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Dr. Pratik Sidhdhapuria
Senior resident, Department of Orthopaedics, Government Medical College, Surat, Gujarat, India

Dr. Shahrukhkhan Pathan
Senior resident, Department of Orthopaedics, Government Medical College, Surat, Gujarat, India

Dr. Vijay Chaudhary
Senior resident, Department of Orthopaedics, Government Medical College, Surat, Gujarat, India

Correspondence
Dr. Shahrukhkhan Pathan
Senior resident, Department of Orthopaedics, Government Medical College, Surat, Gujarat, India

Anterior approach of the elbow for fixation of capitulum fractures

Dr. Pratik Sidhdhapuria, Dr. Shahrukhkhan Pathan and Dr. Vijay Chaudhary

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Abstract
Objective: Fractures involving the capitellum can be treated surgically by excision of the fragment, or by reduction and internal fixation with headless screws. The lateral Kocher approach is the most common approach for open reduction. We believe that the anterior approach of the elbow, could be a valid technique for treating these fractures, as it does not involve the detachment of any muscle group or ligament, facilitating the recovery process.
Material and Method: 4 Patients with capitulum fracture admitted in NCH-Surat. As a primary treatment above elbow splint applied. X-ray and CT scan was done. Patient was operated via anterior approach and fracture was fixed with Herbert screws. Exposure, intraoperative blood loss, duration of surgery and any significant intraoperative events if any are noted. Stitches was removed on 12th post operative day and elbow mobilized according to fixation. Patient was followed up till 6 months and clinical and radiological examination was done.
Results: Anterior approach to capitulum provide good exposure. The patients showed favourable clinical progress at 6 months, respectively, with a mean extension/flexion movement arc of 0 to135°. The patients showed radiological consolidation with no signs of osteonecrosis.
Conclusions: We believe that the anterior approach of the elbow is a technical option to consider for the open surgical treatment of a capitellum fracture, although further studies are needed to demonstrate its superiority and clinical safety compared to the classical lateral Kocher approach.

Keywords: Capitulum fracture, anterior approach, Kocher lateral approach, osteonecrosis

Introduction
Fractures involving the capitellum can be treated surgically by excision of the fragment, or by reduction and internal fixation with headless screws. The lateral Kocher approach is the most common approach for open reduction. We believe that the anterior approach of the elbow, could be a refined technique for treating these fractures, as it does not involve the detachment of any muscle group or ligament, facilitating the recovery process [1].

Material and Method
- Patients with capitellum fracture admitted in NCH, Surat.
- As a primary treatment above elbow splint applied.
- X-rays and CT scan was done. (figure 1)
- After informed written consent Patients was operated via anterior approach and fracture was fixed with Herbert screws.

Fig 1: Xray and CT scan showing Capitulum fracture

Surgical Technique

The patient is positioned supine on operating table, with arm in 90-degree abduction and supported by a forearm post. With the elbow in extension, the biceps tendon is located, and the line is drawn on the skin corresponding to the longitudinal axis that divide the cubital fossa in two to form medial and lateral halves. Another line drawn that coincides with the flexion skin crease of the elbow. The lateral halves of this transverse line coincides with the diameter of capitellum, and medial half coincides with axis of trochlea. (Figure 2) [2].

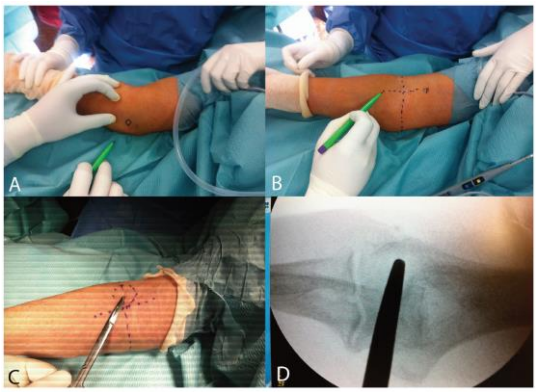

Fig 2: Preoperative Skin marking

Skin incision and superficial dissection

A transverse incision is made lateral to midline. cephalic vein and its tributaries should be moved laterally or medially (Figure 3). Once anterior brachial fossa is opened, biceps brachii muscle can be seen. Underneath the biceps brachii muscle, we locate the thicker brachialis muscle. The musculocutaneous nerve was identified between the two muscles running obliquely [3]

Fig 3: Skin incision

Locating the radial tunnel

At this point we must locate the radial tunnel, which is the space between the brachioradialis muscle and the brachialis muscle. (Figure 4)

1. in some patients we can identify a fatty plane through the fascia
2. in others we can see a difference in volume
3. identify a change in direction of the muscle fibers that indicates the radial tunnel

This step is the most difficult and probably the most important, because it in turn determines that the radial nerve is located and handled correctly and that a true internervous approach is performed, with less bleeding and a lower risk of muscular denervation [4].

In addition, exposing the fracture will be easier, especially if distal extension is needed to treat an associated radial head fracture.

