Hemiarthroplasty for Complex Distal Radius Fractures in Elderly Patients

Guillaume Vergnenègre, MD[1] Jérémy Hardy, MD[1] Christian Mabit, MD[1]
Jean-Louis Charissoux, MD, PhD[1] Pierre-Sylvain Marcheix, MD[1]

[1] Orthopedics and Traumatology Unit, CHRU Limoges, Limoges, France

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Address for correspondence G. Vergnenègre, Service d'orthopédie-traumatologie, CHU Limoges, 2 Avenue Martin Luther King, 87000 Limoges, France (e-mail: gvergnenegre@yahoo.fr).

Abstract

Background In elderly patients, distal radius fractures frequently occur in osteoporotic bone and may be nonreconstructable. It is our hypothesis that a hemiarthroplasty replacment of the articular surface can provide satisfactory results in terms of range of motion, pain, and function for immediate salvage of a fracture that is not amenable to internal fixation.

Methods Between July 2009 and January 2012, eight elderly patients were treated with insertion of a Sophia distal radius implant (Biotech, Paris, France). Inclusion criteria consisted of an isolated AO type C2 distal radius fracture in patients over 70 years old. All patients were reviewed by an independent surgeon.

Results The mean follow-up was 25 months (range, 17–36 months). Mean wrist range of motion (ROM) was 45° (40–50°) of flexion, 44° (40–50°) of extension, and a mean pronation-supination arc of 160°. Mean grip force was 18 kgf. The mean QuickDASH (Disabilities of the Arm, Shoulder and Hand) was 18.2/100 (6.82–29.55), and the mean visual analog scale (VAS) was 2.33 (0–4). X-ray images did not demonstrate implant loosening or ulnar translation of the carpus.

Conclusions The Sophia hemiarthroplasty provided rapid recovery of independence in elderly patients with a nonreconstructable comminuted distal radius fracture.

Keywords
- distal radius fractures
- prosthesis
- epiphyseal comminution

Displaced distal radius fractures are becoming more frequent and remain a public health problem.[1] Treatment options are numerous.[2–4] Although malunion may be tolerated in the elderly,[5] some authors still strive for a restoration of the bony alignment.[4,6] Complex articular fractures in the knee or elbow are often treated with primary prosthetic replacement.[7]

These concerns prompted us to investigate the use of a resurfacing prosthesis for comminuted nonreconstructable distal radius fractures in elderly patients, as first described by Roux.[8]

Materials and Methods

Patients

Eight elderly patients with complex articular distal radius fractures underwent a primary hemiarthroplasty of the comminuted articular surface from 2009 to 2012 using the Sophia implant (Biotech) (►**Fig. 1**). This anatomic prosthesis is composed of a radial stem and an epiphyseal-metaphyseal block that articulates with both the carpus and the ulnar head. The purpose of this implant is to restore the length of the radius and replace the radiocarpal and distal radioulnar joint while providing immediate stability. The same surgeon performed all of the procedures. Inclusion criteria were fractures with metaphyseal comminution, significant radial shortening, and articular comminution (AO type C-2) in patients over 70 years old. Patients with a distal ulna fracture were excluded because the cutting guide relies on an intact ulnar head.

Surgical Technique[8]

The preoperative planning included posteroanterior (PA) and lateral view X-ray images as well as computed

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Fig. 1 Example of wrist hemiarthroplasty (Sophia, Biotech France).

