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Research Article

Comparative Study between Kapandji Intrafocal Pinning Versus Plaster Immobilization of Pouteau-Colles' Fractures in Adults in Bangui

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Abstract

Aim: To evaluate the results of the treatment of Pouteau-Colles' fractures by Kapandji intrafocal pinning versus plaster immobilization alone.

Materials and Methods: This was a prospective study conducted from May 2011 to April 2013, involving trauma patients with Pouteau-Colles' fractures treated by Kapandji intrafocal pinning or by plaster. The results of the treatment were analyzed and compared in the two groups. Patients were randomized and their consent was required before treatment. The Metsdagh criteria were used for clinical and functional evaluation after a minimum follow-up of 12 months. Patient satisfaction with treatment was also collected in the two groups.

Results: During the study period, one hundred patients with a Pouteau-Colles fracture were included, 50 in each group. There were 56 men and 44 women, average age was 36, distributed evenly across the two groups. During the follow-up, we recorded five displacements in plaster, two migrations and two externalizations of the pins. There was no difference in the consolidation time which was 6 weeks (range: 4-10 weeks) in both groups. We observed 34 cases of malunions, including 28 in the plastered group and six in the wired group (RR = 4.66, p = 0.000001). After an average follow-up of 29 months, the overall results were excellent and good for 42/50 in the wired group versus 17/50 in the plastered group in the poor results of the series were observed among. The patients were satisfied with the treatment in 42/50 intrafocal pinning versus 12/50 plastered for aesthetic, clinical and functional reasons.

Conclusion: The systematic pinning of Pouteau-Colles' fractures gives good clinical and functional results, prevents from malunions often observed after conservative treatment.

Keywords: *Fracture; Radius; Distal; Pinning; Plaster; Treatment; malunion*

Introduction

Fractures of the distal end of the radius (EDR) account for about 20% of all fractures in the body [1,2]. Pinning techniques such as styloid pinning, the isoelastic pinning of Py [3] or the intrafocal pinning proposed by Kapandji completely supplanted the conservative which results in led many complications including malunions and secondary displacements in which can affect 64% of cases [3-5, 10]. Other complications such as stiffness of the wrist or painful algodystrophy due to an imperfect initial reduction or poor post-therapy monitoring [6-8].

However, osteosynthesis by a screw plate remains the "gold standard" because avoiding malunions but its realization requires qualification and equipment.

In the only orthopedic-trauma department, the current practice is plastered immobilization with their corollary of deplorable complications.

Aim of the Study

The aim of our study was to assess the results of the treatment of Pouteau-Colles' fractures by pinning and by plastered immobilization in Bangui in order to improve management.

Patients and Methods

This is a prospective, mono-operator and mono-evaluator study conducted from May 2011 to April 2013. The study focused on adult patients, with a Pouteau-Colles' fracture, treated in the service of Orthopedics-Traumatology of the Community Universitary Hospital of Bangui.

Included were cases of extra-articular posterior tilted EDR fractures; received before 21 days. The traumatized wrist should be free from any previous trauma; the fracture should be isolated. Patients should have a minimum follow-up of 12 months at the time of assessment.

Intraarticular complex, or open EDR fractures were not included, as well as cases treated by other methods and patients not consenting to the proposed treatments.

Course of the study

Patients were distributed in two treatment groups according to their consent, either in conservative or surgical treatment. When the patient was not consenting to the proposed treatment, his choice was respected. The number of cases included by group was fixed by convenience at 50 patients. Both conservative and surgical treatment were carried out by the same operator. All fractures were reduced under general anesthesia before immobilization. AP and lateral X-Rays of the wrist were performed immediately after, then on the 7th day and every two weeks until consolidation. The glenoid angle of the face (AGF), the glenoid angle of the profile (AGP) and the radio-ulnar index (IRU) were the criteria for evaluation of the post-therapeutic reduction. Bone consolidation was clinically asserted by the absence of pain and mobility at of the fracture site, and radiographically asserted by the appearance of a mature bone fusion. Rehabilitation sessions were prescribed after the pins or plaster were removed at 4 and 6 weeks of treatment.

Malunions were considered when AGF was < 14° (normal: 15 to 30°); when AGP was < 1° in case of posterior tilt and > 21° in case of anterior tilt, and when IRU was > 3 mm, suggesting involvement of the distal radio-ulnar joint. Patients were assessed with the criteria of Metsdagh [11] (Table 1).

A file was used to collect the data. The data were entered in Epi-info 2008 software version 3.5.2. The means were compared by the chi square test and the relative risk was defined for the factors of occurrence of complications. The significance threshold was set at 5%.

Results

Series

The average age of our patients in both groups was 39.5 years (range: 17 and 80 years). Male subjects were predominant (sex ratio = 1.38). The main causes of injuries were accidents on the public highway (n = 59) and accidents at in home (n = 31). Patients were seen within 24 hours of the accident in 78% of the cases. Our series was homogeneous in the distribution of the parameters (Table 2).

