Scientific Research Publishing

Open Journal of Orthopedics, 2025, 15(4), 167-174
https://www.scirp.org/journal/ojo
ISSN Online: 2164-3016
ISSN Print: 2164-3008

Missed Diagnosis of Snapping Triceps Syndrome: An Overlooked Cause of Failed Ulnar Nerve Transposition

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How to cite this paper: Farivar, D., Koh, J.J. and Tsai, E.Y. (2025) Missed Diagnosis of Snapping Triceps Syndrome: An Overlooked Cause of Failed Ulnar Nerve Transposition. *Open Journal of Orthopedics*, **15**, 167-174.
https://doi.org/10.4236/ojo.2025.154017

Received: March 4, 2025
Accepted: April 26, 2025
Published: April 29, 2025

Abstract

Background: Snapping triceps syndrome (STS) is a challenging condition to diagnose as it is rare and can easily be mistaken for ulnar nerve subluxation. **Aim:** To present a case of STS that was initially missed, and to describe the special diagnostic approaches and surgical techniques used for treatment. **Case:** A 21-year-old male patient previously underwent subcutaneous ulnar nerve transposition for ulnar nerve subluxation at the elbow. Postoperatively, patient continued to have elbow, reproducible with active elbow extension, and was taken back to the operating room with a diagnosis of persistent ulnar nerve subluxation versus STS. Patient underwent revision subfascial ulnar nerve transposition but intraoperative wake-up test still demonstrated snapping, so lateral transfer of the medial triceps tendon was performed with subsequent symptom relief. **Conclusion:** Intraoperative examination with active range of motion may help prevent overlooking the subtle diagnosis of snapping triceps syndrome.

Keywords

Snapping Triceps, Ulnar Nerve, Cubital Tunnel Syndrome, Wake up Test

1. Introduction

Snapping triceps syndrome (STS) is described as anteromedial subluxation of the medial edge of the triceps tendon over the medial epicondyle. The instability of the tendon itself may cause inflammation and pain, but due to the close proximity of the tendon to the ulnar nerve, ulnar nerve neuritis may also be seen. The first case described in the literature was by Rolfsen in 1970: a 21-year-old male who underwent ulnar nerve transposition with resolution of neuritis symptoms, but

had persistent elbow snapping. He ultimately returned to the operating room for resection of the offending portion of the triceps tendon, and had satisfactory resolution of the snapping [1]. STS is rarely diagnosed, and only a few cases have been reported since Rolfsen's initial study. It occurs more often in young adult men, laborers, and athletes, especially in those with cubitus varus, as this may alter the line of pull of the triceps in relation to the distal humerus [2]-[5]. Analogous to the Q angle of the quadriceps, Spinner introduced the T angle for the triceps to assess this biomechanical relationship [5]. Other risk factors for STS include certain anatomical variants, such as the presence of a fourth slip of the triceps [6]-[8], hypoplasia of the medial epicondyle [2], and hypertrophy of the distal triceps [5] [9] [10].

STS is a challenging condition to diagnose. Triceps and ulnar nerve snapping both typically occur at similar degrees of elbow flexion: about 115˚ and 90˚, respectively [11]. In clinic, this may be subtly appreciated as two separate clicks when ranging the patient's elbow. However, when considering the common prevalence of isolated ulnar nerve dislocation, which is present about 16% in healthy individuals, the clinician may easily misdiagnose triceps snapping as an isolated ulnar nerve dislocation [12]-[16]. This may result in postoperative complaints of persistent snapping following ulnar nerve transposition. To aid the diagnosis of STS, the physical exam can be supplemented with further imaging such as MRI or dynamic ultrasound. In a dynamic ultrasound, the transducer is placed transversely between the medial epicondyle and olecranon, initially starting with the elbow in full extension and shoulder in slight external rotation. The assessment continues by having the patient subsequently flex the elbow, ensuring visualization of the ulnar nerve, medial border of triceps, and medial epicondyle throughout [17]. Another option is an intra-operative assessment where the elbow is taken through deep flexion [18]. Once STS is diagnosed, the subluxating portion of the triceps can be addressed with either a lateral transfer or excision of the medial tendon slip, in conjunction with a corrective osteotomy if there exists any humeral malalignment [2] [6].

