

Case Report

Severe injury of bilateral terrible triad of the elbow joints: a case report

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Abstract: Terrible triad of the elbow is recognized as posterior dislocation combined with the fractures of the radial head and coronoid process of the ulna, which is rare and has a historically poor clinical outcome. We report a case of a 34-year-old man presenting with bilateral terrible triad of the elbow joints after he fell from height. The fragments of the radial head ran to the ulnar sides on both elbows, which is particularly rare. Our surgical procedure included fixation of the radial head through a lateral approach and fixation of the coronoid process and repair of the common flexor muscle and medial collateral ligament (MCL) injury through an anteromedial incision. Bone union was achieved 3 months after surgery. He has returned to preinjury levels of laboring activities. Clinical experience was acquired during the diagnosis and treatment procedures.

Keywords: Bilateral terrible triad of the elbows, coronoid process fracture, radial head fracture, treatment

Case presentation

A 34-year-old, right hand-dominant male fell from a wall about two meters high with upper limbs straight and touched the ground using his palms. He was taken to the emergency room in the local hospital immediately with severe pain and significant luxation of bilateral elbow joints. He underwent manipulative reduction and the elbow was fixed in flexion with plaster (**Figure 1**). Then he was transferred to our hospital. Physical examination revealed significant swelling, no soft tissue laceration, no signs of neurovascular injury. There were no previous medical comorbidities. Three dimensional (3D) Computed Tomography (CT) reconstruction showed apparent coronoid process fractures and radial head fractures in both sides (**Figure 2**). Additionally, there were small bone fragments under the coronoid process (as the red and yellow arrow point in **Figure 2**) and we could not accurately identify where they came from. According to the mechanism of injury that the patient told us, we assumed that the fragments maybe the part of the radial head or coronoid process. Seven days after the injury, open

reduction and internal fixation was performed under general anaesthesia. The patient was placed in the supine position and antibiotic prophylaxis was administered. The combination of elbow lateral (Kocher approach) and anteromedial approaches were chosen. Initially, the left radial head was addressed first. However, the integrity of radial head could not be restored due to partial loss of head, and thus the residual part of radial head in the anteromedial skin incision was reduced by 2 mm Kirschner wires and the periosteal elevator in the lateral incision (**Figure 3**). Fixation using 2 miniature steel plates was performed. Next, the coronoid process fracture was reduced and repaired by a T-type buttress plate. One non-absorbable suture anchor was applied to repair the MCL and the common flexor muscle after the valgus stress test showed the instability still existed after bone fixation. The right elbow joint was subject to the same approaches as the left and the fragments of the right radial head were also located in the ulnar side. Then the fractures of radial head and coronoid process were reduced and fixed using miniature steel plates in the same way. Intraoperative C-arm fluoroscopy

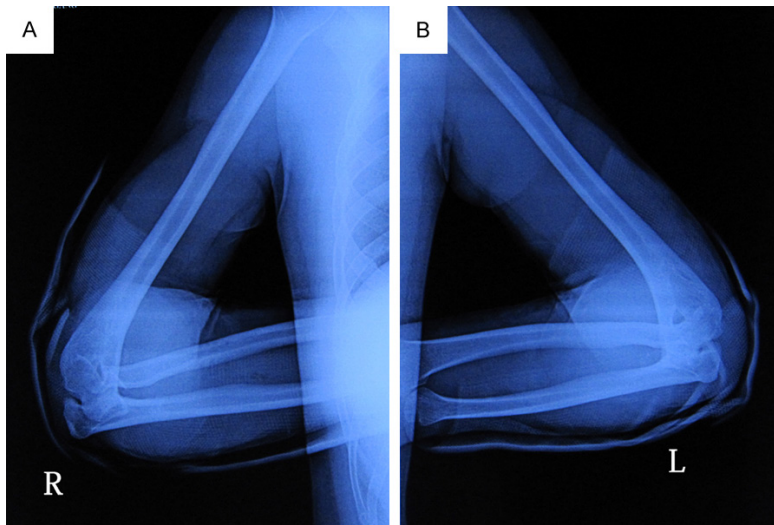


Figure 1. Plain film after manipulative reduction and fixed in flexion with plaster in the local hospital.

showed good reduction and fixation and stability was evaluated without subluxation during flexion-extension arc between 0-130°. The incision was closed in layers, and a drainage tube was routinely used. After dressing the wound, the bilateral elbow joints were immobilized with the elbow bent at 90° and the forearm was in neutral position using plaster splints. Postoperative X-rays confirmed that the implants were in their appropriate positions and showed a good reduction (**Figures 4, 5**).

