Arthroscopic Anatomy of Shoulder

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2.1 Introduction

In the last 30 years, shoulder arthroscopy has become of greater importance in the diagnosis and treatment of shoulder diseases. An increasing number of arthroscopic techniques together with innovations in surgical equipment have resulted in several surgical procedures which were applied as open surgery in the past now being applied as arthroscopic procedures. The aim of arthroscopic surgery is to provide rapid, accurate diagnosis and treatment during surgery together with the least morbidity possible to the patient. Therefore, the most important factor increasing the success of arthroscopic surgery is the ability to identify natural-healthy anatomic structures.

In this section, it is aimed to identify natural-healthy anatomic structures in shoulder arthroscopic surgery.

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2.2 Surgical Technique

In our hospital, arthroscopic shoulder operations are performed in the beach chair position. The patient is placed on the operating table seated in 70° flexion, and as deep vein thrombosis prophylaxis, both lower extremities are wrapped in elastic bandages. A hip support is placed below the hips to prevent the patient slipping on the table. The head position of the patient is fixed with a head holder. All patients are administered hypotensive anaesthesia under neuromonitorisation. The shoulder that is to be surgically treated is placed at the edge of the table. Epinephrine is routinely included in the isotonic fluid to be used in the arthroscopy. After entry to the joint, fluid pressure is adjusted to an initial pressure of 40 mmHg with automatic pressure control.

We routinely use the posterior portal at the start of arthroscopy, and the surgical procedure begins with intra-articular diagnostic arthroscopy. Respectively, the skin, subcutaneous tissue, deltoid muscle, teres minor and infraspinatus interval, then the capsule are passed with the trochar. Adjacent to this area are the quadrangular and triangular gaps. In the first entry to the glenohumeral joint space, a blunt-end obturator is used, and the arthroscopic cannula is placed over the obturator.

To be able to identify pathological structures in shoulder arthroscopy, it is necessary to be able to identify the natural appearance of non-pathological intra-articular structures. During
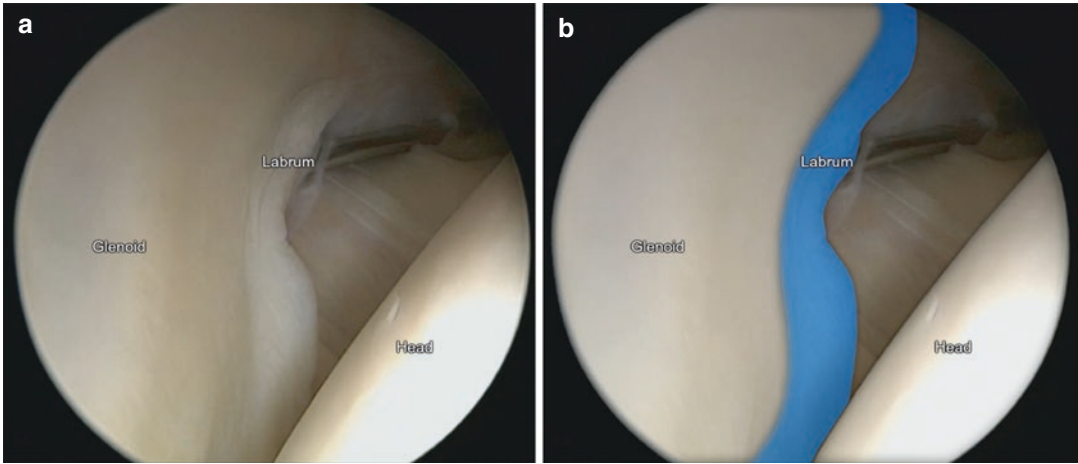
Fig. 2.1 (**a**) Arthroscopic evaluation with the posterior portal (**b**) Glenoid, labrum and humeral head
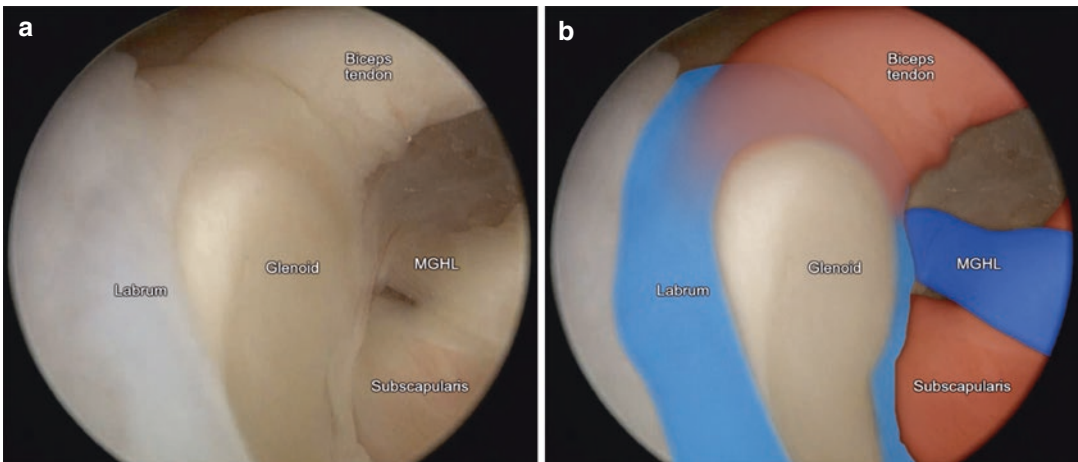

