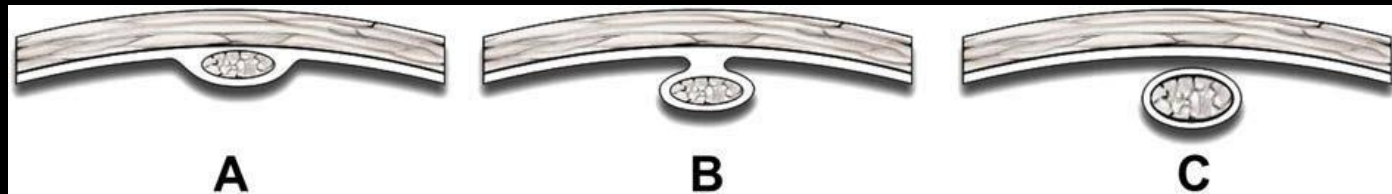


- 50% of the biceps tendon directly from the superior glenoid labrum with
- The remainder attached to the supraglenoid tubercle

Vangsness, C. T., et al. "The origin of the long head of the biceps from the scapula and glenoid labrum. An anatomical study of 100 shoulders." *Journal of Bone & Joint Surgery, British Volume* 76.6 (1994): 951-954.

LHBT anomalies

1. Mesotenon (MESO)
2. Partial or complete fusion with the capsule (ADH)
3. Split variant (SPL)
4. Absence of LHBT (ABS)

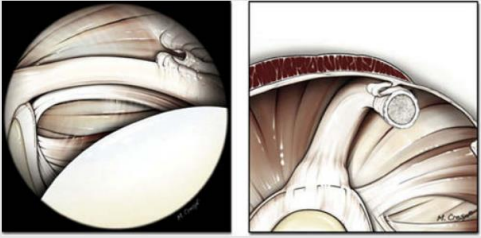
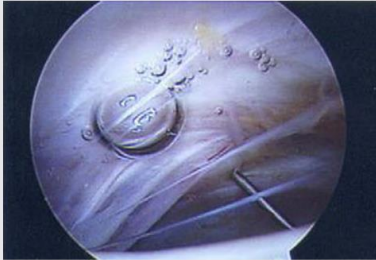
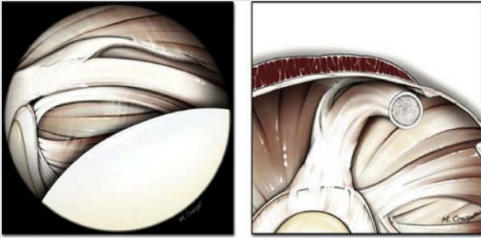

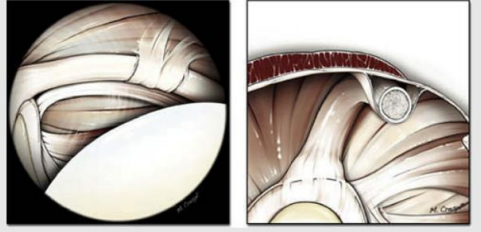
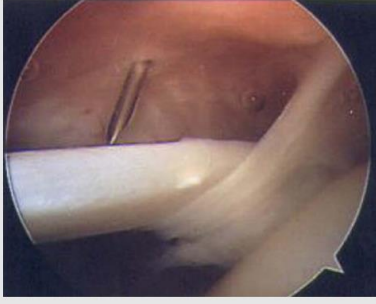


The transmigration from extra-articular to intra-articular according to Welcker.²⁶ (A) Adherent long head of the biceps, (B) mesotenon, and (C) free intra-articular LHB.

The ‘ ‘mesotenon’ ’ family

- 5 types of connections
- LHB able to move but not glide in a hammock-like synovial sling
- Very good movement between the LHB and the rotator cuff.

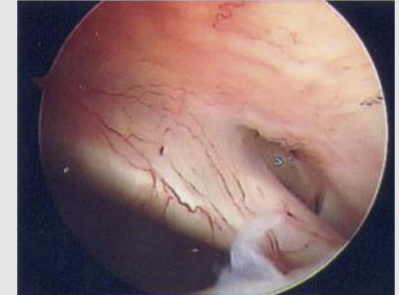
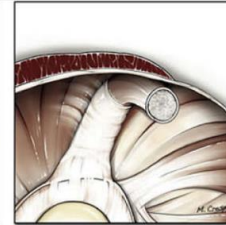
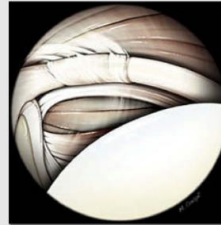
Table II Classification: 12 types of variations of the intra-articular portion of the long head of the biceps*

Classification	Description	Patients, %	Illustrations †	Arthroscopic examples
Mesotenon (MESO)				
MESO-VI (vinculum)	Fine string, providing vascularization to the tendon.	7.0		
MESO-SB (small band)	Small synovial band from medial to lateral, connecting the rotator cuff with the biceps. They are never on stress.	8.8		
MESO-PU (pulley-like sling)	Pulley or hammock-like sling, whereby the biceps can move or slide freely up and down.	17.5		

MESO-PA (partial mesotenon)

A hammock-like synovial sling in which the biceps tendon is able to move but not to glide.