The patient elevated the affected limbs and was encouraged to perform finger and wrist joint movements as tolerated on post-operative day one to alleviate edema. The patient was informed to take indomethacin (25 mg tid) orally for 6 weeks to avoid the occurrence of heterotopic ossification. The plaster splints were removed 3 weeks after the operation, and active exercise for the bilateral elbow joints was initiated with guidance.

Result

No infection, neurovascular injury, redislocation, nonunion, or heterotopic ossification was noted in the bilateral elbows. At postoperative 3-months, bone healing was observed in X-rays (**Figures 6, 7**), but the patient complained of bilateral elbows pain occasionally, the Visual analog pain scale (VAS) of the right side was 5 points, and the left side was 2 points. The flexion-extension arc of the left elbow ranged from

20° to 113°, 55° pronation and 76° supination in the left forearm rotation (131° in total). The range of the flexion-extension arc of the right elbow was from 20° to 100°, 23° pronation and 57° supination in the right forearm rotation (100° in total). The Mayo elbow performance score (MEPS) of the left and right side were 80 and 60. With aggressive stretching exercises, he eventually regained a good range of motion except for mild restriction on the pronation in the right side (**Figure 8**). The flexion-extension arc of the left elbow ranged from 15° to 125°, 70° pronation and

86° supination in the left forearm rotation (156° in total). The range of the flexion-extension arc of the right elbow was from 15° to 118°, 45° pronation and 81° supination in the right forearm rotation (126° in total). Bone remodeling was quite well at the 12-month follow-up, and no sign of heterotopic ossification was noted (**Figures 9, 10**). The VAS of the left and right elbows were 0 points and 0 points, meanwhile, the patient's MEPS score was 95 for the left elbow and 80 for the right elbow. The physical and mental component summary SF-36 scores were 80 and 88, respectively. The patient also regained a satisfactory grip strength (75 and 70 pounds for the left and right side). However, he complained that a little difficulty to scrubbing his back with the right side. He has also returned to preinjury levels of laboring activities.

Discussion

The terrible triad of the elbow was first defined by Hotchkis in 1996 [1] as elbow dislocation associated with fractures of the coronoid process of the ulna and the radial head. In addition, ligament injuries concurrent with bone injuries are very common, especially lateral collateral ligament (LCL), MCL, which can cause a definite instability of the elbow. The mechanism of injury is the determinant of the terrible triad. Most of this complex injury can be explained by the following sequence of events. The patient straightened the elbows with forearm supina-

