

Ossification of the transverse humeral ligament and its relevance to clinical practice

Ossificação do ligamento transverso do úmero e sua relevância na prática clínica

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ABSTRACT

Introduction: The classical anatomical literature describes the transverse humeral ligament as a distinct anatomical structure located between the greater and lesser tubercles of the humerus, which, together with the intertubercular groove, creates a canal through which the long head of the biceps tendon and its synovial sheath pass, stabilizing the biceps tendon. Ossification of the transverse humeral ligament has an incidence of 1% and has been suggested as one of the predisposing factors for biceps tendinitis and tenosynovitis. **Case report:** During a routine study in the anatomy laboratory, ossification of the transverse humeral ligament was found in the right humerus, which had a vertical length of 8.75 mm and a horizontal length of 6.53 mm. **Conclusion:** Knowledge of the existence of ossification of the transverse humeral ligament is of great importance not only to anatomists but also to radiologists and orthopedists in the management of the diagnosis and treatment of pain in the anterior region of the shoulder.

Keywords: transverse humeral ligament, brodie's ligament, anatomy, biceps tendon dislocation, tenodesis, anterior shoulder pain, humeral prosthesis.

RESUMO

Introdução: A literatura anatômica clássica descreve o ligamento transversal do úmero como uma estrutura anatômica distinta localizada entre os maiores e menores tubérculos do úmero, que, juntamente com o sulco intertuberculares, cria um canal pelo qual passa a cabeça longa do tendão do bíceps e sua bainha sinovial, estabilizando o tendão do bíceps. A ossificação do ligamento transversal do úmero tem uma incidência de 1% e tem sido sugerida como um dos fatores predisponentes para a tendinite e tenossinovite do bíceps. **Relato de caso:** Durante um estudo de rotina no laboratório de anatomia, a ossificação do ligamento umeral transversal foi encontrada no úmero direito, que tinha um comprimento vertical de 8,75 mm e um comprimento horizontal de 6,53 mm. **Conclusão:** O conhecimento da existência da ossificação do ligamento umeral transversal é de grande importância não apenas para os anatomistas, mas também para os radiologistas e ortopedistas no manejo do diagnóstico e tratamento da dor na região anterior do ombro.

Palavras-chave: ligamento umeral transversal, ligamento de brodie, anatomia, luxação do tendão do bíceps, tenodese, dor no ombro anterior, prótese umeral.

1 INTRODUCTION

The transverse humeral ligament (THL), also known as Brodie's ligament, was first described by the Scottish anatomist and surgeon Charles Gordan Brodie as a wide band of trapezoidal fibrous tissue between the greater and lesser humeral tubercles.¹ The THL superiorly covers the intertubercular groove, forming a channel that prevents displacement of the tendon of the long head of the biceps brachii and protects the anterior humeral circumflex

artery.² During multidirectional biomechanical movements of the arm, the THL provides stability and effective functioning of the long head of the biceps brachii and prevents subluxation of the tendon.³ For several authors, this ligament results from the intersections of the adjacent tendon fibers of the subscapularis and supraspinatus muscles and the coracohumeral ligament.⁴⁻⁶ Complete ossification of THL is reported to have an incidence of 1%.^{2,7} The aim of the present study was to report a case of ossification of a right THL and to highlight its relevance in clinical practice.

2 CASE REPORT

During a routine study in the human anatomy laboratory of the Department of Morphology, Federal University of Sergipe (UFS), we found a right humerus that had complete ossification of the THL (**Figure 1**). In the inferior view of the bicipital canal, the ossified THL had an oval-shaped morphology, thin smooth margins, and a larger diameter (**Figure 2**). In the superior view, it had a jagged, thick contour and prominent narrowing (**Figure 3**). The vertical and horizontal lengths and thickness of the ossified ligament were 8.75 mm, 6.53 mm, and 0.47 mm, respectively. The anteroposterior and laterolateral diameters of the canal of the bicipital groove in the superior view were 2.49 mm and 4.36 mm, and in the inferior view, they were 4.75 mm and 8.03 mm, respectively.