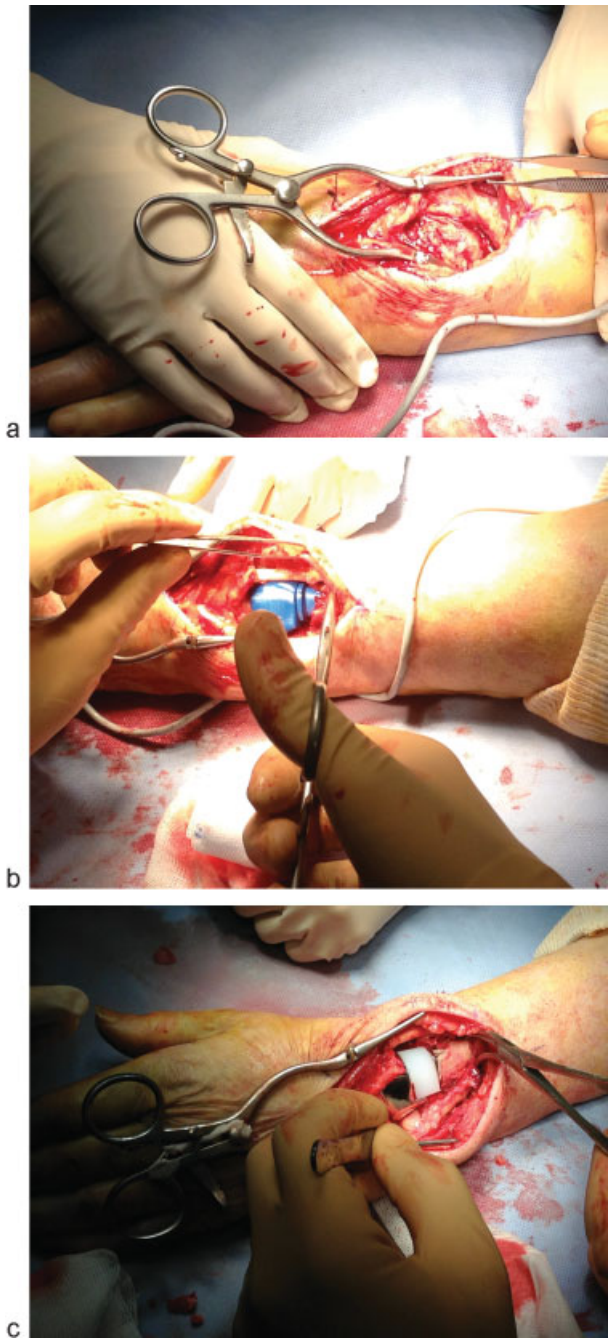


Fig. 2 **(a–c)** Perioperative pictures of surgical technique.

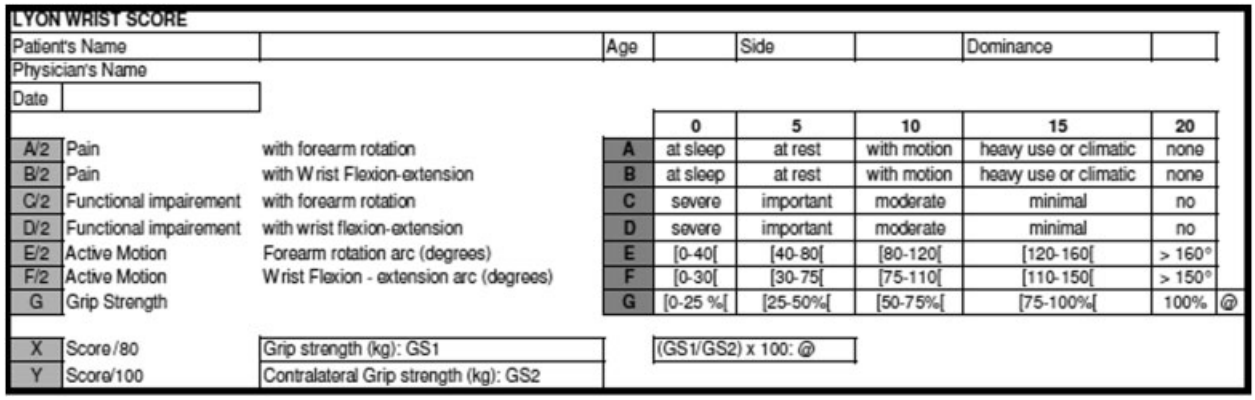
tomography (CT). The procedure (►**Fig. 2**) was performed under regional anesthesia (axillary block). The fracture was approached through a 5–6-cm dorsal incision with exposure of the distal radius though the interval between the extensor digitorum communis and the extensor pollicis longus. A subperiosteal dissection was performed as described by Roux[8] so that the periosteum was in direct contact with the implant at the completion of the procedure to help maintain stability. The posterior interosseous nerve was coagulated and resected. Once all of the free epiphyseal fragments were removed, the radius was resected proximally to create a negative ulnar variance, using a cutting guide positioned with a stem that sat on the distal portion of the ulnar head. Resection was performed using an oscillating saw. Rasps of increasing size were then used to enlarge the medullary canal, followed by insertion of trial implants under radiographic control. The stainless steel head of the implant comes in four sizes, whereas the metaphyseal polyethylene insert is available in three thicknesses. Ten degrees of longitudinal rotation is possible to reduce the risk of loosening. After the correct trial implant size was determined, the definitive implant was cemented into the radius. Patients were immobilized in a below-elbow cast for 3 weeks to allow soft tissue healing, followed by a home program for 3 weeks, then 15 formal physical therapy sessions.

Radiographic Examination and Clinical Evaluation

An independent surgeon reviewed all of the patients at the final follow-up. Wrist motion and grip strength using a a Jamar dynamometer were recorded. Subjective and objective data were graded using the Herzberg scoring system,[9] (►**Fig. 3**), DASH (Disabilities of the Arm, Shoulder and Hand) score,[10] VAS (visual analog scale), and patient satisfaction form. X-ray images were taken to look for prosthetic loosening.

