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Original article

Contribution of arthroscopy to the treatment of intraarticular fracture of the distal radius: Retrospective study of 40 cases

Apport de l'arthroscopie en complément de l'ostéosynthèse des fractures articulaires de l'extrémité distale du radius : étude rétrospective et comparative à propos de 40 cas

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ABSTRACT

Our study aimed to compare the anatomical result after treatment of intraarticular distal radius fracture with locking volar plates with and without arthroscopy. This was a retrospective, single-center study of intraarticular fractures. A volar locked plate was used for fracture fixation in all patients. Twenty patients were operated on with fluoroscopy only ("plate" group) and 20 operated using arthroscopy assistance ("arthroscopy" group). All patients underwent a CT scan before surgery and at 3 months postoperative. The main outcome measure was the residual intraarticular step-off (measured in millimeters). Other studied outcomes were the residual gap between fragments and extra-articular reduction. The two groups were similar preoperatively in all aspects except the size of the gap between fragments. The residual step-off was significantly less in the arthroscopy group: 1.9 mm (Q_1 1.7; Q_3 2.25) for plate versus 0.8 mm (Q_1 0.7; Q_3 1.5) for arthroscopy ($P = 0.001$). The change from the preoperative to the postoperative measurement was significantly greater in the arthroscopy group: 0.1 mm (Q_1 −0.5; Q_3 0.8) for plate and −1 mm (Q_1 −1.9; Q_3 −0.6) for arthroscopy ($P = 0.0002$). The residual gap was similar between both groups: 2.4 mm (Q_1 1.9; Q_3 3.5) for plate vs. 2.3 mm (Q_1 1.1; Q_3 2.8) for arthroscopy ($P = 0.37$). The change in gap was not significantly different between the two groups: −0.9 mm (Q_1 −1.8; Q_3 −0.1) for plate vs. −2.9 mm (Q_1 −4.4; Q_3 −1.7) for arthroscopy ($P = 0.32$). There was no difference in the extra-articular reduction. Damage was found to the scapholunate ligament in 30% and the TFCC in 30% of arthroscopy cases. Arthroscopy improves intraarticular reduction without altering extra-articular reduction in patients with intraarticular fractures of the distal radius, and it allows for assessment and treatment of any injuries discovered. We must now follow these patients over the long-term to assess the clinical benefit.
Level of evidence: 3.

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Mots clés :
Fracture du radius distal
Plaque palmaire verrouillée
Arthroscopie
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RÉSUMÉ

Cette étude visait à comparer le résultat anatomique obtenu après ostéosynthèse par plaque antérieure verrouillée des fractures articulaires de l'extrémité distale du radius, avec ou sans aide arthroscopique. Il s'agissait d'une étude monocentrique, rétrospective comparant 20 patients ayant une fracture articulaire de l'extrémité distale du radius, opérés sous fluoroscopie seule, à 20 patients opérés avec assistance arthroscopique. L'ostéosynthèse utilisait une plaque antérieure verrouillée. Tous les patients ont

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bénéficié d'un scanner pré- et postopératoire à 3 mois. Le critère principal était la mesure de la marche d'escalier intra-articulaire résiduelle (en mm). Étaient également mesurés l'écart interfragmentaire résiduel et la réduction extra-articulaire. Les groupes étaient comparables en préopératoire pour toutes les caractéristiques sauf pour l'écart interfragmentaire. La marche intra-articulaire résiduelle était significativement inférieure dans le groupe arthroscopie, de 1,9 mm (1,7/2,25) pour les plaques contre 0,8 mm (0,65/1,5) pour l'arthroscopie. La différence entre les états pré- et postopératoire était significativement supérieure dans le groupe arthroscopie : 0,05 mm (−0,45/0,75) pour les plaques et de −1 mm (−1,9/−0,55) pour l'arthroscopie. L'écart interfragmentaire résiduel n'était pas différent : 2,4 mm (1,9/3,5) pour les plaques contre 2,25 mm (1,1/2,8) pour l'arthroscopie. La différence était significativement supérieure dans le groupe arthroscopie : −0.9 mm (Q_1 −1,8 ; Q_3 −0,1) pour le groupe plaque contre −2,9 mm (Q_1 −4,4 ; Q_3 −1,7) pour le groupe arthroscopie ($p = 0,32$). Il n'y avait pas de différence pour la réduction extra-articulaire. Il était retrouvé 30 % de lésions du ligament scapho-lunaire et 30 % de lésions du TFCC diagnostiquées lors de l'arthroscopie. L'arthroscopie permet d'améliorer la réduction intra-articulaire sans modifier la réduction extra-articulaire des fractures articulaires de l'extrémité distale du radius. Elle permet de faire le bilan et le traitement des lésions associées. Il faut maintenant suivre ces patients à long terme pour juger du bénéfice clinique.
Niveau de preuve. – 3.

