INTRODUCTION

The functions of rotator cuff are reported to be as follows: That is, in the case of elevation movement of the arm, humeral head is lowered to the downward direction, humeral head is pushed to the glenoid cavity, sliding movement is given with the directional change at the humeral head between the humeral head and glenoid cavity, and shock absorber effect is given between the humeral head and the acromion. Whereas, there seems to be less reports demonstrating these functions of the rotator cuff in detail.

In the routine surgical reconstruction for the rupture of the rotator cuff, a massive tear may not be primarily repaired. In such a case, the rupture can be repaired by the patch of teflon or by fascia. Also, as in Debeyre's Method the supraspinatus is separated from the scapula and is transferred to the direction of the humeral head.

All these reconstructing methods are reported to have shown better results.

Now, if the major function of the rotator cuff is the depression of the humeral head downward at the elevation movement of the arm, then, the rotator cuff repaired with the patch by teflon or fascia lata may transmit the force to the humeral head. Also, the rotator cuff repaired by teflon patch or by fascia lata may soon be elongated, thereby, the initial function may not be maintained.

From such viewpoints, the ruptured rotator cuff was investigated for the state before and after surgical reconstruction. Thus, the function of the rotator cuff at the shoulder motion was investigated, thereby, it was intended to open the new fields for the reconstruction of shoulder function.

METHOD

In various symptoms of rupture at the rotator cuff, review was made in the states before and after surgical reconstruction from the viewpoint of shoulder movement. That is, in the above mentioned at each stage, the cases were improved to make abducting elevation movement of the arm, then, X-ray pictures were taken by serial radiography at the speed of 4 pictures per second from AP projection of shoulder joint. Thus, the loci of humerus and scapula were analyzed and reviewed. Also, the above mentioned method was performed for each stage of periarthritis of humeroscapularis.
RESULTS

The outlines of loci of scapula and humerus at the time of abducting elevation movement in sound side were as follows: The locus of the humerus by the abducting elevation movement was elevating at a certain incline. While, the scapular movement was as follows: Up to the incline about 70° of the abducting elevation movement of the arm, abducting movement was observed with a certain incline. When the elevation movement of the arm increases to about 70°, the locus-incline of abduction-angle decreases remarkably (Fig. 1). Based on such patterns, various reviews were made.

CONCEALED TEAR

Loci of humerus and scapula at time of abducting elevation movement of the arm before surgery: With the elevation of humerus locus, scapular locus was elevated with nearly same pattern. Both loci showed similar patterns, that is, phase-difference was greatly reduced in between loci of humerus and scapula (Fig 2). After surgery, rotator cuff was re-constructed postoperatively in about five months, shoulder could be fully elevated with movement, and a survey was made for the loci of humerus and scapula at the time of abducting elevation movement.

As a result, both loci showed similar patterns to those of sound side (Fig. 3).

COMPLETE TEAR

Loci of humerus and scapula at the time of abducting elevation movement: Scapular locus against humerus locus showed medium-pattern between concealed tear and massive tear as mentioned later. That is, less elevating angle of scapular locus was observed (Fig 4). After surgery, rotator cuff was re-constructed by operation. Then, after full recovery of shoulder function, the same test as the above was made.

As a result, loci of humerus and scapula showed nearly the same patterns as those of sound side (Fig. 5).

MASSIVE TEAR

Loci of humerus and scapula at time of abducting elevation movement of the arm before surgery: With the elevation of locus of humerus, scapular locus was slightly elevated, but its degree was very insignificant, that is, a feature was great delay in scapular locus at time of abducting elevation movement of the arm (Fig. 6). After surgery, rotator cuff was re-constructed, and under full recovery of shoulder function, similar test to the above was performed, then, the loci of humerus and scapula showed similar patterns to those of sound side (Fig. 7).

PERIARTHRITIS

Before treatment, survey was made for the loci of humerus and scapula at time of abducting elevation movement of the arm. As a result, phase-difference of loci in between humerus and scapula was very small, showing the pattern near the concealed tear (Fig. 8).
Fig. 5

Fig. 6

Fig. 7

Fig. 8
DISCUSSION

As for therapeutic methods for the trauma of rotator cuff at the supraspinatus or infraspinatus, some clinicians suggest conservative therapy, while others suggest operative therapy.

Ground for conservative therapy: Rupture of rotator cuff induces initial impossibility of elevating motion of shoulder joint; however, its elevation can be accomplished within a few weeks, and motion pain is also reduced.

Ground for operative therapy: Rupture of rotator cuff induces the continuous weakness of muscle force for shoulder elevation or motion pain of shoulder joint. Moreover, labor with rupture of rotator cuff will repeat the relapse of the limited movable area of shoulder joint.

In short, even the rupture of rotator cuff may or may not cause the disturbance of shoulder function, thus it is necessary to clarify the role or function of rotator cuff at the shoulder.

As a means for the pursuit of the function of the rotator cuff in shoulder motion, loci of the humerus and scapula were analyzed and reviewed at the time of abduction movement of the arm under the state before and after surgical reconstruction of rotator cuff. The movement of scapula with the elevation of the shoulder is the same as that of glenoid cavity as a part of scapula.

The moving significance of the glenoid cavity of this shoulder-elevating motion can be summarized in the following 2 points.

1. Movement of glenoid cavity means the formation of fulcrum of humerus head of elevating movement of shoulder.
2. The movement of glenoid cavity exerts the effective muscle power in intrinsic muscles and extrinsic muscles.

In order to satisfy the above 2 phenomena, it is necessary to take the phase-difference in between loci of humerus head and scapula at abducting elevation movement of the arm. This is intended for this purpose.

For the treatment of rupture of the rotator cuff, massive tear is most troublesome to be treated.

When it is difficult to reconstruct this rotator cuff, our investigations revealed a better method to produce the phase difference in the movement of glenoid cavity and humerus head for elevation of shoulder. For this purpose, a suggested method is to insert a sliding apparatus to produce the phase difference in the movement of acromion or greater tuberosity.

SUMMARY

The function of the rotator cuff in abducting elevation movement of the arm was considered to induce a desirable phase-difference between the humerus and scapula at the abducting elevation movement of the arm.
REFERENCE


