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Methodology Article

Surgical Reatment of Acromioclavicular Dislocation-reconstruction of Coracoclavicular Ligament

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Abstract: Background: Dislocation of acromioclavicular joint is a relatively common injury, accounting for about 9% to 10% of all shoulder injuries. There are many surgical methods to treat dislocation of acromioclavicular joint, including fixation through acromioclavicular joint, intercoracoid fixation and ligament reconstruction. However, at present, more and more attention has been paid to biological reconstruction technology, and related technologies have also been greatly developed. Methods: The semitendinosus tendon from the body is used as the material for the reconstruction of the ligament. The reconstruction holes were made at the original attachment of the clavicular conical ligament and the trapezium ligament, and 10 absorbable lines were taken to pass through the lower part of the coracoid process through the two reconstruction holes respectively. The semitendinosus tendon was pruned, and the two ends were inserted through the reconstruction holes respectively to reach the lower part of the coracoid process. While pressing down on the clavicle, 10 absorbable lines were knotted on the surface of the clavicle, and the semitendinosus tendon was knotted below the coracoid process. Finally, two u-shaped loops were formed to complete the reconstruction of the coracoid ligaments. Results: The intraoperative and post-operative imaging examination indicated that acromioclavicular joint dislocation was well treated. Conclusions: This kind of surgery has many advantages over traditional plate fixation, such as reducing postoperative complications, shortening the length of hospital stay and so on.

Keywords: Semitendinosus Tendon, Acromioclavicular Dislocation, Anatomical Reconstruction

1. Introduction

The acromioclavicular joint is a joint where the medial border of the acromion is connected to the outer end of the clavicle. The devices to maintain the stability of the acromioclavicular joint include: (1) Joint capsule and acromioclavicular ligament; (2) Coracoclavicular ligament (rhombic ligament and conical ligament); (3) Attachment of deltoid and trapezius muscles. The coracoclavicular ligament is the main stabilizing device [1]. Dislocation of acromioclavicular joint is a relatively common injury, accounting for about 9% to 10% of all shoulder injuries. There are many surgical methods to treat dislocation of acromioclavicular joint, including fixation through acromioclavicular joint, intercoracoid fixation and ligament reconstruction [2, 3, 4]. At present, clavicle plate fixation is the most widely used in China [5], and this article introduces a surgical method to treat dislocation of acromioclavicular joint by using autologous tendon reconstruction of coracoclavicular ligament, and compares this surgical method with traditional surgical methods.

2. Operation Method

2.1. Preparation Before Operation

After successful general anesthesia, the beach chair position was taken, protect waist with a lumbar pillow, and the surgical field was routinely sterilized.

2.2. Autologous Tendon (Semitendinosus Tendon Semitendinosus, ST)

(1) A longitudinal incision was made at the lower and medial

1cm of the tibial tubercle, and the skin was cut directly to the goose foot. The ST attachment point was found with bending forceps, lifted to higher than the skin incision with bending forceps, and sutured and fixed with absorbable sutures at the stop point. Bend the knee for 60°, pull the rectus tendon at the proximal end, cut off the ST from the farthest end, and remove the tendon from far to near with a 6 mm wide tendon harvester. Close deep fascia and skin incisions. (figure 1)

