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Yergason's Test: Discrepancies in Description and Implications for Diagnosing Biceps Subluxation

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Yergason described the case of a woman with bicipital pain that was confirmed with isolated forearm supination. Since publication of this respective case report in 1931, orthopedic assessment textbooks have provided a wide range of descriptions for Yergason's Test and what a positive sign implicates. Vast differences in hand placement, along with the vernacular for shoulder, forearm, and elbow motions, have been associated with Yergason's Test. Many authors associate pain with the maneuver as a diagnosis for a rupture of the transverse humeral ligament (THL) and subsequent subluxation of the long head of the biceps tendon (LBT). Interestingly, many now believe that the THL is not a distinct ligament; rather, support of the LBT within the bicipital groove occurs from a fibrous extension of the subscapularis tendon. Thus, evaluation of the subscapularis when a subluxing LBT is suspected is critical. The discrepancies of Yergason's Test among orthopedic assessment textbooks shall be summarized along with a brief review of contemporary views on how to clinically evaluate the subluxing LBT. Until consensus is reached on hand placement and joint movements to provoke subluxation of the LBT, Yergason's Test should be removed from instructional materials and the Board of Certification examination for athletic trainers, if applicable.

Key Words: biceps brachii; long head biceps tendon; subscapularis; transverse humeral ligament

The physician, Robert Yergason, is associated eponymously with the maneuver he described originally in 1931[1] as the "supination sign." In his manuscript, Yergason described the case report of a patient with bicipital groove pain who experienced heightened symptoms when the forearm was supinated from a pronated position actively and against manual resistance provided "by the surgeon." Although Yergason described that his maneuver should be performed with the elbow in a position of 90 degrees flexion, he neither mentioned resisting elbow flexion nor any actions involving the shoulder joint. Because Yergason provided no illustrations or descriptions of associated hand placement for his test, subsequent descriptions and variations of his original maneuver have emerged, especially in several leading textbooks.[2-10] These discrepancies are problematic in that differences in hand placement, direction of force, and type of contraction result in different maneuvers. Moreover, many even suggest that a positive sign with Yergason's Test implies rupture of the transverse humeral ligament (THL),[3, 4, 7, 9, 10] and significant debate is occurring as to even the existence of the THL! In fact, two recent anatomical reports[11, 12] indicate that the long-believed premise of a distinct THL is faulty. Rather, an annular sling or retinaculum supporting the long head of the biceps tendon (LBT) within the bicipital groove is likely a continuation of fibrous tissue from the subscapular tendon. These newly reported anatomic insights may explain why the mechanism of injury for the LBT subluxation injury versus the reproduction of subluxation symptoms using Yergason's Test may differ. The purpose of this article is to revisit the execution of Yergason's Test, how it differs from forces associated with an injury mechanism for a subluxing LBT, and whether such a maneuver is useful in evaluating the LBT subluxation.

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Discrepencies For Describing Yergason's Test

In spite of the lack of a description for shoulder motion in Yergason's original description of his "supinator sign," many textbooks describe the need for rotary movement of the shoulder (Table 1); however, clarity as to whether manual resistance should be applied to promote isometric tension, concentric tension, or eccentric tension is lacking. Some authors describe Yergason's Test with the application of manual resistance to the lateral arm/forearm to prevent external rotation.[3, 7, 9] Others[5, 10] have called for the need to provide resistance at the arm/forearm to prevent internal rotation. External shoulder rotation with contraction of the biceps brachii is designed to bowstring and stress the LBT medially from the bicipital groove, and such maneuvering is occasionally

Table 1. Comparison of Hand Placement and Vernacular for Performing Yergason's Test Appearing in Leading Textbooks (Listed Alphabetically by Author)

