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Study of Monteggia fracture and dislocation and its treatment with plating

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Abstract

Aim: The aim of this study was to assess the effectiveness of surgical treatment by open reduction and internal fixation of Monteggia fracture dislocation and evaluate the union of fracture, complications encountered during treatment and assess the functional outcome of the results.

Methods: The present study consists of 20 cases of Monteggia fracture dislocation in adults treated by 3.5mm Dynamic compression plate/Locking Compression plates/Buttress plates and screws in the Department of Orthopaedics, SSG Hospital, Govt. Medical College, Baroda over the period of 1 year (2019-2020). There were fifteen male patients and five female patients who underwent surgery.

Results: In our study patients are of age group between 19-59 years. Majority of our patients belonged to 21-40 age group. The ratio between Male to Female is 3:1. In our study labourers (manual & farm) were 13 (65%). Most of patients had sustained fracture with fall. 16 (80%) patients had Monteggia fracture with anterior radial head dislocation (Type 1). 1(5%) patient had Monteggia fracture with posterior radial head dislocation (Type 2). 1(5%) patient had Monteggia fracture with lateral radial head dislocation (Type 3). 2(10%) patients had Monteggia fracture with upper third radius fracture (Type 4). Both infections were superficial and healed eventually. 1(5%) patient went under non-union. Majority of patients are having excellent results 10 (50%). 9 patients had good result (45%). 1 patient had poor result (5%).

Conclusion: The treatment plan in Monteggia Fracture dislocation depends on fracture pattern, soft tissue injury, patient co-morbidity, fixation resources. Fracture pattern, condition of soft tissue are important factors to be considered before selection of fixation method. The present case series showed that open reduction and internal fixation with DCP/Locking Plate is an effective treatment method in terms of better fixation with better outcome in terms of union time and complications rate.

Keywords: Monteggia fracture, radial head dislocation, ulna fracture

Introduction

Monteggia fracture is a combination of fracture of proximal ulnar shaft associated with radial head dislocation (proximal radioulnar joint subluxation or dislocation). Such an injury is not common among children but may be challenging and lead to serious complications if not treated in acute stage. The original Bado's classification of this injury depends upon the direction of radial head dislocation and ulnar fracture apex. Over time, variant types have been described and subclassified^[1]. Monteggia fractures are more commonly seen in adults but they are well described in children. These injuries are relatively uncommon, accounting to less than 5% of all forearm fractures^[2]. It is inherently unstable due to variety of factors which are poorly understood by many surgeons. Mistakes in their management account for high incidence of poor results. Until 1940, the overall results of treatment were abysmal. In a series of 34 Monteggia lesions treated by many surgeons, there were only two good results, and 32 out of 34 had serious permanent disabilities^[3].

A fracture of the shaft of the ulna associated with an anterior dislocation of the radial head was described by an Italian surgeon, Giovanni Battista Monteggia, in 1814^[3]. This injury pattern was eponymously named as the Monteggia fracture-dislocation by Perrin in 1909^[4]. In 1958, Jose Luis Bado, a professor of orthopedic surgery from Uruguay, elaborated on the pathomechanics and management of this fracture-dislocation in a monograph that was first published in Spanish then later in English^[5, 6]. He introduced the concept of a Monteggia lesion and Monteggia equivalent injuries.

Bado included a group of injuries having in common a dislocation of the radial head associated with fractures at various levels of the ulna or with injuries at the wrist.

The key feature in the management of Monteggia fractures is to ensure the stability of the reduced radial head. A radial head dislocation that goes undiagnosed for longer than 4 weeks is considered neglected [7-9]. Treatment of a neglected radial head dislocation in children remains a challenge for pediatric orthopedic surgeons. The primary issue with neglected radial head dislocation or subluxation is that it can lead to chronic elbow disability, progressive deformity, and loss of motion, particularly supination and pronation. This leads to a high probability of the requirement of an invasive operation and elbow dysfunction.

The aim of this study was to assess the effectiveness of surgical treatment by open reduction and internal fixation of Monteggia fracture dislocation and evaluate the union of fracture, complications encountered during treatment and assess the functional outcome of the results.

Materials and Methods

The present study consists of 20 cases of Monteggia fracture dislocation in adults treated by 3.5mm Dynamic compression plate/Locking Compression plates/Buttress plates and screws in the Department of Orthopedics, SSG Hospital, Govt. Medical College, Baroda over the period of 1 year (2019-2020). There were fifteen male patients and five female patients who underwent surgery.

Of the twenty cases, six patients met with road traffic accidents, eight patients had fallen from a height on to the ground, five patients sustained injury while guarding against assault with a stick and one patient had an animal bite.