Figure 1 – Ossified transverse humeral ligament.



Figure 2. View of the inferior opening of the bicipital canal.



Figure 3. View of the superior opening of the bicipital canal.



3 DISCUSSION

The THL (Brodie's ligament), located on the anterior surface of the humeral proximal epiphysis, is an important transverse fibrous complex of the shoulder joint.⁸ The THL, ossified or not, allows the formation of a bicipital canal bounded anteriorly by the THL, posteriorly by the bicipital groove, medially by the lateral border of the lesser humeral tubercle, and laterally by the medial border of the greater humeral tubercle.^{3,9}

According to the description in anatomy textbooks, the bicipital groove is crossed by the THL. The existence of the ligament has been questioned by some authors, who suggested that the ligament is formed by intersections of tendon fibers from adjacent muscles.⁴⁻⁶

Regarding the formation of the THL, there is no consensus in the anatomical literature, as few precise analyses and descriptions have been performed; however, recent macroscopic and microscopic histological studies have shown that Brodie's ligament is a continuity of the fusion of fibers from the tendons of the subscapularis and supraspinatus muscles as well as from the coracohumeral ligament.^{2,4}

An ossified THL may damage the contents of the bicipital groove during biomechanical arm movements because it provides stability and effective functioning of the long head of the biceps brachii muscle and prevents tendon subluxation during multidirectional biomechanical arm movements.^{3,10} In the present study, the ossification of the THL in a right humerus was complete. It had a vertical length of 8.75 mm, a horizontal length of 6.53 mm, and a thickness of 0.47 mm. These measurements were similar to those described by Singh,² and Chidambaram et al.⁷

Ossification of the THL can damage the biceps tendon and its synovial sheath, leading to tendinitis and tenosynovitis with anterior shoulder pain.² When the THL is ossified, the bicipital groove may not act as a useful landmark to restore humeral head retroversion during the treatment of a complex proximal humeral fracture with arthroplasty.^{11,12}

Although no theory of the causes of fiber ossification over the bicipital groove is available in the literature, logically based formulations try to explain the reasons. It may occur due to genetic issues involving a predisposition to developing calcium metabolic disorders in people, although more clinical studies are required for its confirmation.² The hypothesis derives from the finding of two patients, members of the same family with calcification of the superior transverse ligament of the scapula—a 58-year-old man and his son of unreported age, who complained of pain and weakness of the region by the entrapment of structures and nerves similar to what occurs with THL.¹³ Another possibility for the formation of the bone bridge is because repetitive strain movements, especially of the subscapularis, supraspinatus, and pectoralis major muscles, cause stress in these regions, resulting in the appearance of microtrauma of the fibers followed by calcification.² Anatomical studies have shown that the biceps tendon is surrounded by a visceral and parietal layer of synovium as it travels through the intertubercular groove, making the tendon intra-articular but extrasynovial.^{14,15} The tenosynovitis associated with the biceps is abundant and runs 2 to 3 cm inferiorly through the osteoligamentous sheath formed by the transverse ligament of the humerus.^{16,17} However, during exertional movements, such as external rotation, internal rotation, abduction and adduction of the arm, weight lifting, and constant stretching, the biceps tendon can rub against the calcified bone structure, developing cases of inflammation, tendonitis, and tenosynovitis.⁷

These authors also reported that, together with the degeneration of tendons and nervous structures, the ascending branch of the anterior circumflex artery of the humerus can be affected, which can result in thrombosis and, consequently, ischemia in the regions supplied by it. **Conclusion**

Knowledge about the clinical significance of the ossified transverse humeral ligament is essential for radiologists and orthopedic surgeons in the management of anterior shoulder pain and a complex fracture of the proximal humerus. Calcification of the THL may predispose patients to complaints of biomechanical movement complications of the biceps brachii muscle in addition to the complaint of anterior shoulder pain.

