

# EXCISION OR SILASTIC REPLACEMENT FOR COMMUNATED RADIAL HEAD FRACTURES A LONG-TERM FOLLOW-UP

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**This report comprises a follow-up of 39 patients after simple excision and 16 patients after Silastic replacement of the radial head for displaced comminuted fractures. Prostheses were used when similar fractures were associated with an unstable elbow. The excision group was followed up for 6.1 years on average, and the replacement group for 5.7 years.**

**The objective result after simple excision was good in 55% of cases, fair in 26% and poor in 19%. The results in the replacement group were only 13% good, 38% fair, 37% poor and in 12% the prostheses had to be removed.**

**Keywords :** radial head ; fractures ; excisions ; replacement.

**Mots-clés :** fracture tête radiale ; excision ; prothèse de tête radiale.

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## INTRODUCTION

Radial head fractures have always been a controversial subject. Although most authors come to the conclusion that excision is the treatment of choice for comminuted radial head fractures (4, 7, 10), little is known about the long-term outcome of this procedure. Mason (6) described 18 excisions on average at six days after initial injury, with an average follow-up of 26 months and found no abnormalities of the distal radioulnar joint. Eight patients had minor discomfort and palpable crepitus at the elbow. The basic principle asserted by Mason : "when in doubt, resect", contrasts with Charnley's : "when in doubt, leave it in" (2).

Another point of disagreement is whether the timing of radial head resection has any influence on the outcome (10, 11).

Distal radioulnar discomfort after radial head fractures is said to vary from "clinically important in 50% of the patients", to a rare radiographic curiosity with no clinical relevance (1, 4, 7, 9, 10). The cause of this distal radioulnar problem remains unclear, although most authors believe that tightening of the interosseous membrane results in distal radioulnar pain.

Both conservative treatment and internal fixation have been advocated for radial head fractures, but no studies included a significant number of comminuted fractures. Even in apparently simple fractures, the degree of comminution is often worse than the radiographs reveal, which leads to difficulties during internal fixation (1, 6, 11).

Controversy persists concerning prosthetic replacement. Some authors conclude that Silastic replacements can be used for primary fracture treatment or for salvage procedures (12), while others feel this technique is most effective when associated with dislocation (Johnston type IV fractures (5)). Cherry thought a prosthesis can only be used if the capitulum is not affected (3).

Definitive answers to many of these questions are pending.

This is the reason why we have done a retrospective study on the cases treated in our institution for radial head fractures.

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**PATIENTS AND METHODS**

This study includes 53 patients with comminuted radial head fractures and two with type II injuries. Thirty-nine patients had simple excision and 16 underwent Silastic replacement.

The latter was carried out only if, following radial head excision, the elbow was found to be unstable at operation. It was thought this replacement might stabilize the elbow, pending adequate healing of the soft tissues, while allowing early active movement.

All results were classified according to the rating system described by Radin *et al.* (13). In this system, the assumption is made that slight loss of motion is consistent with good function, provided the elbow is asymptomatic. The results were rated good, if there was less than 10° loss of motion in any direction and no symptoms; fair, if there was up to 30° loss of motion in any direction or minor complaints; and poor, if there were major complaints or more than 30° loss of motion in any direction.

The patients' own assessment of their outcome was also graded. All patients were examined by one person (DS). The range of movement in flexion, extension, pronation and supination was examined, as was the grip strength, using a conventional dynamometer. Swanson concluded that in normal individuals, the dominant side was up to 5% stronger than the contralateral side. In this series, the grip strength was considered reduced if the dominant side was fractured and scored less than the nondominant. When the nondominant side was fractured, the grip strength was termed "diminished" if it measured less than 90% of that on the dominant side.

The type of fracture was defined according to the radiological classification of Johnston, a modification of the Mason method as follows (fig. 1) :

- Type I fissure fracture or undisplaced marginal sector fracture
- Type II displaced marginal fracture
- Type III comminuted fracture involving the whole radial head
- Type IV comminuted radial head fracture with posterior dislocation of the elbow.