Fig 4: Radial Tunnel

Exposing capitellar and radial head fractures: We position two retractors, one that retracts the mobile wad of Henry laterally (this muscle group will include the radial nerve and the recurrent radial artery) and the other retracts the brachialis muscle and the biceps tendon medially [5].

At the bottom of the approach we will be able to see the joint capsule. (Figure 5)

Fig 5: Joint exposure

The joint capsule must be cut. The aim is to expose the capitellum without compromising the proximal periosteal flap, which is usually kept attached to the distal humerus thus providing blood supply and stability

Once the joint capsule is open, the capitellum is exposed, and with

the elbow in a position of extension, it usually "reduces itself" to its approximate anatomical position. (Figure 6) [6].

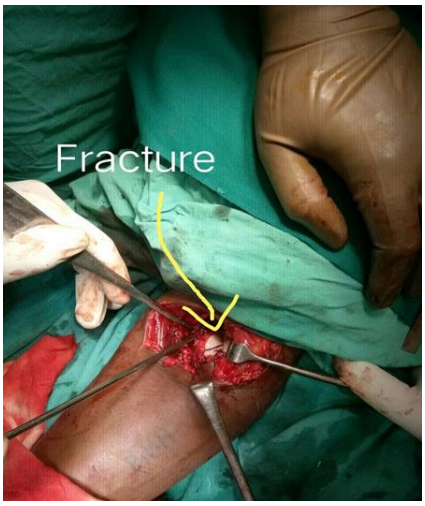

Fig 6: fracture reduction

The reduction is performed, paying attention to the distal edge of the distal humerus, a detail that can help us to decide the correct position for reduction; we can also see the relationship of the capitellar fragment to the trochlea, medially.
Once we are happy with the reduction, with the help of 2 or 3 Kirschner wires, we fix the fragment in position (Figure 7)

Fig 7: Temporary fracture fixation

Definitive fixation:
With the fragments reduced, we proceed to measure and insert the headless screws. (Figure 8)
We then check with fluoroscopy that the screws are correctly positioned and we also check that the elbow has a range of flexion-extension with no restrictions If the capitellar fracture involves the most distal edge (due to impaction or loss of bone)

Fig 8: Definitive Fixation

Exposure, intraoperative blood loss, duration of surgery and any significant intraoperative events if any are noted and tabulated.
Elbow mobilized on 2nd postop day.
Stitches was removed on 12th postop day.

Fig 9: postoperative scar mark

Patient was followed up till 6 months and clinical and radiological examination was done.

Discussion
Fracture of the capitulum humeri is often referred to as Mouchet's fracture but Hahn published the first description of it in 1853 [6].
Many agree that excision of the fragment is the best treatment for patients in which the fragment involves merely a thin segment of cartilage, or a small segment of cartilage and its underlying sub-chondral bone, or when there is a comminuted fracture with several small fragments [4].
But Diversity of opinion lies to the treatment of fractures with a large fragment

Treatment of fracture with large fragment:

1. Manipulative reduction under general anaesthesia: should always be tried before open reduction is undertaken. (DePalma 1970, Watson- Jones 1976). To obtain perfect reduction by closed means is, however, very difficult. Many have abandoned this method because of consistent failure [8].
2. Early excision of the capitular fragment: simple and definite procedure with a short postoperative immobilization period. However, it can lead to valgus deformity and lateral instability in the elbow joint. Excision of the fragment leaves a raw bone surface which increases the risk of developing capsular adhesions and restricted mobility Watson-Jones (1976) [9]
3. Open reduction with or without internal fixation: Technically difficult and that a perfect reduction is mandatory. Reduction can also lead to avascular necrosis of the fragment Judet & Raynal (1957) [10]

Table 1: Lateral (Kocher's) Approach Vs Anterior Approach

Lateral (Kocher's) approach	Anterior approach
Most commonly used, Conventional	Newer
Involves Osteotomy	Does not involve the detachment of any muscle group or ligament
And therefore, longer recovery time	Therefore, easy rehabilitation and early recovery
Screw may be positioned in antero-posterior direction	Direct visualization of fracture fragment
	Trochlear extension is easy

Results

Anterior approach to capitellum provide good exposure to the elbow joint.

No wound complications were found.

The patients showed favourable clinical progress at 6 months, respectively, with a mean extension/flexion movement arc of 5 to135º.

The patients showed radiological consolidation with no signs of osteonecrosis.

Table 2: Results of Patients

Patients	Intraop blood loss	Duration of surgery	Remarks (if any)	Rom At 6 months follow up
1	60mL	45 mins		5º to 130º
2	65mL	60 mins	guide-pin was broken in olecranon process	5º to 130º
3	70mL	50 mins		0º to 135º
4	70mL	50 mins		5º to 130º

Fig 10: Capitulum fracture united with Herbert screw

Fig 11: Postoperative range of motion

Conclusions

We believe that the anterior approach of the elbow is a technical option to consider for the open surgical treatment of a capitellum fracture.

Learning curve is easy but care must be taken for neurovascular stuctures although further studies are needed to demonstrate its superiority and clinical safety compared to the classical lateral Kocher approach.

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