Here, we report a case of a 21-year-old male with a missed case of STS, initially thought to be a subluxating ulnar nerve that was treated with a subcutaneous transposition and later a subfascial transposition. An intra-operative wake up test demonstrated triceps snapping during active extension of the elbow, and a lateral transposition of the medial triceps was performed with complete resolution of symptoms.

The patient was informed that data concerning the case would be submitted for publication, and he provided consent.

2. Case Report

At initial presentation, the patient was an 18-year-old, right-hand dominant male high school student who played competitive soccer and enjoyed weight-lifting. He presented to an outside hand surgeon in the spring before leaving for college to

discuss a 4-year history of left elbow snapping, most noticeable when doing push-ups. He endorsed pain only when the elbow snapped. Patient's history was only significant for a left elbow fracture sustained when he was 4 years old, that healed well with nonoperative measures. On exam, the medial elbow was mildly tender to palpation, and there was visible popping when ranging the elbow. There was a weakly positive Tinel's at elbow, but other provocative maneuvers were negative. He had no neurovascular deficits distally. There was no cubitus varus, and radiographs of elbow do not demonstrate any sequelae of the previous remote trauma. At this time, the differential included ulnar nerve subluxation, snapping triceps syndrome, as well as an osteochondral defect of the elbow joint. Patient was recommended to undergo an MRI and to avoid volitional popping of the elbow and heavy weightlifting in the interim.

The MRI demonstrated swelling around the ulnar nerve, without abnormal findings in the cartilage and triceps. Thus, there was a strong suspicion for isolated ulnar nerve subluxation causing the painful snapping sensation, and so a cubital tunnel release with anterior subcutaneous transposition of the ulnar nerve was performed by the initial treating surgeon. Intra-operatively, a patulous, insufficient cubital tunnel was appreciated, with the ulnar nerve subluxating anteriorly with deep elbow flexion. A subcutaneous transposition was performed, and the patient was placed in a soft, bulky wrap for 14 days. Patient did well initially, but when he resumed movement with gentle range of motion, he felt several occasional instances of persistent elbow snapping. Patient was soon moving away for college, so he was advised to continue with observation and continued activity modification, with instructions to return for reevaluation when back in town on school vacation.

Patient returned one year later to the original surgeon. He stated that the snapping felt "different," but was still present. He reported being unable to participate in certain activities at school due to the elbow, such as upper body weight lifting, instead mainly going on runs for exercise. He did not experience recurrent paresthesias or motor weakness in the hand. We discussed possible additional surgery with the patient to further explore the instability of the ulnar nerve, as well as to explore potential contributions from the triceps with possible repositioning of the muscle. At that point, he was also referred to our clinic for a second opinion and discussion of possible revision surgery. Due to the patient's school schedule and physical distance, he was not taken to the operating room until nearly 3 years after the index operation.

When patient presented for surgery, he was re-evaluated in the pre-operative area. Elbow snapping was reproducible, particularly with active elbow extension. He appeared to have clear anterior subluxation of the ulnar nerve and when the ulnar nerve was manually held in a reduced position behind the medial epicondyle and the elbow was taken through a full range of motion, the snapping appeared to resolve, suggesting to the authors that the persistent ulnar nerve subluxation may be the root cause of his symptoms. Anesthesia administered only light sedation

during the case, to allow for the option of an intra-operative wake-up test to actively flex and extend the elbow and evaluate for residual dynamic snapping. No tourniquet was used, for improved proximal visualization, prevention of triceps paralysis due to prolonged tourniquet time, and avoidance of altered biomechanics of the triceps muscle-tendon unit due to the pressure of the tourniquet on the muscle. The patient agreed and we proceeded with the case.

