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Anatomic measurements of the coracoid and its implication in the Latarjet procedure

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Abstract

Background: Latarjet procedure is frequently done to treat shoulder instability. It includes osteotomizing the coracoid distal to the insertion of coracoclavicular ligament. Knowledge of the insertion of the trapezoid ligament is important to determine the level of coracoid osteotomy.

Methods: Ten shoulders were dissected free of overlying soft tissue while preserving the ligament and muscle attachment on the coracoid. The distance between the tip of the coracoid to the coracoclavicular ligament and the pectoralis minor insertion width on the coracoid was measured.

Result: The average distance from the tip of the coracoid to the trapezoid insertion was 2.6 cm. The average pectoralis minor insertion width was 1.9 cm.

Conclusion: To preserve the insertion of the trapezoid ligament, the coracoid should be osteotomized less than 2.6 cm from the tip of the coracoid.

Keywords: Latarjet, unstable shoulder, coracoclavicular ligament, coracoid length

Introduction

The Latarjet procedure, which was described in 1954^[1], is frequently done to treat recurrent anterior dislocation of the shoulder. The indications for Latarjet include glenoid bone loss and / or big hill sachs defect. However, for many surgeons in Europe it is a primary procedure of choice to treat anterior instability, irrespective of the bone loss^[2]. The procedure includes osteotomizing the coracoid at its base, mobilizing it along with the conjoint tendon and fixing it medially on the glenoid with the help of two screws^[2]. This is done by first removing the coraco- acromial ligament and the pectoralis minor tendon and then osteotomizing the coracoid at the base but sparing the coracoclavicular ligaments. However, the coracoclavicular ligaments are often not visible at the time of surgery. There is also, no consensus on the size of the coracoid that should be osteotomized. Thus the knowledge of the insertion of the trapezoid ligament on the coracoid is important to decide the level of the osteotomy. It is also desirable to have a big coracoid graft to ensure good bone availability for two screws^[3]. According to some reports in the US and Europe, a graft size of 2.5-3 cm is usually available during the surgery^[4]. Our surgical experience in the Indian population says that the available coracoid graft is smaller than the western counterpart.

The purpose of this study was to measure the distance between the tip of the coracoid and the distal insertion of the trapezoid ligament. This distance will define the safe zone of the coracoid, which is free of the coracoclavicular ligament at the time osteotomizing the coracoid, as the osteotomy should not violate the insertion of the trapezoid ligament

Material and methods

Ten shoulders in embalmed cadavers were dissected free of skin, subcutaneous, overlying deltoid and pectoralis major muscle to expose the coracoid and its ligamentous attachment. These cadavers had no shoulder joint pathology or any scars on gross inspection. The coracoid along with conjoint tendon, pectoralis minor tendon, coracoacromial ligament and trapezoid ligament was exposed (fig1). The tip of the coracoid was defined as the most distal bony projection of the coracoid. A digital caliper was used to measure the distance of the trapezoid ligament attachment on the coracoid from the tip of the coracoid and the width of the pectoralis minor attachment on coracoid.

The distance between the tip of the coracoid and the distal insertion of the trapezoid attachment was considered as the safety zone for the osteotomy of the coracoid process.

Results

The coracoid anatomy measurements were repeated twice to record the average value. The mean width of the pectoralis minor attachment on the coracoid was 1.6 cm (S.D. 1.1 cm) (fig 1). The average distance from the tip of coracoid to the distal attachment of the trapezoid ligament was 2.6 cm (S.D. 1.1 cm) (fig1). This distance was the safety zone, which was free of any trapezoid ligament attachment.