Source	Proximal Hand Placement	Distal Hand Placement	Shoulder Movement*	Forearm Movement	Elbow Movement†
Cook & Hegedus[2]	Lateral surface of flexed elbow	Posterior surface of distal radius and ulna	Unstated	Starting Position: "pronated position". Action: "Patient is instructed to supinate…examiner concurrently resists"	Unstated
Gross, Fetto, & Rosen[3]	Over bicipital groove - Distal Hand:	Anterior surface of distal radius and ulna	"Ask patient to resist external rotation of the arm"	Starting position: unstated. Action: "Resistance of attempted supination should also be included"	"Push downward as the patient also resists flexion of the elbow"
Gulick[4]	Over bicipital groove	Anterior surface of distal radius and ulna	Unstated	Starting position: unstated. Action: "resist supination"	"Resist elbow flexion"
Hoppenfeld[5]	Posterior surface of the flexed elbow	Anterior surface of distal radius and ulna	"Externally rotate patient's arm as he resists"	Starting position: unstated; depicted in the midpronation position Action: unstated; depicted in midpronation	"Pull down on the elbow"
Konin, Wiksten, & Isear, Jr.[6]	Lateral surface of upper arm	Posterior surface of distal radius and ulna	"resist subject's attempt to externally rotate"	Starting Position: "pronated position". Action: "resist subject's attempt to supinate"	Unstated
Magee[7]	Over bicipital groove	Anterior surface of distal radius and ulna	"… laterally rotates the arm against resistance"	Starting position: "with the forearm pronated" Action: "the examiner …resists supination"	Unstated
Reider[8]	Dorsal surface of distal radius and ulna	Palm of hand	Unstated	Starting Position: "pronated position". Action: "Ask patient to attempt supination"	"Ask patient to attempt elbow flexion"
Shultz, Houglum, & Perrin[9]	Lateral surface of the flexed elbow	Anterior surface of radius and ulna	"Resist…the athlete's attempt…to laterally rotate the shoulder"	Starting position: forearm begins in a "pronated position". Action: "resist the athlete's attempt… to supinate the forearm"	Unstated
Starkey & Ryan[10]	Posterior surface of the flexed elbow	Anterior surface of distal radius and ulna	"The patient provides resistance while the examiner concurrently moves the glenohumeral joint into external rotation"	Starting position: forearm begins in "neutral position" (i.e., midpronation) Action: "examiner …moves the proximal radioulnar joint into supination"	Unstated

Notes: *All sources have the maneuver beginning with the shoulder in its anatomical position (i.e., arm at side stabilized to thorax).
†All sources have elbow beginning in a position of 90° elbow flextion. Hand placement and direction of resistance is occasionally inferred from photographs and illustrations.

represented with illustrations.[3, 5] Numerous authors assert that resistance against elbow flexion should be provided during Yergason's Test,[3-5, 8] presumably to heighten tension in the LBT; however, by illustration, this is an isometric elbow flexion contraction. One text, based on hand placement and direction of force, described Yergason's Test with a pronation force,[10] clearly the antithesis of what Yergason originally described in his "supination sign".

The precise reason for the various explanations of Yergason's Test is unknown. Perhaps the effort was to pay tribute to Yergason

for the insight of his original supination sign. However, inconsistency of description for Yergason's Test (Table 1) actually seems to have created a source of major confusion for the practicing clinician and professional student. Multiple, and at times, conflicting descriptions of clinical maneuvers using a common name creates poor communication between experienced clinicians and present significant challenges for those both developing and sitting for professional examinations for graduation requirements, licensure, etc.

Anatomy and Pathomechanics of The Subluxing LBT

The biceps brachii is a biarticular muscle crossing the elbow and shoulder joints. The distal aponeurosis of the biceps attaches at the radial tuberosity, and when the forearm is pronated, the distal tendon is rolled internally.[13] Such a position creates the appearance of the biceps belly being longer, whereas when fully supinated, the biceps belly has a balled appearance. In the supinated position, Basmajian and Latif[14] reported that as low as five pounds of supination force would elicit maximal electromyographic activity of the lateral head of the biceps brachii. Perhaps, such rationale was applied by Yergason when he conceived his "supination sign" maneuver.[1]

The short head of the biceps brachii originates on the coracoid process of the scapula while the LBT of the lateral head traverses through the bicipital groove and originates on the lip of the glenoid labrum.[15] The bicipital groove is formed laterally by the greater tuberosity and medially by the lesser tuberosity. The belly of the subscapularis muscle resides ventrally on the scapula, dorsal to the rib cage and subscapularis bursa, and its tendon attaches to the lesser tuberosity of the humerus.[16] As such, the subscapularis is the chief internal rotator muscle of the humerus.