The previous curvilinear incision along the medial elbow was used and extended 2 cm distally and 5 cm proximally, with care taken to identify and protect branches of the medial antebrachial cutaneous nerve. The ulnar nerve was then identified, and released to a point 8 cm proximal to the medial epicondyle, confirming thorough release of the intermuscular septum to allow optimal nerve mobilization for transposition. Next, an external neurolysis to separate the nerve from the surrounding scar tissue was performed in an antegrade fashion. The flexor carpi ulnaris [FCU] fascia and muscle overlying the ulnar nerve was released. 1 cm of the medial intermuscular septum was also excised to provide a path for the ulnar nerve from posterior to anterior (**Figure 1**). A step cut incision was made on the flexor pronator fascia and the ulnar nerve was then transposed underneath the fascia. The fascia was then sutured in a z-lengthened fashion using 3-0 braided uncoated polyethelene suture. To further augment the transposition, and the subcutaneous tissue of the overlying skin was also sutured to the fascia at the medial epicondyle. The elbow was then taken through full passive range of motion without noticeable clicking or snapping.

Figure 1. Mobilized ulnar nerve.

At this point, sedation was weaned by anesthesia, and the patient was asked to perform the specific active extension movement of the elbow that previously caused the snapping. The snapping event was observed dynamically, which appeared to be coming from the medial triceps over the medial epicondyle [Video 1]. The snapping portion of the triceps was marked, and patient was sedated again. With the nerve safely transposed anteriorly, a slip of the medial triceps was split longitudinally with a 15 blade and disconnected distally at its insertion on the olecranon (**Figure 2**). This portion of the triceps tendon measured approximately

4 cm × 2 cm. The elbow was taken through a full passive range of motion to evaluate if the released segment resolved the snapping, which was confirmed [Video 2]. A 3-0 braided coated polyethelene suture was then stitched through the free end of the free tendon in a Kraków fashion. A hemostat was then used to tunnel the suture and attached free tendon end from deep to superficial through the intact portion of the lateral triceps tendon. The free tendon end was tensioned and sutured in place with 3-0 braided coated polyethelene suture (**Figure 3**). The elbow was then taken again through a full passive range of motion and there was no residual snapping of the triceps. The wound was closed, dressed, and placed in a long-arm plaster splint.

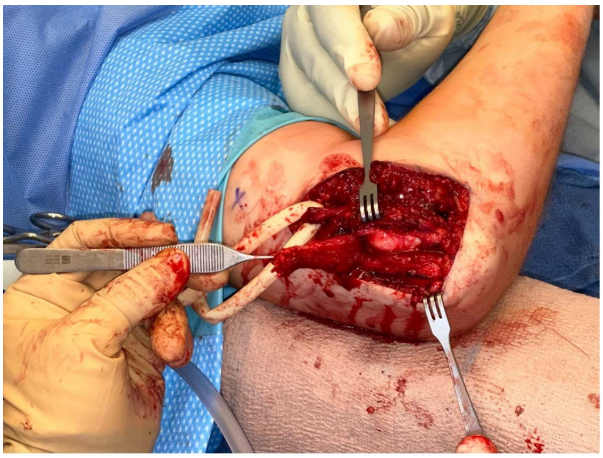

Figure 2. Ulnar nerve after subfascial transposition with snapping portion of medial triceps dissected off distal olecranon insertion.

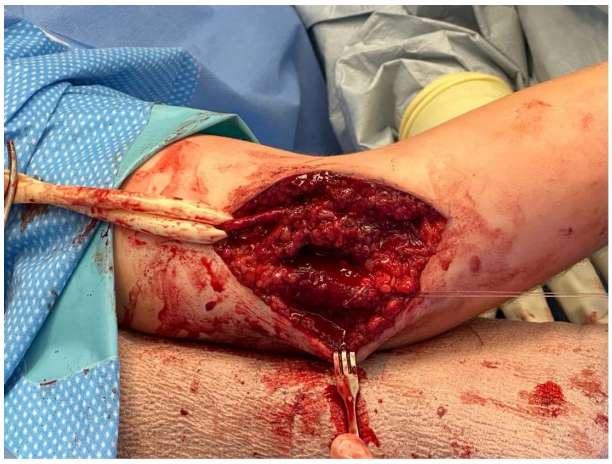

Figure 3. Subfascial transposition of ulnar nerve with lateral transposition of snapping portion of medial triceps tendon.

