Management of ipsilateral trifocal fracture of the radius-a case report

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\textbf{ABSTRACT}

\textbf{Introduction:} Diaphyseal forearm fractures are commonly seen in clinical practice. However, segmental forearm fractures are relatively rare. We hereby present a case of surgical management of trifocal fracture of radius (mid-shaft of radius, distal end of radius and neck of radius fracture) with ipsilateral shaft ulna fracture.

\textbf{Case report:} A middle aged patient with ulnar shaft fracture and trifocal radius fracture was managed surgically with open reduction and internal fixation of all four fractures. The ulna was addressed first, to achieve alignment, followed by distal radius and shaft radius fixation through the same incision. A separate incision was used to address radial neck fracture.

\textbf{Conclusion:} A trifocal radius fracture with ulna shaft fracture has been rarely reported in the literature. Prompt surgical management of the complex fracture led to rapid and satisfactory recovery and good functional outcome for our patient.

\textbf{Introduction}

Multifocal fractures of the upper limb occur most likely in an event of fall from height and account for 1.3\% of all upper limb injuries with the majority of them involving proximal humerus or distal radius (89.2\%). Multifocal injuries can be classified as bifocal, trifocal injuries which occur commonly in middle aged and old women \cite{1}. Segmental radial fracture occurs due to high energy injury with axial energy transmission. Various previous reports have highlighted multifocal fractures of upper limb, but multifocal fracture of radius has rarely been reported, to the best of your knowledge. Our review of the literature revealed only one previous case report relating to the surgical treatment of a trifocal radius fracture in which all three fractures were in the diaphyseal region \cite{2}. The present report highlights a case of trifocal fracture of radius (mid-shaft of radius, distal end of radius and neck of radius fracture) with shaft ulna fracture.

\textbf{Case presentation}

We present a case of a 30 years old gentleman, salesman by occupation, who met with a roadside accident while driving a bike at a speed of approximately 40 km/h with a speeding car. He was immediately taken to a local hospital. Upon initial assessment, the patient was oriented with stable vitals. He had pain in the elbow with bruising and swelling over the forearm with visible deformity without
Fig. 1. Preoperative radiographs.

Fig. 2. Postoperative radiographs.
any distal neurovascular deficit. Radiographs revealed a trifocal fracture of radius involving a closed displaced extra articular fracture of the distal end of radius, shaft radius and radial neck fracture in combination with a comminuted displaced fracture of the ipsilateral ulna in the mid-shaft region (Fig. 1). There was no other associated injury to the patient.

Radiographs revealed a trifocal fracture of radius involving a closed displaced extra articular fracture of the distal end of radius, shaft radius and radial neck fracture in combination with a comminuted displaced fracture of the ipsilateral ulna in the mid-shaft region (Fig. 1). There was no other associated injury to the patient. The fractured limb was splinted with an above-elbow splint and the limb was elevated and the patient was monitored for compartment syndrome. The patient was operated up-on after 2 days of presentation.

Ulna fracture was addressed first in order to get the forearm to correct length, alignment and rotation. It was approached through a standard ulnar approach and stabilisation was done with a 3.5 mm limited contact dynamic compression plate (LC DCP). After fixation of ulna, the forearm was fully supinated and distal radius fracture was addressed. The fracture was exposed through a modified flexor carpi radialis (FCR) approach [3] and fixed using an anatomical plate. The incision was extended proximally as Henry’s approach and shaft radius fracture was fixed with a 3.5 mm limited contact dynamic compression plate (LC DCP). Radial neck fracture was approached through separate Kocher’s approach [4] and stabilised with an anatomical radial head plate (Fig. 2).

Post-operative period was uneventful and active assisted range of motion exercises were initiated as soon as the patient was comfortable, with limited rotatory movements of forearm.

Patient returned to work as salesman by the end of third month. Patient was followed up for 1 year and all fractures went into union.
Fig. 4. Range of motion of wrist and elbow.
Patient gained full flexion and extension at elbow and wrist but there was slight restriction in supination. Hand grip was comparable to the other side. At one year follow-up patient's DASH score was 27.5 and the patient returned to previous work without any difficulty.

**Discussion**

Forearm diaphyseal fractures in adults are of common occurrence [5], but there are very few reported cases of segmental complex fracture of the forearm. Most of the reported fractures are bifocal segmental diaphyseal fractures of radius with fracture shaft of ulna. Trifocal radial diaphyseal fracture has been reported in one case report [2]. To the best of our knowledge, no previous study has reported a trifocal radius fracture with distal end radius and radial neck fractures.

In our case, the injury complex resulted from high-energy trauma with comminution and instability. Looking at the fracture pattern, with ulnar comminution and radial fracture at multiple levels, it seems that strong axial force could have caused the rare injury. Radius was fractured in metaphyseal region proximally and distally jeopardising the function of both the elbow and wrist joint. The AO classification system of forearm fractures has described complex fractures, but only bifocal injuries have been included [6].

Over the years, open reduction and compression plating has evolved as the gold standard for the fixation of diaphyseal forearm fractures [7]. Juxta-articular fractures have always been a challenge for the surgeons [8]. Also, the sequence of fracture fixation is of importance in order to get the best possible outcome. In our case, the ulna was addressed first in order to achieve correct limb length, alignment and rotation. Following that the distal radius fracture was addressed through modified FCR approach which was later extended proximally as Henry’s approach for shaft radius fixation. The proximal radial fracture was addressed using a separate Kocher approach for better and safer exposure (compared to proximal extension of Henry’s approach). We were able to achieve good reduction and absolute stability in all four fractures, therefore we did not feel the need to do bone grafting. Patient had good bone quality, so the need for locking plates was not felt for the shaft fractures.

Both the juxta-articular fractures were fixed with anatomical plate, so early range of motion could be started without compromising the stability of the fixation construct.

**Conclusion**

This case report highlights a rare injury combination and its successful surgical management. Prompt surgical management of the complex fracture led to rapid and satisfactory recovery with good functional outcome for our patient.

**Consent**

Written informed consent for publication of this report along with pictures was obtained from the patient.

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**Declaration of competing interest**

The corresponding author, on behalf of all the authors declares that there was no conflict of interest in this study.

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