



## 성인 여성에서 발생한 상완골 소두 감입 골절 - 증례 보고 -

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## Capitellar Osteochondral Impacted Fracture of the Humerus in an Adult Female - A Case Report -

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Received January 15, 2018

Revised April 4, 2018

Accepted August 15, 2018

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Financial support: None.

Conflict of interests: None.

Capitellar osteochondral impaction fractures of the humerus are an uncommon injury and not encompassed by commonly used classification systems, such as that of Bryan and Morrey. Only a few cases of capitellar osteochondral impaction fractures have been reported. We report a case of a 53-year-old female with a capitellar osteochondral impaction fracture. The osteochondral fracture fragment of the capitellum was impacted and there was a step-off on the articular surface. Recovery of congruence in the capitellar articular surface was necessary. Satisfactory clinical and radiological results were obtained through the 'lever arm' reduction of the fracture fragment with a small osteotome and fixation with 'raft' K-wire.

**Key Words:** Humerus, Capitellum fracture, Elbow injury, Osteochondral fracture, Impacted fracture

Capitellar fractures account for approximately 1% of all elbow fractures and 6% of distal humerus fractures.<sup>1)</sup> Bryan and Morrey classification has been widely used to classify capitellar fractures and provide therapeutic guidelines.<sup>2)</sup> According to their system, type 1 fractures include a coronal shear fragment; type 2 result in a predominantly cartilaginous 'thin' fragment; type 3 are comminuted, multi-fragmented; and type 4 describe a shear fracture extended

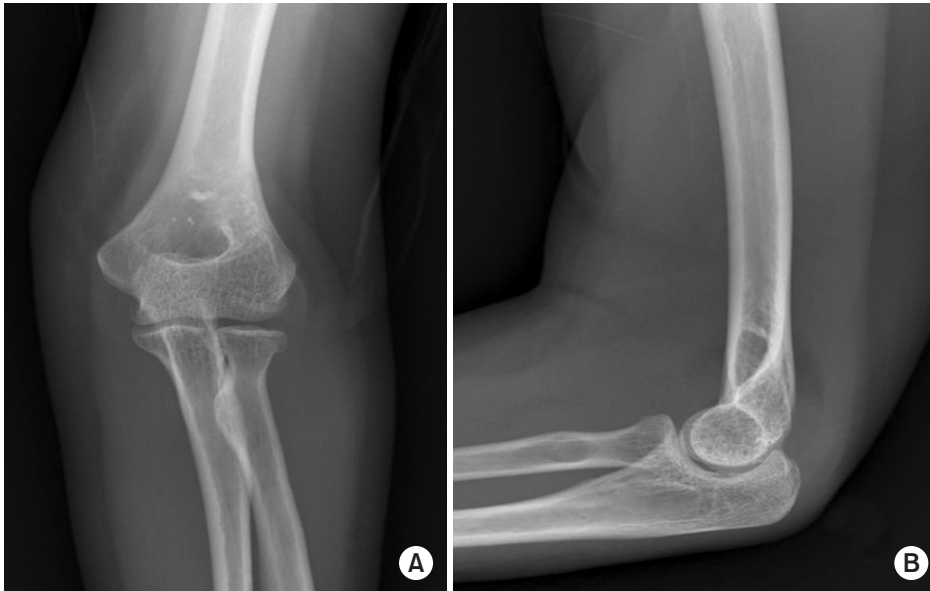
medially to the trochlea. Capitellar impaction fracture is an uncommon type of injury and is not encompassed by commonly used classification systems such as that of Bryan and Morrey.<sup>3)</sup> Furthermore, to the best of our knowledge, there have been only few cases reporting a capitellar impaction fracture with a radial head fracture.<sup>4)</sup> Herein, we present a case of capitellar impaction fracture in a 53-year-old female patient.

## Case Report

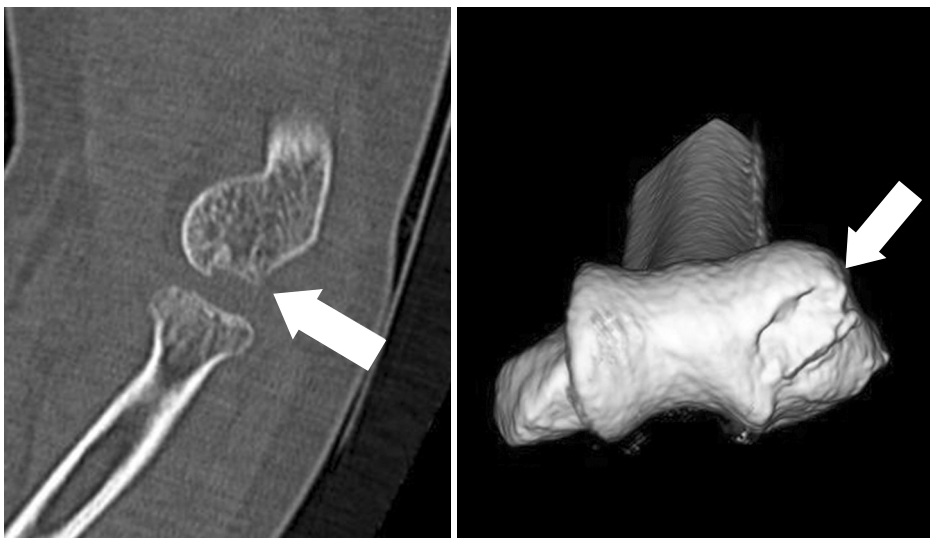
A 53-year-old female came to the emergency department after falling on to her left arm. She presented a painful and mild swollen elbow. On physical examination, her upper extremity was neurologically intact and there was no external wound. She complained of pain on palpation over the radio-capitellar joint of the elbow. It was impossible to apply the stress test to evaluate for any instability of the elbow due to severe pain. The patient's visual analogue scale (VAS) score was 6 out of 10 on the numeric rating