At one week follow-up, patient was placed in a soft dressing and instructed he could begin gentle elbow range of motion exercises. At two week follow up, patient had not experienced any clicking and reported doing well. He was started in therapy at that time and full active range of motion resumed at six weeks.

3. Discussion

STS is challenging to diagnose. Snapping sensation at the elbow may be due to subluxation of the ulnar nerve but it should be recognized that a snapping triceps tendon may be a cause. When both are present, it can be challenging to identify each pathology independently, and this can be the reason for failed cases of ulnar nerve transposition, as was the case here. Obtaining appropriate imaging can be helpful in making the STS diagnosis. Static CT and MRI scans can be helpful, but since STS is a dynamic phenomenon, images should be taken in both extension and flexion so to image the elbow during snapping to allow for comparison to the normal state [2]. However, ultrasound remains the best choice for its accessibility, affordability, and dynamic characteristics, although technical proficiency of the sonographer can come into play [2] [19]. Neither CT nor MRI at multiple flexion angles nor ultrasound was used for this case. Our finding of edema within the ulnar nerve on MRI suggested ulnar nerve irritation, but acquiring images at various flexion angles may have revealed the triceps snapping that was ultimately addressed 3 years later. Even with advanced imaging, triceps snapping may still be overlooked, so one should consider the routine examination of triceps snapping intra-operatively when ranging the elbow in patients undergoing ulnar nerve surgery.

Intra-operatively, we found that triceps snapping was not observed during passive range of motion, but only seen when the patient was woken up to actively extend the elbow. This may illustrate another challenge when trying to diagnose STS and make treatment decisions. A recent study described an alternative method of recreating active range of motion via intraoperative myoelectric stimulation of the triceps muscle, which may recreate triceps snapping physiology [20].

Once STS is confirmed, treatment options generally include the lateral transposition of the medial edge of the triceps, often chosen when the snapping triceps segment is significant, or excision of the offending portion of the medial triceps, which is commonly done when the snapping portion is small [2]. In the current study, the offending portion of the triceps measured 4 cm × 2 cm. However, there are reports of excision also performed with similar sized portions of offending muscle. For instance, Cho *et al.* describe removing a 4 cm × 1 cm sized triceps tissue and the patient was able to return to sport within 3 months of surgery [21]. Another study performed a lateral transposition of the triceps tendon in a 16-year-old softball player, and she returned to sport in 3 months as well [2]. Ultimately, given the scarcity of available data, there is no consensus of surgical treatment currently. With regards to postoperative management, no standard protocol exists. Previous studies have described using a long arm orthosis for the first 1 - 2 weeks, followed by gentle range of motion and therapy with full return to activities by 2 - 3 months [2] [11]. In the current study, we followed a similar protocol, placing the patient in a long arm splint for 1 week, followed by gentle range of motion thereafter. The short term results have been satisfactory.

4. Conclusion

In conclusion, this case demonstrates the importance of accurate diagnosis of snapping elbows. Utilization of dynamic ultrasound if there is a skilled operator present, or advanced imaging in multiple flexion angles can be considered. Due to the difficult nature of differentiating ulnar nerve subluxation from a medial triceps, ordering aforementioned imaging routinely may aid in identifying subtle cases of STS that are ordinarily missed. Additionally, in patients undergoing cubital tunnel release with or without ulnar nerve transposition, routine intra-operative examination of the medial triceps in passive flexion and extension can further aid in diagnosing STS. Additionally, if possible, waking up the patient to achieve an active range of motion or emulating active range of motion another way is superior to passive range of motion evaluation, as was done in the current study with the wake-up test.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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