Notes	Points
1/ Pain	
Absent or rare pain, meteorological ……..	1
Severe but inconsistent exertion pain ……..	2
Pain in all wrist movements but without limitation of activity……	3
Severe pain with activity limitation ……	4
2/ Gripping force compared to the healthy side	
Identical ……..	1
strength decreased by1/4…… ……	2
strength decreased by 1/2……	3
Strength decreased by 3/4 and more……..	4
3/ Protrusion of the ulnar head compared to the healthy side	
Morphologically normal ulnar head …… ……	1
Net projection ……..	2
Sharper projection ……..	3
4/ Mobility compared to the healthy side Flexion/extension	
Normal……	1
Deficit flexion / extension of 20°……	2
Flexion Flexion / extension deficit of more than 20°……..	3
Radio-ulnar to	
Normal……..	1
Radio-ulnar tilt deficient 20°.....……..	2
Loss of radio-ulnar tilt of more than 20°……..	3
Pronosupination	
Normal……..	1
Loss of 20°……..	2
Loss-making by more than 20°……	3
Adding up the ratings gives a total of 6 to 20. Overall results: Very good = (6 to 7 points), Good = (8 to 12 points), Fair = (13 to 16 points), bad = (17 to 20 points).	Total = 20

Table 1: *Criteria for clinical evaluation of Mestdagh., et al [11].*

Characteristics overall	Plastered (G1)	Brocaded (G2)	Tests Statistics P
Sex			
Male (n = 58)	23	35	p = 0,008
Female (n = 42)	27	15	
Age			
Average = 39,4 years	40,3 years	38,6 years	
(extreme: 17 and 80)	(17 - 80)	(17 - 65)	
Involved side			
Right (n = 46)	n = 25	n = 21	p = 0,2
Left (n = 54)	n = 25	n = 29	
Dominant side			
Right (n = 96)	n = 49	n = 47	p = 0,1
Left (n = 4)	n = 1	n = 3	
Etiology			
AVP (n = 56)	n = 31	n = 25	
AD	n = 11	n = 20	p = 0,2
AS	n = 5	n = 3	
AT	n = 2	-	
Brawl	n = 1	n = 2	
Admission delay			
J1 (n = 78)	n = 46	n = 32	p = 0,02
≥ J2 (n = 22)	n = 4	n = 18	

Table 2: *Characteristics of the global series and of the two groups compared.*

Radiological parameters: Out of the 50 patients with pre-operative AGF < 14° and treated with BABP plaster, 37 had normal post-operative values, and out of the 48 patients with pre-operative AGF < 14°and treated by pinning, 43 had normal post-operative values [RR = 1.85 (extremes = 0.8 and 4.2), CI = 95%, p = 0.07].

On the lateral X-Rays, 15 patients had persisting post-operative posterior tilt with AGP > 1°. Among them, 13 were included in the plaster group and two were included in the pinned group [RR = 6.5 [extremes = 1.5 - 27.33] CI = 95% and P = 0.001].

IRU was affected in eight patients in the series, six of whom had an IRU greater than 3 mm which persisted in 4 patients treated conservatively, and in 2 patients treated by pinning.

Evolution

Five cases of displacement were observed in the patients conservatively treated. In the group treated by pins, we recorded two pins migrations and two pins end externalizations. We recorded no cases of infection, non-union or tendon injury.

The average duration of consolidation was 6 weeks (range 4 to 10 weeks). This consolidation time was identical in the two groups and was 6 weeks in 78 patients. One plastered patient had a consolidation time of up to 10 weeks. Physiotherapy was prescribed and followed by 83 patients. The average number of sessions performed was 15 (range: 10 and 25 sessions).

We observed 34 cases of malunions including 28 in the plastered group and six in the pinned group (RR = 4.6 [2.1 - 10.2]; p= 0.000001). Patients treated with plaster were 4.6 times more likely to develop a malunions compared to patients treated by with pinning. Seven severe malunions were observed in the plastered group (RR = 7 [Extremes: 4.3 and 18.5], p = 0.003). This risk for severe malunions is 7 times higher after in plastered.

Evaluation

After an average follow-up of 29 months (range: 12 and 36 months), the overall results were excellent and good for 42/50 in the pinned group against 17/50 in the plastered group. The 12 poor results of the series were observed among plasters (Chi2: 28.94, p = 0.001) (Table 3).

Results achieved					
Groups treated	**Excellent**	**Well**	**Way**	**Bad**	**Total**
Plastered (G1)	5	12	21	12	50
Pinned (G2)	17	25	8	-	50
Total	22	37	29	12	100

Table 3: *Overall results according to the Metsdagh score in the two groups.*

Patients were satisfied with the treatment in 42/50 pinned versus 12/50 plastered. The reasons for satisfaction were aesthetic, clinical and functional. The functional recovery at the same level and the absence of deformation of the wrist was the motivation for satisfaction in pinned group. On the other hand, the malunions, the stiffness and the residual pain justified the main reasons for the majority dissatisfaction of the patients.

Discussion

This homogeneous comparative series conducted prospectively by the same operators represents a reliable level of evidence study (level III). The conclusions drawn can constitute proof.

