



# The Ramp Test: An Arthroscopic Technique for Confirming Intra-articular Subluxation and Instability of the Long Head of the Biceps Tendon Within the Shoulder

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**Abstract:** Shoulder arthroscopy in expert hands is now a tool for diagnosis and treatment. Diagnostic shoulder arthroscopy begins with a systematic review of the shoulder. This review should include the ramp test for confirming normal superior glenohumeral ligament (SGHL) integrity and function. The ramp test uses manipulation of the biceps tendon to achieve this. A negative ramp test finding means that the SGHL is intact and the biceps tendon moves freely down in a V-type pattern. A positive ramp test finding results when the biceps tendon subluxates through a failed SGHL and therefore presents with a U-shaped pattern indicating pathology. Intra-articular biceps tendon instability occurs due to SGHL tearing, which can lead to upper subscapularis rotator cuff partial tears or complete tears either acutely or over time.

Anterior shoulder pain is an elusive clinical diagnostic problem. The multiple structures located in such a small area in the most mobile joint in the body create a clinical diagnostic gray zone even with magnetic resonance imaging.

Biceps intra-articular instability can cause anterior shoulder pain as the superior glenohumeral ligament (SGHL) begins to fail or completely fails.<sup>1</sup> The coracoid itself can impinge within this area, creating injury, referred to as “coracoid impingement.”<sup>2</sup>

Treating biceps intra-articular instability is now broken down into 2 treatment options, each with its extensive support in the literature: biceps tenotomy versus biceps tenodesis.<sup>3</sup> Diagnosing biceps intra-

articular instability within the shoulder joint is determined by shoulder arthroscopy and the use of the ramp test, which determines whether the SGHL is intact, tearing, or completely torn. The diagnosis can be made by use of this test.<sup>4</sup>

Walch et al.<sup>5</sup> termed the SGHL tear and biceps intra-articular subluxation as the “hidden lesion.” Early arthroscopy of the shoulder went through evolutionary phases of determining normal anatomy, without variants, such as the Buford complex, and development of better equipment to attain better access to the shoulder joint.<sup>5</sup>

The SGHL functions to maintain the biceps tendon in an exact position on the anterior-superior humeral head articular cartilage through full range of motion and to allow the tendon to move freely in and out of the joint during motion.<sup>1</sup> The breakdown of the SGHL—laxity, partial tearing, or full tearing—will determine whether the hidden lesion is present.<sup>5</sup> Finding this lesion during shoulder arthroscopy is determined by the ramp test.<sup>4</sup>

The clinical test for complete intra-articular instability of the biceps uses resisted full range of motion from full internal rotation to full abduction and full external rotation and will reproduce a clinical “pop.” If the SGHL is incompletely torn or lax, then the clinical examination findings may not be positive.<sup>6</sup>

Magnetic resonance imaging has some specific findings for biceps instability, but these require complete

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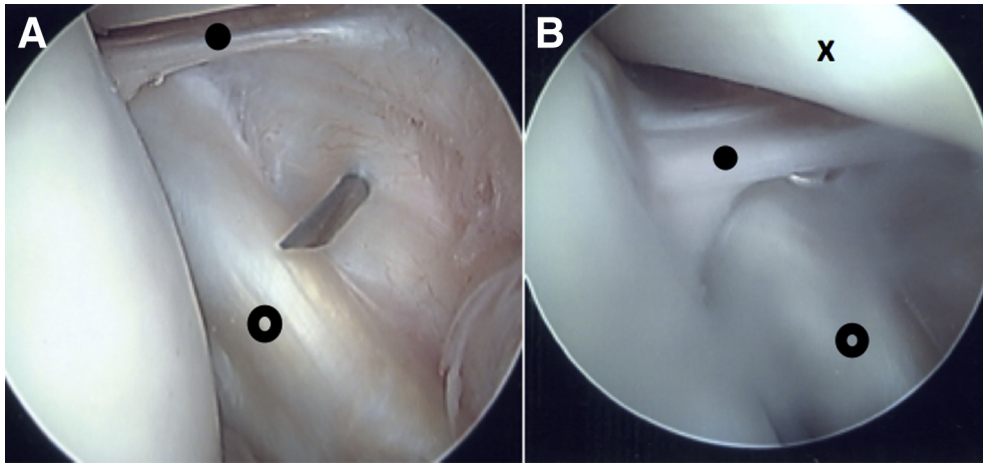
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**Fig 1.** (A) Subscapularis tendon (circle) and superior glenohumeral ligament (dot). (B) Normal biceps tendon (X), superior glenohumeral ligament (dot), and subscapularis tendon (circle).