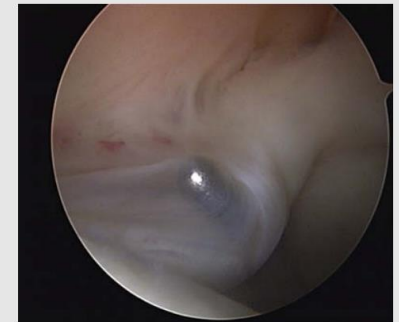
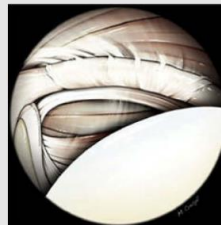
7.0



MESO-CO (complete mesotenon)

The biceps tendon runs in a synovial sheath that is connected, loose woven but well vascularized, to the inferior surface of the capsule. No sliding is possible.

10.5



The ‘ ‘adherent’ ’ family

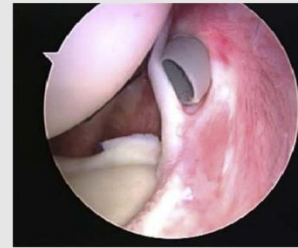
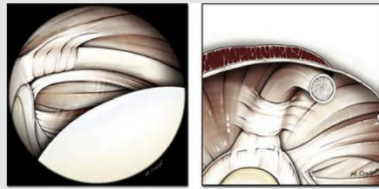
- 4 types
- Stronger connections between a single LHB tendon and the capsule.

Adherent (ADH)

ADH-PM (partially medially adherent to the SSP)

A partial but strong medial adhesion runs cranial and medial to the inferior surface of the capsule. This fan-wise expansion to the articular side of the SSP tendon stops laterally and does not involve the cable. This type of adhesion becomes taut on the abduction maneuver and will usually give a downward and inferior traction on the rotator cuff.

10.5[†]

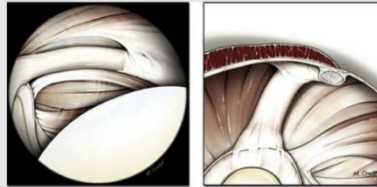


(continued on next page)

ADH-PL (partially laterally adherent to the SSP)

The adhesion is laterally located and involves also the rotator cuff cable. This adhesion becomes taut on abduction. The medial portion of the LHB is free from the upper synovial layer and will relax on abduction. This gives an hourglass-type of impingement of the free medial portion of the LHB between humeral head and glenoid, well seen during dynamic arthroscopic inspection.

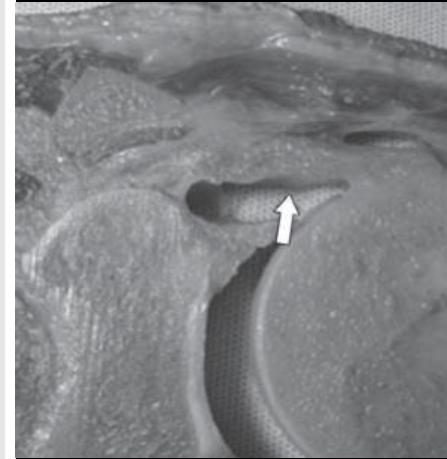
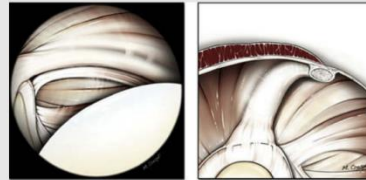
5.3[‡]



ADH-CL (complete adherent; attaching to the labrum)

No mesotenon is visible; instead a taut synovial covering runs in front of and behind the biceps tendon in continuity with the capsular synovium. The biceps tendon, fanning out to the upper labrum, appears no longer to be able to move up and down during the abduction maneuver in this extracapsular position.

