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Surgical treatment of the Bipolar Segmental Clavicle Fracture: A case report

the Bipolar Segmental Clavicle Fracture

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Abstract

BACKGROUND

Shoulder injuries caused by trauma are common, including clavicle fractures. Even so, bipolar segmental fracture of the clavicle is extremely rare and seldom reported. Therefore, there is still a controversial issue about how to treat these bipolar segmental clavicle fractures.

CASE SUMMARY

A 56-year-old security staff who fell down from an electric bike was taken to our emergency room. There was no loss of consciousness and no pain elsewhere. And there was no numbness of his all fingers. X-ray and 3D computed tomography (CT) revealed that there was bipolar segmental clavicle fracture of the patient's right shoulder. An operation was performed with both open reduction and internal fixation. After one-year follow-up, he had full functional motion of the injured shoulder with only mild discomfort left.

CONCLUSION

We provided a rare case of bipolar clavicle fracture in the right clavicle. We hold the opinion that the patients would get better clinical and radiological outcomes by early and correct operation.

Key Words: bipolar segmental clavicle fracture; arm sling; open reduction and internal fixation; acromioclavicular hook plate; -; -

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Core Tip: Highlights 1) A rare case of bipolar clavicle fracture due to trauma 2) The choice between conventional conservative treatment and early surgery 3) Early operation provides a possibility for patients to recover well later

INTRODUCTION

Clavicle fractures are common in clinical practice. More than 70% of the clavicle fracture occurs in the midshaft region, which is on account of the anatomy of the clavicle⁽¹⁾. However, simultaneous fractures of the proximal and distal end of the clavicle which is known as the bipolar clavicle fracture are not often referred in the literature with the low occupancy of the clavicle fractures. It is often caused by high energy damage, for example, car accidents, falling down from high places, direct violence and so on⁽²⁻⁴⁾. It still remained controversial ranging from non-operative to surgical management. In the past, the traditional conservative treatments are most used with a figure-8 sling⁽⁵⁻⁷⁾. However, with the development of people's knowledge and notion, more and more evidence proves that surgical management results in a more reliable and earlier return to full function with a lower complication rate. In this article, we treat the patient who has right bipolar segmental clavicle fracture.

CASE PRESENTATION

Chief complaints

A 56-year-old security staff presented to our hospital with pain of right shoulder following a fall from an electric bike for one day.

History of present illness

The patient fell on his right shoulder the day before, and felt swelling and pain in his right shoulder but without coma, dyspnea or numbness of his upper limbs. He did not go to the hospital immediately after his falling. Subsequently, the patient felt there was increasing swelling and pain in his right shoulder, accompanied by limited movement

at the right sternoclavicular joint. He visited the emergency room of our hospital, and was sent for imaging.

History of past illness

The patient was previously healthy. He denied the history of diabetes, hypertension, coronary heart disease, other major surgical trauma, or food and drug allergies.

³ *Personal and family history*

The patient had no relevant personal or family history.

Physical examination

The patient was conscious with stable vital signs: the ² temperature was 36.6°C; pulse rate was 75 beats/min; respiratory rate was 21 breaths/min; blood pressure was 138/87 mmHg; and oxygen saturation was 99%. His right shoulder and right sternoclavicular joint swelled, and showed local congestion. The right upper limb couldn't be raised above the shoulder. No limb numbness. Muscle strength and radial artery pulsation of the injured limb was normal.

Laboratory examinations

⁷ Blood analysis revealed the following: White blood cell count, $5.5 \times 10^9/L$; red blood cell, $3.11 \times 10^{12}/L$; haemoglobin, 113 g/L; and platelet count, $116 \times 10^9/L$. Biochemical analysis revealed the following: Total protein, 56.9 g/L; albumin, 34.8 g/L; creatinine, 100.4 $\mu\text{mol}/L$; urea nitrogen, 3.12 mol/L; prothrombin time, 12.0 s; prothrombin activity percentage, 100%; activated partial prothrombin time, 41.3 s; and D-dimer, 2.41 mg/L. The findings of routine urine and stool examinations were normal, as were the findings of electrocardiography.