Fig. 2.2 (**a**) Anatomical structures seen from posterior portal (**b**) Labrum, glenoid, biceps tendon, MGHL and subscapularis tendon

arthroscopy, examination of the intra-articular anatomic structures in the same order will help in making a correct diagnosis. In diagnostic arthroscopy, we place the camera parallel to the floor perpendicular to the glenoid with the end of the camera superomedial to the humerus head (Fig. 2.1a, b).

By turning the camera viewing angle to the glenoid, it is attempted to understand whether or not there is chondral damage and whether or not the glenoid bone edges intact. Degeneration of the glenoid superior articular surface is evaluated in respect of cartilage loss. It is thicker than the central section. The central glenoid cartilage may sometimes be thin and can therefore be observed as cartilage defect (Fig. 2.2a, b).

The first things to be visualised within the joint are the triangle formed by the biceps tendon in the superior and the humerus head in the lateral and the subscapularis in the inferior. Of the intra-articular structures, the first to be located is the biceps tendon. On first entry to the joint, the biceps tendon must be identified for orientation purposes. The biceps tendon is visualised from the attachment known as the biceps anchor in the supraglenoid tubercle and superior labrum, along the rotator interval as far as the point where it emerges from the shoulder (Figs. 2.2a, b and 2.3a, b).

