

Monteggia Fractures: Assessment of the Results of a Series of 17 Cases

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Abstract

Original Research Article

The Monteggia fracture is characterized by a combination of cubital fracture and radial head dislocation. In this retrospective study, we analyzed 17 cases of Monteggia fracture-dislocation, which were collected between 2006 and 2011 in the Traumatology-Orthopedics department of Ibn Sina Hospital. Patients ranged in age from 16 to 56 years, and radial head dislocation was anterior in 11 cases, posterior in 3 cases, and lateral in 3 cases. According to the Bado classification, the anatomopathological aspect was type I in 10 cases, type II in 3 cases, type III in 3 cases, and type IV in one case. All patients were surgically treated by osteosynthesis, with different types of cubital fracture fixation. Functional results were evaluated using DASH and Broberg-Morrey scores, which showed 36% very good results, 45% good results, 9.5% average results, and 9.5% poor results. In conclusion, it is important to diagnose and treat Monteggia fractures early, which require a quality radiograph to detect radial head dislocation. Functional results are satisfactory if appropriate treatment is applied.

Keywords: Ulnar fracture, dislocation of radial head, Monteggia, elbow, forearm.

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INTRODUCTION

The Monteggia fracture-dislocation was historically described by Giovanni Battista Monteggia in 1814. Today, the concept has evolved and is called the Monteggia lesion, which is defined as a fracture-dislocation affecting the ulna with a fracture at one or more levels, as well as a dislocation of the radial head at the level of the radius, often accompanied by a fracture at any level. This condition is relatively rare, representing only 5% of forearm injuries [1]. It is caused by direct or indirect trauma. Diagnosis can be difficult in a third of cases where the dislocation of the radial head is not recognized, leading to serious sequelae for the function of the elbow, forearm, and wrist. Treatment should be performed urgently by reducing the ulnar fracture and radial head dislocation, followed by immobilization to prevent complications that could have a negative impact on the prognosis.

Our goal is to:

- Highlight the clinical and radiological characteristics of this condition,
- Emphasize the importance of early diagnosis to prevent chronic injuries that can be difficult to treat,

- Evaluate the clinical, radiological, and functional management of this pathology in our institution, the traumatology-orthopedic department at CHU Ibn Sina in Rabat.

MATERIALS AND METHODS

• Patients

In our study, we analyzed 17 cases of Monteggia fracture treated at the Traumatology and Orthopedics department of Ibn Sina University Hospital in Rabat over a period of 6 years (from January 2006 to December 2011). Patients who left the hospital against medical advice were excluded from our study.

• Methods

We conducted a retrospective analysis of patients' medical records from the archives of the Traumatology Orthopedics department and the operating room registry. Incomplete or unusable records were excluded from the study. Data were collected using a pre-established data collection form that included epidemiological, clinical, radiological, and therapeutic information. Patients were invited to attend a follow-up consultation as part of the study to evaluate their functional outcomes using the Dash and BROBERG ET MORREY scores.

RESULTS

I- Epidemiological Study:

We conducted an epidemiological study based on the analysis of 17 cases of Monteggia fracture in adults admitted to the Traumatology-Orthopedics department of CHU Ibn-Sina in Rabat between 2006 and 2011. Regarding age distribution, we found that the mean age of the patients was 37 years, ranging from 19 to 55 years. As for gender distribution, we observed a clear male predominance with 13 men (76%) and 4 women (24%), in line with accepted statistics. Concerning the circumstances of the injuries, most patients (94%) consulted on the same day of trauma, while one patient (3%) consulted after 27 days, already being treated for a neglected radial dislocation. The direct mechanism was found in 11 patients (65%), while the indirect mechanism was noted in the remaining 35%, including 15% in extension and 85% in hyperflexion. Finally, among the 17 patients, none had resorted to a bonesetter for manipulation.

II- Clinical Study:

The first point to consider in our clinical study concerns the time to consultation for patients with Monteggia fractures. We found that all patients, except for one, were seen in consultation on the same day as the trauma. The patient who was seen on the 27th day was already being treated for a neglected radial dislocation. With regard to the affected side, we observed that 52% of patients were affected on the right side and 48% on the left side, with no patients admitted for trauma to both forearms. In terms of clinical data, we noted that pain and functional impairment were constant symptoms in all patients. The most common physical signs were an attitude of the injured upper limb, notches, and deformities of the elbow. No nerve or vascular complications were noted in our series. However, 30% of fractures were open, with skin openings of type I, II, or III according to the Cauchoix and Duparc classification. Regarding associated injuries, 47% of patients were admitted for isolated elbow trauma, while 35% were admitted for polytrauma. Three patients had associated fractures at the level of the humerus, femur, and radial head.