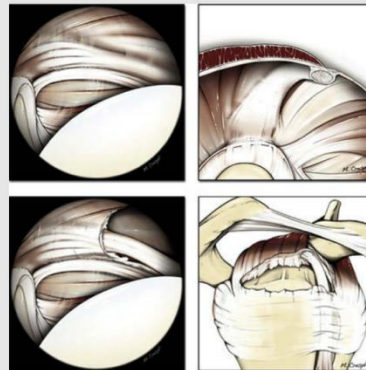
8.8[†]



ADH-CO (complete adherent to SSP; not attaching to the labrum)

A complete adherent course, without extension to the upper labrum, was only seen in a case with full-thickness SSP tear. The biceps tendon was located in the mass of the rotator cuff (SSP tendon).

1.7



The ‘ ‘adherent’ ’ family

- ADH-PM
 - 2 of 6 patients: SSP tear
- ADH-PL
 - Hour-glass impingement of the free medial LHB
- ADH-CO
 - 1 case with full-thickness SSP tear
- ADH-CL
 - 2 of 5 patients: SSP tear

The ‘ ‘split’ ’ family

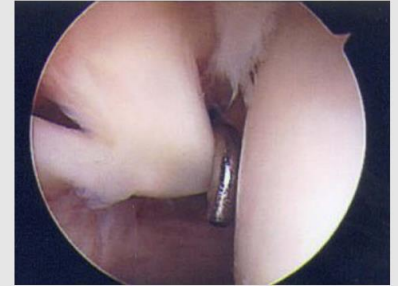
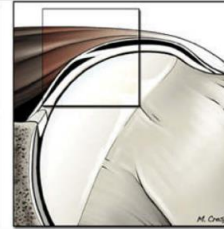
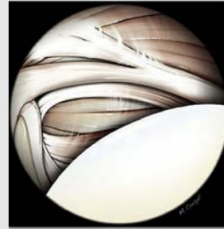
- Two types of split biceps
 1. Split biceps double origin
 - 5 of 9 patients: SSP tear
 2. Split biceps reversed type

Split biceps (SPL)

SPL-DO (split biceps double origin)

The biceps partially originates from the inferior surface of the SSP, partially from the glenoid, and joins before the bicipital groove. This extra band gets tight in abduction.

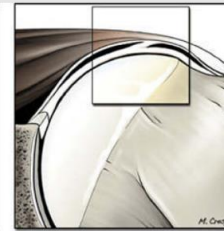
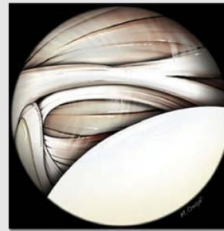
15.8



SPL-RE (split biceps reversed type)

Besides the loose-woven mesotenon there is also a part that is clearly firmer and harder, running out from the biceps tendon, then laterally to the inferior surface of the capsule. This type of adhesion relaxes upon the abduction maneuver when the SSP tendon moves medially and the biceps glides laterally.

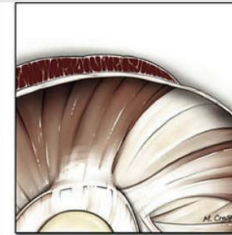
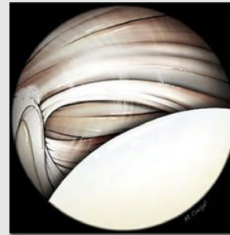
3.5[†]



The ‘ ‘absent’ ’ family

Absent biceps (ABS)

ABS (complete absence of LHB) A complete absence of the LHB 3.5[†]



LBH, Long head of the biceps; *SSP*, supraspinatus.

* Our suggested classification of the four families and a total of 12 subgroups. Including the incidence in our population, illustrations from Massimiliano Crespi© as seen in the arthroscopic posterior view in the beach-chair position with traction (except where noted) together with a transsectional or coronal anatomic view.

[†] Picture was taken in lateral decubitus position with traction.

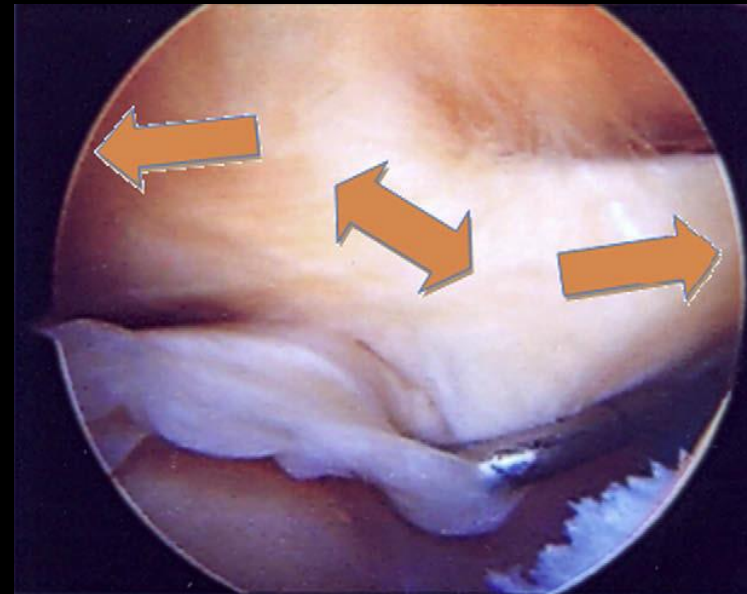
[‡] Illustration of the hourglass-type impingement in abduction, due to a lateral adhesion.

