	25	Returned to regular employment after what time ?
	20	Restricted employment
	15	Able to work, unemployment
	0	Unable to work because of pain
3. Range of motion : Percentage of normal : (including prosupination)		
	25	100
	15	75-100
	10	50-75
	5	25-50
	0	0-25
4. Grip strength : Percentage of normal		
	25	100
	15	75-100
	10	50-75
	5	25-50
	0	0-25

D dorsiflexion, P palmar flexion.  
90-100 excellent ; 70-90 good ; 50-70 fair ; < 50 poor.

Indications for single Sauvé-Kapandji procedures were 16 wrist fractures, one Madelung deformity, one primary arthritis of the distal radioulnar joint, one DRUJ disorder after radial shortening for Kienböck disease, 2 patients with pain at the DRUJ after radial head resection and 4 patients with an ulnar impaction syndrome. The Sauvé-Kapandji procedure was combined with a radial osteotomy in 3 malunions after a Colles fracture and in 1 Madelung deformity. In 2 patients with persistent pain after an intra-articular wrist fracture a radioscapolunate arthrodesis was added.

Six patients had a previous operation at the wrist (not taking into account manipulation for wrist fractures). One had a pinned fracture ; two had an external fixation ; two a radial head resection and one a radial shortening.

**RESULTS**

Thirty-one patients had this operation performed and all were reviewed. The overall Cooney score was 78.2 (range 30-100) (fig. 3). The Cooney

score with simple Sauvé-Kapandji procedures was 87.4 (range 30-100), and the Cooney score in combined procedures was 60 (range 35-90).

The total score for patients with previous operative procedures averaged 60.8 (fig. 3). Twenty-seven patients (87%) were satisfied or very satisfied, 2 indifferent and 2 were dissatisfied (fig. 4). Figure 5 compares the patients' satisfaction to the

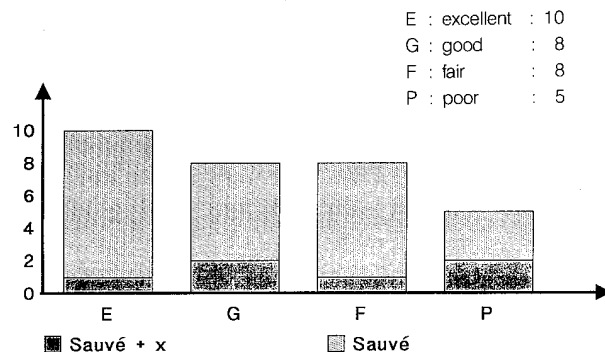


Fig. 3. — Distribution of the Cooney score.

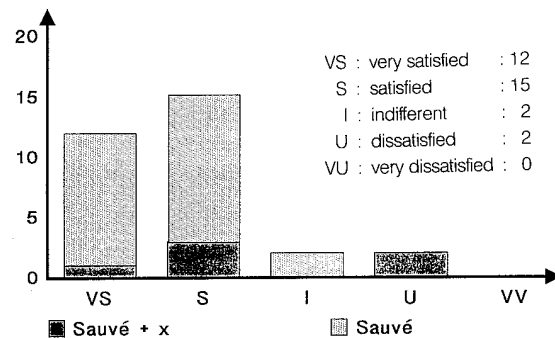


Fig. 4. — Patient satisfaction.

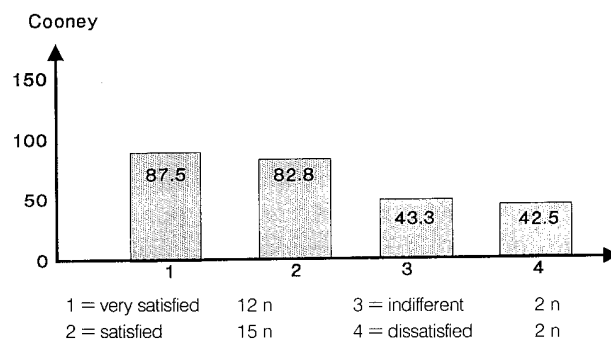


Fig. 5. — Correlation between patient satisfaction and Cooney score.

1 = very satisfied 12 n 3 = indifferent 2 n  
2 = satisfied 15 n 4 = dissatisfied 2 n

Cooney score, and this correlation was rather poor.

