Luschka's tubercle and snapping scapula syndrome: an anatomical and clinical discourse

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SUMMARY

Snapping Scapula Syndrome (SSS) is an uncommon orthopaedic disorder characterised by audible crepitations and disrupted shoulder kinematics due to pathological interactions within the tissues between the scapula and ribcage. One rare cause of SSS is the presence of Luschka's Tubercle, a bony prominence located on the costal surface of the superior angle of the scapula. Diagnosis of SSS due to Luschka's Tubercle (LT) can be challenging, often eluding conventional imaging, potentially leading to mismanagement and worsening symptoms. This case series underscores the significance of LT detection, explores its role in SSS, and discusses treatment options.

This series presents five patients with posterior shoulder pain and a palpable click indicative of SSS over a six-month period. Three of these patients did not exhibit Luschka's Tubercle (LT) on 3D CT scans, while the remaining two patients had LT detected on the imaging. Arthroscopic resection successfully resolved symptoms in one of the two patients with LT.

SSS is characterised by scapular snapping during movement, often associated with anatomical abnormalities such as Luschka's Tubercle. A comprehensive approach to diagnosis and management, including imaging, conservative measures, and, when necessary, surgery, is crucial for alleviating symptoms and enhancing shoulder function in affected individuals.

Key words: Shoulder – Orthopaedics – Scapula – Shoulder pain – Ribs – Musculoskeletal diseases

INTRODUCTION

Snapping Scapula Syndrome (SSS) is an intriguing yet uncommon orthopaedic disorder characterised by audible crepitations and disrupted shoulder kinematics resulting from pathological interactions within the tissues located between the scapula and the ribcage (Lazar et al., 2009; Kuhne et al., 2009; Carvalho et al., 2019; Vidoni et al., 2022). The causes of SSS are diverse and can include morphological alterations of the scapula and rib cage, an imbalance in periscapular mus-

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culature forces (dyskinesia), or neoplasia (bone tumours or soft tissue tumours) (Carvalho et al., 2019). This condition predominantly affects young, active individuals, often with a history of pain stemming from overuse, rapid shoulder movements, or participation in sports activities (Gaskill and Millett, 2013).

Among the rare causes of SSS is the presence of Luschka's Tubercle (Carvalho et al., 2019; Gallien, 1985; Estwanik, 1989; Dietrich et al., 2017; Somerson et al., 2024). Luschka's tubercle, first described and illustrated by Gruber, Luschka and Sauser in the years 1864, 1870 and 1936, is a bony protuberance found on the costal surface of the superior angle of the scapula (Sauser, 1936). The tubercle is distinct due to its hook-shaped morphology and discreet location at the superomedial aspect of the scapula. It occurs in approximately 3% of the general population and significantly influences the dynamics of the scapulothoracic articulation (Totlis et al., 2014). LTs can restrict normal shoulder mobility, contributing to the symptomatic expression of SSS by reducing the scapular interspace and increasing friction, thereby causing discomfort (Dietrich et al., 2017).

Diagnosis of SSS due to Luschka's Tubercle (LT) can be challenging, as it are often missed on conventional imaging, potentially leading to mismanagement of SSS and worsening symptoms in affected patients (Kuhne et al., 2009). This case series aims to emphasise the importance of detecting Luschka's Tubercle (LT), to explore its role within the context of SSS and to discuss the different treatment options.

CASE SERIES

In this series, we report on five patients with a mean age of 40 years (ranging from 26 to 46), comprising three females and two males. All patients presented with posterior shoulder pain, associated with pain on passive movements of adduction and forward flexion, and a palpable click, typical of Snapping Scapula Syndrome, over a six-month period. There was no history of trauma. The overlying skin over the scapula was normal. Cross-sectional imaging was performed to evaluate this further. Three out of the five patients did not exhibit Luschka's Tubercle (LT) on a 3D CT scan (15 slice ACT revolution, GE) and further assessment by Magnetic Resonance Imaging (MRI) (1.5T HDXT, GE MRI, T1 and STIR axial, coronal and sagittal), and there was no oedema in the scapulothoracic interval. The remaining two patients, a 26- and a 39-year-old male, presented with similar symptoms, with LT being detected on the 3D CT scan. There was oedema of the soft tissues between the LT and thoracic wall on MRI (Fig. 1).

