RESEARCH ARTICLE

A NEW MONTEGGIA EQUIVALENT INJURY PATTERN WITH TYPE 1 EPIPHYSEAL SEPARATION PROXIMAL RADIUS – A CASE REPORT

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ABSTRACT

We hereby report a case of type 3 Monteggia equivalent injury in a 12 year old male child which consisted of an oblique proximal third ulna fracture with Salter-Harris type 1 epiphysial separation proximal radius with maintained radial head and capitellar relationship with proximal radius being displaced antero laterally through and through the physis. A unique and rare variant of Monteggia fracture dislocation and to our full knowledge till date no similar case has yet been reported in the literature.

Citation: Ziaul Hoda Shaan, Mohd. Faizan, Latif Z. Jilani, Naiyer Asif, Sohail Ahmad and Mazhar Abbas, 2017. "A New Monteggia equivalent injury pattern with Type 1 Epiphyseal Separation Proximal Radius – A case report", *International Journal of Current Research*, 9, (08), 55879-55881.

INTRODUCTION

Giovanni Batista Monteggia had originally described the Monteggia fracture dislocation for the first time dating back to 1884 for the first time as as an anterior dislocation of the head of radius and fracture of the proximal ulna. (James *et al*., 2006) few years before his death he wrote

"...I unhappily remember the case of a girl who seemed to me to have sustained a fracture of theupper third of the ulna. At the end of a month of bandaging, the head of the radius dislocated when I extended the forearm. I applied a new bandage but the head of the radius would not stay in place..."

It was Bado who classified Monteggia fracture dislocation into four types and described 'True Monteggia lesions' (Bado, 1967). Certain injuries with similar biomechanical radiographic pattern were also described by Bado as 'Monteggia equivalent'.

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Various equivalent patterns have been described in literature since then. We also describe a very rare kind of Monteggia equivalent pattern through this case report and to our knowledge no similar case have been reported in literature till date.

Case report

A 12 year old right handed boy presented to our casualty department 6 hours after sustaining injury to his right forearm when he fell on his outstretched hand with elbow being in pronation and hyperextension. On presentation vitals were stable and there was swelling, deformity and tenderness present over the proximal third forearm. Distal neurovascular status was intact. There was no significant associated injury. For this X ray right forearm including elbow and wrist joint was done which showed fracture shaft proximal third ulna with anterolateral angulation with epiphyseal separation (Salter-Harris type 1) proximal radial physis with radial head epiphysis being in its place while proximal radius being displaced anterolaterally and proximally (Figure-1,2 and 3).

Table 1. Bado's classification of Monteggia fracture dislocation and their proposed mechanism of injury

	Direction of dislocation of radial head	Pattern of Ulna fracture and its level	Mechanism	Incidence as percentage
Type I	Anterior	Anterior angulation, usually midshaft	Hyperextension, Hyperpronation, Direct blow (?)	~70%
Type II	Posterior	Posterior angulation, diaphyseal or metaphyseal	Hyperflexion	~3%–5%
Type III	Lateral or anterolateral	Lateral angulation, Metaphyseal, usually greenstick	Hyperextension, Lateral varus stress	~23%–26%
Type IV	Anterior, with fracture radius shaft at same level or distal to ulna fracture	Diaphyseal	Hyperpronation	<1%

Table 2. Monteggia equivalent injuries

Type I Monteggia equivalents (de la Garza et al., 2006)	Type II Monteggia equivalent (de la Garza, 2006):
• Isolated anterior dislocation of radial head (with plastic deformation of ulna) • Isolated radial neck fracture • Pulled elbow syndrome • Fractures of both bones in forearm (wherein, the radial fracture is above the junction of the proximal and the middle third) • Fracture of ulnar diaphysis with anterior dislocation of radial head and an olecranon fracture • Fracture of ulnar diaphysis (at proximal and middle third junction) with displaced extension type supracondylar fracture of humerus	Posterior elbow dislocation in children Type III Monteggia equivalent (de la Garza, 2006): • Fracture of the ulnar diaphysis with fracture of radial neck Oblique fracture of ulna (with varus malalignment) with displaced fracture of the lateral condyle of humerus • Type 1 epiphyseal separation radial head with ulnar proximal third fracture with radial head being alighned to capitellum with anterolateral displacement of proximal radius (present case) Type IV Monteggia equivalent (de la Garza, 2006): • Distal humerus fracture with proximal third ulnar diaphysis fracture and distal radial metaphyseal fracture with anterior dislocation of radial head

For this patient was operated under general anaesthesia in supine position where closed reduction and internal fixation with 2.5 mm k wire was done for fracture ulna and after maintaining ulnar length proximal radius aligned with its epiphysis itself which was fixed with transcapitellar K wire (2.5 mm) (Figure 4). Trans capitellar k wire was removed after 4 weeks and elbow range of movement exercises were started. Ulna fracture united after 8 weeks and K wire removed after 3 months of surgery from ulna. Full range of movement was achieved at the end of 5 months post op.

