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Original article

Minimally invasive surgery of distal radius fractures: A series of 20 cases using a 15 mm anterior approach and arthroscopy

Chirurgie mini-invasive des fractures du radius distal : à propos de 20 cas par abord antérieur de 15 mm et arthroscopie

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Abstract

This study reports the results of minimally invasive surgical treatment of distal radius fractures using a 15 mm incision with arthroscopic assistance. This was a retrospective series of 20 distal radius fractures in young or middle-aged patients caused by high-energy trauma and/or with articular involvement. The surgical procedure included two stages: fixation using a locking plate and then arthroscopy. The incision for plating was always 15 mm long. Arthroscopy was used to reduce osteochondral fragments in two cases and to suture and pin six scapholunate lesions. After a mean follow-up of 4.3 months, the mean pain score was 1.9, QuickDASH was 24.6 and the mobility and grip strength were at least 75% of the contralateral side. The mean palmar tilt was 8.8° and the mean radial inclination 20.7°. The radio-ulnar index was –1 mm with no DISI and the scapholunate gap was 1.5 mm. There were three cases of CRPS type I. Our results show that arthroscopy-assisted, minimally invasive surgery for distal radius fractures using a 15 mm incision results in a scar with good cosmetics and allows for easy reduction and fixation, and management of articular and ligament lesions. Its indications must take into account the functional demands placed on the wrist by the patient, energy of the trauma and fracture type.
Level of evidence. – IV.

Keywords: Distal radius fracture; Volar plate; Minimally invasive surgery; Wrist arthroscopy

Résumé

Dans le cadre du concept de chirurgie mini-invasive des fractures du radius distal introduit récemment, ce travail étudiait les résultats d'une voie d'abord de 15 mm avec arthroscopie. Il s'agissait d'une série rétrospective de 20 fractures chez des patients physiologiquement jeunes à demande fonctionnelle importante ou modérée, à haute énergie ± refend articulaire. L'intervention comprenait 2 étapes : ostéosynthèse par plaque verrouillée antérieure puis arthroscopie. L'incision pour ostéosynthèse a toujours été de 15 mm. L'arthroscopie a permis la réduction de 2 fragments ostéochondraux, et la suture-brochage de 6 lésions du ligament scapho-lunaire. À 4,8 mois, la douleur était en moyenne de 1,9, le quick DASH de 24,6, et la mobilité et la force de préhension > 75 % par rapport au côté opposé. La pente radiale sagittale était en moyenne de 8,8° et frontale de 20,7°, l'index radio-ulnaire –1,0 mm sans DISI et le diastasis scapho-lunaire 1,5 mm. Trois SDRCI type I étaient encore évolutifs. D'après nos résultats, la chirurgie mini-invasive des fractures du radius distal, associant voie de 15 mm pour la plaque antérieure puis arthroscopie, a pour avantages l'esthétique, la facilité de la réduction et l'ostéosynthèse, le contrôle articulaire et ligamentaire. Elle est indiquée en fonction de la demande du patient, de l'énergie du traumatisme, et du type de fracture.
Niveau de preuve. – IV.

Mots clés : Fracture distale du radius ; Plaque antérieure ; Chirurgie mini-invasive ; Arthroscopie du poignet

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1. Introduction

The most common radius fractures are those involving the distal radius, all ages included [1]. These fractures were responsible for over $164,000,000 in hospital costs in the USA in 2007 [2]. Six years later, the increased incidence is becoming a public health concern because patients cannot use their wrist until the fracture has healed [3]. In younger patients, the economic repercussions are related to functional sequelae after bone union, especially radiocarpal arthritis [4].

Surgical techniques for distal radius fractures have evolved considerably over the past ten years. External fixator and K-wires are increasingly being replaced by locking plates [3], which provide much better fixation [5]. The concept of minimally invasive surgery is well developed in lower limb surgery such as hip fractures, hip replacement and knee replacement and is being developed in wrist surgery. The size of the incision for plate fixation of wrist fractures has recently been reduced to 15 mm [6].

Wrist arthroscopy — a minimally invasive technique — is being used more and more often as it allows for better reduction and accurate assessment of ligament lesions [7,8]. Many authors use arthroscopy but add a standard open approach for distal radius plate insertion. Recently, the concept of minimally invasive surgery has been applied to distal radius fractures; it combines wrist fixation using a locking plate through an anterior 25 mm incision with arthroscopic exploration [7].

The aim of the current study was to evaluate the results of a retrospective series of 20 distal radius fractures treated using minimally invasive surgery (15 mm Henry approach and arthroscopy) using an algorithm that takes into account the patient's age, energy in the trauma and fracture type.

2. Material and methods

Between May 2012 and March 2013, all distal radius fractures in young or middle-aged patients caused by high-energy trauma and/or with articular involvement were included in the study. These patients all placed high or moderate functional demands on their wrist. The inclusion criteria corresponded to the equation $P \cap (E \cup F)$, where P was the set of young or middle-aged patients with high functional demands, E was the set of high-energy trauma, and F was the set of intra-articular fractures (AO types B and C). This was a continuous retrospective series (Table 1) of 20 patients (13 men and 7 women) with a mean age of 35 years (range 9 to 53). There were 14 manual workers and 9 athletes. The dominant side was affected in 9 cases. The fracture was the result of high-energy trauma in 18 of the 20 cases. One fracture was a Type A

Table 1
Patient characteristics for this series of 20 radius distal fractures.

Patient	Gender (M/F)	Age (age)	Manual worker (Y/N)	Athlete (Y/N)	Dominant side injured (Y/N)	Injury mechanism	Fracture (AO)	Osteochondral lesion	Scapholunate lesion (EWAS)	Arthroscopic procedure(s)	Immobilization for 6 weeks (Y/N)
1	M	42	N	Y	N	Bike	C3.2	Free bony fragment	II	Fragment reduction	N
2	M	23	Y	N	N	Ladder	A3.2				N
3	M	53	Y	Y	N	Bike	C3.1	Radius surface	I		N
4	M	33	N	Y	N	Stool	C1.2		IIIC	Capsule–ligament suture repair + pinning	Y
5	M	37	Y	N	N	Car	C1.2		IIIC	Capsule–ligament suture repair + pinning	Y
6	F	26	N	Y	N	Snowboard	C1.2		I		N
7	M	22	Y	N	Y	Car	C3.1		IIIB	Capsule–ligament suture repair + pinning	Y
8	F	24	Y	N	N	Ladder	C1.3		I		N
9	M	46	Y	N	Y	Snowboard	C2.1	Free fragment	I	Fragment removal	N
10	M	22	Y	N	Y	Crush	B1.1		I		N
11	F	41	Y	N	Y	Stairs	B3.3	Scaphoid surface	I		N
12	M	25	Y	Y	Y	Scooter	B1.1		IIIC	Capsule–ligament suture repair + pinning	Y
13	F	44	Y	Y	Y	Bike	C1.2		II		N
14	F	41	Y	N	Y	Fall	C2.1		I		N
15	F	41	Y	N	Y	Roller	C2.1		I		N
16	M	19	N	Y	N	Skateboard	B3.2		IIIB	Capsule–ligament suture repair + pinning	Y
17	M	48	N	Y	N	Race	C1.2		I		N
18	M	39	Y	N	Y	Ladder	C3.1	Lunate surface	I		N
19	M	33	N	Y	Y	Bike	B1.1		IIIA	Capsule–ligament suture repair + pinning	Y
20	F	48	Y	N	N	Stairs	C2.1		I		N

Y: yes; N: no; M: male; F: female; EWAS: European Wrist Arthroscopy Society.