

CASE REPORT

SEGMENTAL FRACTURE OF THE CLAVICLE – UNCONVENTIONAL FRACTURE PATTERN OF A CONVENTIONALLY FRACTURED BONE: A CASE REPORT WITH REVIEW OF LITERATURE

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Abstract: Though clavicle fractures are routinely seen in clinical practice, rarely do we encounter segmental fractures. This unusual pattern of fracture in clavicle has been seldom reported previously. We present a case of segmental fracture of the left clavicle fracture in a 64-year-old who was treated successfully. A detailed literature review has been presented too.

Citation: Mohapatra A, Arora Y, Choudhury P, Jangir R. Segmental fracture of the clavicle – unconventional fracture pattern of a conventionally fractured bone: A case report with review of literature. J Ayub Med Coll Abbottabad 2024;34(2):385–8.

INTRODUCTION

The incidence of clavicle fractures in adults is 2.6–4% with the majority being in the midshaft (69–82%) followed by the lateral part (12–26%) and then the medial part (2–6%).¹ Strong ligaments and muscles secure the medial and lateral parts of the clavicle with the middle part lacking in any strong attachments and thus being more susceptible to trauma.² Segmental clavicle fractures (SCF) constitute a combination of either of the following three: a) mid-shaft fracture + proximal end fracture or b) mid-shaft fracture + distal end fracture or c) proximal end + distal end fractures.

Proximal end fractures with distal end fractures are also called Bipolar fractures. The incidence of segmental clavicle fractures has been documented to be just 0.8%.³ We present a case of a 64-year-old man who presented to us with a history of trauma. After thorough investigations he was diagnosed with segmental fracture of the left clavicle and treated successfully with plate osteosynthesis. The purpose of presenting this case is to highlight the occurrence of this rare phenomenon in clinical practice and its successful management. A detailed literature review has been presented too highlighting its aetiology and management.

CASE PRESENTATION

A 64-year-old male, bullocky by profession was brought to our emergency department with complaints of pain and swelling of the left shoulder for 2 hours. On inquiring the patient revealed that he met with an accident involving himself and the bullocks. The patient was conscious and well oriented at the time of presentation. He complained of severe tenderness over his left shoulder with an inability to move his left shoulder joint. Examination of the left upper extremity revealed swelling and tenderness over the left clavicle

area with the presence of a contused lacerated wound measuring 2 cm over his left forearm. Neurovascular status was normal. Radiographic evaluation of the left upper extremity revealed a segmental fracture of the left clavicle (middle 1/3rd + lateral end) fracture (Figure-1) with no associated fractures present. A complete and thorough evaluation of the body was done clinically and radiographically to rule out any other injuries. Three-dimensional Computed Tomography (CT) scan revealed posterior displacement of the middle fragment with moderate displacement of the distal fragment with intact coracoclavicular ligaments (Figure-2a, Figure-2b). The fracture was classified as middle – Robinson type 2B and lateral – Robinson type 3. Based on the displacement and the distal nature of the fracture, a decision of surgical intervention was made and performed within seven days of the injury with the consent of the patient. Both the fracture fragments were treated with Open reduction internal fixation (ORIF) with plate osteosynthesis. Middle fracture fragment was fixed first using a 6-hole 3.5 mm locking reconstruction plate placed anteriorly while the lateral fracture fragment was fixed using a 5-hole lateral end clavicle plate. The acceptable placement of the plates was confirmed using fluoroscopy.

Post-Operative radiograph too revealed absolute reduction of the fracture fragments with satisfactory placements of plates (Figure-3). Postoperatively passive range of movements of the shoulder joint was started with a shift to active movements as tolerated by the patient. Two weeks postoperatively the patient had satisfactory wound condition and was discharged. He displays no discomfort on his postoperative follow up visits with gradual increase in his range of movements.

