A CASE REPORT: SECONDARY DISPLACEMENT AFTER OSTEOSYNTHESIS HUMERAL SHAFT FRACTURE BY PLATING

Tran Quoc Doanh*, Nguyen Anh Sang*,**

ABSTRACT

A 53-year-old woman, the patient had a humerus fracture 4 months before admission, had undergone surgery with plating. Currently, the patient went for a follow-up examination and found that the fracture was displaced secondary and failure of plating. No history of trauma was recorded. There was no evidence of damage to the radial nerve. We report a clinical case of secondary displacement of a humeral shaft fracture after an open reduction internal fixation by plate to discuss the treatment of this case.

Keywords: *humeral shaft fracture, osteosynthesis, secondary displacement*

I. INTRODUCTION

Humerus fractures account for 7.4% of all fractures in adults [1]. Clinicians have many surgical options when encountering a humeral shaft fracture because each method has its own advantages and disadvantages. Recent reports suggest that plating fixation is a good treatment method for humeral shaft fractures [2], [3]. However, encountering complications of the method is inevitable. We report a clinical case of secondary displacement of a humeral shaft fracture after an open reduction internal fixation by plate to discuss the treatment of this case.

** Military Hospital 175*
*** Vietnam Military Medical University*
Responsible person: Nguyen Anh Sang
Email: dr.anhsang@gmail.com
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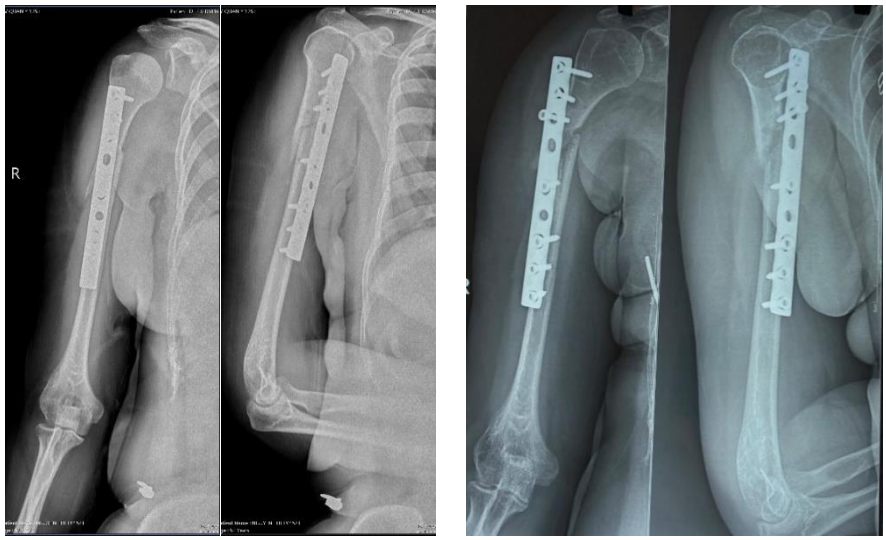
II. CLINICAL CASE SUMMARY

A female patient, her name is Nguyen Thi T., born in 1971 and admitted to the hospital complaining of right arm pain.

Through medical examination, the patient said that about 4 months before being admitted to the hospital, she had an accident and fell with her right elbow onto the hard floor. At that time, she was diagnosed with a closed fracture of the right proximal third humeral shaft and was treated with surgery using locking plate. After surgery, x-rays showed that was to achieve stability and restoration of the axis, then the patient was discharged when her condition stabilized. The patient had a follow-up examination at the local medical facility and had an x-ray to check the fracture. At the present time, after 4 months of surgery, a follow-up examination found that the fracture was secondaryly displaced, failure of plating, which was not caused by trauma. When coming to us, she complained of pain in the area corresponding to the old incision site, and limited movement of her right shoulder and elbow due to pain. On clinical examination, no radial nerve damage was detected. The radial pulse must be clearly discernible, with pink fingertips. X-ray images showed a failure of plating and secondary displacement of the humeral shaft fracture (Figure 1).

We explained to the patient that she will have surgery to remove the old screws and plate, remove fibrous tissue, renew the fracture, reduction the bone and place a new

plate, as well as the the complications during and after surgery. In the operating room, we make an incision in the skin along the antero-external line along the old surgical scar. Conduct dissection on the old fracture to reveal the plate, remove them, remove fibrous tissue and renew the fracture, reduction, tie reinforced steel threads, place the new plate, screw in and re-check the fracture under the x-ray (Figure 2). Then close the wound.



a b

Figure 5: ***X-ray of the patient's right upper-arm upon admission to the hospital a: 1 month after bone fusion surgery; b: 4 months after bone fusion surgery***

(Source: Author's research materials)