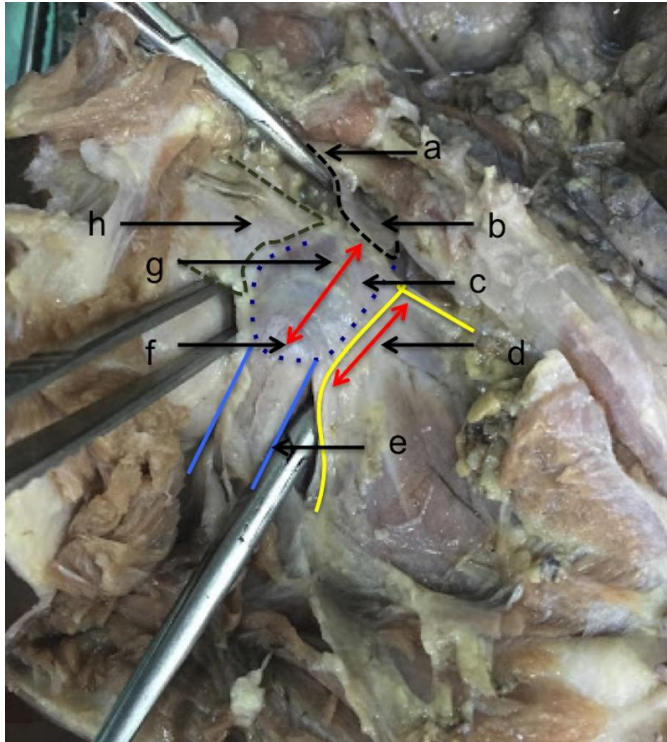


Fig 1: Coracoid with its attachments: a-Hemostat under the Coracoclavicular ligament, b-trapezoid ligament, c-coracoid, d-pectoralis minor tendon width, e- conjoint tendon, f- tip of coracoid, g- tip to CC ligament distance, h- Coraco-acromial ligament

Discussion

The coracoid transfer procedure described by Michele Latarjet in 1954 used one screw to fix the coracoid in horizontal lying down position to the glenoid neck [1]. Bristow also described a procedure to treat recurrent dislocation wherein he used one screw to fix the coracoid in standing position [5]. However, Didier Patte modified the original Latarjet procedure to fix the coracoid in the lying down position with two screws and also explained the triple blocking effect of the grafted bone [6]. Gilles Walch further pioneered the procedure by fixing the coracoid with two malleolar screws, which are 4.5 mm in diameter and partially threaded [2].

Thus it is desirable to osteotomize as big a size of coracoid as possible. However, the coracoid attachment of coracoclavicular ligament and most specifically the trapezoid ligament limits the size of coracoid that we can osteotomize. The European and American papers recommend osteotomizing 2.5- 3 cm of the coracoid [7]. However, we felt that in Indian demographics, the coracoid size will be smaller than those reported in the Western literature. Our study proves that the size of coracoid, which is available for osteotomy and is free of the coracoclavicular ligament attachment, is less

than 2.6 cm. Knowledge of this length is important, as the attachment of the trapezoid ligament is often not discernable during the surgery. The surgeon chooses the osteotomy level by the keeping the osteotomy just distal to the insertion of the coracoclavicular ligament attachment. As per our study, the osteotomy should always be done less than 2.6 cm from the tip of the coracoid, so that the trapezoid ligament insertion is always preserved. Preserving the coracoclavicular ligament is important; since a coracoclavicular ligament injury has clinical implications [8]. We also found that the average pectoralis minor attachment width is 1.6 cm. The pectoralis minor is always removed from the bone during the surgery. Thus the level of osteotomy is proximal to the pectoralis minor attachment and this also serves as a guide to choose the level of the osteotomy.

Few other studies done in Europe have also studied the coracoid anatomy. Terra *et al* found that the safe zone is around 2.64 cm in their population. However, they found an average distance of 3.3 cm from the tip of the coracoid to the trapezoid ligament [4]. Dolan *et al* found that $2.85 \text{ cm} \pm 5.1$ to be the safe level of osteotomy without compromising the trapezoid ligament [7]. This is larger than the size of coracoid found in our study. Our study was the only study done to measure the coracoid in Indian demographics. We found it to be smaller than found in European studies. The recommended technique by Walch *et al* utilizes two malleolar screws, which are 4.5 mm in size. If two malleolar screws are used to fix the coracoid, we have to ensure there is at least 1 cm bone between the two screws. It is also desirable to leave 3 mm of bone on either side of the bone [3]. The length of the coracoid should be around $10+4.5+4.5+6 = 24\text{mm}$. When the coracoid is smaller than this size, the screws can be 3.5 mm [9]. The arthroscopic Latarjet technique described by Lafosse *et al* uses two 3.5 mm screws for fixation of coracoid. Armitage *et al* also measured the coracoid on CT scans and found the mean length, width to be 16.8 and 15 mm respectively [10]. Our study was done to assess the safe zone, which is free of coracoclavicular ligament attachment, hence raw measurements of the width and height of coracoid were not considered significant.

The limitations of this paper are that we only studied 10 shoulders due to the limited availability of cadavers. The other limitation is that this study was done in embalmed cadavers, however the measurements were done in shoulders with intact ligaments, so there should not be a difference in accuracy as compared to fresh cadavers.

Conclusion

The recommended level of the osteotomy of the coracoid in classic Latarjet procedure should be less than 2.6 cm from the tip of the coracoid to preserve the attachment of the trapezoid ligament.

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