Pain relief was very good to complete in 27 wrists (87%); 4 however still experienced moderate to severe pain (fig. 6). Despite the fact that we did not distinguish the workmen's compensation cases from the others, 81% or 25 patients returned to their previous jobs (fig. 7). The score of the 6 patients not going back to work was less than 65. The distribution of the grip strength is shown in fig. 9. The grip strength compared to the normal contralateral side was 66.9% (range 25%-100%). In patients with combined procedures the grip power was less than 50% compared to the opposite side (range 25%-75%). Only in combined procedures was the mobility restricted. In all cases prosupination was fully restored.

There were 5 complications: in 4 cases new bone formation occurred in the gap created which required reoperation (resection of ectopic bone), and in one case screw perforation occurred on the radial side. All patients with ectopic bone formation had the bone slice removed subperiosteally, leaving the periosteum in place. All four were reoperated with complete restoration of mobility.

Stump pain, proximal radial impingement and/or instability of the proximal ulnar stump were not seen at follow-up in this series, although they were present during the 3 months postoperatively (as had been noted in the files).

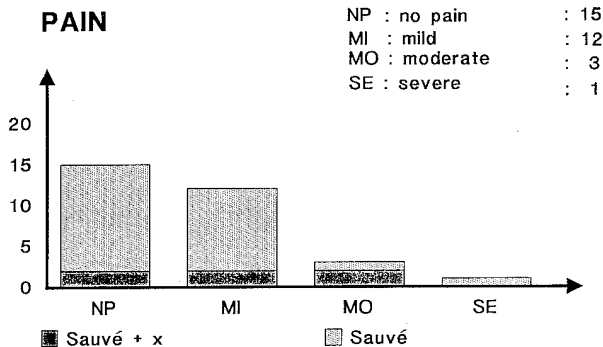


Fig. 6. — Pain distribution, number of patients in each group.

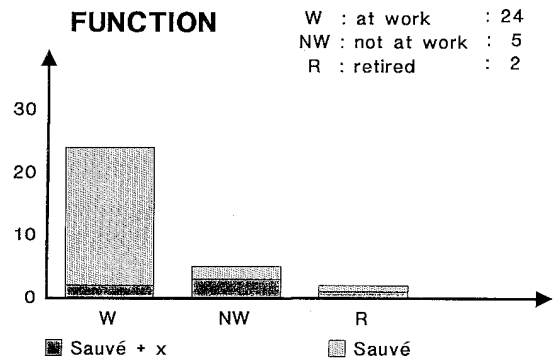


Fig. 7. — Work situation at follow-up, number of patients in each group.

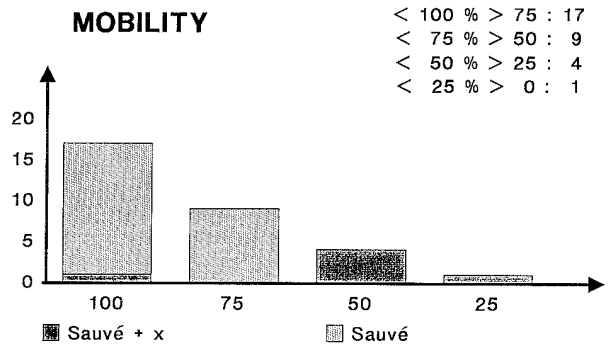


Fig. 8. — Overall wrist mobility (flexion/extension; radio-ular deviation, pronation-supination) compared with the other side.

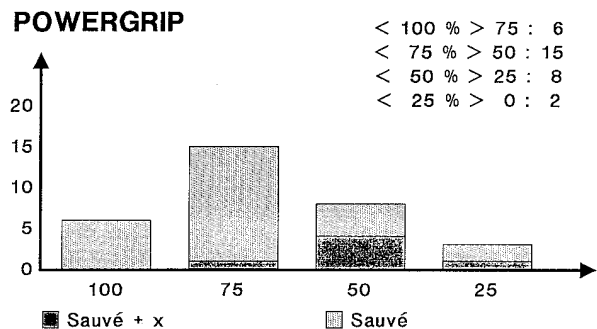


Fig. 9. — Distribution of grip strength.