Double tendon variant

- Variant of a double tendon with separate attachments to the supraglenoid tubercle and posterosuperior capsulolabral tissue.

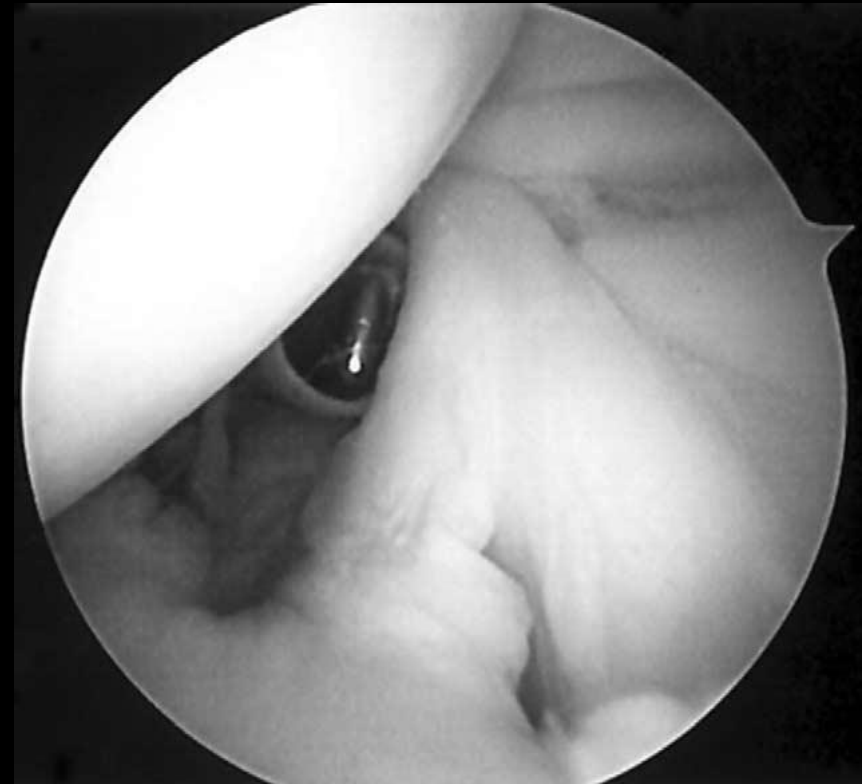
Physiopathogenesis of inferior traction of SSP in:

- Double-origin (SPL-DO)
 - Medial Adherence (ADH-PM)
 - Lateral Adherence (ADH-PL)
- Medial migration of SSP during abduction with lateral gliding of the LHB into the bicipital groove
- Aggravated by simultaneous flexion of the biceps



- 2/90 patients with preoperative diagnoses of concomitant subacromial impingement and acromioclavicular arthrosis
- Bifurcate origin of the biceps tendon was identified.

- Bifurcate origin of the proximal 6 mm of the biceps tendon
 - One limb to the supraglenoid tubercle and
 - The other limb separate attachment to the posterosuperior capsulolabral tissue



Enad, Jerome G. "Bifurcate origin of the long head of the biceps tendon." *Arthroscopy: The Journal of Arthroscopic & Related Surgery* 20.10 (2004): 1081-1083.

- Bifurcate origin in the proximal 5 mm (slightly frayed)
 - One limb to the supraglenoid tubercle
 - The other limb had a separate attachment to the posterosuperior capsulolabral tissue.



Enad, Jerome G. "Bifurcate origin of the long head of the biceps tendon." *Arthroscopy: The Journal of Arthroscopic & Related Surgery* 20.10 (2004): 1081-1083.

- Bifurcate long biceps tendon about 1 cm distal to its origin with both limbs originating from a single biceps tendon origin.

Kim, Kyung Cheon, et al. "Biceps long head tendon revisited: a case report of split tendon arising from single origin." *Archives of orthopaedic and trauma surgery* 128.5 (2008): 495-498.