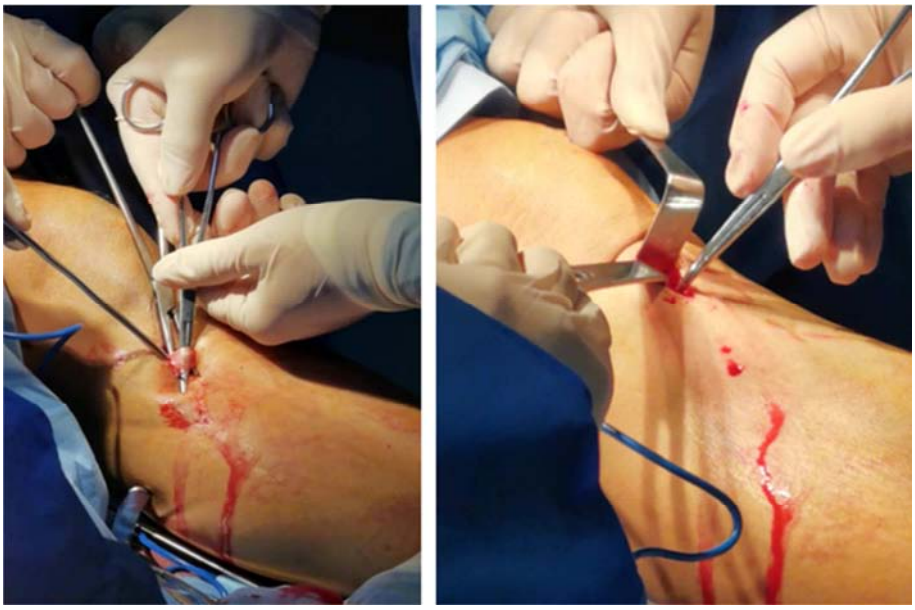

Figure 1. *Autologous tendon (semitendinosus semitendinosus, ST).*

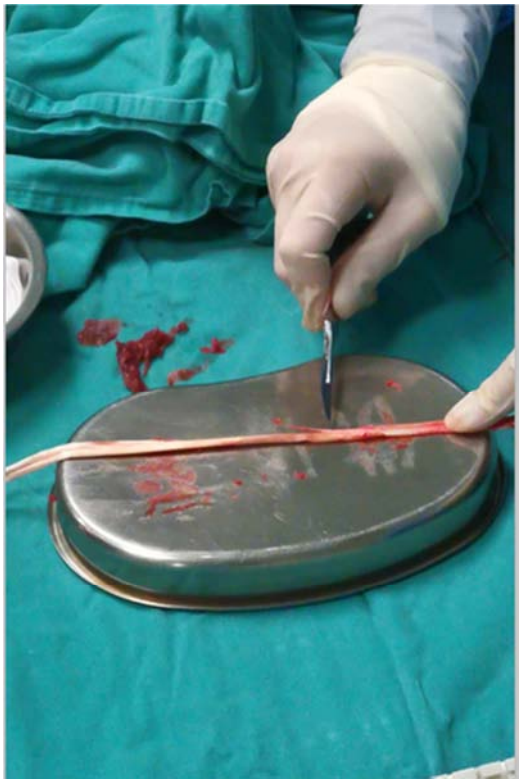

Figure 2. *Processing the removed ST.*

(2) The ST was straightened and placed on the tendon table to measure the length and record the length of the ST, which was generally about 20-25cm. The tendon abdominal muscle was scraped off with the back of the scalpel, and the ST was sutured with absorbable suture to form a single-strand width 4.5cm graft. The tendon in the folded end 3cm was sutured to form a strand. Then ST was prestretched 10-15 min, with a force of 20 N and 10 absorbable sutures were prepared, which were set aside with ST. (figure 2)

2.3. Reconstruction of Coracoclavicular Ligament

(1) The longitudinal incision from the coracoid process to the clavicle began from the projection point of the coracoid process and extended upward to the lateral side of the clavicle to reach the acromial position. The length of the incision was about 6-7 cm. Carefully cut the skin, cut and separate the subcutaneous tissue. The deltoid-trapezius fascia should be cut along the superior edge of the clavicle, along the natural boundary between the trapezius and the posterior part of the clavicle and the triangle. The natural boundary between the starting point of the muscle and the front of the clavicle; the incision should extend medially beyond the stop of the conical ligament, outward beyond the anterior 1/3 of the acromioclavicular joint and acromion, and reach the bone surface of the upper end of the coracoid process, that is, the attachment point of the original coracoclavicular ligament. Burn the bone surface with an electric knife until completely exposed, fully expose the lateral side of the clavicle and the acromioclavicular joint, remove the soft tissue compression such as the articular disc in the acromioclavicular joint, and avoid affecting joint reduction. (figure 3)