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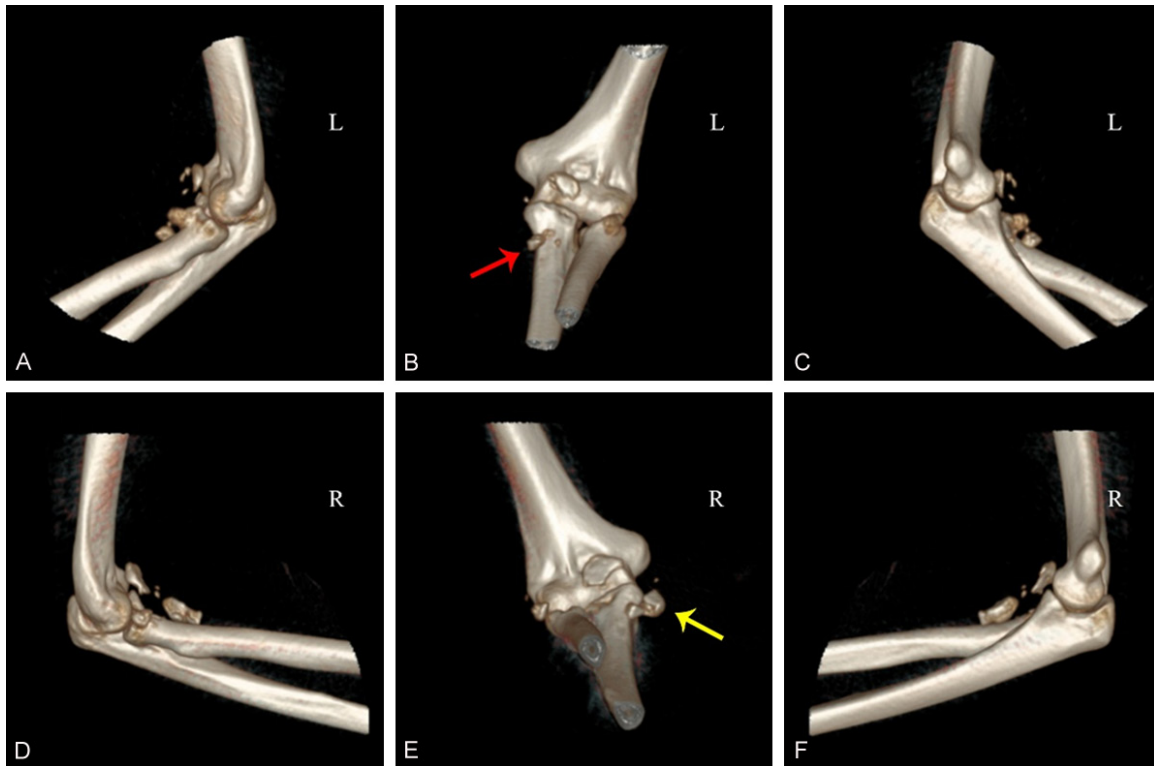


Figure 2. 3D CT reconstruction revealing terrible triad of the bilateral elbows and bone fragments under the coronoid process.

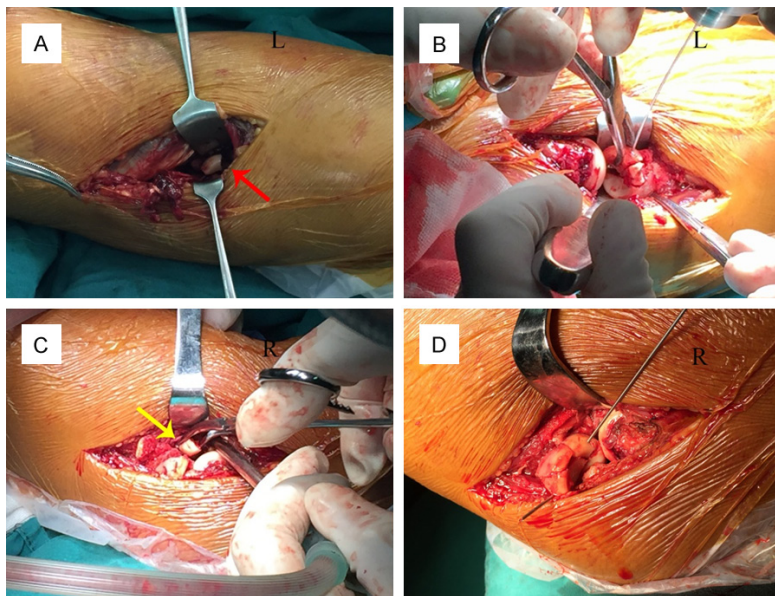


Figure 3. Intraoperative photos revealing the fragments of the radial head ran to the ulnar side in both sides.

the radial head and coronoid fractures. In this case, the patient touched the ground with excessive abduction of the elbow, and the valgus stress drove the fragments of the radial head to the ulnar side and probably caused the MCL injury simultaneously.