Then the first area to be identified should be the rotator interval region. Structures in this area are
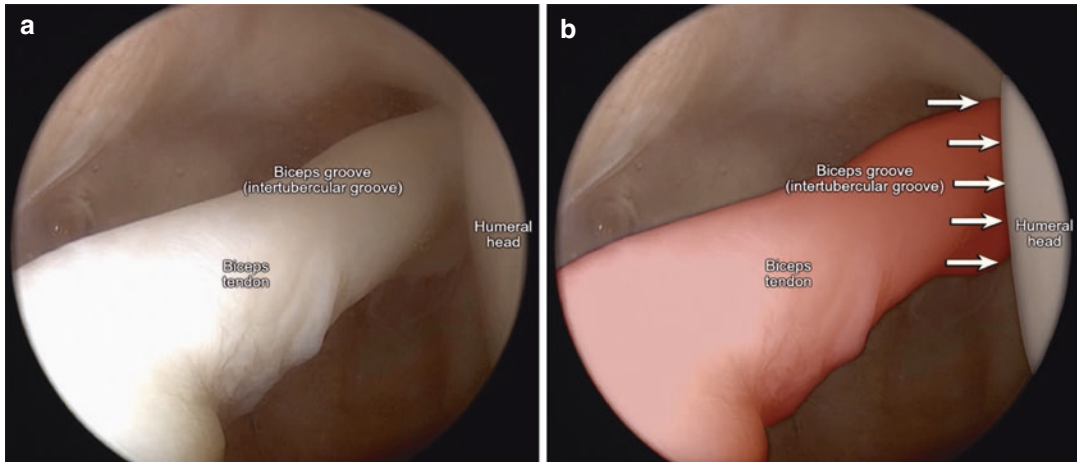
Fig. 2.3 (**a**) Visualization of biceps tendon (**b**) Biceps groove of humeral head
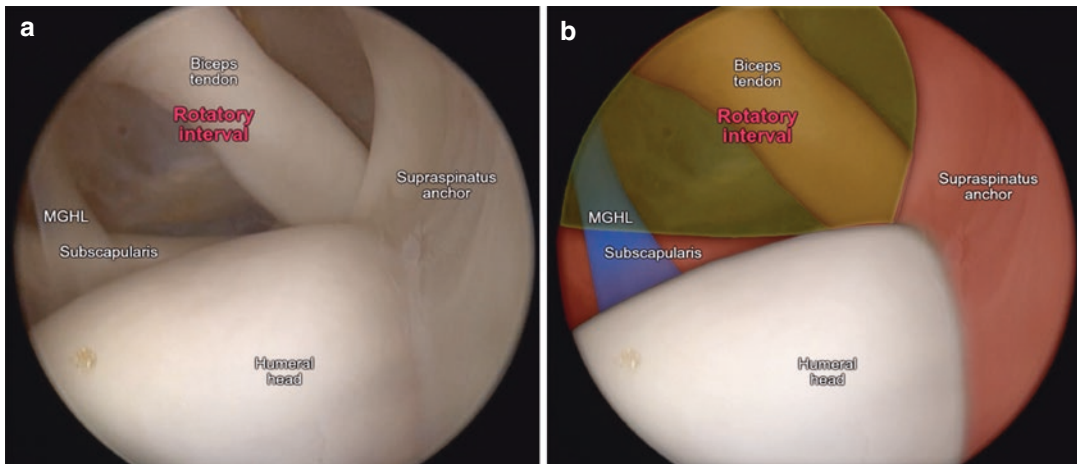

Fig. 2.4 (**a**) Identification of the rotator interval (**b**) Anatomic structures of the rotator interval

the upper intra-articular tendinous section of the subscapularis muscle, the middle glenohumeral ligament (MGHL), the superior glenohumeral ligament and the subscapular recess. After posterior portal entry, we use a guide needle in the identification of the site of the anterior portal entry in the rotator interval. The anterior portal is located approximately 1 cm lateral to the coracoid process. After opening the anterior portal, a cannula can be placed by widening the portal (Fig. 2.4a, b).

With the aid of a prop, it is necessary to examine whether or not the biceps tendon has separated from the biceps anchor and whether or not there is full continuity in the bicipital groove at the point of emergence from the joint.

Stability of the biceps tendon within the groove is provided by the support formed by the supraspinatus and the subscapularis attachment sites. This structure is also held by the superior glenohumeral ligament and the coracohumeral ligaments. By acting as a pulley, this structure provides stability to the biceps tendon. Treatment should be planned by pathological evaluation of degeneration, tears or dislocations which may be encountered in this area (Figs. 2.5a, b and 2.6a, b).

