CASE REPORT

VOLUME 72 | ISSUE 2 | APRIL - JUNE 2021

Normal variants of the glenoid superior and anterosuperior labrum; case presentation and review of the current literature

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ABSTRACT

A 22-year-old male professional basketball player underwent shoulder arthroscopy for assessment and treatment of a symptomatic type II SLAP lesion. During the course of arthroscopic evaluation, a cord-like middle glenohumeral ligament was identified in conjunction with absence of the antero-superior labrum (Buford complex). The detached biceps tendon anchor was subsequently repaired by means of diathermy debridement and suture anchors fixation. The Buford complex was readily identified and ignored. The patient had an excellent result in terms of pain control and shoulder function during follow-up and was eventually discharged from clinic after 12 weeks. Normal variants of the superior and antero-superior labrum are increasingly identified during shoulder arthroscopy and do not necessitate repair since they are not regarded as independent contributors to shoulder instability.

KEY WORDS: Sublabral recess, sublabral foramen, Buford complex

Introduction

The role of various anatomic structures in maintaining shoulder stability is well defined. Normal variants, however, are increasingly recognized especially since the advent of shoulder arthroscopy. The most common anatomic variations include a separation of the biceps tendon anchor from the superior labrum named as sub*labral recess*, the presence of a *sublabral foramen*, which is characterized by detachment of the anterosuperior quadrant of the labrum from the underlying glenoid and the *Buford complex* which combines the presence of a large sublabral foramen with a thickened cord-like middle glenohumeral ligament (MGHL). Identification of such variants is of paramount importance, since they can be easily mistaken for pathologic lesions and thus lead to unnecessary overtreatment with likely adverse results.

Case report

A 22-year-old male professional basketball player was referred to our service for evaluation of de-

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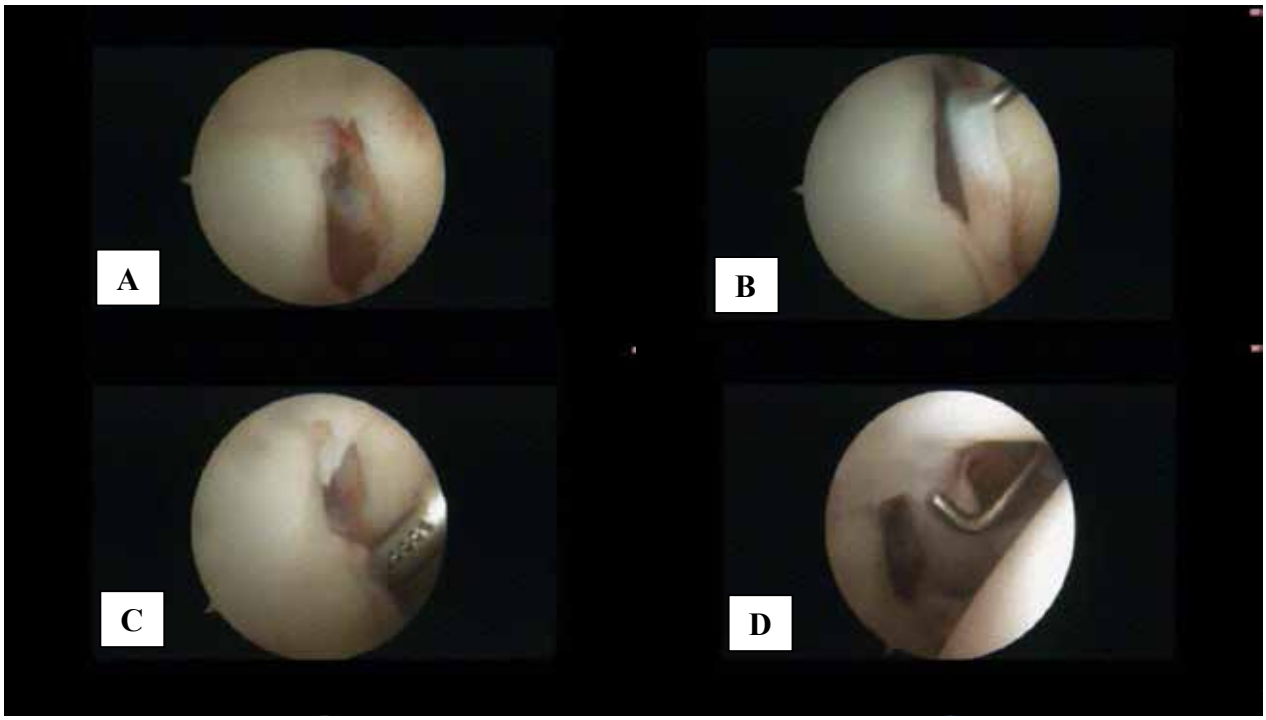