III- Radiological Study:

The first step to consider in the clinical analysis of Monteggia fracture was the use of standard radiography. In all cases, radiographs of the elbow, forearm, wrist, and shoulder, both frontal and lateral views of the affected limb, were used to diagnose the fracture. This technique allowed to determine the level of ulnar fracture and the direction of radial head dislocation to classify these fractures. As for the location of the ulnar fracture, 8 patients had a fracture at the upper third (47%), 6 at the middle third (35%), 2 were metaphyseal-epiphyseal (11%), and one was a fracture at the olecranon (7%). Regarding the types of fracture, 6 were transverse (35%), 2 were short oblique (13%) and 9 had a third fragment (52%). Only 3 out of

17 fractures were non-displaced (17%). It was noted that 11 patients had an anterior dislocation (64%), 3 had a posterior dislocation (18%) and 3 had a lateral dislocation (18%). Finally, CT scans of the elbow were not requested nor performed for any of the patients in the study.

IV- Treatment:

In this study, the average length of hospital stay was 4.33 days, with 30% of patients staying in the hospital for 1 to 3 days, 58% for 4 to 7 days, and 12% for more than 7 days. All patients received a prescription for painkillers before and after surgery, as well as antibiotic therapy in case of skin opening or closed fracture. None of the patients underwent orthopedic treatment. All patients underwent surgery under either general or local anesthesia, with systematic antibiotic prophylaxis. The posterior or posterolateral approach was used for the patients, depending on the case. All patients underwent osteosynthesis, either by special radius plate screws or by half-tube plate screws, or by centromedullary nailing or olecranon tension band wiring. Resection of the radial head was performed in only one patient. After surgery, all patients received immobilization with a brachio-ante-brachio-palmar plaster for one month.

V- Functional Results:

The functional results of a study conducted on 17 adult patients who suffered from Monteggia fracture over a period of 6 years were evaluated. Out of the 11 patients available for follow-up after a mean duration of 3 years (ranging from 1 to 5 years), 7 had no pain, 2 had mild pain, 2 had moderate pain according to the EVA scale, and none had intense pain. Regarding muscle strength, 9 patients retained their muscle strength in flexion, while one had reduced strength and another had very weak strength compared to the healthy side. Muscle strength in extension was retained in 8 patients, reduced in 2 patients, and very weak in one patient compared to the healthy side. Functional results were evaluated according to DASH criteria and the BROBERG and MORREY functional score. According to the BROBERG and MORREY score, 4 patients had an excellent outcome, 5 had a good outcome, 1 had a moderate outcome, and 1 had a poor outcome. The average global score according to the Broberg and Morrey scale was 85 points (ranging from 54 to 99 points). According to the Disability of Arm, Shoulder, and Hand (DASH) score, the average score was 15.8 (ranging from 5.5 to 51). The results were considered good after rehabilitation with a better functional prognosis.

DISCUSSION

The retrospective study of 17 cases of Monteggia fractures-dislocations seen at the Ibn Sina Hospital in Rabat between 2006 and 2011 allowed us to highlight certain data. Firstly, publications on series of Monteggia lesions in adults are indeed rare. In our

series, the Monteggia fracture-dislocation remains rare and represents only 4% of all forearm traumas. The statistics show a low frequency of Monteggia fracture-dislocation because a large number of cases remain unrecognized. Secondly, in most series, the diagnosis

and management of Monteggia fractures are usually done in adults, with a maximum frequency between 18 and 70 years of age.

This is consistent with the data from our series: [2-10]

Authors	Duration of Study (years)	Number of cases	Mean Age (years)	Age Range
RING	10	48	42	22-70
STRAUSS	7	23	51	20.5-85
PEREZ	6	54	41	18-81
EGLESEDR	11	121	39	15-85
KAZAKOS	5	14	36	19-64
KONRAD	11	63	42.1	21-72
JANBAKLY	6	16	38	18-58
GOURRAM	7	16	36	12-84
BEL LEFKI	7	19	29	16-56
OUR SERIES	5	17	37	19-55

Most authors have noted a predominance of male involvement in Monteggia fractures. This may be due to the etiologies of these fractures, which are often caused by violent accidents that occur during work or traffic. These factors may disproportionately affect men [2-10].

Monteggia fracture-dislocation can be caused by direct, indirect, or complex trauma. Our patient series showed that direct mechanism was present in 11 patients, accounting for 65% of cases, while the remaining patients (35%) had an indirect mechanism, with 15% in extension and 85% in hyperflexion. Direct trauma can affect the forearm at three different levels, causing either a fracture by extension with anterior dislocation of the radial head, or a fracture by flexion with posterior dislocation of the radial head, or a fracture of the upper end of the ulna. Indirect traumas, such as a fall on the hand in pronation [11], can cause a fracture of the ulna followed by dislocation of the radial head. Another indirect mechanism involves forced extension of the elbow, which causes dislocation of the radial head under the effect of a violent contraction of the biceps. In this case, the ulna can fracture with anterior angulation due to axial pressure, traction of the interosseous membrane, and simultaneous contraction of the anterior brachial muscle [12]. Radiological examination is crucial for the diagnosis of Monteggia fracture-dislocation. In all cases of forearm trauma, it is essential to take radiographs of the joints above and below from the front and side. Radiographs determine the level, nature, and displacement of the ulnar fracture, as well as the type and extent of radial head dislocation.

