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Case Report

Osteosynthesis of fractures after elbow ankylosis treated with an Ilizarov external ring fixator: A case report

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ABSTRACT

Treatment with an Ilizarov ring external fixator is less invasive of soft tissues than is open reduction and internal fixation (ORIF) surgery. Operative treatment of fractures with an Ilizarov ring external fixator after elbow ankylosis has not been reported. We describe our experience with this surgical treatment (i.e., placement of an Ilizarov external ring fixator) for a fracture that occurred after elbow ankylosis. A 63-year-old Japanese woman fell from standing height onto her left elbow. A transverse fracture was observed at the ankylosed site and the patient underwent surgery 8 days after the injury. The surgery was performed in the prone position under general anesthesia. Four months postoperatively, the fracture showed bone union and the fixator was removed. At the 1-year follow-up, she had no pain and no nerve palsy, can could perform the same activities as before the injury. Thus, treatment with an Ilizarov ring external fixator for a fracture around the elbow joint is a minimally invasive procedure that affords firm fixation and achieves fracture-site compression. Osteosynthesis of fractures after elbow ankylosis treated with an Ilizarov external ring fixator has not been reported previously. This technique was less invasive to the soft tissues and was considered to be a good surgical treatment to achieve osteosynthesis of fractures after elbow ankylosis.

Introduction

Treatment with an Ilizarov ring external fixator is less invasive of soft tissues than is open reduction and internal fixation (ORIF) surgery. The fixation stiffness can be modified during the course of the treatment to enable proper manipulation of the healing process [1]. Hence, external fixation offers various advantages compared with ORIF. It is a minimally invasive technique, the application of which is a valuable tool in the management of some cases of fracture and other complicated musculoskeletal conditions [1]. Operative treatment of fractures with an Ilizarov ring external fixator after elbow ankylosis has not been reported previously.

We describe our experience with the placement of an Ilizarov external ring fixator to treat a fracture after elbow ankylosis.

Case presentation

The patient was a 63-year-old Japanese woman who had sustained a fracture around the elbow joint 51 years prior to presentation (when she was 12 years old). After operative treatment of this fracture, the elbow joint developed bony ankylosis. The medical records of that event had been discarded, and her and her parents' memories were ambiguous regarding the causes of ankylosis.

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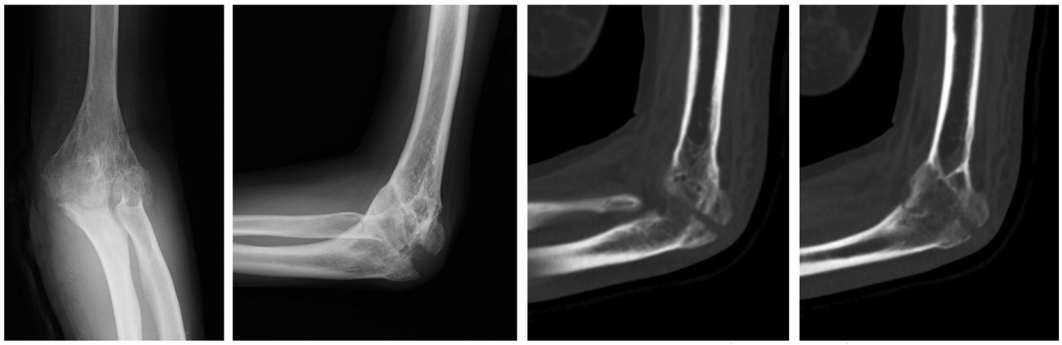

Fig. 1. AP and lateral X-ray of the left elbow, sagittal CT images.

Regarding the current event, the patient fell from a standing height onto her left elbow. She was neurovascularly intact on examination, with pain at the elbow, and visited an orthopedic clinic. The diagnosis was a fracture and her left arm was braced. She was then referred to our hospital, which she visited on the day after the injury. Radiography and computed tomography (CT) revealed complete ankylosis of the humeroulnar joint and arthritic changes in the radiohumeral joint. A transverse fracture was observed at the ankylosed site (Fig. 1, X-ray and CT). Moreover, the patient exhibited strong swelling around the elbow joint, and several blisters formed on the dorsal side. She was waiting for surgery with splinting. The patient had a scar inside the elbow, which was suspected to result from the previous surgical wound. We decided that ORIF was difficult because the soft tissue part was thin and poorly extensible; thus, we opted for treatment with a ring-type external fixator.

The patient underwent surgery 8 days after the injury. The surgery was performed in the prone position under general anesthesia. Four TrueLok (Orthofix, Lewisville, Texas) rings were used (130 mm, 5/8 semi-circular rings). Olive-stopped (1.8 mm) K-wires (Orthofix, Lewisville, Texas) were inserted percutaneously through the humerus, from the lateral to the medial side, otherwise through the ulna, from the ulnar (medial) to the radial (lateral) side, and fixed after tensioning to 80 Nm. The two half pins were inserted in the humerus on orthogonal surfaces, and one half pin was inserted in the ulna. Four Rapid Adjust Struts (Orthofix, Lewisville, Texas) were installed across the fracture site. These struts were installed in the direction perpendicular to the fracture surface (Figs. 2 and 3).