For evaluation of the intra-articular labrum and capsule attachments in the next stage, a 360° examination is made around the glenoid to check attachment of the labrum to the glenoid and
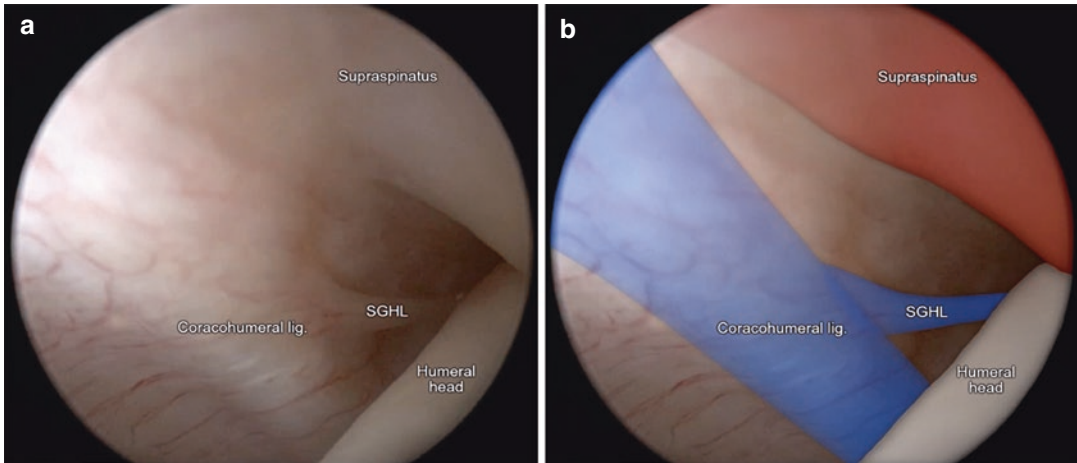
Fig. 2.5 (**a**) View of the coracohumeral ligament and superior glenohumeral ligament (**b**) Colored view of the coraco-humeral ligament , superior glenohumeral ligament , supraspinatus tendon and humeral head
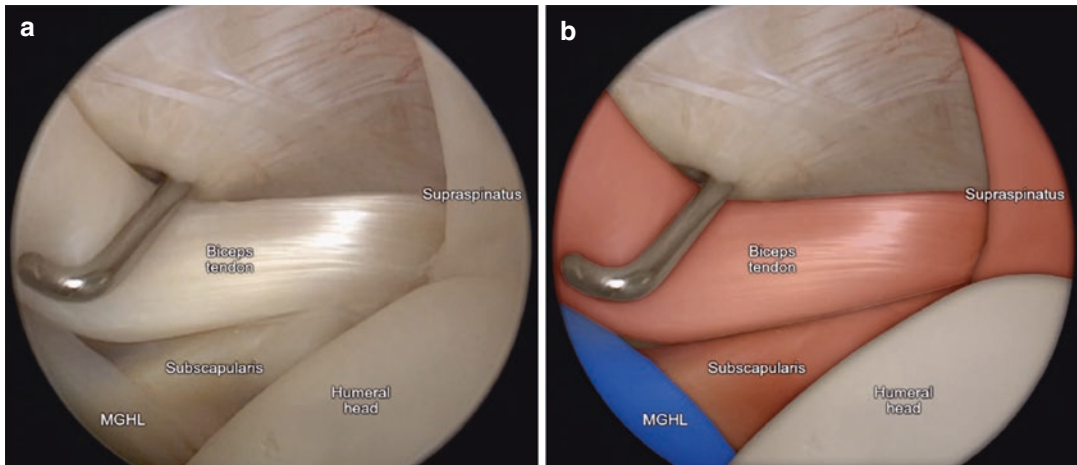

Fig. 2.6 (**a**) Arthroscopic evaluation of biceps tendon with prop (**b**) Colored view of the anatomic structures

whether or not there is capsular separation. Intra-articular loose bodies can generally be determined in the inferior recess of the capsule.

Examination continues of the ligaments and tendons starting from the anterior structures of the shoulder. Evaluation continues of the anatomic structures forming the rotator interval which is formed by the glenoid edge, the biceps tendon and the subscapularis tendon in the anterior. The attachment site of the subscapularis muscle and tendon integrity are observed. It can be seen that 30% of the subscapularis tendon is inside the joint. It forms the lower border of the rotator interval. It is particularly difficult to see the humerus attachment site, but this is extremely important in respect of the evaluation of tears.

The subscapular recess is a site where loose bodies could be hidden (Fig. 2.7a, b).