The purposes of treatment is to recover the congruency of the elbow joint, restore stability, and allow early joint mobility of the elbow to avoid complications [2]. However, poor functional outcomes are commonly presented due to the nature of this injury. The conservative treatment requires immobilization of the elbow for 4-8

weeks, which is detrimental if the period beyond 4 weeks [3]. Currently, surgical intervention has been proven as the optimal option

when he fell from standing height. The axial force transmitted to the ulnohumeral joint contributed to posterior dislocation and led to

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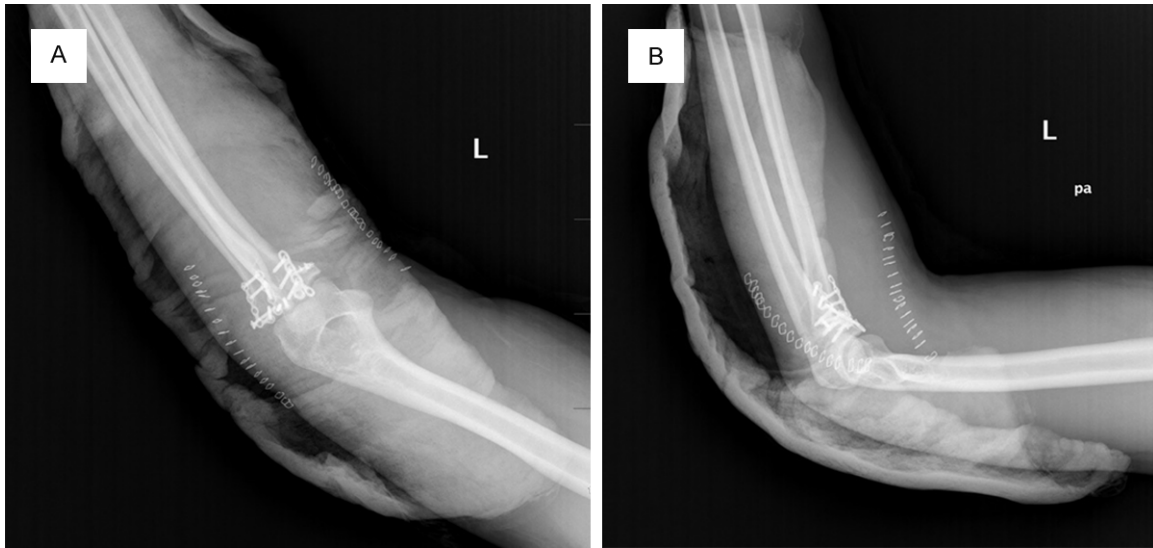


Figure 4. Anteroposterior and lateral film of the left elbow after surgery.

