발음성 삼두근 증후군의 근전도 및 초음파 소견: 증례 보고

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Findings of Electrodiagnosis and Ultrasonography in Snapping Triceps Syndrome: A Case Report

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Snapping triceps syndrome is a rare disorder in which the medial head of the triceps muscle moves anteriorly over the medial epicondyle during elbow flexion. Characteristically, visible and palpable snapping can be observed during elbow flexion. Several hypotheses have been proposed about its cause, but the etiology is still unclear. The diagnosis of snapping triceps syndrome is based on clinical symptoms and imaging studies. Early diagnosis is important to prevent symptom worsening and unnecessary surgical treatment. Snapping triceps syndrome is often accompanied by ulnar neuropathy. However, few electrodiagnostic findings have been reported for snapping triceps syndrome. Therefore, we report the ultrasonographic and electrodiagnostic findings in a patient with snapping triceps syndrome.

Keywords: Snapping triceps syndrome, Ulnar neuropathies, Electrodiagnosis

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Introduction

Snapping triceps syndrome was first reported by Rolfsen in 1970 [1]. It is a relatively rare condition in which a part of the medial head of the triceps dislocates beyond the medial epicondyle during elbow flexion, and it is often accompanied by ulnar nerve dislocation [2,3]. Isolated ulnar nerve dislocation is relatively common and is found in approximately 16% of healthy subjects [4]. However, snapping triceps syndrome is an uncommon disease and no study has reported its prevalence.

Patients with snapping triceps syndrome may complain of symptoms of medial elbow pain, paresthesia in the ulnar nerve

distribution, and visible, audible, or palpable snapping during elbow flexion. Such symptoms may be unilateral or bilateral and become worse after excessive activity using elbow joints. However, the syndrome can be asymptomatic. If the diagnosis is clinically unclear, magnetic resonance imaging (MRI) can be performed. However, because MRI is a static imaging modality, it should be performed on the elbow in both fully flexed and extended positions so that the ulnar nerve and medial head of the triceps muscle are dislocated. Therefore, dynamic ultrasonography, which can visualize movements during elbow joint motion, is considered the imaging modality of choice [5].

Previous studies on snapping triceps syndrome have reported

ultrasonographic findings and surgical treatment [3,5], but electrodiagnostic findings have rarely been reported. Therefore, we report the findings of a nerve conduction study and electromyography in a patient with snapping triceps syndrome confirmed by ultrasonography.

Case report

A 55-year-old man who had been training with weights for about 10 years visited the local orthopedic clinic with a chief complaint of left shoulder pain and a limitation in elbow extension when the left shoulder was flexed greater than 90°. After conservative management, the pain was alleviated but the limitation of the elbow extension persisted, and he was referred to a tertiary-care hospital. He had a medical history of 5 years of hypertension, 5 years of dyslipidemia, and early gastric cancer treated with an endoscopic mucosal resection 2 years ago. And he had a left elbow fracture when he was young, and the left elbow showed an increased cubitus valgus compared with the right side. When his left medial elbow was physically contacted, he felt a tingling sensation in his left fourth finger. No abnormal findings were detected on upper limb radiographs and brachial plexus MRI, but left foraminal stenosis was found between the sixth and seventh cervical disks (Fig. 1). On physical examination, palpable and visible snapping was observed when he flexed his left elbow over 90° with shoulder flexion over 90°. There was no tenderness around the medial epicondyle. Therefore, we performed dynamic ultrasonography to determine which structure was snapping during elbow flexion motion. Ultrasonography showed that the medial head of the triceps dislocated anteriorly over the medial epicondyle with the ulnar nerve when the elbow flexion

was more than 90-100° but there was no enlargement of the left ulnar nerve compared with the right ulnar nerve (Fig. 2). The findings could be diagnosed as snapping triceps syndrome.