The study was conducted in a developing country where the conservative treatment with immobilization by plaster remains the standard choice while this treatment is almost completely no more used abandonned in the west. This series convinces these teams to prefer have gone through Kapandji intrafocal pinning of Pouteau-Colles' fractures or even other of the distal radius rather than before any plastered immobilization.

All of the movements in our series were in rear displacement flip is explained by explains the mechanism occurrence of Pouteau-Colles' fracture with a wrist in a the compression-extension position during accidents. The study by Trumble., et al. [12] confirms this mechanism. Kapandji in his princeps study had reserved this technique for extra-articular fractures with posterior rocker movement [13,14]. Its indication is currently extended to slightly displaced joint fractures [10,15-17].

The radiographic parameters at consolidation (AGF, AGP and IRU) show that pinning provides a better immediate postoperative reduction and at consolidation than plasters (Figure 1a, 1b, 2a, 2b). This is confirmed by the statistical tests of the study. The stability provided by the pinning spindle is greater than plaster, whose effectiveness is decreased after reduction of loses its continence when the post-traumatic edema melts. Also, swelling may the reduction by external maneuvers is not always perfect if there is a swelling.

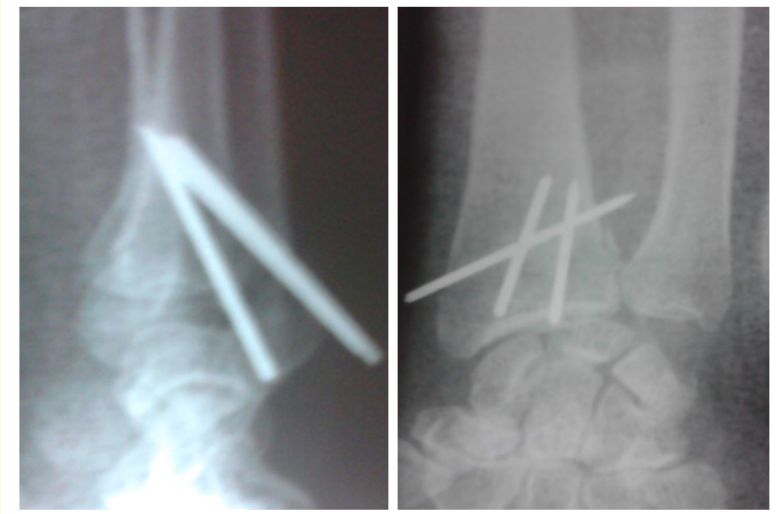

Figure 1a and 1b: *Immediate radiographic control of the face and profile of the wrist.*

Figure 2a and 2b: *Malunions calluses after plaster treatment.*

The study by Hollevoet., et al. [18] comparing the percutaneous pinning and the palmar screw plate did not note report any advantage of the plating, neither in reduction nor in functional results.

The complications observed during our study were displacement under plaster and migration of the pins. Even during unstable posterior cortical fractures, Kirschner wires remain effective compared to conservative treatment [19]. In the study by Abhishek, et al. [15], out of 32 EDR fractures evaluated, 13 pin migrations out of 32 fractures were observed. This study notes that the migration of the pins is the main complication. Other complications include two cases of infection, two cases of non-union and one case of radial nerve damage. These complications must be avoided by mastering the technique. For Lakshamanan., et al. [20] out of 43 pinned skewered patients, 21% of wire spindle tip infection. This complication could be avoided by cutting the wire close to the skin and by close to the spindle and their local care. Guelmi., et al. [5] observed a frequency of 64% of secondary displacement, compression under plaster and sometimes compression of the median nerve. The study by Milliez, et al. [21] notes cases of rupture of the extensor tendons when early rehabilitation begins. It is advisable to keep an immobilization in a plastered palmar splint for 21 days before physiotherapy.

The consolidation time was 6 weeks on average in 67% of the cases. For Beumer., et al. [22], this average consolidation time is 4 weeks (range: 3 and 6 weeks). As for Rangjeet., et al. [23] this consolidation period is between 4 and 6 weeks after plastered immobilization of EDR fractures.

Our results were better in the pinned group compared to the plastered group at an average follow-up sufficient at 29 months. This delay is superimposable on that of Wijffels., et al. [24] which is 31 or less (range: 7 and 73 months). However, our extremes diverge. Our better results in pinned patients are similar to those of studies evaluating pinout according to Kapandji [10,12,25].

At follow-up, patient evaluation had shown that patient satisfaction predominated in the surgical group than in the conservative treatment group. Chin-En., et al. [26] in a prospective study of 54 patients with an EDR fracture observed 68.3% satisfactory functional results in the two groups. Our result suggests that systematic pinning provide better results.

Conclusion

Systematic intrafocal pinning of Pouteau-colles' fractures provide good clinical and functional results, avoiding malunion often observed after conservative treatment.

This risk of occurrence of malunion is approximately 5 times higher in the conservatively treated group. When indicated, any fracture of the distal radius should be routinely treated by pinning completed by a temporary palmar splint.

Conflict of Interest

The authors do not declare any conflict of interest.

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