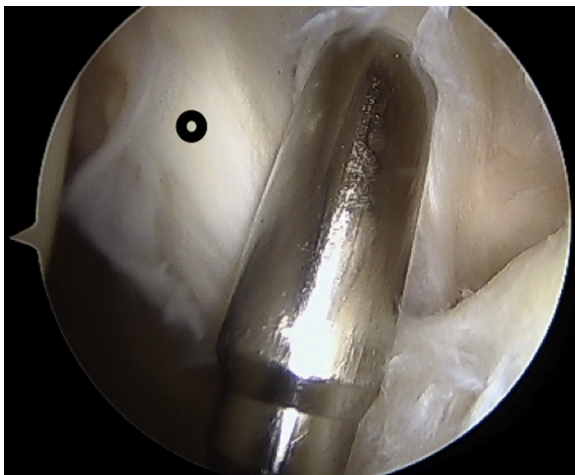
rupture or laxity in the SGHL to show the tendon subluxating out of the bicipital bone tunnel.<sup>1</sup> After many cadaveric dissections and extensive intraoperative use in a teaching institution, the ramp test is now a conformational simple test that can be used intraoperatively to help shoulder surgeons and developing resident surgeons to look at the anatomic structures and determine whether the SGHL is normal, lax, or torn.<sup>4</sup> The test is very simple and can be completed within 15 seconds during the arthroscopic evaluation of the shoulder joint to determine SGHL integrity. The purpose of this Technical Note is to review the ramp test.<sup>4</sup>

### Technique

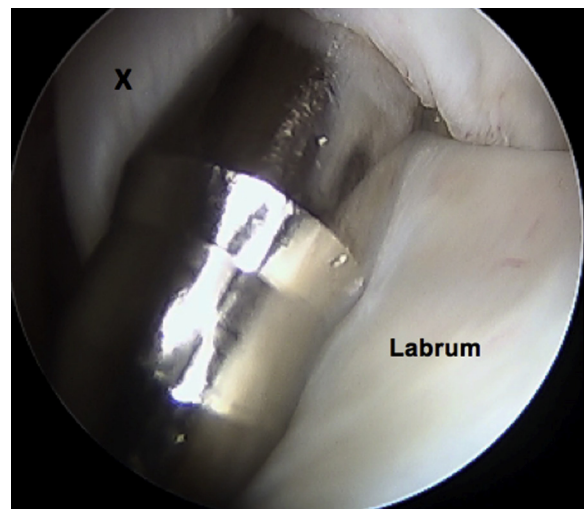
After induction of general anesthesia, the patient is positioned in the lateral position with all bony landmarks padded and the neck stabilized. The shoulder is

examined with the patient under anesthesia to assess range of motion and instability patterns. The extremity is scrubbed with povidone-iodine and wiped with alcohol, and chlorhexidine gluconate is applied in a sterile fashion.

The arm is placed in a lateral traction device with 10 lb of weight. The shoulder anatomy is marked. A standard posterior shoulder portal is made with a No. 11 blade. The shoulder arthroscope is placed and confirmed to be within the glenohumeral joint. We recommend localization of the anterior portal with a spinal needle after looking through the joint for other pathology so that exact skin and portal placement can be more specific. The anterior portal's location is determined by spinal needle localization above the subscapularis tendon and below the SGHL, as shown in [Figure 1](#). This forms a small capsular triangle where the