Immediate management

As soon as the patient was admitted to hospital, thorough clinical examination was done regarding general condition of the patient, any associated systemic disease and any associated injuries were recorded. All patients presented with elbow in about 30 degrees of flexion supported by the other hand. All of the cases were simple fracture-dislocations. Clinically tenderness, bony irregularity, crepitus and deformity of ulna were elicited. In sixteen patients, radial head was palpable anteriorly which was confirmed by rotatory movements. One of the patients who presented late to the hospital had minimal pain and restriction of movement. In two patients radial head was palpated posterolaterally and in two patients who had signs of fracture of proximal ulna and proximal radius, the head was palpated anteriorly.

Radiographic examination

Standard x-rays in anteroposterior and lateral views were taken for confirmation of diagnosis and also to know the type of fracture. Out of twenty patients, sixteen patients had fracture of ulnar diaphysis at upper third with anterior angulation at the fracture site and an associated anterior dislocation of the radial head. This was type 1 fracture dislocation, according to Bado's classification. Out of sixteen cases, two cases were comminuted fractures, six transverse and eight cases were short oblique. One had fracture of ulnar diaphysis with posterior angulation at the fracture site and posterolateral dislocation of radial head, which were type 3 fractures which was of transverse type. Two patients had fracture of the proximal third of radius and ulna at the same level with anterior dislocation of radial head, which was type-4 fracture-dislocation. In this case the fracture type of ulna

was short oblique. One had type-2 fracture-dislocation. The affected limb was kept elevated. Pain and inflammation were managed by using oral analgesics like Diclofenac sodium 50mg with serratiopeptidase twice daily or Brufen 400mg twice daily.

Routine examination of urine was done for presence of albumin and sugar. Examination of blood was done for Hemoglobin percentage, Total and differential WBC counts, Fasting blood sugar, Blood urea, serum creatinine, Bleeding and Clotting time. HIV, HBSag and ECG were done. Physician fitness was obtained in all cases. Patients were then prepared for surgery after pre- anaesthetic checkup.

Evaluation of results

The results of all treated Monteggia fracture dislocations were evaluated in our study using "Mayo Elbow Performance Scoring System".

All of the cases were fresh fractures, wherein closed reduction of the radial head was done and ulna fixed with plating. In none of the cases annular ligament reconstruction was done and there was no case of radial head redislocation.

Results

Table 1: Demographic data

Age in years	Patients	Percentage (%)
10 to 20	1	5
21 to 40	10	50
41 to 60	9	45
61 to 70	0	0
Gender		
Male	15	75
Female	5	25
Occupation		
Manual Labourer	8	40%
Farmer	5	25%
Housewife	3	15%
Student	2	10%
Shop keeper	2	10%
Mode of Injury		
Fall	8	40
RTA	6	30
Assault	5	25
Animal bite	1	5
Type of fracture		
Closed	8	40
Open Grade I	7	35
Open Grade II	5	25
Open Grade III	0	0
Total	20	100
Bado's classification		
I	16	80
II	1	5
III	1	5
IV	2	10

In our study patients are of age group between 19-59 years. Majority of our patients belonged to 21-40 age group. The ratio between Male to Female is 3:1. There was male dominance. The lower incidence of fracture in females is attributed to their lesser involvement in outdoor activities. Labourers (Manual & Farm) sustained maximum injury. In our study labourers (manual & farm) are 13 (65%). Majority of patients 8 (40%) are laborers. Most of patients had sustained fracture with fall. In our study it comprised 8 patients (40%). 8 (40%) cases are of close injury. In our study

there were 7 cases of open grade- 1 injuries (35%). In our study there are 5 cases of open grade 2 injuries (25%). 16 (80%) patients had Monteggia fracture with anterior radial head dislocation (Type 1). 1(5%) patient had Monteggia fracture with posterior radial head dislocation (Type 2). 1(5%) patient had Monteggia fracture with lateral radial head dislocation (Type 3). 2(10%) patients had Monteggia fracture with upper third radius fracture (Type 4).

Table 2: Other details

Type of Plate	Patients	Percentage (%)
LOCKING PLATE	17	85
DCP	3	15
Hospital stay Time (weeks)		
<2	17	85
2to 3	3	15
Time taken for union Duration (weeks)		
10 – 12	7	35
13-16	12	60
(Non-union)	1	5
Complications		
Non union	1	5
Mal union	0	0
Implant failure	0	0
Infection	2	10
Results		
Excellent	10	50
Good	9	45
Fair	0	0
Poor	1	5
Total	20	100

Depending on patient's bone characteristics and fracture pattern & Implant availability in hospital decision was made to use Locking plate or DCP. Most of the patients 17(85%) were discharged in less than 2 weeks. 3(15%) patients remained hospitalized for >2 weeks. 7 (35%) fracture united between 10-12 weeks. 12(60%) fracture united between 13-16 week. Average time for union is 13.4 weeks. 2 (10%) patients got infection. Both infections were superficial and healed eventually. 1(5%) patient went under non-union. Majority of patients are having excellent results 10 (50%). 9 patients had good result (45%). 1 patient had poor result (5%).