Imaging examinations

On standard radiograph of the patient, both the proximal and distal end of the clavicle fractures were detached (figure1). In addition, 3D computer tomography (CT) scan revealed the degree of the displacement and classification of fracture (figure2). The distal end of the clavicle was displaced upward and the proximal end anteriorly. It showed the fracture instability and the risk of non-union or malunion.

FINAL DIAGNOSIS

Bipolar segmental clavicle fracture

TREATMENT

After admission, we decided to treat the patient with open reduction and internal fixation. The surgery was performed four days after the injury with the consent of the patient. The patient underwent surgery under general anesthesia and propped up 30 degrees. The skin incision was made over the proximal and distal end of clavicle and the fractures were showed on direct vision. On the proximal end, one cortical screw and kirschner wire were used to fix the free bone fragment, followed by a fragment contoured T plate. The distal end of the clavicle was displaced upward. And the rupture of acromioclavicular ligament led to the subluxation of acromioclavicular joint. An acromioclavicular hook plate was placed to stabilize the fracture and dislocation.

OUTCOME AND FOLLOW-UP

On radiographic evaluations of post-operation, reduction was observed to be excellent on fracture line and dislocation (figure3). The patient exercised with supervised range of right shoulder's motion horizontally. Gradually, active motion for the right shoulder joint was allowed as tolerated six weeks after surgery. Ten weeks after surgery, the patient went back to work. The patient could elevate his right shoulder forward up to 150 degree after 4 mo' follow-up. X-ray and 3D CT scans showed that the bone union of

bipolar segmental clavicle fractures was complete (figure4). At the one-year follow-up, the implant was removed because of discomfort brought by the effect of implant.

DISCUSSION

Clavicle fracture represents 2-5% of all types of fracture, even 5-10% in young adults⁽⁸⁾. However, bipolar clavicle fractures are rarely reported in the literature. Due to this rarity, the treatment of bipolar clavicle fractures is still not consensus. It was reported that it suggests using age and activity demands as criteria in deciding the approach to treatment. Elderly patients were managed conservatively, while young and active ones tended to be operated. But there is an opposite point. Some articles reported that non-surgical treatment leads to gross deformity of the clavicle and poor function. The patients could persist the instability of the shoulder even if associated with low-energy trauma. And therefore, we selected surgical intervention for our patient.

It is also a debatable issue to select the internal fixation material. Locking plate is often used to treat clavicle fractures. Takahisa Ogawa ¹*et al* selected internal fixation of only the distal end in the bipolar segmental clavicle fracture, while the proximal end was treated conservatively in their report⁽⁹⁾. After the operation, an arm sling was used to prevent the proximal clavicle fracture displacement for one month. Three years after operation, the patient existed neither pain nor hypofunction. In their case about the left segmental bipolar fracture of the clavicle, Varelas *et al* chose conversational treatment with regard to the patient's age and low functional demand firstly. After one week, the computer tomography underlined a displaced medial fracture with shortening of the clavicle bone. They selected two locking compression anatomical plates with a lateral extension⁽¹⁰⁾.

In our case, one 3.5mm cortical screw and one kirschner wire were used to immobilize the broken bone in the proximal end. The proximal clavicle fracture was secured by another 9-hole reconstruction locking plate to avoid rotational displacement. The distal end fracture was fixed with a 7-hole locking hook plate. Wu k *et al* drew a conclusion that hook plate fixation was associated with statistically better shoulder function and

more stability^(11, 12). Since day one after surgery we instructed the patient to activate the shoulder joint and raise right upper limb above the shoulder gradually. Three months later, the fracture line of the clavicle disappeared and healed.

CONCLUSION

We provided a rare case of bipolar clavicle fracture in the right clavicle. We hold the opinion that the patients would get better clinical and radiological outcomes by early and correct operation.

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