They were initially managed with analgesics and physiotherapy. The 39-year-old male patient had recalcitrant pain despite these, and hence underwent arthroscopic resection of the tubercle with complete resolution of symptoms at a six-month follow up (Fig. 2). The other patient was also offered surgical resection; however, he could not proceed due to financial constraints. Other three out of the five patients with LT were managed conservatively, involving analgesia and steroid injections.

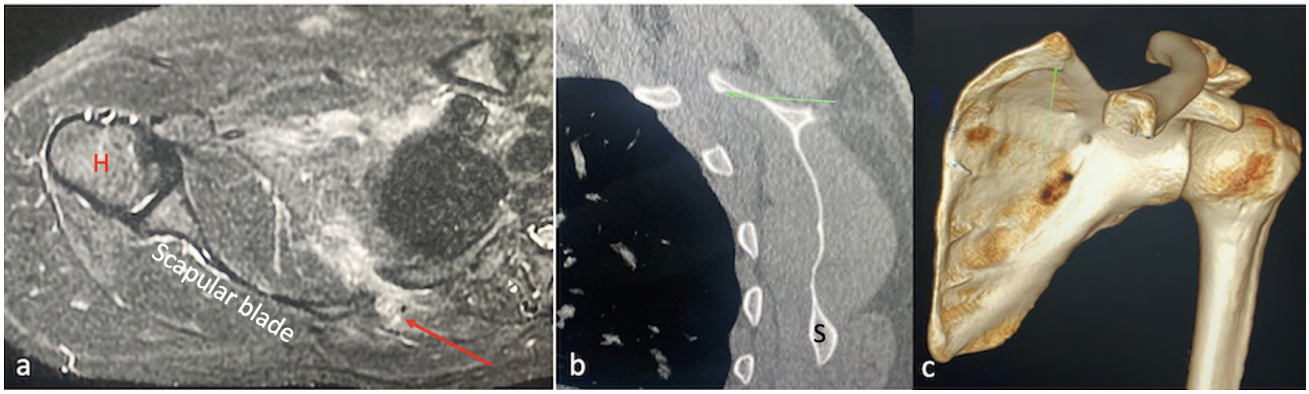

Fig. 1.- Axial STIR (**a**) showing edema between the Luschka's tubercle and posterior chest wall (arrow). Sagittal CT showing Luschka's tubercle (**b**) (arrow) and 3D reconstruction showing Luschka's tubercle (**c**). H (humeral head), S (scapula).