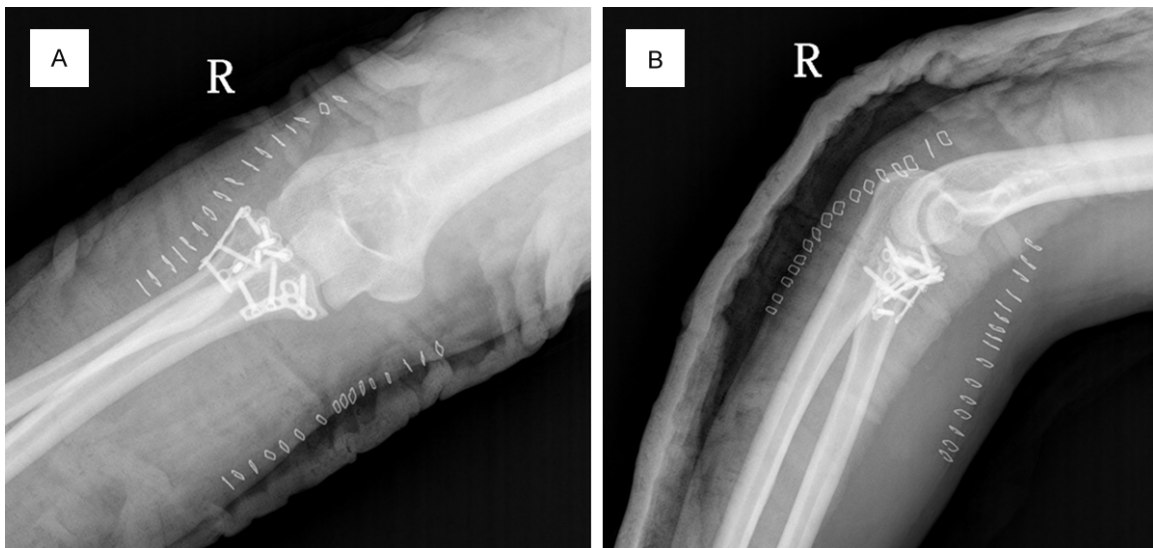


Figure 5. Anteroposterior and lateral film of the right elbow after surgery.

for favorable clinical outcomes [4, 5]. Both the standard protocols proposed by Pugh et al. [6] and Zhang et al. [7]. for treating the terrible triad of the elbow have emphasized: (1) Restoration of the anatomical structure of humero-radial joint (fixation or replacement of the radial head); (2) Reduction and fixation of the coronoid process fracture; (3) Repaired or restoration of joint capsular injuries to the lateral stability of the LCL complex, the common extensor origin; (4) Repair the MCL when needed; (5) Encourage early active elbow exercise to avoid stiffness.

There are various approaches have been reported to treat the terrible triad of the elbow. The posterior approach is advocated in most literature because both the medial and lateral sides of the elbow can be exposed [8, 9]. However, this approach has some deficiencies such as long skin incision, wide dissection, severe soft tissue damage, and the risk of hematoma formation, heterotopic ossification, even flap necrosis [6, 10, 11]. We chose a combination of lateral (Kocher approach) and anteromedial approaches, which is less traumatic, more effective for fracture exposure [7],

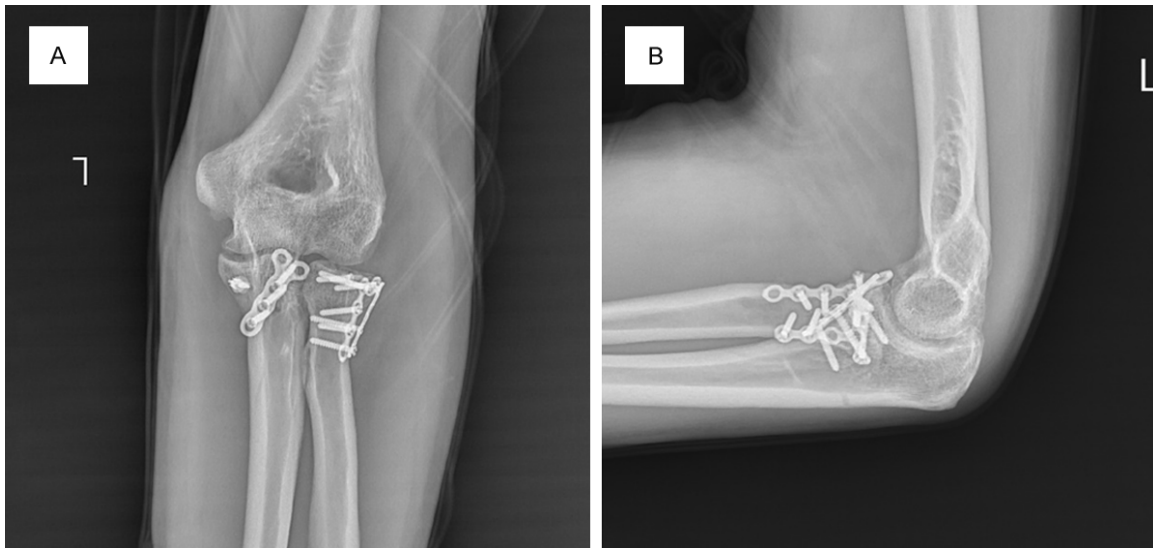


Figure 6. Bone union of the left elbow at 3 months after surgery.