The THL was originally purported to be a fibrous band passing over the top of the LBT, attaching to the lesser and greater tuberosity.[16] Others[11,12] more recently have concluded that the THL is in actuality a fibrous band extension of the subscapularis, and to a lesser degree, the supraspinatus tendon and coracoclavicular ligament.[11] Thus, injury of a subscapularis tendon is commonly a precursor injury to the subluxing LBT[17,18] (Figure 1). In fact, based on clinical trial data, Walch et al.[18] concluded a decade ago that forced external rotation, or eccentric strain of the subscapularis, is the primary mechanism of injury for LBT subluxation and dislocation. Gerber and Krusell,[19] whose primary focus was to describe the evaluation process for a torn subscapularis muscle, described the dislocated LBT as the "hallmark sign" for a torn subscapularis. Thus, both groups observed and described the interdependence of a torn subscapularis with the LBT dislocation/subluxation. Thus, when evaluating for a potential subluxation of the LBT, it is imperative to evaluate the obligatory injury: a tear of the subscapularis.

Clinical Manifestation and Evaluation of the Subluxing LBT

As stated above, structural support of the LBT within the bicipital groove includes a fibrous extension of the subscapularis tendon.[11,12] Thus, a mechanism of forced external rotation,[18] ascertained while elucidating the patient's historical account of the chief complaint, should raise the examiner's suspicion of a subluxing LBT. Walch et al.[18] also described that patients with LBT subluxation and dislocation commonly report general weakness of the shoulder, a clinical presentation they described as "pseudoparalysis" of the shoulder. Such a complaint assuredly affects activities of the patient's daily living, warranting further inquiry.

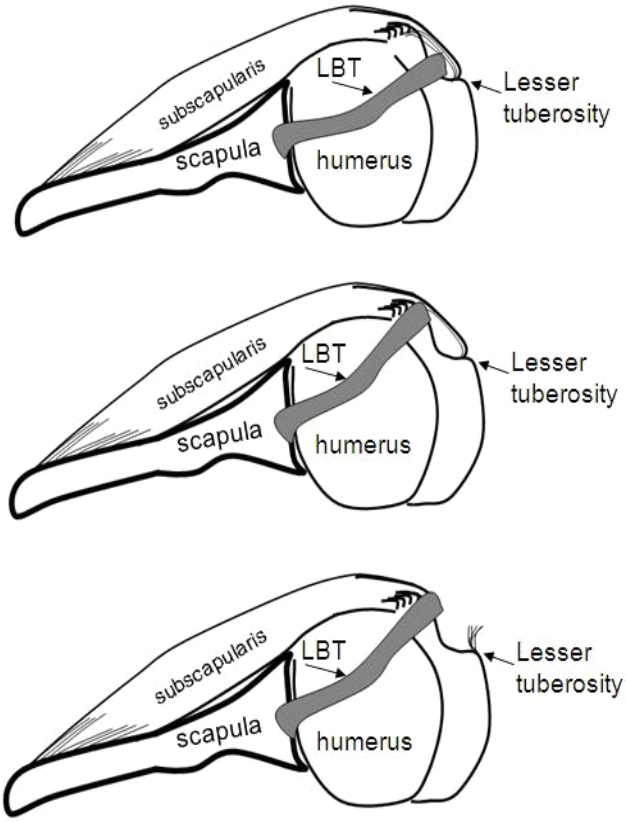

Figure 1. Overhead View of the Subscapularis Muscle, Long Head of the Biceps Tendon (LBT) and Bicipital Groove. The top illustration is of an intact structure and depicts normal anatomy. The middle panel depicts a partial tear of the subscapularis tendon from the attachment on the lesser tubercle. With this injury, the LBT subluxes over the lesser tubercle into the subscapularis muscle. The bottom panel depicts a complete tear of the subscapularis tendon from the attachment on the greater tubercle. With this injury, the LBT subluxes over the lesser tuberosity and the subscapularis tendon.

Upon clinical inspection, frontal and sagittal plane views of the pectoral girdle postures should be assessed, along with an observation for apprehension, shoulder hiking, or a painful arc during active range of motion. Weakness and pain during crossed-body and overhead movements of the Apley's scratch test are expected, whereas the behind the back scratching motions may present with limited motion. Palpable pain is expected over tendon insertions of the subscapularis on the lesser tubercle and LBT within the deltopectoral girdle with the patient's arm positioned in

the "hands-on-lap" position.[20] Palpation of the bicipital groove with the humerus positioned neutrally also may be tender.[5]