Figure 1. *Intraoperative arthroscopic findings. A sublabral foramen is depicted in picture A. Pictures B and D reveal the presence of a thickened cord-like MGHL, which is stouter superiorly and gradually fans out inferiorly.*

bilitating pain affecting his right shoulder, following a sport-related injury during basketball. His past medical history was free of any systemic disease. Clinical assessment suggested the presence of a SLAP tear, which was further investigated by means of an MR arthrogram. Following confirmation of the labral injury, the patient was listed for shoulder arthroscopy.

Shoulder arthroscopy

The patient was placed in beach chair position and the right shoulder was routinely sterilized and draped. Standard posterior viewing and anterior working portals were created. Diagnostic arthroscopy revealed the presence of a type II SLAP lesion, namely fraying and detachment of the biceps tendon anchor from the superior glenoid. Peel back test was positive with the labrum sliding medially over the glenoid when the arm was placed in 90 degrees of abduction and external rotation. Absence of the labrum at the anterosuperior quadrant of the glenoid was noted in conjunction with the presence of a thick cord-like MGHL which was extending from the base of the biceps tendon anchor, crossing the subscapularis tendon at a 45 degrees angle, towards the humerus. (**Figure 1**) This was readily identified as Buford complex and therefore ignored as is the prevailing practice. Attention was turned back to the biceps tendon anchor which was debrided by means of arthroscopic diathermy and subsequently repaired with two suture anchors. Stability of the biceps tendon anchor was evaluated following the repair and deemed satisfactory.

The patient was followed up for a total period of twelve weeks in the outpatients' clinic before discharge. Constant-Murley score at final follow-up was 96/100 suggesting an excellent outcome.

Discussion

The role of labrum and its ligaments to glenohumeral stability

The glenohumeral joint is often analogized to a golf ball sitting on a tee, to highlight the relatively limited contact area between the shallow glenoid and the much larger humeral head. These unique anatomic features provide the shoulder with an excel-

