BACKGROUND:
The Latarjet procedure is one of the commonly performed procedures with excellent clinical results for treating patients with anterior instability of the shoulder. To date, “sling effect” and “bone block effect” have been considered as the main stabilizing mechanisms of this procedure. However, its precise stabilizing mechanism is still unknown. We reported, in a prior cadaveric biomechanical study, that the stabilizing mechanism of the Latarjet procedure was both a sling effect and a capsular re-tensioning effect at the end-range of motion and a sling effect and glenoid plasty effect in the mid-range (AAOS, ASES 2009). However, small capsulotomy and bone exposure to transfer the coracoid process, which is performed in real surgery, were not simulated in that study. In this study we further investigated the effect of suturing the lateral capsular flap to the stump of the coracohumeral ligament (CAL) which is a common addition to the Latarjet technique.

MATERIALS AND METHODS:
Nine fresh-frozen cadaveric shoulders (mean age, 75 years) were investigated. Two arm positions (60° of abduction relative to the scapula and maximum external rotation and neutral rotation) were chosen to simulate the end-range and mid-range positions, respectively. A custom multiaxis electromechanical testing machine with a six-degrees-of-freedom load-cell was utilized (Figure 1). With a 50-N axial force, the humeral head was translated in the anterior direction, and the peak translational force was measured with the intact capsule, with a Bankart lesion, and after the Latarjet procedure with the capsule re-attached to the CAL. Three sets of loads were applied to see the relationship between the loading on muscles: (10 N, 2.5 N), (20 N, 5 N), and (30 N, 7.5 N) applied to the subscapularis and conjoint tendon, respectively. Then, two tendons were removed to see the contribution of the sling effect to the stability, and the sutures of the capsular flap to the CAL (Figure 2) were removed to see its contribution. The surgical procedure was performed as described by Walch et al.1. A small anterior capsulotomy was performed. The bone block was positioned flush to the anterior-inferior margin of the glenoid. Two AO 4.5-mm malleolar screws driven into the posterior cortex secured the bone block to the glenoid. The Bankart repair was not performed.

RESULTS:
The peak translational force with the intact capsule, which significantly decreased after creating a Bankart lesion (P < 0.001), significantly increased after the Latarjet procedure (P < 0.001) regardless of the magnitude of the applied loads at both the end-range (Figure 3) and mid-range (Figure 4). The force after the Latarjet procedure (157 ± 22 N, 158 ± 23 N, and 160 ± 22 N) with three sets of loads decreased to 41 ± 9 N after removing two tendons. However, the force after removing two tendons did not significantly decrease after removing the sutures of the capsular flap to the CAL (39 ± 6 N). With an increase of the force from a Bankart lesion to the condition after the Latarjet procedure being 100%, 69% to 78% of the stability was contributed by the sling effect.

DISCUSSION:
The contribution of the sutures of the capsular flap to the CAL was 19% to 20% at the end-range position as the load changed, whereas the sutures to the CAL did not contribute to the stability at the mid-range position. Some surgeons2, 3 do not suture the capsular flap to the CAL. However, by adding sutures of the capsular flap, a 19% to 20% increase in stability is expected at the end-range position. Thus, we recommend that the capsular flap be sutured to the CAL when performing the Latarjet procedure.

Our data showed that the contribution of the sling effect was 80% to 81% at the end-range position and 69% to 78% at the mid-range. Thus, the sling effect has greatest effect at both arm positions. It was demonstrated that this procedure provides a reasonable stabilizing mechanism at both arm positions for shoulders with anterior instability.

REFERENCES:

The Stabilizing Mechanism of the Latarjet Procedure: Part II
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Figure 1. Mechanical testing device
Figure 2. Sutting to the CAL.

At the mid-range position, the force after the Latarjet procedure (68 ± 4 N, 76 ± 4 N, and 84 ± 5 N) with three sets of loads decreased to 41 ± 9 N after removing two tendons. However, the force after removing two tendons did not significantly decrease after removing the sutures of the capsular flap to the CAL (39 ± 6 N). With an increase of the force from a Bankart lesion to the condition after the Latarjet procedure being 100%, 69% to 78% of the stability was contributed by the sling effect.