Discussion

A fracture of the proximal ulna associated with an anterior dislocation of the radial head 1 was first described by an Italian surgeon, Giovanni Battista Monteggia ^[10]. This injury pattern was eponymously named as the Monteggia fracture-dislocation (MFD) by Perrin ^[11]. The Monteggia lesion is a typical example of a double bone injury, characterized by a radial dislocation and a fracture of the ulna. 'Monteggia lesion' is a group of traumatic lesions having in common dislocation of the radio-humero-ulnar joint, associated with a fracture of ulna at various levels or with lesions at the wrist. This concept is different from that described by Monteggia ^[10], which represents only one type. Bado preferred the term 'monteggia lesion' and classified these injuries into 2 categories: 'Monteggia lesion' and 'Monteggia equivalents' based on the mechanism of the injury and the direction of the dislocation ^[6].

In our study patients are of age group between 19-59 years. Majority of our patients belonged to 21-40 age group. The ratio between Male to Female is 3:1. There was male dominance. The lower incidence of fracture in females is attributed to their lesser involvement in outdoor activities.

The percentage of male predominance is slightly higher than the earlier observed results of Ring *et al.* ^[1] In this study the incidence of injury of Type I was in 77.77% cases and 22.23% cases were of Type II and no cases of type III and Type IV fracture dislocation. Our findings are similar to the observations made by Henry *et al.* ^[13] 16 (80%) patients had Monteggia fracture with anterior radial head dislocation (Type 1). 1(5%) patient had Monteggia fracture with posterior radial head dislocation (Type 2). 1(5%) patient had Monteggia fracture with lateral radial head dislocation (Type 3). 2(10%) patients had Monteggia fracture with upper third radius fracture (Type 4). Based on Bado's classification, study conducted by Henry *et al.* ^[13] showed 79% cases of Type I, 12% Type II, 6% Type III, and 3% cases of Type IV. Earlier studies reported 70% cases of Type I, 18% Type II, 12% of Type IV and no case belonging to Type III.5 Most of patients had sustained fracture with fall. In our study it comprised 8 patients (40%). 8 (40%) cases are of close injury. In our study there were 7 cases of open grade- 1 injuries (35%). In our study there are 5 cases of open grade 2 injuries (25%). Evans ^[14] and Speed and Boyd ^[15] suggested that the injury is due to direct trauma while Naylor ^[16] attributed it to be due to direct trauma. They supported their statement by the fact that in majority of the cases comminuted fracture of ulna and the local signs of injury in the shape of bruises and contusions occur.

Depending on patient's bone characteristics and fracture pattern & Implant availability in hospital decision was made to use Locking plate or DCP. Most of the patients 17(85%) were discharged in less than 2 weeks. 3(15%) patients remained hospitalized for >2 weeks. 7 (35%) fracture united between 10-12 weeks. 12(60%) fracture united between 13-16 week. Average time for union is 13.4 weeks. 2 (10%) patients got infection. The radial head plays a key role in maintaining stability of the elbow joint. Unreduced dislocation of the radial head for more than 4 weeks is considered to be chronic. The factors like interval between injury and treatment, patient's age and the amount of joint incongruity plays an important role. ^[17] Hirayama *et al.* ^[18] and Stoll *et al.* ^[19] reported that reconstruction could be successfully achieved in children up to the age of 10 years and at least four years after the injury. Monteggia fractures are rare, representing approximately 1% of all fractures and/or dislocations of the wrist and mid or proximal forearm ^[20]. Majority of patients are having excellent results 10 (50%). 9 patients had good result (45%). 1 patient had poor result (5%). Ring *et al.* ^[12] reported 37.5% excellent results, 43.75% satisfactory results, 8.5% unsatisfactory results and failure in 10.45% of cases with slight variations compared to the present study findings. Both infections were superficial and healed eventually. 1(5%) patient went under non-union. Naylor ^[16] in his series of 7 cases described fracture of radial head in one case. Speed and Boyd ^[15] has mentioned re-dislocation of radial head.

Conclusion

The goals of treatment of Monteggia Fracture dislocation are anatomical reduction, restoration of axial alignment, maintenance of joint stability, achievement of fracture union, pain free weight bearing and motion, without any wound complications. The treatment plan in Monteggia Fracture dislocation depends on fracture pattern, soft tissue injury, patient co-morbidity, fixation resources. Fracture pattern, condition of soft tissue are important factors to be considered before selection of fixation method. The present case series showed that open reduction and internal fixation with

DCP/Locking Plate is an effective treatment method in terms of better fixation with better outcome in terms of union time and complications rate.

Conflict of Interest

Not available

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Not available

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