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1. Introduction

Distal radius fractures make up nearly 18% of all fractures in adults and are the reason for 1.5% of emergency room visits [1]; 10% of these fractures are intraarticular. Several studies have shown that a residual step-off or gap between fragments greater than 2 mm, or even 1 mm, after fracture reduction can lead to radiocarpal osteoarthritis (OA) in up to 91% of cases at 6 years [2–6].

Concurrent ligament damage has been found in 20% to 30% of cases, and can lead to degenerative wrist lesions if not treated adequately [7,8]. Arthroscopy can be used to assess and treat these additional injuries [9].

Intraarticular fractures of the distal radius are increasingly being treated by open reduction and internal fixation (ORIF) using volar locking plates. In comparison to fracture pinning, plate fixation reduces secondary displacement and post-traumatic stiffness by shortening the immobilization period [10].

It was shown that fluoroscopy was not sufficient to determine whether the articular surface had been correctly reduced. But until now, no study has used objective CT-based criteria to compare postoperative reduction when arthroscopy is performed in addition to standard ORIF [11,12].

The purpose of our study was to compare the treatment of intraarticular distal radius fracture with locking volar plates with and without arthroscopy. We compared short-term anatomical recovery between the two groups. We hypothesized that the intraarticular reduction was better with arthroscopic assistance than without.

2. Methods

2.1. Patients

This was a retrospective, single-center study with parallel groups. In one group, the fracture was treated with a volar locking plate (plate group) and in the other group, the fracture was treated with the same locking volar plate (Stryker VariAx Distal Radius Locking Plate™) but arthroscopy was also performed (arthroscopy group). The arthroscopy was performed by two surgeons who were experienced in wrist arthroscopy and the ORIF was performed by orthopedic surgeons.

Patients were eligible for the study if they were between 18 and 65 years of age and came to the emergency room with an intraarticular fracture of the distal radius.

The delay between diagnosis and surgery was always less than 72 hours.

Patients were excluded if they had neurological or vascular deficits in their hand, suffered a fracture-dislocation, had previous surgery on the ipsilateral wrist or other fracture of the ipsilateral limb, suffered polytrauma or were pregnant.

The two study groups were similar preoperatively (Table 1). The extra-articular displacement was similar between groups (Table 2). There were 2 fragments in 2 cases, 3 fragments in 16 cases, 4 fragments in 15 cases and more than 4 fragments in 7 cases.

In nine patients, we performed subchondral pinning in addition to plate fixation because of poor reduction (Fig. 1). Double scapholunate (SL) pinning was performed in one patient because of a type 2 injury; SL pinning with scaphocapitate pinning was performed in two patients because of stage 3C injuries. The TFCC was reattached peripherally in 3 patients and shaved down in 3 patients.

2.2. Arthroscopy

All patients were operated under regional anesthesia. The installation was in supine position. An arm tourniquet was inflated to 250 mmHg. Counter support was made thanks to an inverted U-type on the tourniquet to allow traction with the elbow at 90°. The traction was made on the 2nd and 3rd finger by means of a Japanese finger and connected to weights of 5 to 8 Kg. The intraarticular fragments were reduced using the probe hook and stabilization was done using K-wires (8 or 10/10th).

2.3. Methods

The main endpoint was the residual articular step-off (measured in millimeters) on CT scans done preoperatively and at 3 months postoperative. The largest step-off on frontal and sagittal slices was measured (Fig. 2a). This allowed the groups to be compared preoperatively and postoperatively. The change (delta)

Table 1
Characteristics of study population.

	Plate group $n = 20$	Arthroscopy group $n = 20$	*P* value
Men, *n* (%)	10 (50)	9 (45)	0.75
Age, mean ± SD	48 ± 15	43 ± 15	0.27
Right side, *n* (%)	7 (35)	9 (45)	0.52

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