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Perilunate Dislocations and Fracture-Dislocations: A Retrospective Study of 11 Cases

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Abstract **Original Research Article**

Perilunate dislocations (PD) and perilunate fracture-dislocations (PFD) of the carpus are rare but important entity in so far as it presents a high risk of after-effects and post-traumatic osteoarthritis. We report a retrospective, monocentric and multioperator series of 11 patients with a mean follow-up of 24 months over a -year period from 2016 to 2020. The objective of our study was to establish an epidemiological profile and to study the clinical, functional and radiological results of PD and PFD of the carpus while underlining the interest of early management. There were 3 pure PDs and 8 trans-scaphoid PFDs with 10 dorsally displaced forms and only one ventrally displaced form. Clinical and functional evaluation was based on mobilities, strength, pain, Cooney Score, Quick-DASH, and PRWE. Radiological abnormalities were analyzed with the Herzberg classification. All patients were treated surgically after closed reduction, with a dorsal approach in 3 cases, and a palmar approach in 8 patients. Early diagnosis and anatomical reduction provide a satisfactory functional result to avoid complications. This implies an emergency open surgical treatment, a close follow-up and a postoperative rehabilitation in the shortest possible time.

Keywords: Perilunate, Dislocations, Fractures, Wrist, Trauma.

INTRODUCTION

Perilunate dislocations of the carpus are defined by a total loss of contact of the surfaces of the capitolar, scapholunate and lunotriquetral interlines. This pathology is rare, often unrecognized, and represents about 5 to 10% [1] of carpal injuries and is the most frequent carpal dislocation. These dislocations, which usually occur in high-energy trauma of the wrist, hand in hyperextension and ulnar tilt, are often accompanied by severe ligamentous and osteo-cartilaginous lesions. Despite the extent of anatomical displacement, perilunate dislocations often go unnoticed (25% of cases) in the acute stage, and even after surgical treatment, 50-100% of patients will develop carpal instability, bone necrosis, or radiocarpal and/or mediocarpal osteoarthritis.

MATERIAL AND METHODS

Our work presents the results of a retrospective series of 11 cases of perilunate dislocations and fracture-dislocations of the carpus, treated surgically by reduction and open-focus osteosynthesis in our department over a period of 4 years from March 2016 to June 2020 in order to emphasize the interest of early treatment for better results.

The 11 patients were selected based on the following criteria: Age greater than 18 years; Hospitalization through emergency department (trauma delay of 0H to 48H); Recent closed or open dislocations and fractures.

The objective of this study is to establish an epidemiological profile and to specify the clinical, radiological, therapeutic and evolutionary characteristics of this traumatic pathology in the cases studied, in order to compare them with the data in the literature.

RESULTS

All cases are male. This predominance of men has been found in the majority of statistics previously compiled. The average age at the time of injury for our series was 37 years with extremes ranging from 20 to 76 years. The dominant hand of all the cases studied was the right hand and the injured side affected the

dominant hand in 5 cases, i.e. in 46% of the cases. In our series, 3 cases were chronic active smokers, and one 76-year-old case was parkinsonian, diabetic and hypertensive. Of the 11 cases in our series, 5 patients were manual workers (46%), 1 was a sport's instructor (9%), 3 were students (27%) and 2 were sedentary retirees (18%). This is usually violent trauma with high energy. In our series, we found as circumstances of accidents of the public road in 4 cases, a fall from a high place in 5 cases, and accident of sport in 2 cases and this is consistent with the statistics already made. In our series, the 11 cases were diagnosed in the acute phase with a consultation delay varying between 0h and 48h, these delays are distributed as follows: between 0-12h in 6 cases, between 12-24h in 1 case and between 24-48h in 4 cases. All the patients had an upper limb trauma attitude. They presented initially and to varying degrees the following functional signs: pain, edema, deformity, swelling and functional impotence. But pain and functional impotence were constant signs in all the cases of the series.

The local clinical examination found the following signs: the deformity of the hand in 5 patients is 45%. Localized edema in 8 cases is 72%.

Regarding mobility, flexion-extension, ulnar-radial tilt and pronosupination were very painful and limited or impossible. In search of lesions associated in our series, none of the cases in the series presented a skin opening and we did not notice any vascular or nerve lesions in all our patients. On the other hand, a fracture of the left clavicle was present in one case, a fracture of the ulnar styloid was present in 2 cases.