In addition to its diagnostic value, radiological examination helps determine the reducibility and stability of the Monteggia lesion, based on the nature and location of the fracture line on the ulna. In adults, the diagnosis of radial head dislocation is easier than in children. Even with perfect radiographs, subluxation is challenging to recognize in children, especially in younger ones whose radial head and condyle are incompletely ossified. In adults, the clinical deformity is sufficient to suspect the diagnosis, and the lateral radiograph perfectly shows the position of the head in front and above the coronoid. It also helps identify, in some cases, an associated fracture of the radial head or the external edge of the head.

In 1962, BADO [14] introduced the term "Monteggia lesion" to describe a combination of ulna fracture and radial head dislocation, as the concept of "Monteggia fracture" was considered too restrictive. This classification into four types is based on the direction of radial head displacement, but some anatomical forms are not included in this classification and are grouped under the term "Monteggia equivalent". This classification is widely used by Anglo-Saxon authors as it has both anatomical and therapeutic value (figure 1-4).

The treatment of MONTEGGIA fracture has a dual principle, aiming at both bone repair of the ulna and, most importantly, the reduction of the radial head. These two injuries are interdependent as they occur simultaneously during the trauma, with one making the other possible. They are managed together during

treatment, as correct alignment of the cubital structures and restoration of the ulna length are necessary to stabilize the reduction of the radial head. The achievement of a near-perfect reduction of a reduced and stable radial head is crucial for obtaining optimal functional results. Surgical methods are considered the first-line treatment for Monteggia fractures in adults and are systematically employed. This approach is supported by the findings of some authors [2, 4, 6-8, 10].

Osteosynthesis is a surgical technique that involves fixing fractured bone fragments using various types of implants. Osteosynthesis methods include the use of plates, centromedullary nailing, external fixators, nails, and struts. Several authors have studied these different techniques by collecting data on the number of cases treated.

The results of these studies show that some methods are more frequently used than others. For example, centromedullary nailing was used in over half of the cases studied by Konrad (63 out of 31) [7]. In contrast, the strut method was less frequently used, as evidenced by Janbakly's case series, where this technique was used in only three out of 25 cases treated [8].

The results of these studies also showed that outcomes can vary depending on the method used. For example, Perez reported a series of 44 cases treated with plates [4], and 13 of them developed postoperative complications, while Gourram [9] used the same technique in 16 cases without any complications.

In this series, plate fixation was used in most cases, followed by centromedullary nailing and struts. In one case, an external fixator was used alone, while in three other cases, a combination of pins and external fixator was used.

Rehabilitation is an essential step in the treatment of injuries and should be initiated as soon as possible, typically after plaster removal. It is essential for optimal functional recovery and to prevent the occurrence of sequelae such as muscle atrophy, joint stiffness, or radio-cubital synostosis. The timeliness of rehabilitation is a key element for treatment success, and the treating surgeon will be there to guide physiotherapy and explain to the patient the importance of active participation. It is worth noting that two of our patients were able to self-rehabilitate under the guidance of their treating physician.

The aim of this retrospective study was to determine the long-term functional outcomes and prognostic factors of adult patients with Monteggia fractures, in correlation with Bado classifications. Of the 17 patients included in the study, 11 were followed for a period ranging from 1 to 5 years after surgical

treatment. Functional outcomes were evaluated using the Broberg and Morrey scores and the DASH score. Results showed a mean flexion of 131 degrees, a mean loss of extension of -14 degrees, a mean pronation of 67 degrees, and a mean supination of 73.7 degrees. The mean DASH score was 15.8 and the mean Broberg and Morrey score was 85 points, with 36% of patients having an excellent outcome, 45% having a good outcome, 9.5% having a fair outcome, and 9.5% having a poor outcome. Post-operative mobility gains varied among patients.