Posterior interosseous nerve palsy occurred after surgery. The paralysis resolved naturally 2 weeks after surgery. One week after the surgery, the fracture site was compressed three times using the Rapid Adjust Struts, by 1 mm each time. Four months post-operatively, the fracture showed bone union and the fixator was removed (Fig. 4). At the 1-year follow-up, the patient had no pain

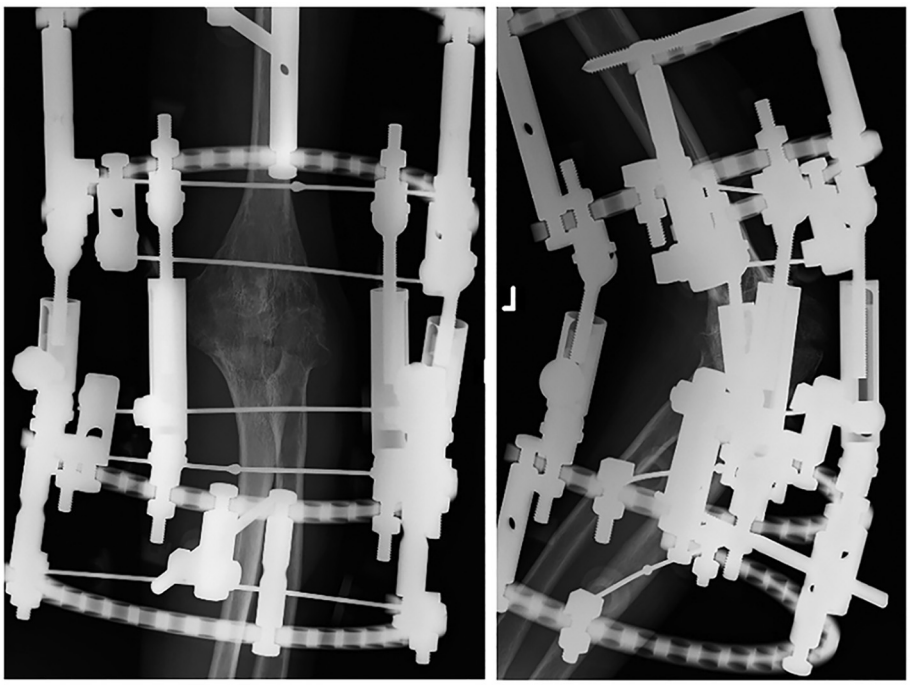

Fig. 2. Postoperative X-ray.

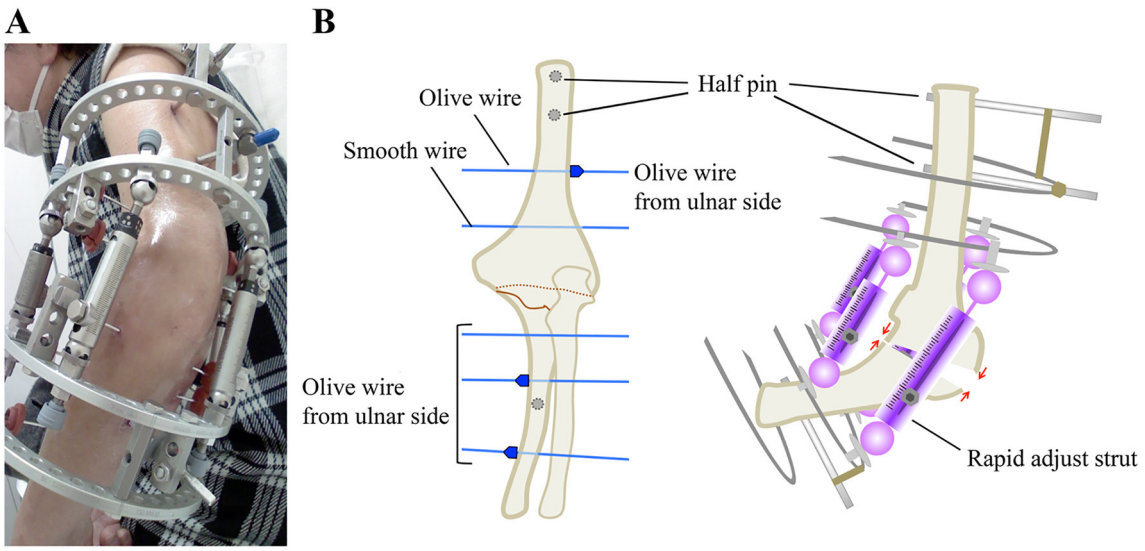

Fig. 3. (A) Postoperative view of the left arm and the Ilizarov ring external fixator.
(B) Schematic representation of the Ilizarov ring external fixator.