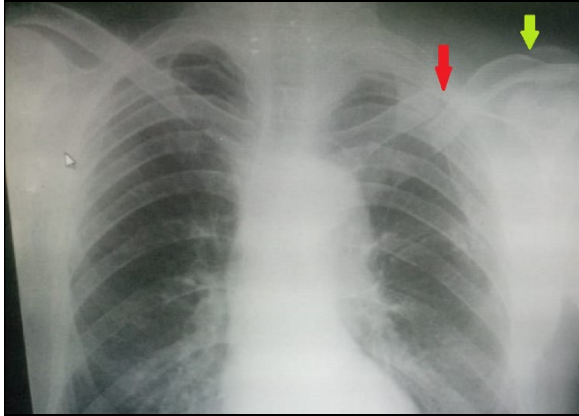


Figure-1: Segmental fracture of the left clavicle with middle fragment (red arrow) and lateral fragment (green arrow).

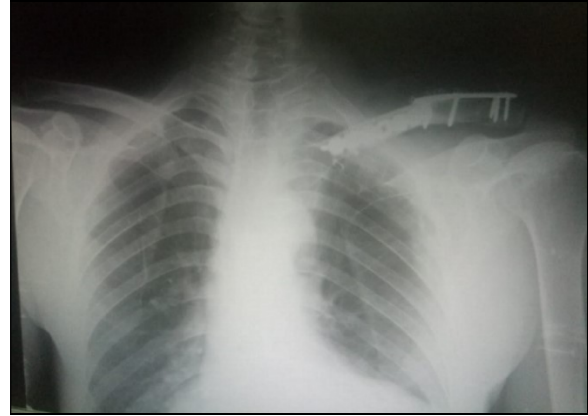


Figure-3: Post-operative radiograph showing absolute reduction of fracture fragments.

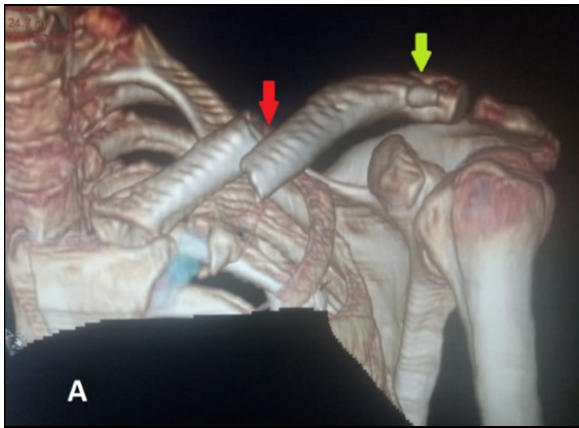


Figure-2A: Computed Tomography 3D of the left shoulder girdle showing segmental fracture of the left clavicle with middle fragment (red arrow) and lateral fragment (green arrow).



Figure-2B: Computed Tomography 3D reconstruction of the left shoulder girdle (coronal view) showing the displacements of the middle fragment (red arrow) and the lateral fragment (green arrow).

DISCUSSION

Due to the paucity of reports in literature, the mechanism of injury is still unclear. Some reports attribute the cause of injury to a combination two separate concurrent forces. One is direct force on the point of the shoulder girdle due to fall. The other is an indirect force, which may give rise to clavicle fractures by the shearing force delivered from the humerus to the sternum.¹ Previous cases report falls from height, stairs, roof, on ice or push up bar. Road Traffic Accidents (RTA) and assault has also been documented.¹⁻¹⁴ Our patient too was involved in an RTA involving bullocks. Our patient does not remember the exact sequence of events leading to the fracture, but mentioned that when he fell on the road, he was trampled by his bullocks. So, we can concur that our patient must have undergone the combination of both the concurrent forces. Though majority of the reports show high energy trauma to be the source of such fractures, a simple fall on outstretched hand can cause also result in the same.⁸ With higher energy injuries, there may also be damage to soft tissue surrounding structures such as the coracoclavicular ligaments, acromioclavicular joint capsule, and underlying neurovascular structures which cannot be visualized with radiographs alone.⁹ Hence a CT becomes an important diagnostic tool in such cases. Fractures of the medial end tend to be missed initially as reported previously. CT was helpful in diagnosing the missed medial fractures in these reports.^{3,9,12,13} Perhaps the importance of CT can be understood by one of the cases documented in which the surgery was performed on only the lateral end of the clavicle based on the radiographs. Post operatively the patient complained of pain over the medial clavicle region and the postoperative CT revealed a medial clavicle fracture which was operated approximately 6 weeks after the initial surgery.⁹ Such mishaps can be

avoided with a CT. Our patient complained of severe tenderness all over the clavicular region and the radiographs too suggested a middle clavicle fracture + lateral end clavicle fracture. But we wanted to avoid any doubts whatsoever in our diagnosis and opted for a CT too.