DISCUSSION

Monteggia fracture dislocation comprise of approximately 1.5-3 % of all elbow injury in children and is an uncommon fracture around elbow in this age group. (Bado et al., 1967) Being uncommon injury they can be easily missed in children if the person looking for fracture is not vigilant (James et al., 2006). Uptill now the classification given by Bado has stood the test of time (Williams et al., 2014). In his case series of 40 patient Bado described 4 patterns of injury and classified then according to the direction in which the radial head dislocated (Table-1) and labelled them as 'Monteggia lesions (Bado, 1967). Many unusual injury patterns were also included in his classification later on which he called as Monteggia equivalents or Monteggia like lesions. As per Bado he described three Monteggia equivalent all were variants of type 1 Bado pattern (1) isolated radial head dislocation (with plastic deformation of ulna), (2) fracture of proximal ulna with fracture of the radial neck and (3) both-bone proximal third fractures with the radial fracture more proximal than the ulnar fracture (Terry Canale, 2003). With due course of time various investigators have added to the list of Monteggia equivalents (Table-2). Monteggia in his direct blow theory (Shah, 2015) has described that the ulna fractures as a result of direct blow to the forearm while the radial head dislocates anteriorly by the continuing deforming force. In his 'Hyperpronation theory (Evans, 1949)' Evans described that a hyperpronation force

rotates the radius over middle of the ulna which either result in anterior dislocation of radial head or fractures the proximal third radius with ulnar diaphyseal or metaphyseal fracture.

Figure 1. Preoperative X-ray of forearm with elbow and wrist joint Anteroposterior and lateral view showing fracture shaft proximal third ulna with anterolateral angulation with epiphyseal separation (Salter-Harris type 1) proximal radial physis with radial head epiphysis being in its place while proximal radius being displaced anterolaterally and proximally

However as per Tompkins (Tompkins, 1971) analyzed both theories were correct and proposed that a combination of static and dynamic forces were responsible for these injuries.

Tompkins described three steps of fracture mechanism: Hyperextension of elbow leading to radial head dislocation due to pull of biceps anteriorly. Weight of body is then transferred to the ulna leading to fracture in tension. Radial head dislocation is a more common than radial neck fracture as annular ligament is more lax.
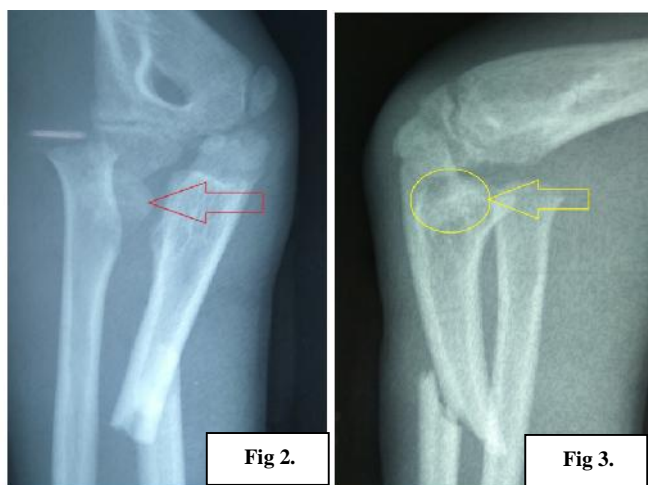
Figure 2 and 3. Shows close up view of AP and Lateral Xrays of elbow with proximal forearm red arrow shows radial head epiphysis in its place and the yellow arrow and circle shows the same in lateral view

Figure 4. Postoperative X ray of patient showing reduced ulnar fracture as well as radial epiphyseal separation which got reduced itself as soon as ulnar length was maintained

As per literature this type of injury pattern has not been reported till date. According to Wright (Wright, 1963) type 3 Monteggia fracture occur as a result of hyperextension with concomitant varus stress at elbow leading to anterolateral dislocation of radial head and lateral angulation at metaphyseal region of ulna that too green stick type. Ravessoud (Ravessoud, 1985) has reported a case of 13 year-old-patient who had an oblique fracture of the ulna with varus malalignment and an ipsilateral displaced fracture lateral condyle of humerus. As per our knowledge this is the only type 3 Monteggia equivalent reported till date. In our case the hyperextension force along with a varus stress has led to a new pattern of injury whereby ulna received an oblique fracture with anterolateral angulation and the radial head epiphysis remained constrained by the annular ligament with maintained radial head and capitellar relationship while the the remaining radius being displaced anterolaterally through and through the

physis (Type 1 Salter Harris epiphyseal separation). In our case as soon as we reduced ulnar fracture and maintained the length radius reduced itself with the radial head we did not had to perform open reduction which may be required if there is difficulty in reduction and acceptable reduction is not achieved due to annular ligament or other soft tissue interposition. To conclude this is a new Type 3 Monteggia equivalent injury which has never been published in literature to the fullest of our knowledge. The combination of dynamic and static forces acting around the elbow can result in varieties of injury pattern described under Monteggia equivalent injuries. Through this case report we have added one more Monteggia equivalent injury to the ever growing ocean of literature Figure 1. Preoperative X-ray of forearm with elbow and wrist joint Anteroposterior and lateral view showing fracture shaft proximal third ulna with anterolateral angulation with epiphyseal separation (Salter-Harris type 1) proximal radial physis with radial head epiphysis being in its place while proximal radius being displaced anterolaterally and proximally Figure 2 and 3. Shows close up view of AP and Lateral Xrays of elbow with proximal forearm red arrow shows radial head epiphysis in its place and the yellow arrow and circle shows the same in lateral view. Figure- 4 Postoperative X ray of patient showing reduced ulnar fracture as well as radial epiphyseal separation which got reduced itself as soon as ulnar length was maintained

Conflicts of Interest: None to declare

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