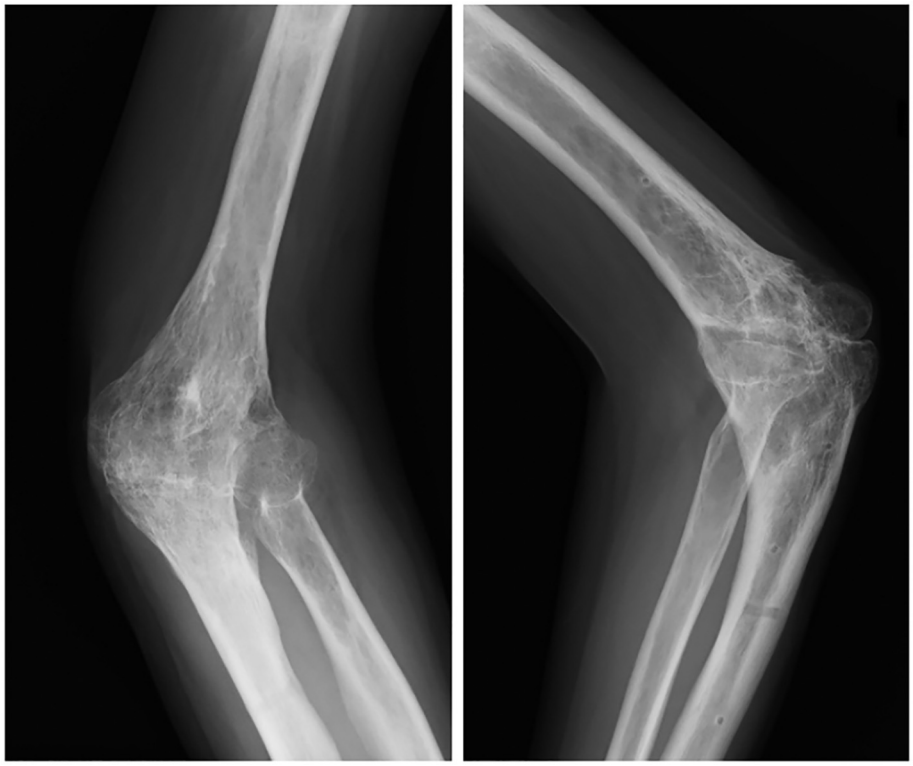

Fig. 4. The fixator was removed and bone union was observed 4 months after surgery.

and no nerve palsy and was able to perform the same activities as before the injury.

Discussion

Total elbow replacement (TER) has been reported as a surgical treatment for elbow ankylosis [2–4]. According to Peden [2], the postoperative complication rate of post-traumatic elbow ankylosis is as high as 25%. Initially, there were no reports of primary TER to treat a fracture after elbow ankylosis. Subsequently, 15 years [3], 16 years [2], and 31 years [4] have been reported as the time since

the initial trauma, because of elbow ankylosis after TER. In the current case, 51 years had elapsed since the initial trauma because of elbow ankylosis. Furthermore, the thinning of the soft tissue, especially on the elbow extension side, was remarkable, and blisters had formed at the same site. Therefore, TER was not selected because it is invasive and soft tissue complications were considered likely to occur at this time.

There are few reports on the internal fixation of fractures of the elbow after ankylosis. Two previous cases were treated with an IP-XS nail which with minimal invasiveness to soft tissues, without complications [5]. Patients with an external fixator may experience mild discomfort, whereas patients treated with ORIF do not feel discomfort from the implants. Our study has a limitation in that we could not obtain any patient-reported outcomes. This is an important consideration when choosing treatment using the external fixator.

Strong fixation is necessary for transverse fractures located at the shaft of long bones. In the present case, the humerus and forearm were fused, and the fracture occurred at the ankylosed site, which is similar to a transverse fracture at the shaft of a long bone. In this case, the fracture site was not expanded, and compression was applied at the fracture site using an Ilizarov ring external fixator, to achieve bone union. Although it is a mechanical test in arthrodesis, it has been reported that the Ilizarov ring external fixator is superior to headless screw fixation regarding compression force of the fixation part [6]. In addition, it has been reported that the external fixation force was effective for arthrodesis fixation of the knee joint [7]. External fixation is an alternate method for achieving fracture-site compression and has the advantage of allowing postoperative compression adjustment when necessary.

Treatment with an Ilizarov ring external fixator for a fracture located around the elbow joint is a minimally invasive technique that affords firm fixation and achieves fracture-site compression; therefore, good clinical outcomes have been reported for surgery on fractures of the distal humerus in elderly patients [8] and periprosthetic humeral shaft fracture after TER in an osteoporotic patient [9]. Osteosynthesis of fractures after elbow ankylosis treated with an Ilizarov external ring fixator has not been reported previously. This technique is less invasive to the soft tissues and is considered to be a good surgical treatment for osteosynthesis of fractures after elbow ankylosis.

Funding

No funds were obtained for doing this research.

Ethical statement

The case was fully compliant with the ethical standards of medical case report. Institutional Review Board (IRB) approval was not required.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Declaration of competing interest

The authors have no conflicts of interest.

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