**Fig 2.** Anterior portal dilated with blunt trocar. The subscapularis tendon is marked with a circle.



**Fig 3.** Dilator placed over top of biceps tendon (X). The attachment to the anterior superior labrum is indicated.

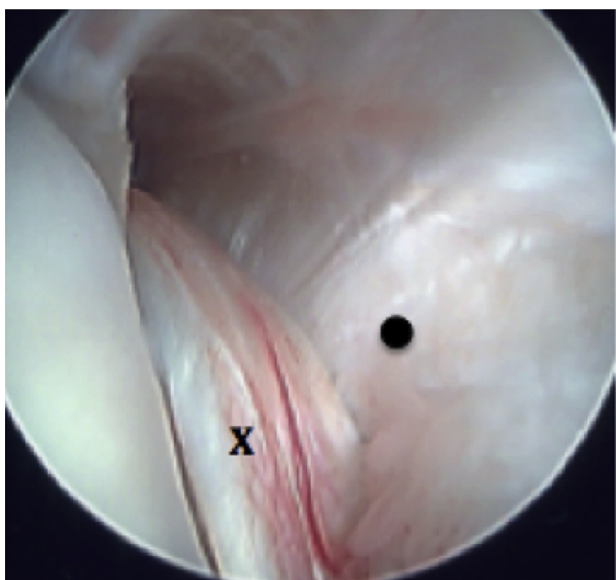


**Fig 4.** The biceps tendon (X) is pulled downward. The subscapularis tendon is marked with a circle. This is our best view of an intact superior glenohumeral ligament (dot). The ramp test finding is negative with normal structures.

needle enters. A No. 11 blade is used to open the skin in line with the needle.

This anterior portal is dilated with a blunt trocar, as shown in [Figure 2](#). A probe or dilator may be used to evaluate the shoulder joint. [Video 1](#) shows the dilator being brought into the joint and the ramp test being performed.

The ramp test is performed by bringing the Stryker dilator or Arthrex probe from under the biceps tendon and placing it over the top of the biceps tendon, as shown in [Figure 3](#). The biceps tendon is



**Fig 5.** Normal V-shaped biceps tendon (X) and normal superior glenohumeral ligament (dot).

**Table 1.** Pearls and Pitfalls

Pearls

- Spinal needle localization is recommended.
- The ramp test should be performed as part of diagnostic arthroscopy.
- The bony landmarks should be marked.

Pitfalls

- No pitfalls have been found.
- Making a portal before spinal needle localization should be avoided.

now pulled downward, and the anterior structures of the shoulder joint are observed. Particularly, the integrity of the SGHL, coracohumeral ligament, and subscapularis is assessed. Thus, the finding of the ramp test is deemed normal, as exemplified in [Figure 4](#). If the SGHL is intact, then a V is formed by pulling down on the tendon; this indicates a normal, negative ramp test finding.<sup>4</sup> If a U is seen during the test, then this confirms SGHL failure within the joint and evaluation of the upper subscapularis tendon must be performed for treatment decision making. The U shape is considered a positive ramp test finding, which indicates failure of the SGHL and confirms biceps intra-articular instability. [Figure 5](#) depicts a negative ramp test finding with an intact SGHL, with the biceps tendon forming a V on testing. [Table 1](#) shows pearls and pitfalls regarding the ramp test, and [Table 2](#) shows advantages and limitations.

## Discussion

The ramp test allows for previous diagnostic limitations to be overcome. Furthermore, it enables SGHL diagnostics to be determined in a timely manner without causing further damage to the joint. Therefore, the described technique should be followed when performing the ramp test, which should be included in the diagnostic arthroscopy of the shoulder joint. The only risks associated with the ramp test are those known to be associated with all arthroscopic procedures.

**Table 2.** Advantages and Limitations

Advantages

- Intra-articular biceps stability can be determined.
- The ramp test can be used for documentation in surgical decision making.
- The test is simple to perform.
- The test is easily taught and learned.
- Significant information is gained to support surgical decision making in <15 seconds.

Limitations

- Inexperienced surgeons who are unable to recognize multiple congenital anatomic variations (i.e., Buford complex)<sup>1</sup> should not perform the ramp test.

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