Of a total group of 69 patients, 14 were not included in this review :

- 3 patients refused assessment, and one had become too frail to be assessed,
- 8 were lost to follow-up, and 2 had died.

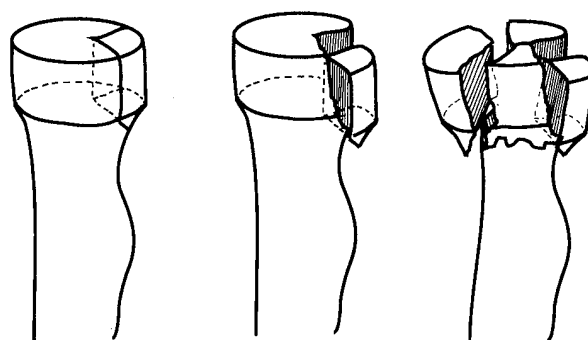
Of the 21 patients with Silastic replacements, 16 were reviewed (76%), and similarly 39 of 48 (81%) after simple excision.

The average follow-up was 6.1 years (range 2.2 — 13 years) in the excision group, and 5.7 years (range 1.6 — 9.5 years) in the replacement group.

**RESULTS**

**1) Excision group (table II)**

The group consists of 39 patients, 23 female and 16 male (M/F ratio = 0.7) with an average age



**Type I**

**Type II**

**Type III**

**Type IV = Type III with dislocation of the elbow**

*Fig. 1.* — Classification according to Johnston.

of 42 years (range 14 — 77 years) and an average follow-up of 6.1 years (range 2.2 — 13.8 years).

The right and left sides were equally affected (R = 19, L = 20); the dominant side was affected in 20 patients (51%). In the excision group, the overall results, according to Radin's criteria, were good in 21 cases (55%), fair in 10 (26%) and poor in 8 patients (19%).

The patients own assessment in the same group was 32 good (82%), 6 fair (15%) and 1 poor (3%).

Most excisions were carried out in the first three days following the accident, but in 13 patients (33%) operation was delayed by more than a week (average delay: 3 months). In this subgroup, six patients had a good result, three a fair and four a poor objective outcome.

The grip strength was normal in 18 cases (46%), mildly diminished in 12 (31%) and markedly reduced in eight patients (20%). One patient had had poliomyelitis affecting the upper limbs so the grip strength in her case was of no value.

Of the eight patients with a poor result, the grip strength was reduced in six, of which four had a severe reduction.

Using the radiological classification of Johnston, the pattern of fractures encountered was:

- Type II : 2 cases (5%)
- Type III : 29 cases (74%)
- Type IV : 8 cases (21%)

The two patients with type II fractures had delayed excision for continuing pain, one after six months and the other after four years. Both had a poor outcome with severely reduced grip strength.

In the eight type IV fractures only one result was good, five results were fair and two patients had a poor outcome. Three patients had a partial excision of the radial head resulting in a poor outcome.

The radiographic findings in 34 patients were examined by follow-up x rays. Early degenerative changes were found in six patients (18%). The three partial excisions were included in this group. Of six patients with heterotopic ossification, four had a poor, one a fair and one a good result. Two patients had a valgus angle of more than 10°, confined to the affected side. Both had a fair result.

## 2) Silastic replacement group (Table III)

Two prostheses had to be removed due to continuing pain. Neither of these patients could be clinically reviewed; hence they are not included in the study although both elbows went on to "normal function" after the removal of the prosthesis, according to their records.

The group reviewed consisted of 14 patients, 9 male and 5 female (M/F ratio = 1.4) with an average age of 50 years (range 24 — 73 years) and an average follow up of 5.7 years (range 1.6 — 9.5 years). The left side was affected eight times, the right side six times. The dominant side was affected in five patients (31%).

All elbows were unstable at the time of operation. Many patients had associated injuries, most commonly dislocations and olecranon fractures (see table I).

The operations were performed within 24 hours, except one, which was delayed for five days due to excessive swelling, in which the outcome was poor.

The outcome of the group, according to the Radin scoring system, was good in two, fair in six and poor in six. The patients' own assessment was good in nine cases, fair in four and poor in one.

The grip strength was normal in seven cases, diminished in three, and severely reduced in four.