All cases in the series underwent a standard radiological workup including a radiograph of the wrist in strict frontal and lateral views. A CT scan of the wrist was performed in addition in all cases in the series. According to the classification of Herzberg [1] we found in our series: 10 dorsal dislocations, 9 of which were stage I and 1 stage II, and 1 stage I volar dislocation.

The only therapeutic modalities recommended was the surgical treatment with possible rehabilitation after. The delay of management was 24h in 7 of our patients, one case was operated on the third day, one on the 5th day, one on the 6th day and the last one on the 7th day of their admission.

All patients underwent emergency reduction on admission under sedation, with success in 4 cases (36%) and failure in the rest. Reduction by external maneuver according to COONEY and BOEHLER consists of progressive traction in the axis of the limb followed by hyperextension reproducing the trauma, then flexion with traction and rotation in order to reintegrate the capitate under the lunate. In terms of surgical procedure, general anesthesia was used in 7 patients in our series, i.e., 64%, while locoregional anesthesia by plexus block was used in 4 patients, i.e., 36%. The palmar approach was used in 8 cases (in perilunate dislocation fractures), and dorsal in 3 cases (pure dislocations).

The osteosynthesis techniques were varied:

- Scaphoid screw fixation (Herbert screw): 1 case
- Scaphoid pinning: 7 cases
- Scapholunate pinning: 11 cases
- Triquetro-lunar pinning: 11 cases
- Capitate-lunar embrochage: 1 case

All patients in the series received immobilization with a brachioanthesis-brachio-palmar cast for an average of 54 days (approximately 7 weeks).

The average time for removal of osteosynthesis material was 6 weeks for arthrodesis pins and 12 weeks for scaphoid pins in dislocation fractures.

Rehabilitation was started in all patients in our series directly after removal of the osteosynthesis material in order to recover wrist amplitudes and strengths, by selectively mobilizing the radiocarpal and midcarpal joints as well as the lateral carpus in relation to the medial carpus. The mobilization is essentially done in decoaptation movements in order to avoid intra-carpal compression.

All our patients have benefited from clinical monitoring and radiological checks periodicals in consultation. The average follow-up in our series was 24 months, with extremes of 9 to 48 months. The two main minor complications were an infection on pins in 1 case and a pin migration in 1 patient. The major complications were algodystrophy in 2 cases, residual pain in 2 cases and stiffness in one case.

Fig-1: Anteroposterior view of the right wrist showing a perilunate dislocation

Fig-2: Lateral view of the right wrist showing a dorsal perilunate dislocation

Fig-3: CT-Scan lateral view of the right wrist showing a perilunate fracture-dislocation

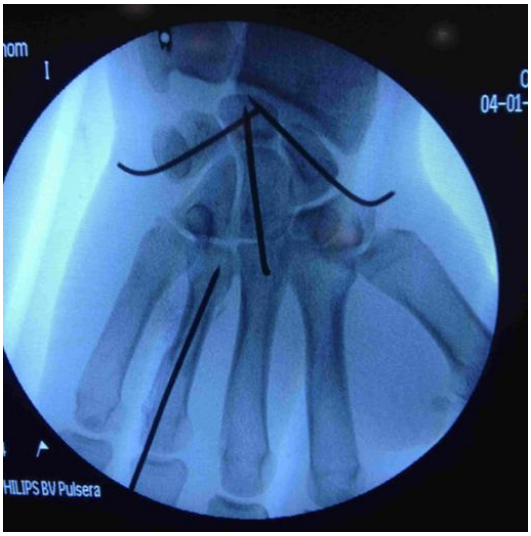

Fig-4: Post-operative lateral view of the reduction and osteosynthesis with pins

Fig-5: Post-operative anteroposterior view of the reduction and osteosynthesis with pins

DISCUSSION

Perilunate dislocations and fracture-dislocations are the most common carpal dislocations, accounting for approximately 5% of wrist injuries [6]. These dislocations can be posterior (most frequent) or anterior. In 60% of cases, they are fracture-dislocations whose line of rupture passes through a carpal bone close to the lunate or the radial styloid, and not pure perilunate dislocation [1, 2, 3, 4]. The authors [5] classify these lesions according to five criteria: the situation of the large bone in relation to the lunate, the level at which the scaphoid lock is lifted, the position of the lunate in relation to the radius, possible variants, and finally the associated ante-brachial and/or metacarpal lesions [5].