Resistive range of motion, performed bilaterally, to assess strength of the subscapularis will evaluate the aforementioned predisposing injury to a subluxing LBT. Gerber and Krushell[19] described a technique for evaluating a rupture of what they termed as the "Lift-Off" Test. This maneuver is depicted and described in Figure 2. Barth et al.[21] more recently conceived a maneuver for evaluating a tear of the subscapularis termed the "Bear-Hug" Test. This test is also depicted and described in Figure 3. According to these investigators, where the lift off test is useful for diagnosing full tears, symptoms may limit the ability to position the patient's arm behind their back to initiate the test. Moreover, the investigators suggested that the Bear-Hug test may be more useful in diagnosing a partial tear of the subscapularis. A partial tear of the subscapularis has been observed with the LBT subluxation injury (see Figure 1).[18]

Figure 2. Scapular Lift Test. With this maneuver, the patient's arm is placed behind his or her back as illustrated. The patient is asked to life their arm away from the back. The left panel depicts an ability to life the arm wheras the right panel depicts an inability to lift the arm. Such inability is indicative of a torn subscapularis.

When palpable pain over the bicipital groove is present, it is critical to rule out isolated tendon pathologies of the LBT and/or a superior labrum, anterior posterior (SLAP) lesion. Resisted shoulder flexion and the Speeds Test have been recommended previously for evaluating biceps tendinitis and tenosynovitis,[22, 23] respectively. These maneuvers, however, also may indicate a SLAP lesion. The SLAP lesion, much like the LBT subluxation injury, is similarly associated with forceful external rotation, or peel-back mechanism.[24] The SLAP lesion is, therefore, the

Figure 3. Bear-Hug Test. With this maneuver, the patient's arm is placed across their body with the palm resting on the opposite shoulder as illustrated in the top panel. The patient is asked to press their palm against their shoulder, with their shoulder contracting internally, as if performing a "bear-hug." The examiner, while stabilizing at the elbow, adds pressure in the opposite direction against their palm, thus pulling into external rotation against resistance (bottom panel). This test is positive for a torn subscapularis if the patient is unable to hold their palm against their shoulder. Bilateral strength deficit may be used to evaluate a partial tear.

primary differential diagnosis to the LBT subluxation injury. The active compression test[25] and the resisted supination-external rotation test[26] are both sensitive and specific for verifying the SLAP lesion. In either instance referral to the physician is recommended and diagnostic imaging may be needed.

In light of the research that has emerged over the past decade, forearm supination may evoke bicipital groove pain, as originally described by Yergason, but will not verify the obligatory pathology (i.e., a tear of the subscapularis muscle). Moreover, performing resisted supination solely is unlikely to provoke bowstringing and subluxation of the LBT. Hypothetically, a combination of supination with resisted external rotation would provoke the LBT to slip over the medial border of the bicipital groove. Inhibition of the subscapularis with resisted external rotation may prevent a partial subscapularis tear from masking a LBT subluxation (refer to middle illustration from Figure 1). Herein resides the paradox: while the mechanism of injury for a LBT subluxation is often supination with forced external rotation (i.e., eccentric strain of the subscapularis), it is quite conceivable that supination with the

opposite action of resisted external rotation (i.e., isometric or eccentric strain of the infraspinatus) may be used in evaluating this pathology. Direct sonography or clinical trials to verify the mechanics of a modification to Yergason's supination sign is warranted before such a maneuver can be recommended. Thus, discretion should be exercised when teaching Yergason's Test to students, as better techniques exist for evaluating the obligatory pathology of the subscapularis tear (e.g., Lift Off Test). Moreover, because of the lack of consensus on description and clinical implications for a positive sign, the Board of Certification, Inc. examination for athletic trainers should omit items on their examination related to Yergason's Test, if applicable.

Conclusions

Explanations on how to perform Yergason's Test vary among textbooks and few, if any, resemble what was described in Yergason's original report. In spite of suggestions that Yergason's Test may diagnose subluxation/dislocation of the LBT, no sensitivity or specificity data exists to support such a claim. As such, there is little evidence to support teaching the Yergason's Test for the diagnosis of LBT pathologies and including this as content for examinations such as the BOC exam until such data exists. Rather, when one suspects a LBT subluxation, as opposed to performing Yergason's Test, current literature indicates it would be more prudent to evaluate pathology of the subscapularis and to rule out the primary differential diagnosis of a SLAP lesion.