Of the six patients with a "poor" Radin score, three had a diminished grip strength, of which two were severely affected.

According to the Johnston classification, there were eight type III and six type IV fractures. The results of the type III fractures were good in two, fair in two and poor in four, while in the type IV cases, four were fair and two were poor. None of the type IV fractures had a good result.

Follow-up radiographs were taken in 13 patients. They showed degenerative changes of varying degrees in five patients (36%), probably due to the associated fractures.

In addition to the two prostheses that had been removed, two were broken at the time of review. The latter still had a "fair" outcome, and both were classified as good by the patient.

Osteolysis of the capitulum was noted in six patients (43%), without obvious clinical effects. A

Table I. — Results of the excision group.

EXCISION GROUP (N = 39)			AVERAGE F.U. : 6.1 years							
	Overall results	Pat. own assessment	Fracture type			Late excision (> 7 d) n = 13	Partial excision n = 3	Grip strength		
			Type II n = 2	Type III n = 29	Type IV n = 8			Normal n = 18	Red. n = 12	Sev. red. n = 8
Good	21	32	0	20	1	6	0	11	7	2
Fair	10	6	0	5	5	3	0	5	3	2
Poor	8	1	2	4	2	4	3	2	2	4

Table II. — Results of the replacement group.

REPLACEMENT GROUP (N = 14) : Replacement removed : n = 2									
AVERAGE F.U. : 5.7 years									
	Overall results	Pat. own assess.	Fracture type		Late repl. n = 1	Grip strength			
			Type III n = 8	Type IV n = 6		Normal n = 7	Red. n = 3	Sev. red. n = 4	
Good	2	9	2	0	0	1	1	0	
Fair	6	4	2	4	0	3	1	2	
Poor	6	1	4	2	1	3	1	2	

Table III. — Associated injuries in radial replacement group.

Associated injuries in radial head replacement group (n = 14)	
— Dislocations	: 6
— Olecranon fractures	: 5
— Coronoid fractures	: 3
— Capitulum fractures	: 1
— Distal radial fractures	: 1
— Distal ulnar fractures	: 1
— Ulna shaft fractures	: 1

valgus angle of more than 20° was observed in one patient who had a fair result on the scoring system and a good outcome on the patient's own score. His other elbow appeared normal.

**DISCUSSION**

The outcome of the replacement group was worse than the excision group, probably partly because of the associated injuries and the higher energy of the accident.

In both groups, but particularly in the replacement group, considerable discrepancy was found between the Radin scoring system and the patient's own assessment. Patients seemed to expect less

function in the replacement group, realizing the complexity of their injury. As mentioned by Miller *et al.* (9), the Radin scoring system is very strict and heavily weighted toward motion and pain. A painless elbow with 30° loss of motion in any direction constitutes a poor result in this system, although this might only be a small handicap to the patient. Both "good" and "fair" results on Radin's scoring system were equivalent to "good" results in the patients' own assessment.

1) The following observations can be made in the *excision group*.

The time of excision may have had some influence on the final outcome, as the results were slightly worse when the radial head was resected more than a week following the injury (55% good results in the early resection, 46% good results when there was one week's delay after the accident). There was however no significant difference between the two.

Type IV fractures had a much worse outcome compared to type III injuries ; only one of eight Type IV cases had a good result compared to 20 of 29 Type III.

Grip strength is not part of Radin's criteria in assessing outcome. Of the eight poor results of excision, six had reduced grip strength. A normal grip strength was found following simple excision in 46% of the cases.

Six patients out of 34 "excision" cases with follow-up radiographs showed osteoarthritis, of which three followed partial radial head excision. Partial excision had a very poor clinical outcome in our cases, and we therefore believe it should be avoided.

A valgus angle of more than 10° was noted in two patients but did not interfere with the end result. It is important to mention that this problem was also encountered in the replacement group. A Silastic replacement did not always prevent a valgus deformity after radial head excision.

Although 14 patients showed radial shortening of up to 4 mm at the distal radioulnar joint, only one patient complained of wrist pain. In the replacement group, six patients had radial shortening of up to 4 mm, and again one patient complained of wrist discomfort, but there was an associated ulnar styloid fracture. Therefore, distal radioulnar pain was not a major clinical problem.