## DISCUSSION

Despite tremendous progress in diagnosis of disorders of the DRUJ (i.e. MRI and arthroscopy), treatment options have not followed this evolution. Disorders of the DRUJ can be of different origin. Palmer and Werner (17) have demonstrated that (pseudo)lengthening of the ulna by 2.5 mm considerably increases the pressure transmission through the ulnar side of the wrist. Fractures of the distal radius tend to heal with slight shortening and fracture lines through the sigmoid notch can cause incongruity of the DRUJ. The proximal migration of the radius after radial head resection produces progressive DRUJ dislocation (13), and the joint leveling procedures such as lengthening the ulna or shortening of the radius or ulna can be the cause of DRUJ incongruity, depending on the shape of the sigmoid notch (8). Major TFCC tears and/or peripheral detachments produce instability of the DRUJ with ulnar wrist pain and weakness of grip and secondary arthritis can result. Fagg (7) has described ulnar wrist pain in Madelung's deformity, independent of the degrees of malformation.

The Darrach resection of the distal ulna has been the solution for these DRUJ problems for a long time. However, there are several reasons for preservation of the ulnar head. The geometry of the wrist with respect to the carpus remains unchanged and ulnar shift of the carpus is prevented. Force transmission also remains more physiological. With Bowers' hemiresection of the distal ulna, an unstable ulnar stump persists and can explain the unfavorable experience we had with this technique.

The Sauvé-Kapandji operation was described in 1936 (19), but apart from the survey of Goncalves in 1974 (10), received only limited attention until recently (4, 11, 14, 15, 18, 20). Most series are limited and have a mixed rheumatic/nonrheumatic patient population which can interfere with the interpretation of the results.

The present survey of the Sauvé-Kapandji operation is one of the largest for nonrheumatic disorders.

Patients' satisfaction and pain relief are good (87%), and the relatively large group (N = 8) of fair results on the Cooney score reflects the severity of the scoring system. Force, mobility, pain relief and function have equal inputs in the total score. The combined procedures with more severe wrist damage had significant negative effect on the overall results. The most frequent complication, reossification of the gap created, can be prevented with extraperiosteal removal of the ulnar sleeve and early postoperative mobilization of the wrist.

Instability of the ulnar stump, as seen after a Darrach resection of the distal ulna, has not been found in this series, nor has it been reported by other authors (4, 10, 11, 17, 18). The recommendations of Kapandji (12) were followed very strictly and only a small distal ulnar fragment (7 to 15 mm) was left in place with the gap never exceeding 15 mm.

The good overall results of this procedure are confirmation of those reported by others (4, 10, 11, 12, 14, 15, 18, 20) (table II).

Table II

Author	Year	Number	RA patients	Remarks
Goncalves	1974	22	6	—
Sanders <i>et al.</i>	1991	10	1	all excellent and good results
Gordon <i>et al.</i>	1991	15	—	pain improvement in all 8/15 pain free
Condamine <i>et al.</i>	1991	69	41	50% pain free
Taleisnik	1992	37	17	RA : 100% pain free others : 15/23 pain free
Millroy <i>et al.</i>	1992	71	—	81% pain free
Nakamura <i>et al.</i>	1992	15	—	pain improvement in all 7/15 pain free

## CONCLUSION

In cases with good indications the Sauvé-Kapandji operation is a very safe procedure with predictable results. It can be used for distal radioulnar joint disorders with different etiologies.

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## SAMENVATTING

*B. ZACHEE, L. DE SMET, P. ROOSEN, G. FABRY.  
De Sauvé-Kapandji procedure voor niet reumatische aandoeningen van het distaal radioulnair gewricht.*

Tot voor kort werd in de literatuur slechts weinig aandacht besteed aan de Sauvé-Kapandji procedure. We voerden een follow-up studie uit bij 31 gevallen met niet-reumatische aandoening. De Cooney score werd gebruikt. In 81% kon een bevredigend resultaat worden bekomen. De meest frequente complicatie is reossificatie in de resectie pseudarthrose. Dit kon worden voorkomen door een correcte techniek.

## RÉSUMÉ

*B. ZACHEE, L. DE SMET, P. ROOSEN, G. FABRY.  
La technique de Sauvé-Kapandji dans les affections non rhumatismales de l'articulation radio-cubitale inférieure.*

Au cours de ces dernières années la technique de Sauvé-Kapandji a connu un regain d'intérêt. Les auteurs présentent le suivi de 31 cas d'affections non rhumatismales. Les résultats sont évalués selon l'échelle de Cooney : le score moyen est de 81%. La complication la plus fréquente était la réossification de la pseudarthrose intentionnelle. Elle peut être évitée par une technique correcte.