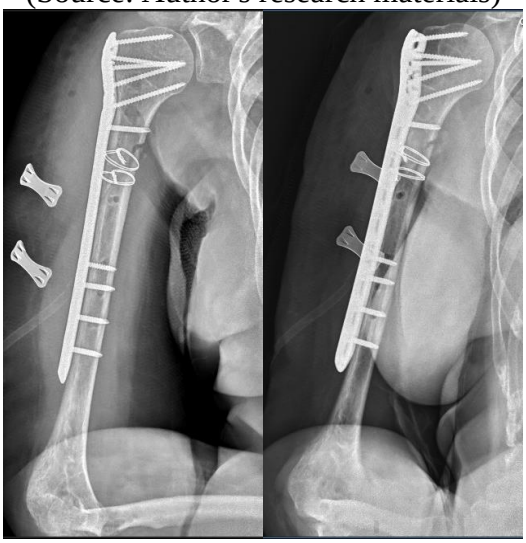


Figure 6: ***The image depicts the reduction and fixation of the humerus shaft***

(Source: Author's research materials)

After surgery, the patient wears a reinforced Desault belt. At the time of discharge, the patient was satisfied with the results of the osteosynthesis and the pain was reduced.

III. DISCUSSION

3.1. Use a plate in the osteosynthesis humerus shaft

The skin incision is considered depending on the location of the fracture, accordingly, the anterolateral incision is often chosen in cases of fractures in the proximal third and middle third of the humeral shaft [4]. With the initial diagnosis of a closed fracture of the proximal third of the right humerus, the choice of anterolateral skin incision was appropriate.

The length of the plate and the location of the screw will affect the force load on the screw. The screw closest to the fracture will bear the greatest force, at the same time, when the plate is used as an internal fixation frame, the force acting on the plate is mainly bending force [5]. Literature suggests screw placement in the hole closest to the fracture, followed by the holes furthest away [6]. If the two screws near the fracture site are too close together, the bending force on the plate will be concentrated, which can create conditions for the plate to fatigue and break. On the contrary, when the two screws closest to the fracture site are placed far apart, the bending force on the plate will be dispersed, helping to reduce plate damage [5].

For complex fractures, indirect reduction and bridging plate fixation are more commonly used. To choose the length of the internal plate in a complex fracture, first determine the extent of the fracture, then select a plate with a length three times the length of the fracture. When placing a bridging plate, 50% of the screw holes of the plate can be screwed. At this time, the length of the plate should be divided into three segments: the segment between the two screws closest to the fracture is the broken bone area where no screws will be inserted; for the proximal and distal segments, a minimum of three screws should be placed; if the patient has osteoporosis, the number of screws can be increased [5]. A study on frozen cadavers of elderly people with osteoporosis, to compare the mechanical stability of using two screws or three screws on each side of the plate. Six pairs of humerus bones were damaged to simulate a complex fracture in the shaft of the bone, the broken bone ends did not contact each other, and then an eight-hole plate was placed on the shaft of the humerus, and is fixed with four or six screws through the two cortical bones. Test results showed that the addition of a third screw in the plate structure did not further increase mechanical stability under axial, bending, or torsional loading. The average torque to failure was 23.5 ± 3.7 Nm in the construct with two locking screws per segment, compared with 20.4 ± 2.8 Nm in the construct with three locking screws per segment [7].

For simpler fractures, such as transverse or short oblique fractures, axial compression screw fixation is recommended, taking advantage of the oval screw holes, The plate must be bent before placing it to compress it into the bone cortex [4] because if the fixation plate is not pre-curved to fit the bone axis, two fracture ends at the fixed position will be separated on the opposite side of the plate, causing instability of the plate [5], as for long oblique or twisted fractures, a neutral splint should be placed, and lag-screw used to compress the fragments[4].

In this case, at the time of admission, we found that during the first surgery, the plate used was not bent to fit the structure of the humerus shaft, therefore, the length of the plate at each fracture is not guaranteed, along with compression screws, which will lead to

concentrated bending force on the plate and increase the risk of screw slipping (Figure 1). After re-surgery, using a suitable type of plate to ensure the length, the postoperative results have brought more satisfaction to the patient (Figure 2).

3.2. Post-operative care

After surgery, it is necessary to immediately check the patient's neurological and vascular signs. The goals of treating humerus fractures are to fully restore limb function and prevent secondary complications after the injury. Gentle exercise is recommended 2 to 3 days after surgery, in the first days after surgery, you can hang your arm or wear a Desault belt to help improve post-operative pain. Avoid weight lifting for 3 to 4 weeks. In complex fractures, active rotation of the upper-arm should be limited until the bony callus is visible. Try to restore maximum muscle recovery in all of the following major muscles: pectoralis major muscle (shoulder adduction), deltoid muscle (shoulder flexion, extension, and abduction), biceps brachii muscle (elbow flexion, forearm flexion and shoulder flexion), triceps brachii muscle (elbow extension and shoulder adduction) [8].

IV. CONCLUSION

Open reduction internal fixation by plate in the treatment of humeral shaft fractures has many advantages. However, to limit possible postoperative complications, the surgeon needs to do a clinical examination and X-ray to be prepared in choosing the incision, plate length and placement, as well as instructions to help the patient recover function after surgery.

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