Several classifications have been described in the literature: Johnson [6], Taleisnik [7], prognostic Witvoet and Allieu [8] and radiological Herzberg [5].

The average age in our series was around 37 years, which is in good agreement with the data in the literature, which associates this trauma with young adults [1, 2, 3, 4]. The predominance in young adults can be explained by: The circumstances of the trauma (traffic accident, falls from a high place, work accident and sports accidents) and the strength of the lower end of the radius at this age.

Regarding gender, in our series, all patients were male, which is totally consistent with the literature [1, 2, 3, 4]. Indeed, perilunate dislocation and fracture-dislocation of the carpus is a pathology of young men, and this can be explained by the exposure of active men to high energy trauma more than women [1, 10, 2, 3, 4].

The most frequent causes of perilunate dislocations and fractures of the carpus are dominated in our context by public road accidents and falls from

high places when working with the hand in hyperextension. The results of our series also point in the same direction.

Although the right side is instinctively projected forward during falls [10], it does not always represent the predominant injured side. In our series, as in several studies [1, 10, 2, 3, 4], it was found that both sides can be affected more or less equally regardless of the dominant side.

The diagnosis of wrist injuries can be suspected from the mechanism and the clinic and confirmed by imaging. However, the images are often difficult to interpret. This explains the frequency of initially unrecognized lesions [10]. It is imperative to carefully assess the vascular and nerve status, paying particular attention to the median and ulnar nerves, which may be injured by direct contusion at the time of impact, by compression due to bony displacement, or by swelling of the carpal tunnel [10].

The aim of treatment is to achieve the best possible reduction of the anatomical bone and ligament structures with stable fixation and to avoid complications such as secondary instability, pseudoarthrosis and carpal osteoarthritis [10]. Several authors have agreed that early management provides better functional results [3, 9, 11, 12, 13, 14].

Rehabilitation after wrist dislocation should be systematic in order to recover maximum wrist range of motion and strength. In cases treated correctly and without delay, the evolution is towards a recovery of normal carpal dynamics with bones in good position both statically and dynamically, with good healing of the ligaments as well as good consolidation of any associated fractures.

Immediate complications specific to carpal dislocation are in fact rare. The major complications are essentially the following: Pseudarthrosis of the scaphoid, which, according to the publications of Green [15, 16], Cooney [9] and Witvoët [8], was very frequent in fracture dislocations treated orthopedically only, much or even absent with surgical treatment, this frequency has clearly decreased but has not disappeared anyway. Post-traumatic arthrosis of the wrist after an unconsolidated scaphoid fracture will evolve in several stages: this is SNAC (scaphoid non-union acute collapse), which requires specific treatment [15, 16]; Aseptic necrosis of the proximal pole of the scaphoid and necrosis of the lunate lead to significant functional discomfort and handicap of the hand [17]. The clinical picture is not very specific, hence the undisputed interest of imaging which will allow an early diagnosis and an adequate follow-up [18]; Scapholunate instability is the most frequent carpal instability [19, 20]. The term "scapholunate advanced collapse" (SLAC) was proposed by Watson and associates [21, 22] to define the degenerative changes secondary to scapholunate instability and which can be classified according to Lluch [23] into five stages of increasing severity. And finally, carpal osteoarthritis, the rate of which is more important in studies with a follow-up of more than 3 years.

CONCLUSION

Perilunate dislocation of the carpus remains a rare and complex pathology because of its mechanism, which has not yet been fully elucidated, and the injuries it induces. It occurs in a context of very high energy trauma explaining the intracarpal ligamentary and osteochondral lesions, and mainly affects men. The initial radiographs are not obvious at first reading and require a diagnostic approach to become, that is why an awareness of the emergency physicians, radiologists and traumatologists is necessary.

A rapid and adequate therapeutic strategy (reduction, stabilization by pins and immobilization) has 2 main goals: to restore function (mobility, pain) and to prevent the appearance of post-traumatic arthrosis. The main concern is the spontaneous and inevitable evolution towards osteoarthritis (SLAC wrist, SNAC wrist), because even after a well conducted treatment, stiffness, explained by an almost inevitable osteoarthritis, is the main complication.

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