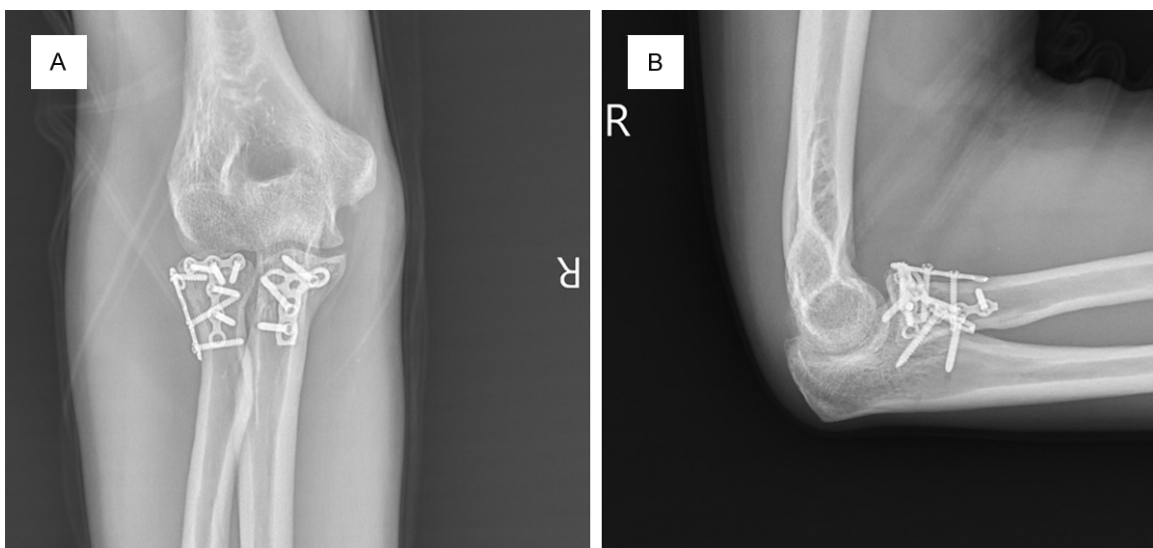


Figure 7. Bone union of the right elbow at 3 months after surgery.

and more directly to check the capsuloligamentous structures. In this case, the fragments of bilateral radial heads ran to the ulnar side, we found the fragments in the anteromedial approaches easily, then reduced the radial head and fixed with a T-type buttress plate in the lateral approach. The radial head plays an important role as a secondary stabilizer of the elbow joint to against valgus load and posterior translation, so we tend to first address the radial head fracture, which can also facilitate the fixation of coronoid fracture. Furthermore, we would rather perform internal fixation for the

radial head fracture rather than excision or replacement with a metal prosthesis, even though radial head replacement is recommended for fractures with more than 3 fragments [12, 13]. Additionally, we did not observe any complication with plate fixation of the radial head fracture that reported in the literature such as interosseous nerve injury, loss of forearm rotation, nonunion, and implantation failure [14, 15].

Whether to repair the MCL in the terrible triad of the elbow joints is still not conclusive from