The middle glenohumeral ligament crosses the subscapularis tendon at an angle of 60°. Starting from the supraglenoid tubercle from the medial and superior glenoid edge, the anatomic neck section is held to the medial of the tuberositas minor. Due to variations in the structure, identification is not always possible. Just as it may not be possible to visualise at all, it may also be seen in the form of a cord. The MGHL tightens in external rotation and loosens in internal rotation. In 45°abduction, it is resistant to anterior translation. When the MGHL is seen, the intactness of the attachment site in the anterior superior labrum is examined. (Figs. 2.8a, b and 2.9a, b).
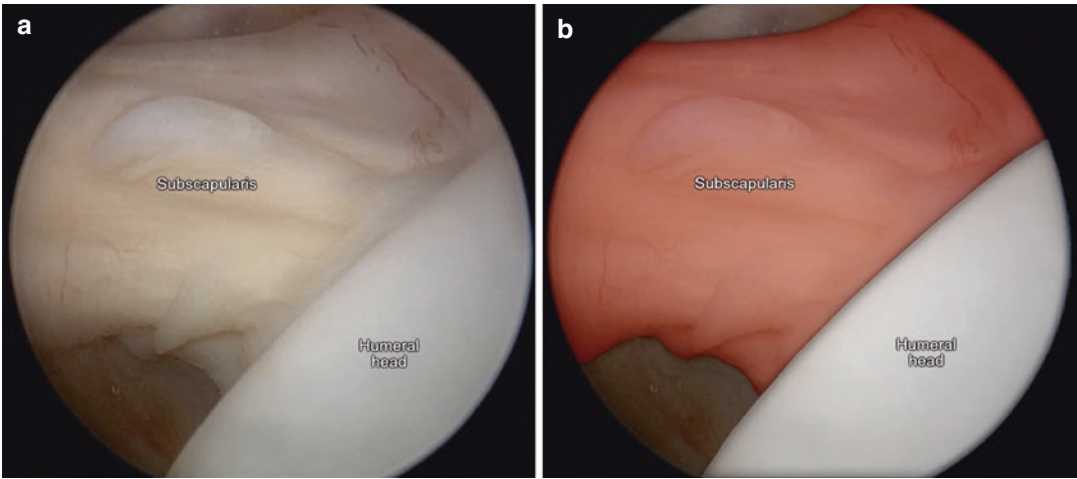
Fig. 2.7 (**a**) The subscapularis recess and attachment (**b**) Colored view of subscapularis tendon attacment
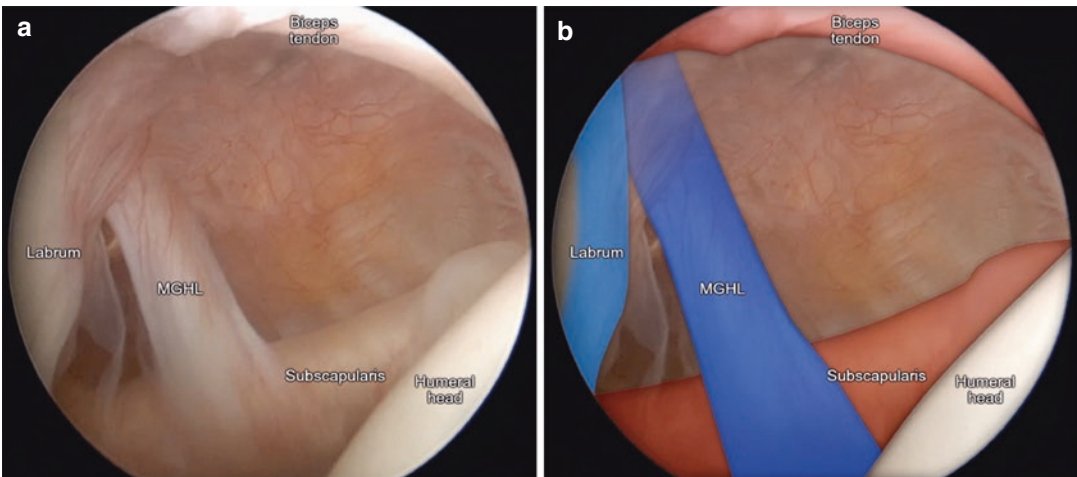