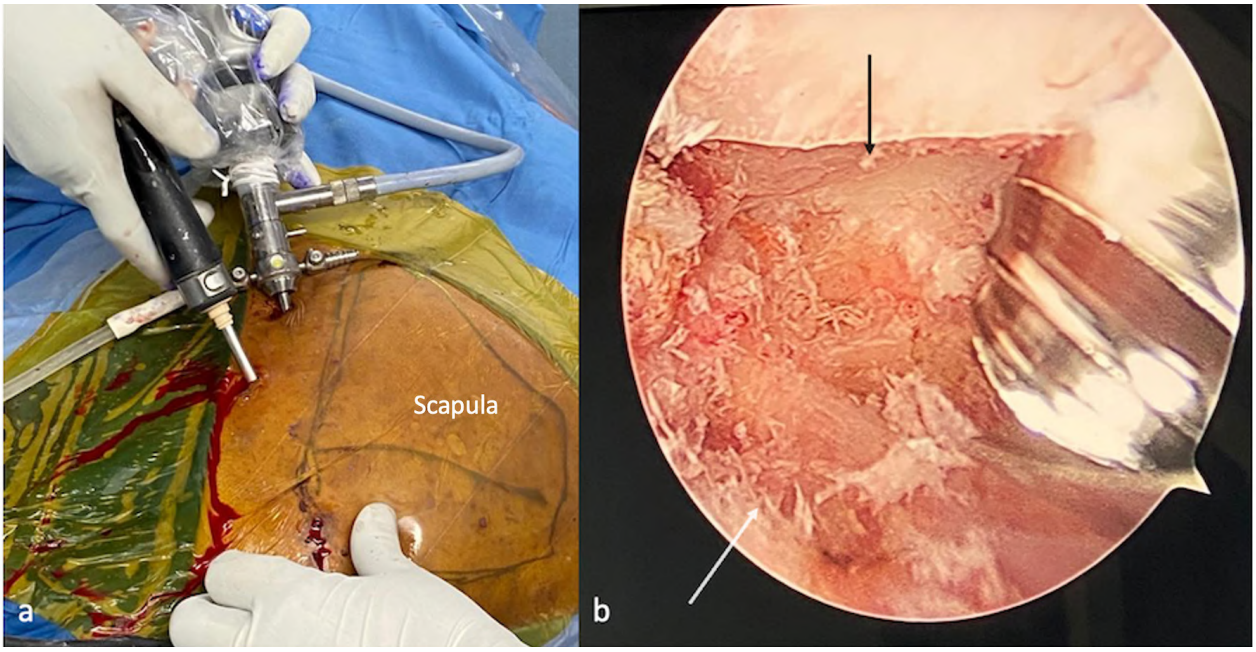

Fig. 2.- Arthroscopy images (**a, b**) showing surface marking of scapula, insertion of arthroscopic ports (**a**) and image after resection of Luschka's tubercle (**b**), highlighted area between the arrows.

DISCUSSION

Snapping Scapula Syndrome (SSS) is a fascinating condition thought to originate from an abnormal scapulothoracic articulation (Lazar et al., 2009; Carvalho et al., 2019). The scapula, a triangular bone situated between the second and seventh ribs, exhibits distinctive surfaces, borders, and angles. Its connection with the ribcage lacks conventional joint structures and is instead surrounded by a complex array of muscles, categorised into superficial, intermediate, and deep layers (Kuhne et al., 2009; Lazar et al., 2009; Carvalho et al., 2019). These encompass the trapezius, latissimus dorsi, rhomboids, levator scapulae, serratus anterior and subscapularis. Precise scapular positioning and control are essential for optimal glenohumeral joint function, necessitating synchronised actions of various scapular muscles (Lazar et al., 2009; Carvalho et al., 2019). These muscles collaborate to enable a range of movements, including abduction, adduction, elevation, depression, and rotation. Any disruption to the biomechanics of scapulothoracic movements can give rise to SSS.

SSS is characterised by an audible pop or clicking of the scapula during scapulothoracic joint movements, often associated with inflammation and irritation of the bursa in the serratus anterior space (Vidoni et al., 2022). Patients with SSS typically present with painful snapping, grinding, or popping of the shoulder during adduction, flexion or extension movements, often accompanied by crepitus and feelings of fullness in the posterior shoulder region. The pain worsens with overhead movements, heavy lifting, and repetitive use (Gaskill and Millett, 2013; Vidoni et al., 2022).

SSS has diverse causes, encompassing scapulothoracic bursitis, ribcage or scapula deformities, and congenital anomalies such as Sprengel's deformity. Occupational factors, particularly repetitive overhead motions, can also contribute to SSS (Kuhne et al., 2009). Notably, Luschka's Tubercle (LT) plays a pivotal role in SSS. LT, characterised as a unique bony protrusion with a distinctive hook-shaped structure located along the superomedial edge of the scapula, often proves challenging to detect by conventional imaging, posing a diagnostic challenge (Sauser, 1936; Lehtinen et al., 2005; Totlis et al., 2014; Dietrich et al., 2017). Despite the surrounding musculature providing support to the scapulothoracic joint, it is crucial to recognise that specific scapular areas, including the superomedial and inferomedial angles, along with the medial border, possess relatively less muscular and bursal coverage. LT develops around the superior angle of the scapu-

la, remaining unsupported by musculature, thus disrupting significantly normal shoulder movement. This disruption leads to the development of SSS by narrowing the space between the scapula and ribcage, resulting in heightened friction and accompanying symptoms (Totlis et al., 2014; Dietrich et al., 2017).