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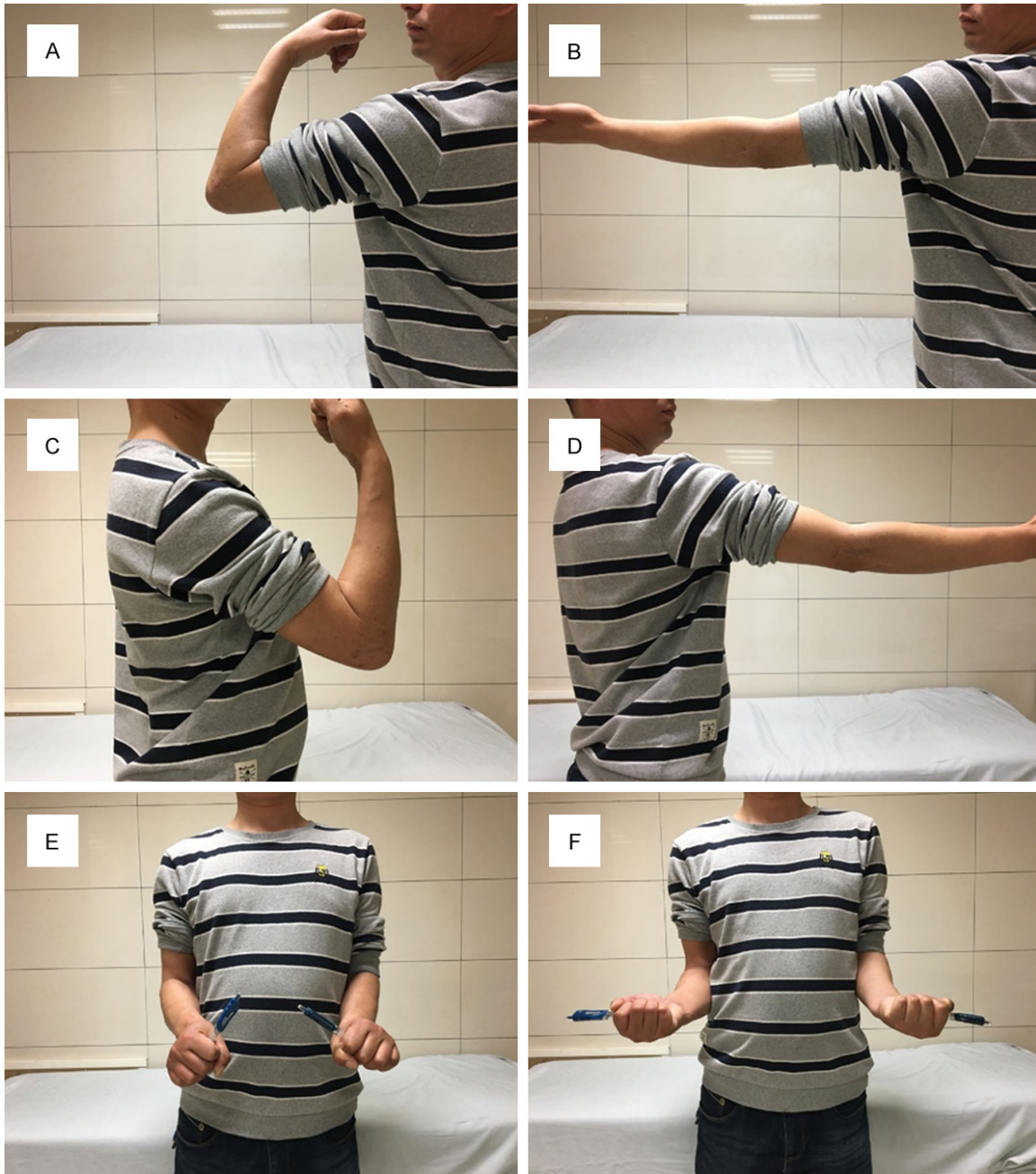


Figure 8. Joint function of bilateral elbows.

reading the literature. Forthman et al. obtained good outcomes without repairing the MCL in terrible triad cases, and they found that the MCL can heal spontaneously and restore the function by avoiding varus stress [16]. In another 13 cases of the terrible triad, Jeong et al. restored both the MCL and LCL in 8 patients, and satisfactory outcomes were noticed [17]. In this case, we repaired the MCL in the left side with a non-absorbable suture anchor due to

apparent valgus instability was observed during the surgery, and it is worth mentioning that we needed to pay attention to the prophylactic decompression of the ulnar nerve in the process.

Conclusion

We describe a rare case of bilateral terrible triad of the elbow joints with the fragments of