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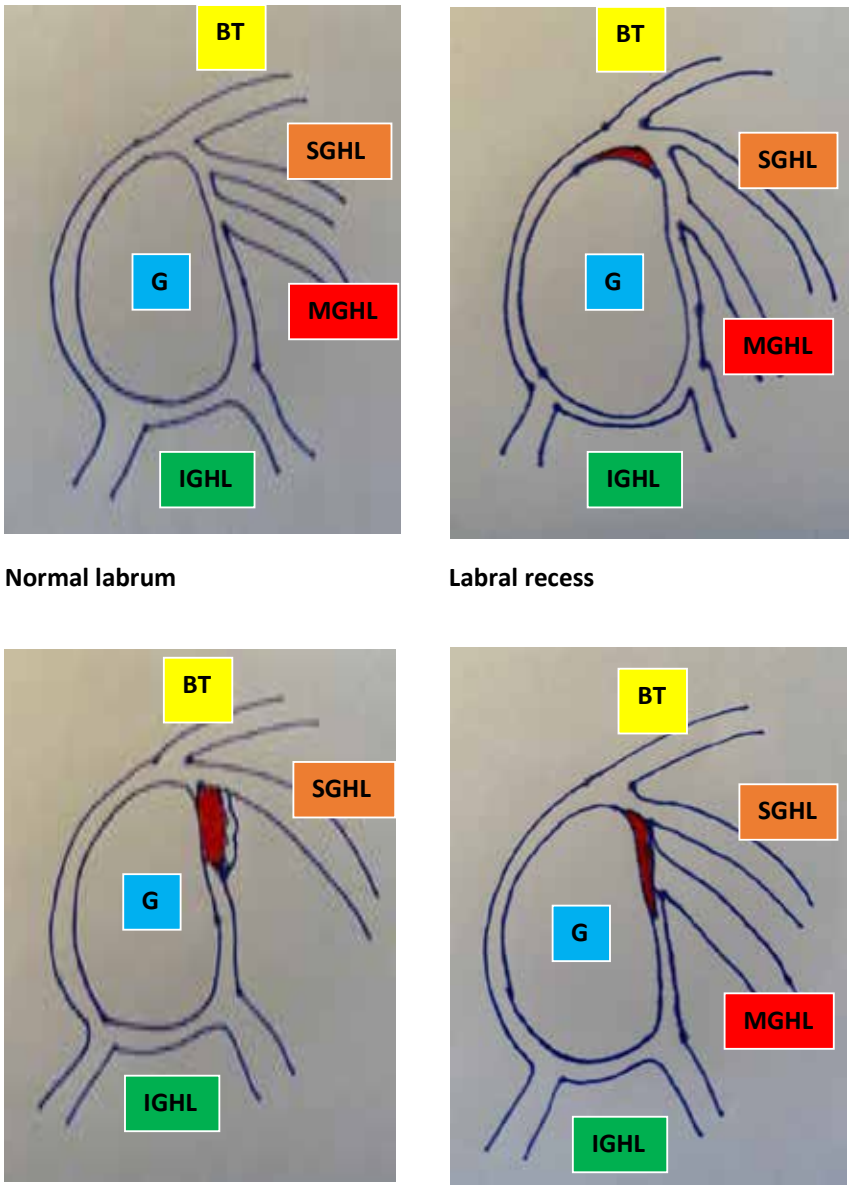

Figure 2. *Schematic description of the antero-superior labrum normal variants. (Drawings by I.K.Triantafyllopoulos)*

Abbreviations

G: Glenoid and the surrounding labrum

BT: Biceps Tendon

SGHL: Superior Glenohumeral Ligament

MGHL: Medial Glenohumeral Ligament

IGHL: Inferior Glenohumeral Ligament (anterior and posterior branch)

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TABLE 1. Definition of the antero-superior labrum normal variants

Sublabral recess	Sublabral foramen	Buford complex
• A separation of the Biceps Tendon anchor • Located at the site of attachment of the biceps tendon • It may coexist with a sublabral foramen • Can be confused with SLAP lesion.	• A separation of the labrum from the underlying glenoid • Located anterosuperiorly and can extend down to but not below the 3 o'clock position, which divides the anterior labrum into superior and inferior halves • It may coexist with a sublabral recess	• It is the absence of the anterior superior labrum in conjunction with a thickened cord-like middle glenohumeral ligament • Can be confused with a sublabral foramen or pathologic labral detachment

lent range of movement, allowing for a wide array of actions ranging from activities of daily living to high-intensity sports.[1] To preserve the balance between function and stability, a number of anatomic structures, including the labrum and the glenohumeral ligaments, act in concert. (**Figure 2) The fibrocartilaginous labrum**, which is firmly attached to the glenoid in its lower half, increases the concavity of the glenoid socket and acts as an attachment for the capsule and the glenohumeral ligaments. However, its superior half is more variable and loosely attached to the glenoid, occasionally giving rise to anatomic variants.[2] The labrum also deepens the glenoid by 9mm and 5mm in the vertical and horizontal planes respectively, accounting for more than 50% of the total glenoid depth.[3] **The superior glenohumeral ligament (SGHL)** originates from the supraglenoid tubercle and anterosuperior labrum running just anterior to the long head of the biceps tendon (LHBT) and parallel to the coraco-humeral ligament (CHL) within the rotator interval. It inserts superior to the lesser tuberosity of the humerus and acts to limit inferior translation and external rotation when the arm is adducted.[2] Further studies have provided evidence that it limits posterior translation of the humeral head when the arm is in forward flexion, adduction and internal rotation.[4] **The middle glenohumeral ligament (MGHL)** originates from the supraglenoid tubercle and anterosuperior labrum in close relation to the SGHL. It is the most variable in appearance and size and runs down obliquely towards the humerus, inserting just anterior to the lesser tuberosity. The MGHL prevents excessive inferior translation of the humeral head when the arm is adducted and posterior-anterior translation of the humeral head when the arm is abducted between 60 and 90 degrees.[5] Lastly, **the inferior glenohumeral ligament (IGHL)** originates from the lower half of the labrum and glenoid neck and inserts just inferior to the MGHL attachment on the humerus. It has further been anatomically divided into 3 distinct components, namely the anterior band, the axillary pouch and the posterior band. The IGHL prevents posterior translation of the humeral head when the arm is internally rotated and inversely anterior translation of the humeral head when the arm is externally rotated. During abduction of the arm, it functions as a net to prevent inferior translation of the humeral head.[6]