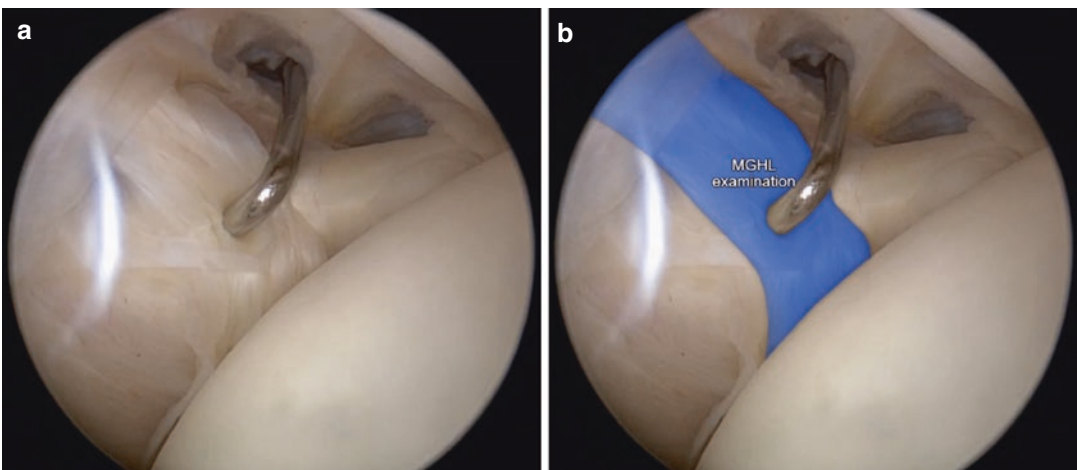**Fig. 2.8** (**a**) Anatomic relationship with subscapularis tendon and MGHL (**b**) Colored view of anatomic structures around of MGHL

Fig. 2.9 (**a**) Examination of MGHL (**b**) Colored view of MGHL
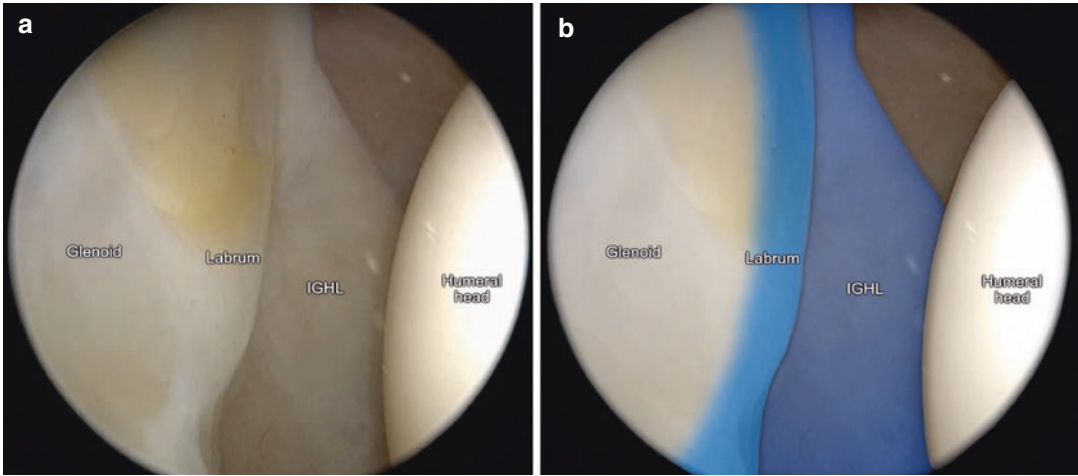
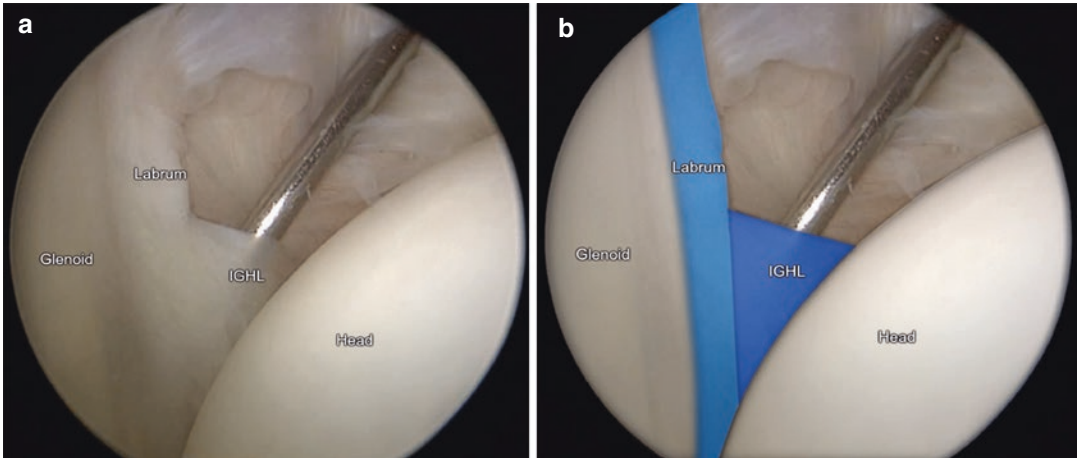**Fig. 2.10** (**a**) Arthroscopic evaluation IGHL (**b**) Colored view of IGHL