scale (NRS)-11 and Mayo elbow performance score was 40. Anteroposterior and lateral radiographs revealed no visible fracture or dislocation (Fig. 1). We took computed tomography (CT) scan to find hidden fractures. The CT scan showed that distal articular cartilage of the capitellum was depressed about 1.7 mm (Fig. 2). There was linear radial head fracture on CT scan.

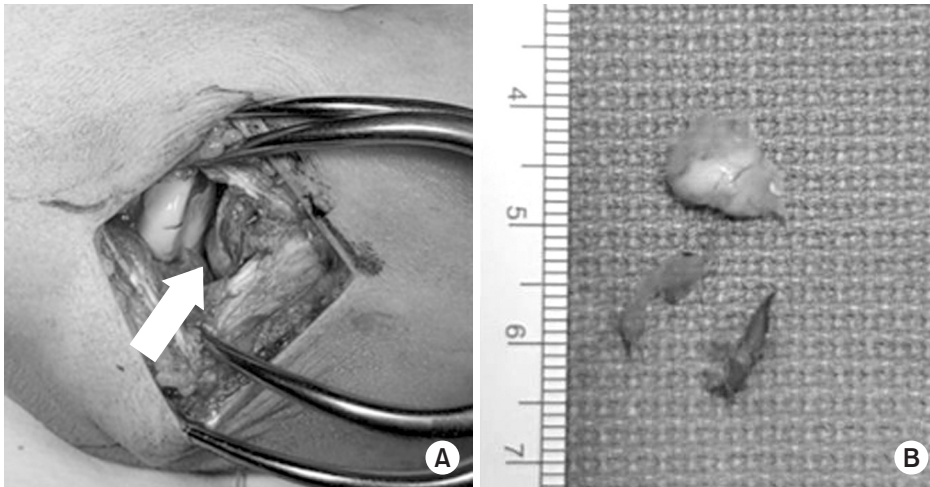
Under general anesthesia, varus and valgus stress test on the elbow was performed at 30° of elbow flexion; no significant instability was noted. The radio-capitellar joint was exposed through a posterolateral approach. The osteo-



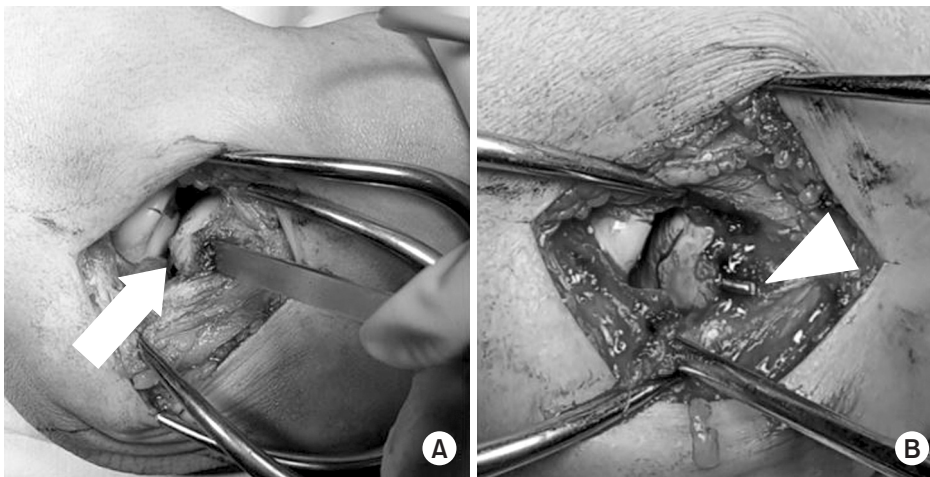
**Fig. 1.** Preoperative anteroposterior (A) and lateral (B) X-ray views of the left elbow were no visible fracture or dislocation.



**Fig. 2.** Computed tomography scans showed osteochondral depression of capitellum (white arrows).



**Fig. 3.** Operation photographs. (A) Articular surface depression of the capitellum (white arrow) and peeled articular cartilage of the radial head. (B) Small cartilage fragments from the radial head.