References

1. Yergason RM. Supination sign. J Bone Joint Surg Br 1931;13:160.
2. Cook CE, Hegedus EJ. Orthopedic Physical Examination Tests: An Evidence-based Approach. Upper Saddle River, NJ: Prentice-Hall; 2008.
3. Gross JM, Fetto J, Rosen E. Musculoskeletal Examination. Malden, MA: Blackwell Science; 2002.
4. Gulick D. Ortho Notes. Philadelphia, PA: F.A. Davis; 2005.
5. Hoppenfeld S. Physical Examination of the Spine and Extremities. East Norwalk, CT: Prentice-Hall, Inc; 1976.
6. Konin JG, Wiksten DL, Isear J, J.A. Special Tests for Orthopedica Examination. Thorofare, NJ: Slack Inc.; 1997.
7. Magee DJ. Orthopedic Physical Assessment. 4th ed. Philadelphia, PA: Elsevier; 2002.
8. Reider B. The Orthopaedic Physical Examination. 2nd ed. Philadelphia, PA: Elsevier; 2005.
9. Shultz SJ, Houglum PA, Perrin DH. Examination of Musculoskeletal Injuries. 2nd ed. Champaign, IL: Human Kinetics; 2005.
10. Starkey C, Ryan JL. Evaluation of Orthopedic and Athletic Injuries. 2nd ed. Philadelphia, PA: F.A. Davis; 2002.
11. Gleason PD, Beall DP, Sanders TG, et al. The transverse humeral ligament: a separate anatomical structure or a continuation of the osseous attachment of the rotator cuff? Am J Sports Med 2006;34(1):72-7.
12. MacDonald K, Bridger J, Cash C, Parkin I. Transverse humeral ligament: does it exist? Clin Anat 2007;20(6):663-7.
13. Chew ML, Giuffre BM. Disorders of the distal biceps brachii tendon. Radiographics 2005;25(5):1227-37.
14. Basmajian JV, Latif A. Integrated actions and function of the chief flexors of the elbow. J Bone Joint Surg Am 1957;39:1184-90.
15. Morag Y, Jacobson JA, Shields G, et al. MR arthrography of rotator interval, long head of the biceps brachii, and biceps pulley of the shoulder. Radiology 2005;235(1):21-30.
16. Gray H, Pick TP, Howden R. Gray's Anatomy: The Classic Collector's Edition. 15th ed. New York, NY: Bounty Books; 1977.
17. O'Donoghue DH. Subluxing biceps tendon in the athlete. Clin Orthop Relat Res 1982(164):26-9.
18. Walch G, Nove-Josserand L, Boileau P, Levigne C. Subluxations and dislocations of the tendon of the long head of the biceps. J Shoulder Elbow Surg 1998;7(2):100-8.
19. Gerber C, Krushell RJ. Isolated rupture of the tendon of the subscapularis muscle. Clinical features in 16 cases. J Bone Joint Surg Br 1991;73(3):389-94.
20. Mattingly GE, Mackarey PJ. Optimal methods for shoulder tendon palpation: a cadaver study. Phys Ther 1996;76(2):166-73.
21. Barth JRH, Burkhart SS, De Beer JF. The Bear-Hug Test: A New and Sensitive Test for Diagnosing a Subscapularis Tear. Arthroscopy 2006;22:1076-84.
22. Bennett WF. Specificity of the Speed's test: arthroscopic technique for evaluating the biceps tendon at the level of the bicipital groove. Arthroscopy 1998;14(8):789-96.
23. Gill HS, El Rassi G, Bahk MS, Castillo RC, McFarland EG. Physical examination for partial tears of the biceps tendon. Am J Sports Med 2007;35(8):1334-40.
24. Burkhart SS, Morgan CD. The peel-back mechanism: its role in producing and extending posterior type II SLAP lesions and its effect on SLAP repair rehabilitation. Arthroscopy 1998;14(6):637-40.
25. O'Brien SJ, Pagnani MJ, Fealy S, McGlynn SR, Wilson JB. The active compression test: a new and effective test for diagnosing labral tears and acromioclavicular joint abnormality. Am J Sports Med 1998;26(5):610-3.
26. Myers TH, Zemanovic JR, Andrews JR. The resisted supination external rotation test: a new test for the diagnosis of superior labral anterior posterior lesions. Am J Sports Med 2005;33(9):1315-20.