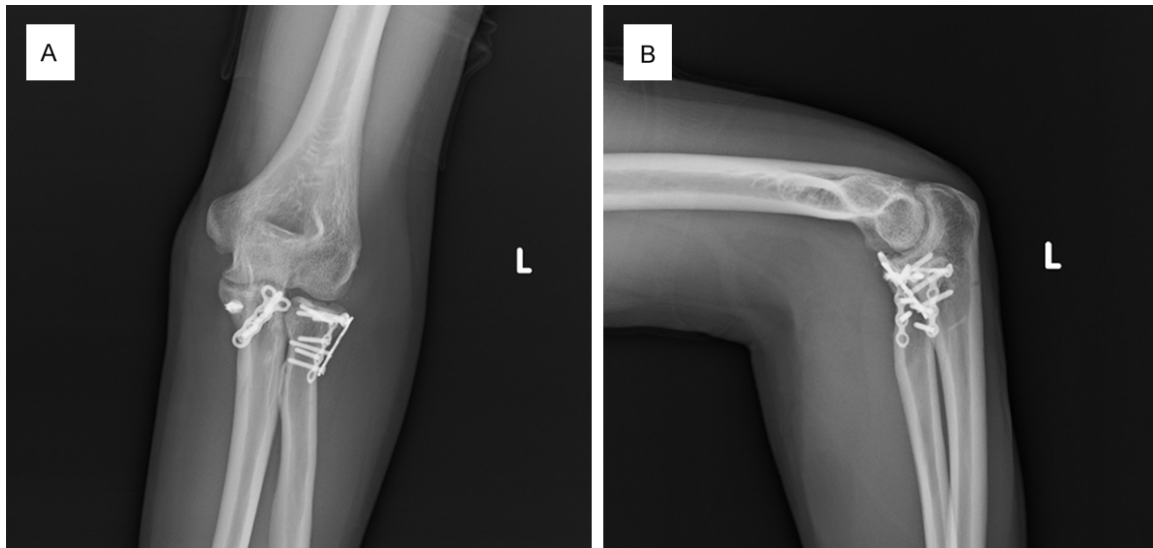


Figure 9. Fracture healing and no heterotopic ossification were noted in the left elbow at 12 months after surgery.

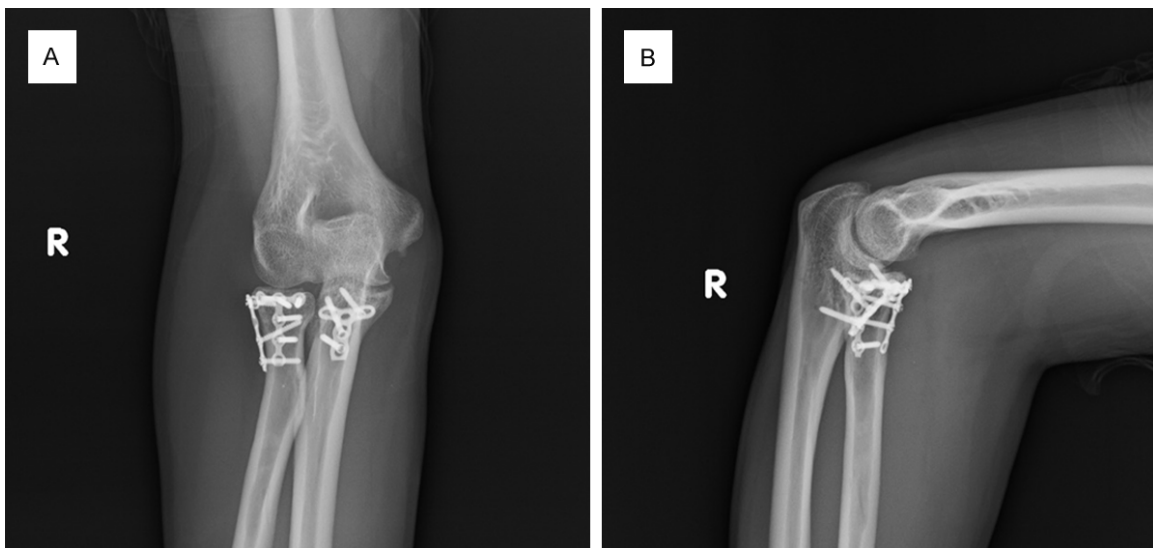


Figure 10. Fracture healing and no heterotopic ossification were noted in the right elbow at 12 months after surgery.

the radial head ran to the ulnar side. 3D CT reconstruction is a practical tool to support diagnosis and formulate surgical plan. Our results indicate that the combination of lateral and anteromedial approaches is a reliable method for the management of this severe injury; it also provided excellent clinical and radiographic outcomes.

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Disclosure of conflict of interest

None.

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