# Investigation of Anterior Instability of the Shoulder Joint Due to the Creation of Anterior Portals

Tomoya Ono[1,2], Tetsuya Takenaga[2], Atsushi Tsuchiya[3], Satoshi Takeuchi[4], Norio Okubo[5],
Sho Yamauchi[2], Kaisei Kuboya[3], Hideki Murakami[2], Masahito Yoshida[2,6]

*[1]Department of Orthopaedic Surgery, Nagoya City University Mirai Kousei Hospital, Nagoya, Japan,*
*[2]Department of Orthopaedic Surgery, Nagoya City University Graduate School of Medical Science, Nagoya, Japan,*
*[3]Department of Orthopaedic Surgery, Meitetsu Hospital, Nagoya, Japan,*
*[4]Department of Orthopaedic Surgery, Toyohashi Medical Center, Toyohashi, Japan,*
*[5]Department of Orthopaedic Surgery, Inabe General Hospital, Inabe, Japan,*
*[6]Department of Musculoskeletal Sports Medicine, Research and Innovation, Nagoya City University Graduate School of Medical Sciences, Nagoya, Japan*
*Email of Presenting Author: tomoya228ohno@yahoo.co.jp*

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INTRODUCTION: The Bankart repair procedure is commonly performed to treat anterior shoulder instability with minimal bone defects. In arthroscopic Bankart repair (ABR), the anterior and anterosuperior portals are typically used as working portals. Prior studies have compared the clinical outcomes between one and two anterior portals in ABR[1,2]. However, basic research comparing the instabilities of these portals has not yet been conducted. This study aimed to investigate the effect of the number of anterior portals on the anterior shoulder instability during shoulder arthroscopy.

METHODS: Six Thiel-embalmed cadaveric shoulders were included. A beach chair position was used during the procedure. An anterior portal was created immediately above the subscapularis tendon at the lateral surface of the coracoid process. In addition, the anterosuperior portal was located directly over the LHB between the acromion and the coracoid process. Cannulas with 8 mm- and 5 mm-diameters were inserted via the anterior and anterosuperior portals, respectively. Each shoulder was categorized into three groups: P group (only posterior portal), PA group (posterior and one anterior portal), and PAA group (posterior, anterosuperior, and anterior portals). Measurements were conducted at abduction angles of 0°, 45°, and 90° and external rotation angles of 0° and 90°. Anterior humeral head translation (AHHT) was measured using ultrasonography with and without a 40N anterior distraction[3].

RESULTS: The PA group showed no significant differences in AHHT compared to the P group in all positions. The PAA group showed significantly greater AHHT than the P group only in the position of shoulder abduction 0° and external rotation 0° external P group. However, there were no significant differences in the AHHT between the PAA and PA groups at any position.

DISCUSSION: A Typical ABR with two anterior portals allows for a more detailed evaluation, including the anteroinferior labrum, rather than one anterior portal. However, ABR with two anterior portals poses a higher risk of iatrogenic neurovascular injuries. Meanwhile, a single anterior portal can reduce costs and iatrogenic injuries to neurovascular tissues. Moreover, the creation of two anterior portals in the ABR can cause more damage to the rotator interval between the subscapularis and supraspinatus muscles than a single anterior portal. According to the results of this study, the increase in the AHHT at 0° abduction and 0° external rotation in the two-portal method may have been due to invasion within the rotator interval. This invasion may have led to the shoulder instability. The limitations of our study include the relatively old age of the specimens, small sample size, and only AHHT under 40N distraction during evaluation for anterior instability.

SIGNIFICANCE/CLINICAL RELEVANCE: Conventional ABR with dual anterior portals can cause potential instability; that is, this procedure can induce anterior shoulder instability during shoulder adduction and neutral rotation. This insight may aid further studies in examining safer and more effective methods for addressing anterior shoulder instability.

REFERENCES: 1. Çiçek, et al. Acta Orthop Traumatol Turc. 2017. 2. Uzun E, et al. Jt Dis Relat Surg. 2021. 3. Inoue J, et al. Orthop J Sports Med. 2022

IMAGES AND TABLES:

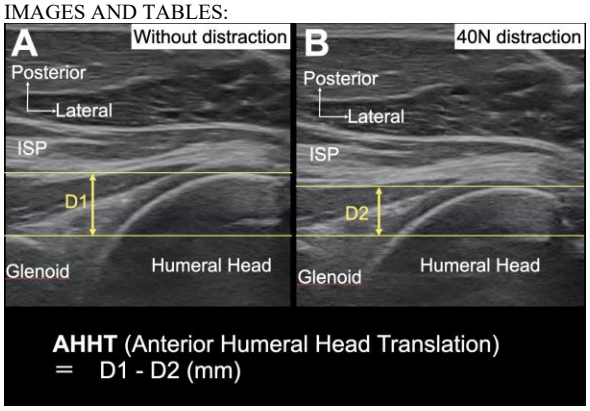


**Figure 1.**
Ultrasound visualization of anterior translation in the glenohumeral joint.
Two parallel lines (highlighted in yellow) were delineated along the posterior margins of the glenoid and humeral head. Distances D1 and D2 represent the minimum intervals between these parallel lines (indicated by vertical yellow lines with arrow marks) in panels (A) without the application of a 40-N anterior distraction force and (B) with it to the humeral head, respectively. The difference between D1 and D2 was calculated as AHHT (anterior humeral head translation). ISP: infraspinatus tendon.

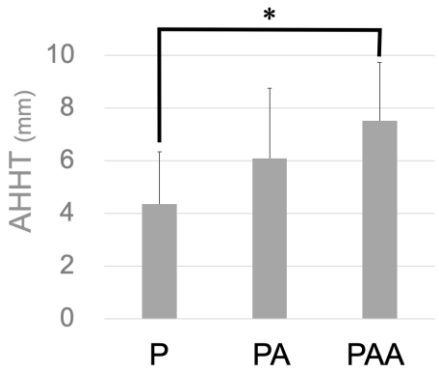


**Figure 2.**
Anterior translation of the humeral head in the position of shoulder abduction 0° and external rotation 0°.
AHHT: anterior humeral head translation, P: P group (only one posterior portal), PA: PA group (one posterior and one anterior portal), PAA: PAA group (one posterior and two anterior portals), *: significant difference ($p < 0.05$).