The results of this study showed a significant correlation between the Broberg and Morrey scores and the Dash score, with a Pearson correlation coefficient of -0.75 ($p=0.0125$). The results also supported the hypothesis that the direction of radial head dislocation (Bado classification) could influence the outcome. Factors such as pseudarthrosis, neglected dislocation, Bado type III fracture, and postoperative complications were associated with a poor clinical outcome and may play a role as negative prognostic factors. Of the 17 patients included in the study, 2 had a poor outcome, one due to a wall infection and the other due to a late cubitus pseudarthrosis (Monteggia fracture type Bado III with neglected dislocation). An earlier study by Konrad also showed a significant correlation between the scores, with a Pearson correlation coefficient of -0.84 ($p=0.01$). This study also concluded that factors such as radial head fracture, coronoid fracture, and postoperative complications were associated with a poor clinical outcome. No correlation was found between functional outcomes and patient sex or age, or the cubitus osteosynthesis method.

The results of this study were analyzed according to the initial injuries. It was observed that Monteggia fracture-dislocations had satisfactory results in 80% of cases, including very good and good results, while type I fractures had satisfactory results in 70% of cases, including very good and good results. On the other hand, type II fractures had excellent and good results in 100% of cases. The only case resulting in an unsatisfactory outcome was a neglected Bado type III fracture. Therefore, it is possible to conclude that Monteggia fracture-dislocations have a good prognosis provided that the diagnosis is early. In KONRAD's [7] study, one patient obtained a fair result due to prolonged immobilization resulting in limited range of motion. Additionally, patients with a posterior Monteggia lesion (Bado type II) showed significantly poorer functional results, according to this study. In RING's study [2], all patients with unsatisfactory results had poor prognostic factors, including a radial head fracture, a coronoid process fracture, a proximal radio-ulnar synostosis, or an ulnar malunion.

According to our study, the use of different methods of osteosynthesis resulted in satisfactory outcomes in 87.5% of the cases treated with plate and

screw fixation, a good outcome in the case treated with tension band wiring, and a poor outcome in the case treated with centromedullary nailing. These results lead us to conclude that plate and screw fixation is a simple, cost-effective, and sufficient technique for achieving consolidation within the usual timeframes without

major complications. As such, this technique deserves to be included among the currently employed means of osteosynthesis.

Iconography:



Figure 1: BADO classification type I (anterior)



Figure 2: BADO classification type II (posterior)



Figure 3: BADO classification type III (lateral)



Figure 4: BADO classification type IV



Figure 5: Monteggia fracture with the fracture site located at the midshaft of the ulna

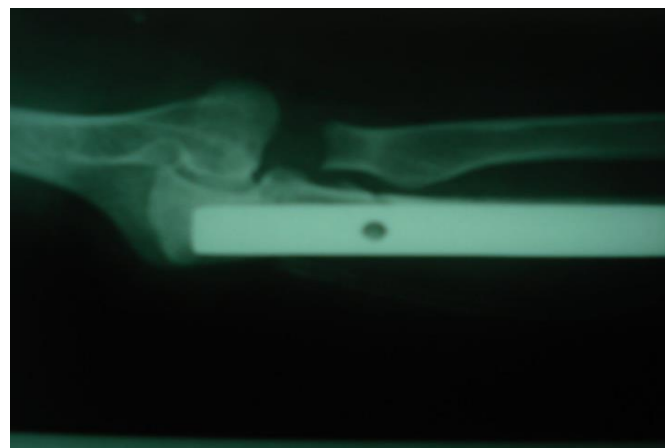


Figure 6: Osteosynthesis of the right ulna with a plate and screws + resection of the radial head

CONCLUSION

The Monteggia fracture-dislocation more commonly affects men than women and is often observed on the left side. Diagnosis is easy if one considers it in cases of forearm trauma and performs a

systematic radiography of the elbow and wrist. However, ignorance of this fracture can lead to complications that are difficult to treat. Once diagnosed, the Monteggia fracture-dislocation is classified according to the direction of displacement of the radial head using Bado's classification. In recent fractures,

reduction of the ulna fracture is essential and often sufficient, but the test of this reduction should be performed on the head of the radius. In adults, surgical treatment of the ulna fracture using osteosynthesis with a plate and screws remains the gold standard. Rehabilitation is an important part of therapy for a good recovery. Results are evaluated using scores such as the DASH score and the BROBERG and MORREY score and classified as very good, good, fair, or poor. The results obtained in recent injuries encourage continuing this therapeutic approach, which includes urgency, anatomical reduction, osteosynthesis with a plate and screws, and early rehabilitation. However, it is important not to neglect the Monteggia fracture, emphasizing the importance of early diagnosis. As JUDET rightly points out, the only complication is ignorance because if the Monteggia fracture is not ignored and osteosynthesis is performed, there will be no complications.

Ethics Approval and Consent to Participate

Ethical approval was not sought. Written consent was obtained from the patients.

Availability of Data and Materials

The data used and analysed during the study are available from the corresponding author.

DECLARATION OF CONFLICTING INTEREST

The authors declare that there is no conflict of interest.

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Authors Contributions

All authors have read and approved the final manuscript.

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