Results

The mean follow-up was 25 months (range 17–36 months). All eight patients (100%) were female. The Mean age of patients was 80 years old at the time of the injury (range: 74–85 years). The dominant side was involved in five of the cases. All of the fractures were AO type C2, with metaphyseal



LYON WRIST SCORE

Patient's Name			Age		Side		Dominance		
Physician's Name									
Date									
				0	5	10	15	20	
A/2	Pain	with forearm rotation	A	at sleep	at rest	with motion	heavy use or climatic	none	
B/2	Pain	with Wrist Flexion-extension	B	at sleep	at rest	with motion	heavy use or climatic	none	
C/2	Functional impairement	with forearm rotation	C	severe	important	moderate	minimal	no	
D/2	Functional impairement	with wrist flexion-extension	D	severe	important	moderate	minimal	no	
E/2	Active Motion	Forearm rotation arc (degrees)	E	[0-40[	[40-80[	[80-120[	[120-160[	> 160°	
F/2	Active Motion	Wrist Flexion - extension arc (degrees)	F	[0-30[	[30-75[	[75-110[	[110-150[	> 150°	
G	Grip Strength		G	[0-25 %[	[25-50%[	[50-75%[	[75-100%[	100%	@
X	Score/80	Grip strength (kg): GS1							
Y	Score/100	Contralateral Grip strength (kg): GS2							

((GS1/GS2) x 100: @

Fig. 3 The Herzberg scoring system.

and epiphyseal comminution and without distal ulnar fractures (except ulnar styloid fracture). The mean delay between injury and surgery was 2 days (range 1–3 days). The average operating time was 66 minutes (range 55–85 minutes). The patients were discharged at an average of 5 days (range 2–8 days). No explantation of this prosthesis occurred at the time of follow-up (implant survival: 100%).

The clinical results are summarized in ►**Table 1**.

Table 1 Clinical data

Study patients	8
Average age (years)	80
Gender: M/F	0/8
Fracture side: Left/Right	3/5
Dominant side: Left/Right	3/5
Average follow-up (months)	25
Motion (degrees):	
Flexion	46 (SD, 4.18)
Extension	44 (SD, 4.18)
Pronation	85 (SD, 7.58)
Supination	75 (SD, 5)
Radial	20 (SD, 5)
Ulnar	25 (SD, 6)
Grip	92 (SD, 9.84)
Herzberg score (%)	78,6%
DASH score (/100)	18 (SD, 6.22)
VAS	2 (SD, 1.5)

Abbreviations: DASH, disabilities of the arm, shoulder and hand ; F, female ; M, male ; SD, standard deviation; VAS, visual analog scale.

The patients were able to come back home and return to activities of daily living (ADLs) on average in 3 weeks (range 0.5–5 weeks).

No patients were disappointed with this surgery according to a patient satisfaction form (►**Fig. 4**).

Only one case of periprosthetic calcification was demonstrated on X-ray. There were no cases of implant loosening, infection, complex regional pain syndrome (CRPS), or dislocation.

Discussion

Treatment of complex distal radius fractures in elderly patients remains controversial.[11,12] Despite numerous plate designs, an anatomical reduction is often unobtainable in elderly patients with complex articular fractures.[13,14] An advantage to the use of a hemiarthroplasty is the rapid return to autonomous function and ADLs, which was typically 3 weeks. Roux obtained similar clinical results to ours in six patients who were treated with a hemiarthroplasty[8] (►**Table 2**). However, our functional results are slightly better with a QuickDASH at 18 versus 27 for Roux.[8] His cases, however, included patients with acute trauma as well as tumors and distal radius malunions: four comminuted and osteoporotic fractures in elderly patients, one malunion in an elderly patient, and one pathological fracture of epiphyseal destructive tumor in a young man.

We utterly agree with Roux on the fact that despite encouraging results, the low follow-up of this technique and the limited number of cases lead us to be cautious and use this procedure only in the indications described previously.

Fig. 4 **(a–g)** Displaced distal radius fractures: Example radiological of the hemiarthroplasty and clinical results at 12 months: flexion-extension (left wrist).

Table 2 Results of two Sophia Biotech hemiarthroplasty series

Series	Our series	Roux 2008
Mean age (years)	80	73
Follow-up (months)	25	27
Mean flexion-extension (°)	89	90
Mean pro-supination (°)	160	110
Grip (kg f)	18 (90%)	16 (80%)
DASH score	18.2	27.2
Complications	1 periprosthetic calcification	1 CRPS

Abreviations: CRPS, complex regional pain syndrome; DASH, disabilities of the arm, shoulder and hand; F, female; M, male.

Conflict of Interest
None

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