**Fig. 4.** (A) Impacted osteochondral fragment of capitellum was lifted to make an articular congruence (white arrow) using a small osteotome. (B) Stability was achieved using a 'raft' K-wire (white triangle).

chondral fracture fragment of the capitellum was impacted and there was a step-off on the posterior articular surface. Though anterior one-third of the capitellar articular surface of the radius was peeled, there was no complete fracture on the radial head (Mason type I). Small cartilage fragments from the capitellum were removed (Fig. 3). Impacted osteochondral fragment of capitellum was lifted to make an articular congruence by using small osteotome and the stability was achieved by using rafting a 1.6 mm K-wire inserted parallel & beneath the fracture fragment and advanced into the medial part of the trochlea (Fig. 4, 5).

After four weeks of immobilization, a limited range of active and passive range of motion (ROM) was allowed. The patient received daily physical therapy, and her ROM—both active and passive—gradually increased. At the

4-months follow-up postoperatively, ROM of the elbow joint was 0° to 135°. Removal of 'raft' K-wire was performed and the congruence of articular surface of the capitellum was confirmed on follow-up CT scan (Fig. 6).

She feels comfortable using her elbow in daily life (combing hair, performing hygiene) without any complications. The VAS score of the patient was 0 out of 10 on the NRS-11, Mayo elbow performance score was 100 and Disabilities of the Arm, Shoulder, and Hand score was 0 for the disability/symptoms.

## Discussion

Impacted fractures of the capitellum are uncommon, and the current body of literature is limited to case series where—



**Fig. 5.** Postoperative anteroposterior (A) and lateral (B) X-ray views of the left elbow.



**Fig. 6.** Follow-up computed tomography scan shows the recovery of articular congruence of the capitellum (arrow).

by it is difficult to draw firm conclusions on injury mechanism and treatment. Moreover, because of the small size of the fracture fragments as well as overlapping of the radial head and capitellum fracture in plain radiographs, diagnosis is still challenging. To avoid a missed diagnosis and to facilitate precise preoperative planning, in patients with suspected capitellum fractures with a concomitant radial head fractures, CT scan of the affected elbow could be helpful.<sup>5)</sup>

Although the mechanism of this injury has not been

clearly elucidated, the following can be assumed. The capitellum is at risk because of reciprocal impinging on the radial head. A total of 60% of the axial load at the elbow is transmitted through the radiocapitellar joint.<sup>4,6)</sup> This axial loading stress may be produced by a fall on the outstretched hand and the capitellum has collapsed by the impact of the radial head. As a consequence, osteochondral fracture and impaction of capitellum may be occurred.

Although this type of injury is not much important to joint stability that relies on both intact articular structures and soft tissue constraints (*i.e.*, lateral collateral ligament, coronoid, and radial head), the bony contribution to radiocapitellar stability is provided by concavity-compressive forces.<sup>3)</sup> Incongruence of the radio-capitellar joint leads to posttraumatic arthrosis, stiffness and potential ulnohumeral instability.<sup>7)</sup> For these reasons, recovery of congruence in capitellar articular surface is necessary in our 1.7 mm depression case.

Reduction and internal fixation of the impacted fracture fragment is technically demanding, owing to the small and often comminuted nature of the fragments as well as the circumferential articular cartilage on the capitellum. We obtained the satisfactory clinical results through the 'lever arm' reduction of the fracture fragment with a small osteotome and fixation with 'raft' K-wire. This case demon-

strates that good functional and anatomic results can be realized by open ‘lever arm’ reduction and fixation with ‘raft’ K-wire allowing early mobilization and a good recovery of elbow.

Our observations must be interpreted within the frameworks of the limitations. The clinical outcome of this patient must be compared and contrasted with another patient; however, to the best of our knowledge, there are no comparable clinical reports to date of this injury in the literature.

## 요 약

상완골 소두의 골절은 드물게 발생하며 Bryan and Morrey의 분류가 사용된다. 하지만 소두의 감입 골절은 이 분류에 속하지 않으며 문헌에 보고된 증례가 드물다. 본 증례를 통해 53세 여자 환자에서 발생한 상완골 소두 감입 골절에 대하여 보고하고자 한다. 전신 마취하에 외측 접근법을 통해 요골-소두 관절을 노출시켰다. 소두의 골-연골 골절 조각이 감입되어 주위 관절면에 비해 함몰되어 있는 소견이 관찰되었다. 감입된 소두의 골-연골 골절면은 작은 뼈 절단기를 이용하여 주위 관절면에 맞게 들어올리고 K-강선을 골절 조각 아래에 삽입하여 버티도록 고정하였다. 술 후 약 4개월 후 정상적인 관절 운동 범위를 회복하여 K-강선을 제거하는 수술을 시행하고, 골절편의 완전한 유합 및 주위 관절면과의 일치를 확인하였다. 상완골 소두 감입 골절에 있어서 관절면의 일치를 회복시키는 것이 필수적이다. 저자들은 본 증례에서 지렛대 방식의 골절편 정복과 골절편 아래에 버팀목이 되어 줄 수 있는 K-강선을 삽입하여 만족스러운 임상 결과를 얻을 수 있었다.

**색인 단어:** 상완골, 소두 골절, 주관절 손상, 골연골 골절, 감입 골절

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