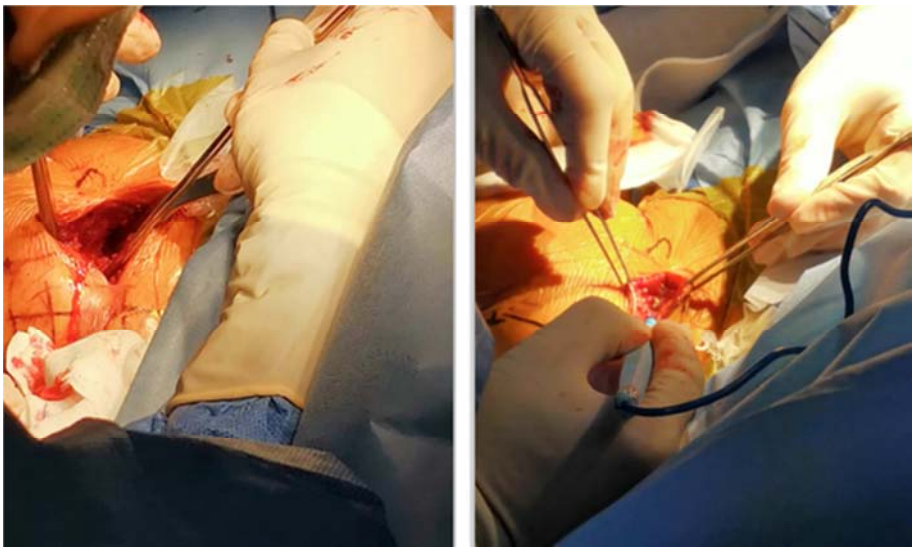

Figure 3. *Exposure of surgical site.*

(2) Using right-angle forceps to pass through the base of coracoid process, holding a PD through the bottom of coracoid process with right-angle forceps, tying the PD line with 10 absorbable lines, and under the guidance of PD line, passing the absorbable line through the bottom of coracoid process.

(3) Perforate the attachment of the conoid ligament and the trapezium ligament: aiming at the central position of the base of coracoid process with the assistance of drilling locator at the position slightly behind the midline of the supraclavicular surface at a distance of 35.4 ±3.4 mm from the lateral edge of the clavicle. Place a 2.5mm kirschner wire into the coracoid process through the upper surface of the clavicle to confirm that the guide wire reaches the center of the coracoid process base, using a 4. 5 mm diameter hollow drill, through which the needle gently drills through the two layers of the clavicle cortex, thereby expanding the drilling. This hole is the reconstruction hole of conoid ligament. The hole was perforated slightly anterior to the midline of the supraclavicular surface at a distance of 21.8 ±2.7 mm from the lateral edge of the clavicle, which was the reconstruction hole of the oblique ligament [6, 7]. (figure 4)

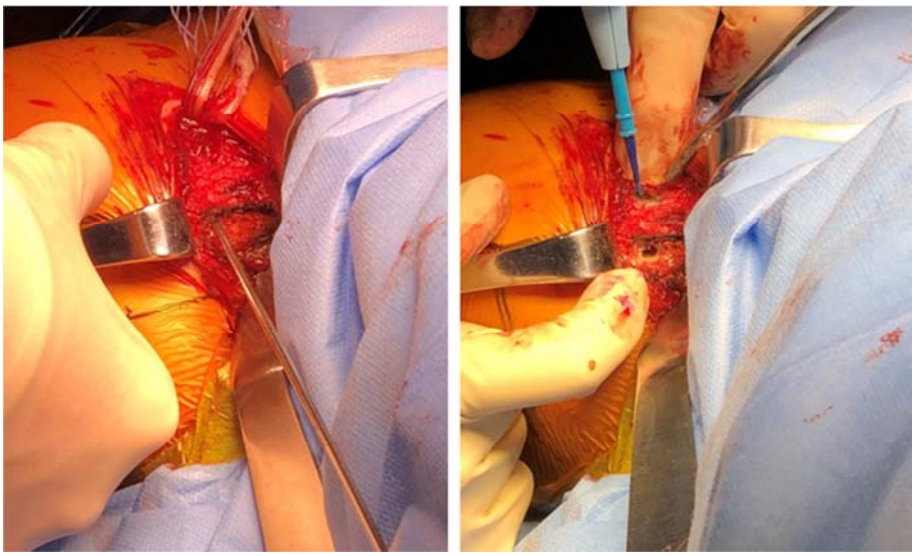

Figure 4. *Reconstruction of clavicular attachment of trapezoidal ligament and vertebral ligament.*

(4) The right angle clamp was used to clip the PD thread through the reconstruction hole of the conical ligament through the bottom of the coracoid process, and the PD line was knotted with 10 absorbable lines, and 10 absorbable lines were passed through the reconstruction hole of the conical ligament under the guidance of PD line, and the other end of the absorbable line was passed through the reconstruction hole of the trapezius ligament again under the guidance of PD line. Ten absorbable lines cross the coracoid process and both ends pass through the reconstruction hole to form an upright U-shaped loop. (figure 5, figure 6)