The normal variants of the superior and anterosuperior labrum

As stated above, the superior half of the labrum is more loosely attached to the glenoid and occasionally a detachment in the anterior superior quadrant can be seen. Thus, normal variants of the anterosuperior labrum must be recognized during arthroscopy. (**Table 1**)

There is an intimate relationship between the superior labrum and the biceps tendon anchor. The attachment of the superior labrum to the glenoid at the site of the biceps tendon insertion may show considerable variation. A **superior sublabral recess** is located at the 12 o'clock position and it is classified into three types. [7] (**Figure 3**) In type I attachment, the labral-bicipital complex attaches firmly to the glenoid rim, so that an arthroscopic probe cannot be inserted between the deep side of the labrum and the glenoid. In type II attachment, a small sulcus is present between the labrum and the glenoid rim. In type III attachment, a deep sulcus is present between the labrum and the glenoid rim, allowing a probe to be inserted between the labrum and the glenoid cartilage. A superior sublabral recess may

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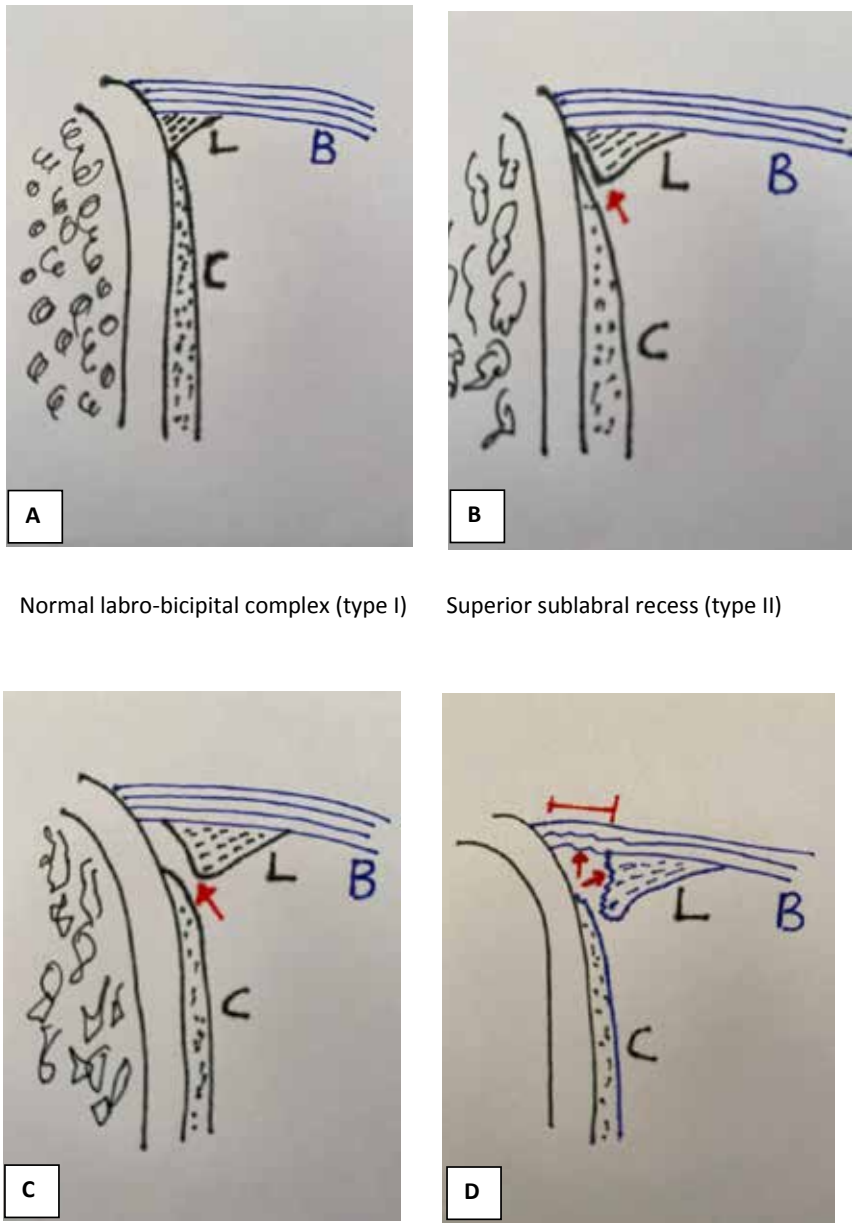