The management of segmental clavicle fracture is a topic of debate due to the scarce nature of available literature. Both conservative and operative management have yielded satisfactory results.¹⁻¹⁴ The anterior strut of the shoulder girdle is formed the clavicle making it especially important for the optimal function of the upper limb.² Though traditionally clavicle fractures have been treated conservatively, severe gross deformity of the clavicle with poor functional outcome and non-union have been reported.^{13,15} Fracture caused by low-energy trauma also leads to persistence of the instability of the shoulder, hence operative treatment is advised.⁸ Also due to the unstable nature of segmental fractures, these fractures are at an increased risk of non-union if treated non operatively which can be debilitating for the patients.¹¹ Like with all fractures, the treatment protocol should be based on the specific fracture patterns and the needs of the patient. Our

patient had considerable displacement of the fracture fragments and being the sole bread earner of his family, wanted a full functional outcome. Keeping in mind the above factors surgical intervention was done.

Various orthopaedic methods like anatomically contoured plates, hook plates, k wires have been used. We used a locking reconstruction plate for the intermediate fragment and lateral end clavicle plate for the lateral fragment. Previous literature also mentions the use of locked plates for osteosynthesis of diaphyseal fractures leading to excellent results. Locking contoured plates of the clavicle minimize the chances of deflection at failure and also reduce the possibilities of plate loosens.^{7,8} The use of plates for lateral end fractures has also yielded satisfactory outcome as seen in many previous cases.^{8-10,13,14}

Due to the rarity of encountering segmental fractures of the clavicle, it is of utmost priority that these fractures should be assessed very thoroughly to avoid missed diagnosis. As is the case in every fracture, they should be treated based on their individual fracture patterns and demands of the patient.

Table-1: Literature review

Study	Demography	Cause	Type of fracture	Treatment	Operative technique
Ha (2017) ¹	40 M	Fall from height	Medial +lateral	Operative	Mid shaft – CRIF with Steinmann pin
Ha (2017) ¹	62 M	bicycle accident	Mid shaft + lateral	Operative	Distal end – ORIF with k wire pinning
Pang (2002) ²	19 M	Fall from push bar	Medial + Lateral	Conservative	-
Sethi (2012) ³	70 F	Fall from stairs	Medial + lateral	Conservative	-
Karimi (2007) ⁴	30 F	Fall from height	Medial +lateral	Operative	Proximal – ORIF with plating Distal – CRIF with k-wire
Daolagupu (2013) ⁵	12 M	Fall from height	Mid shaft + Lateral	Operative	Mid shaft – ORIF with plating Distal – CRIF with K wire
Osman (2009) ⁶	50 M	Fall from stairs	Midshaft +lateral	Operative	ORIF with plating
Grossi (2011) ⁷	71 M	Fall from roof	Midshaft + lateral	Operative	Midshaft – ORIF with plating Lateral – CRIF with K wire
Varelas (2015) ⁸	68 F	Fall on Ice	Medial + lateral	Operative	Both #s fixed with ORIF with plating
Yalızis (2016) ⁹	38 M	RTA	Medial + Lateral	Operative	Both #s fixed with ORIF with plating
Miller (2009) ¹⁰	17 M	RTA	Medial + Lateral	Operative	Both #s fixed with ORIF with plating
Maalouly (2019) ¹¹	78 F	RTA	Medial + Lateral	Operative	Midshaft ORIF with plating Lateral- CRIF with K wire
Marjoram (2014) ¹¹	40 M	RTA	Medial + Midshaft	Operative	ORIF with plating
Ogawa (2017) ¹²	74 F	RTA	Medial + Lateral	Medial – Conservative Lateral - Operative	ORIF with plating
Heywood (2005) ¹⁴	54 M	Assault	Medial + Lateral	Operative	Both #s fixed with ORIF with plating
Our Study	64 M	RTA	Midshaft + Lateral	Operative	Both #s fixed with ORIF with plating

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Submitted: April 15, 2021

Revised: --

Accepted: February 2, 2022

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