Migration of the radius with shortening is possible when ligamentous lesions occur in the interosseous membrane. Tightening of this membrane can lead to distal radioulnar pain according to some authors; however in our series there was no evidence of membrane rupture. This is however difficult to prove in a clinical situation.

## 2) *The replacement group*

This group included more severe injuries with a number of associated fractures and instability of the elbow. The higher energy of the injury was reflected in a reversed male/female ratio compared to the simple excision group. The interval between accident and operation was probably important in this group, as a delay of five days in one patient led to a poor result.

Compared to the excision group, there was less difference in the results between the type III and type IV fractures, but the latter were slightly worse. The grip strength was diminished in 50%

overall and was reduced in half the patients with a fair or poor result.

Radiographs revealed degenerative changes in 36%, and it is therefore obvious that a Silastic replacement did not prevent osteoarthritis following these complex injuries.

The breakage of Silastic prostheses is well recognized (5) and may sometimes give rise to symptoms, but did not do so in our series. Silastic granulomas were not encountered in our series.

No persistent elbow instability was seen after replacement, and recurrent dislocations did not occur. After simple excision "instability" was mentioned in the notes in one patient and the elbow was immobilized for some time. The outcome was poor.

Posttraumatic soft tissue ossification occurred in 18% of the excision group and 36% of the prosthesis group, probably reflecting the severity of trauma rather than the type of operation.

Osteolysis of the capitulum was noted on radiographs in 43% of the cases, but it had no apparent clinical importance. As previously reported by Mackay *et al.* (5), the osteolysis might result from the fact that the prosthesis is easily compressible and therefore may generate insufficient pressure to maintain bone density.

## CONCLUSION

Radial head excision without replacement had a satisfactory outcome in type III and type IV fractures provided the operation was performed in the first week following the accident.

Associated dislocation (Type IV) was found to carry a worse prognosis, despite the use of a Silastic prosthesis which did seem successful in restoring stability to the elbow.

Distal radioulnar problems were occasionally detected on the radiographs, whether or not a prosthesis was used, but were rarely associated with clinical symptoms. Silastic replacement did not prevent osteoarthritis in unstable elbows with associated injuries.

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## SAMENVATTING

*D. V. STOFFELEN, B. J. HOLDSWORTH. Excisie of arthroplastiek met silastic prothese voor comminutieve fracturen van het capitulum radii. Resultaten op lange termijn.*

Dit artikel omvat de follow-up van 39 patiënten na eenvoudige excisie en 16 patiënten na silastische vervanging van de radioliskop voor verplaatste comminutieve fracturen. Wanneer gelijkaardige fracturen geassocieerd waren met een onstabiele elleboog, werd er een prothese gebruikt. De excisie-groep werd opgevolgd voor gemiddeld 6.1 jaar en de prothese-groep voor 5.7 jaar.

Het objectieve resultaat van de eenvoudige excisie was goed in 55% van de gevallen, matig in 26% en slecht in 19%. De resultaten in de prothese-groep waren slechts 13% goed, 38% matig, 37% slecht en in 12% moesten de prothesen verwijderd worden.

## RÉSUMÉ

*D. V. STOFFELEN, B. J. HOLDSWORTH. Excision ou arthroplastie par prothèse en silastic des fractures comminutives de la tête du radius ? Résultats à long terme.*

Les auteurs ont suivi 39 patients après excision simple et 16 après arthroplastie de la tête radiale pour fracture comminutive avec déplacement.

Une prothèse fut associée à l'excision en cas de fracture comminutive avec déplacement. Le suivi moyen était de 6,1 ans pour le groupe «excision» et de 5,7 ans pour le groupe «arthroplasties».

Les résultats objectifs de l'excision simple étaient bons dans 55% des cas, moyens dans 26% et mauvais dans 19%. Les résultats du groupe «remplacement» étaient bons dans 13%, moyens dans 38%, mauvais dans 37% et chez 12% des opérés on a dû procéder à une ablation de la prothèse.