Suitable Drilling Angle for Anchor Insertion At The 5 o’Clock Position Of The Glenoid In Arthroscopic Bankart Repair -a Cadaveric Study-

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Disclosures:

Introduction: Arthroscopic repair techniques using a suture anchor have recently become the gold standard as treatment for labrum injuries including the Bankart lesion, a major cause of anterior gleno-humeral instability. For a successful surgical repair, it is necessary to insert an anchor into the glenoid in the appropriate position and in a suitable direction. However, proper placement of the anchor at 5 to 6 o’clock (for the right shoulder) is difficult; drilling for the anchor bone tunnel sometimes penetrates the anteroinferior cortex of the scapula. Lim et al. reported that 100% of suture anchors (12/12) at the 5:30 to 6 o’clock position penetrated through the far cortex in arthroscopic Bankart repairs (1). The success of anchor insertion depends mainly on the judgment and skill of the surgeon; there is no intraoperative means to assure whether the anchor is indeed inside the glenoid because of the difficulty of direct sighting into the inferior region. The purpose of the present study was to investigate the suitable drilling angle at the 5 o’clock position of the glenoid in arthroscopic Bankart repair.

Methods: Eighteen cadaveric shoulders were used with a mean specimen age of 86.7 years (range, 74-100 years). Specimens with scapular fracture or obvious deformities were excluded. Soft tissues were carefully dissected from each cadaveric shoulder and 2.0 mm K-wire was inserted at the 5 o’clock position of the glenoid edge, penetrating to the 5:30 position 10 mm medial from the glenoid edge, penetrating the anteroinferior cortex of the scapula (Anteroinferior: AI group) (Fig. 1A). The angles between the glenoid articular surface and the K-wire were measured in coronal and transverse planes views (Fig. 2A, B). The length of the bone tunnels was measured by digital calipers and the shortest distance between the K-wire and coracoid process (CP) was also measured by digital calipers. After these measurements, the K-wire was removed and another 2.0mm K-wire was inserted from the 5 o’clock position of the glenoid edge, penetrating the posterior cortex of the scapula (Posteriorinferior: PI group), that is, penetrating the 6:30 position 15 mm medial from the glenoid edge (Fig. 1B). After drilling, the same four measurements (the angles between the K-wire and glenoid articular surface in coronal and transverse planes, tunnel length and distance from CP) were done.

For statistical comparison between the AI and PI groups, the angles in both views, the length of bone tunnels and the shortest distance between the K-wire and CP were analyzed by the Mann-Whitney U test with significance set at $P < 0.05$. The statistical program R (R package; http://www.r-project.org/) was used for data analysis.

Figure 1: Two patterns of drilling. K-wire was inserted at the 5 o’clock position of the glenoid, penetrating the anteroinferior (AI) cortex (A) and posteroinferior (PI) cortex (B) of the glenoid.

Figure 2: Measurements of angles between the glenoid articular surface and the K-wire. Angles were measured in coronal plane (A) and transverse plane (B) views.

Results: The average angle of the K-wire in the coronal plane view was 41.9 degrees (SD, 7.0) in the AI group and 61.8 degrees (SD, 10.8) in the PI group. The mean angle of the K-wire in the transverse plane view was 75.0 degrees (SD, 7.4) in the AI group and 46.0 degrees (SD, 7.8) in the PI group. Significant differences were found in the angle of both plane views (Fig. 3A, B). The length of bone tunnels were 9.5 mm (SD, 1.7) in the AI group and 19.2 mm (SD, 3.0) in the PI group; the tunnels in the PI group were significantly longer. The shortest distances between the coracoid process and K-wire were 12.8 mm (SD, 4.6) in the AI group and 19.8 mm (SD, 6.2) in the PI group; the distance was significantly larger in the PI group.

Figure 3: The comparison of drilling angles between two groups in coronal and transverse planes views. *: p<0.05

Discussion: It is widely accepted that inserting suture anchors into the anteroinferior quadrant of the glenoid by arthroscopy is difficult.

For an ideal implant insertion angle, it is recommended that the anchor be inserted orthogonal to the round glenoid rim while maintaining a 40° angle to the glenoid surface (2). However, it is impossible to drill orthogonal to the round glenoid rim in the anteroinferior part of the glenoid, and there are few reports describing the drill angles in the coronal and transverse planes. Our results show that a coronal drilling angle less than 42° creates a high risk of penetrating the anterior cortex of the scapular neck. Ideally, this angle should be more than 62°. A transverse drilling angle greater than 75° should be avoided to prevent penetration of the anterior cortex of the scapula; this angle ought to be less than 46° to penetrate the posterior cortex of the glenoid. When the drilling was performed to penetrate the posterior cortex of the scapula, the length of the anchor bone tunnel
was twice as long as that of penetrating the anterior cortex. Longer bone tunnels have the advantage of covering the whole anchor. The distance between the K-wire and coracoid process was 20 mm in the PI group; standard procedure to create the anteroinferior portal was 20 mm inferior from the coracoid tip. The use of anteroinferior portal was recommended to drill at 5 o’clock position of the glenoid safely. This study has some limitations. First, a Bankart lesion was not created in this experiment. Drilling was performed on the glenoid rim, penetrating the labrum. Second, none of the cadaveric scapulae had a bony Bankart or erosion of the anteroinferior quadrant of the glenoid which would shorten the length of the bone tunnels. These differences between the cadaveric model and real cases might have influenced our results.

**Significance:** To prevent anterior cortex perforation in drilling at the 5 o’clock position of the glenoid, the use of an anteroinferior portal is recommended in arthroscopic Bankart repairs.

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**References:**
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Fig. 3B

Transverse plane angle (b) (degree)

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