Normal labro-bicipital complex (type I)

Superior sublabral recess (type II)

Superior sublabral recess (type III)

SLAP lesion arthroscopic findings

Abbreviations

L : Labrum

C: Cartilage

B: Biceps tendon

Figure 3. *Superior sublabral recess. Drawings representing a coronal section through the labral-bicipital complex illustrate type I (picture A), type II (picture B), and type III (picture C) labral attachments. In type I, the labrum (L) is tightly attached to the glenoid, whereas in types II and III, a recess is present between the labrum and glenoid (red arrow). In picture D, a real SLAP lesion is represented as fraying, tear or detachment of the labral-bicipital complex from the superior glenoid (red arrows) (Drawings by I.K.Triantafyllopoulos)*

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be continuous with a sublabral foramen. Differentiation on imaging studies between a type III attachment and a type II SLAP lesion may be extremely difficult. However, the surgeon must be aware of such normal variations in order to avoid a false overtreatment.

The sublabral foramen can vary in size from a few millimeters to the whole antero-superior quadrant. (**Figure 2**) A number of studies suggest that it is an age related phenomenon, being more prevalent in the elderly.[8,9] Park et al,[10] noted a 7% prevalence in patients aged 19-24 years old while Yeh et al, [11] reported an incidence of 40% in individuals between the ages of 61 and 96 years old. Sublabral foramens are not associated with glenohumeral instability and as such, the prevailing practice is to ignore them during shoulder arthroscopy.[12]

The Buford complex is a well-defined variant consisting of a large sublabral foramen and a thickened, cordlike MGHL. (**Figure 2**) Its prevalence ranges between 1.3% and 6.5% in studies.[13,14] On MRI, the Buford complex can be easily misdiagnosed as an avulsion of the anterior labrum. However, the absence of labral fraying and the smooth edges of the MGHL make it readily recognizable during arthroscopy.[15] The presence of Buford complex alone does not necessitate repair,[1] though there is some evidence in literature to suggest a higher incidence in patients with SLAP tears,[16] as was the case in our patient. More recently, a novel arthroscopic repair technique was described by Crockett et al, [17] for patients with type II SLAP lesions in conjunction with the presence of Buford complex. The authors suggest fixing the stout superior half of the cordlike MGHL to the anterosuperior glenoid, while leaving the inferior part of the ligament free so as not to impair external rotation. In our opinion, this option could be useful in cases of tenuous SLAP lesion repairs due to poor tissue quality. It should not be regarded, though, as a first-line technique due to the risk it carries for development of shoulder stiffness.

Conclusively, normal variants of the superior and antero-superior labrum are increasingly identified during shoulder arthroscopy and do not necessitate repair since they are not regarded as independent contributors to shoulder instability.