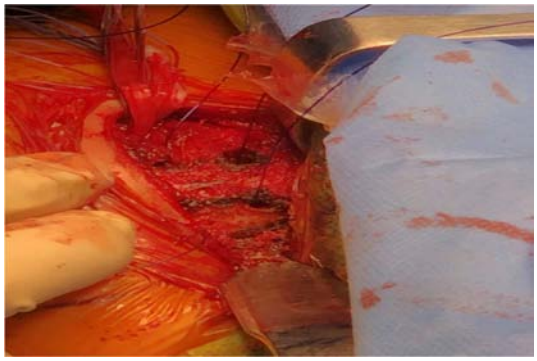

Figure 5. *Piercing the reconstruction hole from below with a guide wire.*

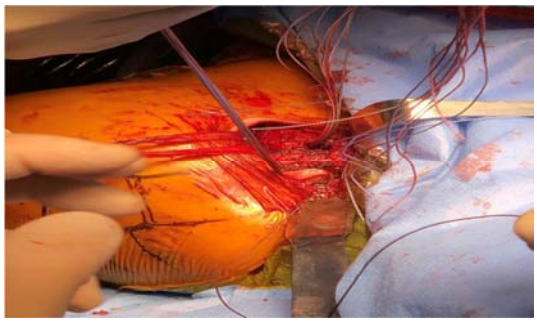

Figure 6. *Guided Absorbable Line through the Reconstruction Hole.*

(5) The absorbable lines at both ends of the ST were passed through the two reconstruction holes respectively from the surface of the clavicle, and the two ends of the ST were summed up at the bottom of the coracoid process to form an inverted U-shaped loop with the bottom on the surface of the clavicle and the two ends below the coracoid process.

(6) The guide wires were taken out and 10 absorbable sutures were knotted to press the acromioclavicular joint at the same time. Finally, ST was knotted at the bottom of the coracoid process to complete the reconstruction of the coracoclavicular ligament. It can be seen that the distal end of the clavicle sinks, C arm fluoroscopy, check the reduction. (figure 7)

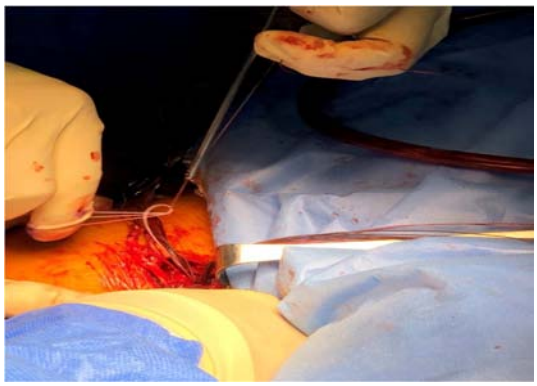

Figure 7. *Knotting absorbable lines on the surface of the clavicle.*

2.4. End of the Operation

After satisfactory reduction, check whether there is active bleeding in the joint cavity, rinse the joint cavity, and suture and close the operation mouth in turn.

2.5. The Effect of the Operation

We compared the X-ray films of patients before and after operation, from the comparison, we can see that the dislocation of acromioclavicular joint has a good reduction effect. (Figure 8, Figure 9)

Figure 8. *DR of shoulder joint after operation.*

Figure 9. *DR of shoulder joint before operation.*

3. Discussion

3.1. This Method Is Compared with the Traditional Method of Using Steel Plate Fixation

(1) The reconstruction of coracoclavicular ligament is based on the anatomical structure of coracoclavicular ligament and conical ligament, which can better reconstruct

the continuity of coracoclavicular ligament and accord with the physiological structure of acromioclavicular joint. And does not interfere with the rotator cuff, does not reduce the second shoulder joint space, reduces the shoulder pain inducement [8, 9].

(2) The reconstruction of coracoclavicular ligament can restore the stability of acromioclavicular joint from the aspects of anatomy and biomechanics, and it does not need to be removed again, which saves the pain and cost of the second operation [10, 11].

(3) The amount of bleeding in this operation was significantly less than that of plate fixation, and the postoperative hospital stay was significantly shortened, which greatly reduced the pain and cost of the patients [12].

(4) Although the operation time of coracoclavicular ligament reconstruction was prolonged, the surgical injury was smaller, the postoperative shoulder function recovered well and the prognosis was better.

(5) Compared with the surgical method of plate fixation, biological reconstruction of coracoclavicular ligament is more acceptable to patients and does not cause patients to have a sense of autonomous foreign body to the surgical site of shoulder joint.

3.2. Suggestions on the Improvement of This Surgical Method

Compared with the allogeneic material, although the biological property of autogenous tendon is better, there is still the possibility of failure of reduction [13] and the possibility of infection after operation [14]. Therefore, we can combine the current coracoclavicular ligament reconstruction techniques with steel plates, anchors and other instruments, and combine the advantages of the two methods to improve the surgical methods of acromioclavicular joint dislocation [15, 16].

4. Conclusion

To sum up, reconstruction of coracoid ligament can be used as an effective and safe method to treat dislocation of acromioclavicular joint.

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