Understanding the embryological development of Luschka's Tubercle (LT) presents challenges due to its rarity in reported literature. The process begins with undifferentiated mesenchymal tissue, and the scapula's primary ossification centre emerges around the seventh week of gestation. During this intricate process, various areas of the scapula undergo differentiation, including the area where Luschka's tubercle eventually forms (Huang et al., 2006). Osteoblasts play a crucial role in depositing bone matrix in this specific region, giving rise to the tubercle. Secondary ossification centres also develop in other scapular areas, further contributing to its growth and maturation. As postnatal growth ensues, and the scapula continues to transform in shape and structure, with Luschka's tubercle becoming more distinct (Totlis et al., 2014). It is important to note that genetic factors and the complex processes of bone formation during embryonic development can influence the presence and characteristics of this anatomical feature.

Diagnosing snapping scapula primarily relies on patient history and physical examination. Some researchers have suggested the use of CT scans as a helpful adjunct in the diagnostic process for snapping scapula cases (Mozes et al., 1999; Kuhne et al., 2009). CT images can provide supplementary information to support clinical assessment. Nevertheless, due to the limited clarity in existing literature regarding the scapular morphology in individuals with snapping scapula, diagnosing this syndrome remains challenging for diagnostic radiologists. In our study, detection for LT was made through CT scans (Mozes et al., 1999). MRI is crucial in the visualisation of surroundings soft tissues but often misses bony anomalies. The use of ultrasound in these cases can be challenging (Conduah et al., 2010).

The treatment approach for Snapping Scapula Syndrome (SSS) associated with Luschka's Tubercle (LT) remains variable and subject to controversy. While some studies have found no conclusive link between LT and SSS (Dietrich et al., 2017), our case series highlights the diversity in management strategies. In our study, two patients with SSS and LT were managed differently. One patient opted for conservative treatment, which involved pain management through analgesia and steroid injections, coupled with physiotherapy to restore scapular control and muscle strength. However, in cases where symptoms persist, surgical intervention may become necessary, as demonstrated in one of our patients. In this instance, arthroscopic debridement of Luschka's Tubercle resulted in the complete resolution of the patient's symptoms, highlighting the potential efficacy of surgical intervention in selected cases. Scapulothoracic arthroscopy offers several advantages, including safe and straightforward access to the superomedial corner of the scapula, improved visibility for bursa and superomedial corner resection, enhanced cosmesis compared to open procedures, and minimal muscle dissection, resulting in reduced pain and quicker rehabilitation. Various approaches can be employed for this procedure. However, the chicken wing position, with the patient in a prone posture and utilizing the 3-portal technique (comprising superior, medial, and inferior portals with blunt trocars for scapular access), is notably effective. Initial access to the scapulothoracic space involves two superiorly positioned portals, one proximal and one medial to the superomedial angle of the scapula. Gaining access to the superomedial corner of the scapulothoracic interspace is a procedure that can be carried out in a straightforward and reproducible manner. However, it is crucial to be aware of the potential complications, such as the risk of injuring the dorsal scapular nerve or vessels, as well as the possibility of iatrogenic damage to the suprascapular nerve. Failing to insert the portal trocars toward the costal surface of the scapula may lead to perpendicular insertion into the thoracic wall and cavity (Saper et al., 2015).

CONCLUSION

SSS is a condition characterised by scapular snapping during movement, often linked to anatomical abnormalities like Luschka's Tuber-

cle. Proper diagnosis and management involve a multidisciplinary approach, including imaging, conservative measures, and, in some cases, surgery, to alleviate symptoms and improve shoulder function in affected individuals.

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