Conflict of interest statement

The authors declare that there is no conflict of interest regarding the publication of this article.

Statement of funding

The authors declare that no funding has been received for this work.

REFERENCES

1. B. Yin, J. Vella, WN Levine. Arthroscopic Alphabet Soup: Recognition of normal, normal variants and Pathology. Orthop Clin N Am 2010; 41: 297-308.
2. SJ O'Brien, SP Arnoczky, RF Warren, et al. Developmental anatomy of the shoulder and anatomy of the glenohumeral joint. In: Rockwood CA, Matsen FA, editors. The Shoulder. Philadelphia: Saunders, 1990: 1-33.
3. SM Howell, BJ Galinat. The glenoid-labral socket. A constrained articular surface. Clin Orthop Relat Res 1989; 243: 122-125.
4. JJ Warner, LJ Micheli, LE Arslanian, et al. Patterns of flexibility, laxity, and strength in normal shoulders and shoulders with instability and impingement. Am J Sports Med 1990; 18(4): 366-375.
5. PW O'Connell, GW Nuber, RA Mileski, et al. The contribution of the glenohumeral ligaments to anterior stability of the shoulder joint. Am J Sports Med 1990;18(6): 579-584.
6. SJ O'Brien, MC Neves, SP Arnoczky, et al. The anatomy and histology of the inferior glenohumeral ligament complex of the shoulder. Am J Sports Med 1990; 18(5): 449-456.
7. M De Maesseneer, F Van Roy, N Lenchik, M Sahabpour, J Jacobson, K N Ryu, F Handelberg, M Ostaeux. CT and MR arthrography of the normal and pathologic anterosuperior labrum and labral-bicipital complex. Radiographics 2000; S67-S81.

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8. CU Schulz, H Anetzberger, M Maier, et al. The sublabral foramen. Congenital or an acquired variance? Unfallchirurg 2003;105(12): 1088-1091.
9. A Alashkham, A Alraddadi, R Soames. Is the existence of sublabral foramen age-related? Eur. J. Anat 2019; 23 (1): 59-63.
10. YH Park, JY Lee, SH Moo,et al. MR arthrography of the labral capsular ligamentous complex in the shoulder: imaging variations and pitfalls. Am J Roentgenol. 2000; 175: 667-672.
11. L Yeh, S Kwak, Y S Kim, et al. Anterior labroligamentous structures of the glenohumeral joint: correlation of MR arthrography and anatomic dissection in cadavers. Am J Roentgenol. 1998; 171:1229-1236.
12. OA Ilahi, MR Labbe, P Cosculluela. Variants of the anterosuperior glenoid labrum and associated pathology. Arthroscopy 2002; 18(8): 882-886.
13. J Ide, S Maeda, K Takagi. Normal variations of the glenohumeral ligament complex: an anatomic study for arthroscopic Bankart repair. Arthroscopy2004;20(2):164-168.
14. AG Rao, TK Kim, E Chronopoulos, et al. Anatomical variants in the anterosuperior aspect of the glenoid labrum: a statistical analysis of seventy-three cases. J Bone Joint Surg Am 2003; 85(4): 653-659.
15. MM Williams, SJ Snyder, D Buford Jr. The Buford complex--the "cord-like" middle glenohumeral ligament and absent anterosuperior labrum complex: a normal anatomic capsulolabral variant. Arthroscopy 1994; 10(3): 241-247.
16. RT Bents, KD Skeete, The correlation of the Buford complex and slap lesions. J Shoulder Elbow Surg 2005;14(6): 565-569.
17. HC Crockett, NC Wingert, JM Wright, et al. Repair of SLAP lesions associated with a Buford complex: a novel surgical technique. Arthroscopy 2011; 27(3): 314-321.

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Karampitianis S, Samdanis VN. , Liosis KG., Makestas MA., Triantafyllopoulos IK. Normal variants of the glenoid superior and anterosuperior labrum; case presentation and review of the current literature. *Acta Orthop Trauma Hell* 2021; 72(2): 156-162.