Fig. 2.11 (**a**) Examination of IGHL (**b**) Colored view of examination of IGHL

In the next stage, the inferior glenohumeral ligament and inferior labrum are examined. In 90° abduction and external rotation, the posterior band of the inferior glenohumeral ligament prevents inferior translation of the humerus head. With traction in 20°–30° abduction, the anterior band of the inferior glenohumeral ligament is more easily observed. In 90° abduction and external rotation, it prevents anterior translation of the humerus head and resists inferior translation. It extends from the glenoid towards the anatomic neck. When damage occurs in these structures, humeral avulsion glenohumeral ligament (HAGL) lesions should be kept in mind (Figs. 2.10a, b and 2.11a, b).

To evaluate the rotator cuff, the end of the arthroscope is turned along the attachment sites over the
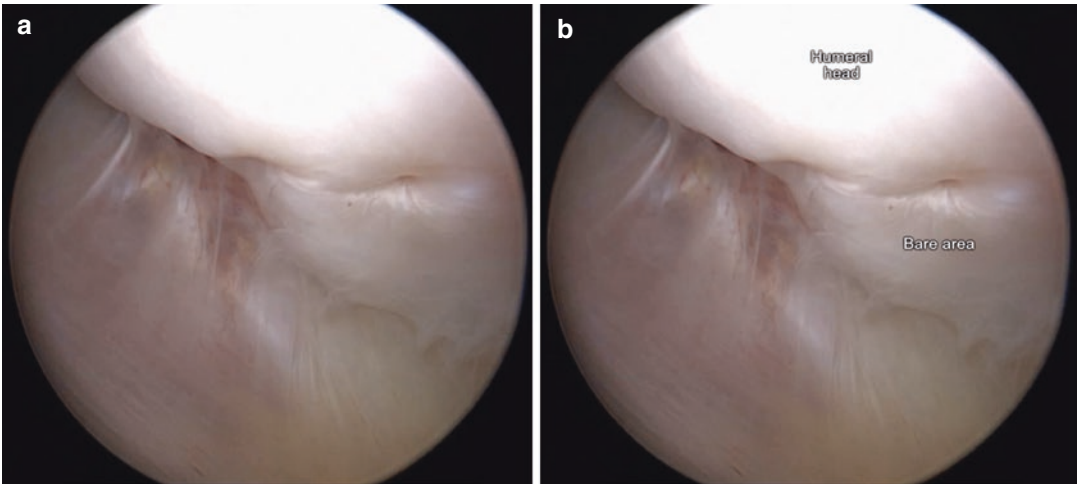
Fig. 2.12 (**a**) Bare area of humeral head (**b**) Infraspinatus footprint on bare area

humerus head (rotator cable) including anterior and posterior of the biceps from the anterior and the continuity of the rotator cuff is evaluated. When there is total separation in this area, the subacromial area which can be observed may cause an incorrect diagnosis. In the posterior humerus, the bare area formed of vessel entries remaining from the foetal period can be observed. Old vascular channels are located here. The bare area is compatible with the infraspinatus tendon attachment site and is an important anatomic point for the identification of the infraspinatus footprint (Fig. 2.12a, b).