REFERENCES

1. Brodie CG. Note on the Transverse-Humeral, Coraco-Acromial, and Coraco-Humeral Ligaments. *J Anat Physiol*. 1890 Jan;24(Pt 2):247-52.
2. Singh R. Analysis of bony bridge over bicipital groove. *OA Case Reports*. 2013 Oct 21;2(13):124. https://www.researchgate.net/publication/327237378_Analysis_of_bony_bridge_over_bicipital_groove_OA_case_reports
3. Rajani S, Man S. Review of bicipital groove morphology and its analysis in north Indian population. *ISRN Anat*. 2013 Sep 11;2013:243780.
4. Gleason PD, Beall DP, Sanders TG, Bond JL, Ly JQ, Holland LL, Pasque CB. The transverse humeral ligament: a separate anatomical structure or a continuation of the osseous attachment of the rotator cuff? *Am J Sports Med*. 2006 Jan;34(1):72-7.
5. MacDonald K. The transverse humeral ligament: a separate anatomical structure or a continuation of the osseous attachment of the rotator cuff? *Am J Sports Med*. 2006 Oct;34(10):1700-1.
6. MacDonald K, Bridger J, Cash C, Parkin I. Transverse humeral ligament: does it exist? *Clin Anat*. 2007 Aug;20(6):663-7.
7. Chidambaram RS, Jayasree N, Sridhar S. Ossified Brodie's ligament: a case report. *Int J Anat Res*. 2015 May;3(2):1084-86.
8. Snow BJ, Narvy SJ, Omid R, Atkinson RD, Vangsness CT Jr. Anatomy and histology of the transverse humeral ligament. *Orthopedics*. 2013 Oct 1;36(10):e1295-8.
9. Vetter M, Oskouian RJ, Tubbs RS. "False" Ligaments: A Review of Anatomy, Potential Function, and Pathology. *Cureus*. 2017 Nov 16;9(11):e1853.
10. Werner A, Mueller T, Boehm D, Gohlke F. The stabilizing sling for the long head of the biceps tendon in the rotator cuff interval. A histoanatomic study. *Am J Sports Med*. 2000 Jan-Feb;28(1):28-31.
11. Enríquez JH, Duralde XA, Caballer AJP. Shoulder Hemiarthroplasty in Proximal Humerus Fractures. In: Fokter SK. editor. *Recent Advances in Arthroplasty* [Internet]. London: IntechOpen; 2012 [cited 2023 Jan 11]. Available from: <https://www.intechopen.com/chapters/26878> doi: 10.5772/27837
12. Johnson JW, Thostenson JD, Suva LJ, Hasan SA. Relationship of bicipital groove rotation with humeral head retroversion: a three-dimensional computed tomographic analysis. *J Bone Joint Surg Am*. 2013 Apr 17;95(8):719-24.
13. Cohen SB, Dines DM, Moorman CT. Familial calcification of the superior transverse scapular ligament causing neuropathy. *Clin Orthop Relat Res*. 1997 Jan;(334):131-5.
14. Cooper DE, Arnoczky SP, O'Brien SJ, Warren RF, DiCarlo E, Allen AA. Anatomy, histology, and vascularity of the glenoid labrum. An anatomical study. *J Bone Joint Surg Am*. 1992 Jan;74(1):46-52.

15. Sethi N, Wright R, Yamaguchi K. Disorders of the long head of the biceps tendon. *J Shoulder Elbow Surg.* 1999 Nov-Dec;8(6):644-54.
16. Sanders WE, Hooper WE. Recalcitrant chronic adhesive capsulitis of the shoulder. *J Bone Joint Surg Am.* 1990 Sep;72(8):1269-70.
17. Sanders B, Lavery KP, Pennington S, Warner JJ. Clinical success of biceps tenodesis with and without release of the transverse humeral ligament. *J Shoulder Elbow Surg.* 2012 Jan;21(1):66-71.