Motor and sensory nerve conduction studies (NCS) of the bilateral median, ulnar and radial nerves showed normal findings (Table 1). In particular, motor and sensory NCS of ulnar nerves were conducted to identify ulnar neuropathy because the patient felt a tingling sensation in the left fourth finger and the dislocated medial head of the triceps can compress the ulnar nerve during elbow flexion. However, no ulnar neuropathy findings were obtained, such as conduction block or focal slowing. Needle electromyography (EMG) was performed for the left paracervical and upper extremity muscles (Table 2). Regarding needle EMG, all the examined muscles, including the ulnar nerve innervated muscles, showed no abnormal findings, except that the triceps muscle showed increased insertional activity and denervation potentials such as positive sharp waves and fibrillation potentials.

Because electrodiagnosis showed no evidence of ulnar neuropathy, he underwent selective transforaminal epidural block (STEB) as a diagnostic and therapeutic option for radiculopathy caused by left foraminal stenosis between the sixth and seventh cervical disks. There was no immediate pain relief after STEB, so it was unclear whether radiculopathy was the cause. A nonsteroidal anti-inflammatory agent and pregabalin were prescribed for him to relieve pain. After 1 month of treatment, the tingling sensation in the left fourth finger and shoulder pain were improved, but the elbow extension limitation and snapping symptoms persisted.

Fig. 1. An mDIXON T2-weighted image (A) sagittal view. (B) Axial view. Left foraminal stenosis between the sixth and seventh cervical disks (arrowhead). A: anterior, P: posterior, R: right, L: left.

Fig. 2. Left elbow in (A) 0° flexion, (B) 45° flexion, (C) 90° flexion, and (D) 120° flexion. The medial head of the triceps (asterisk) dislocated anteriorly to the medial epicondyle with the ulnar nerve (arrowhead) when the elbow flexion was over 90–100°. Cross-sectional area (CSA) of the ulnar nerve on the (E) left elbow (0.08 cm²) and (F) right elbow (0.08 cm²). An ultrasound transducer was applied to a virtual line connecting the medial epicondyle and olecranon in the elbow extension position. ME: medial epicondyle, A: anterior, P: posterior.

Discussion

Snapping triceps syndrome is a rarely diagnosed disease. According to the first case of snapping triceps syndrome reported by Rolfsen [1], only anterior ulnar nerve transposition was performed to relieve the ulnar nerve symptoms. However, the snapping symptoms continued, resulting in further resection of the medial triceps muscle. Therefore, it is important to diagnose snapping triceps syndrome correctly to prevent additional operations.

Several studies have attempted to fully explain this syndrome, but it is thought to be due to structural problems of the muscle

belly, tendon or fascia of the medial triceps [3]. The causes can be divided into congenital and acquired. Congenital causes may include incorrect insertion of the triceps into the olecranon, accessory triceps tendon and fourth head of the triceps muscle. Acquired causes may include hypertrophy of the medial head of the triceps due to excessive muscle use or cubitus varus deformity that occurs after trauma [3,6]. In this case, long-term weight training may be the cause of snapping triceps syndrome; however, further confirmation is required.

Prior studies on snapping triceps syndrome have mostly been conducted on its diagnostic imaging and surgical treatment, but only few have been conducted on electrodiagnostic testing. Boon

Table 1. Motor and Sensory Nerve Conduction Studies

Side	Motor nerve	Stimulation	Recording	Latency (msec)	Amplitude (mV)	Distance (cm)	NCV
Right	Ulnar	Wrist	ADM	2.5	18.1		
		BE	ADM	6.1	17.7	23.5	67.4
		AE	ADM	7.5	16.9	10	68.6
		Axilla	ADM	9.0	16.4	11.5	69.8
Left	Ulnar	Wrist	ADM	2.2	17.9		
		BE	ADM	5.8	17.3	23.5	64.0
		AE	ADM	7.2	16.8	10	68.6
		Axilla	ADM	8.6	16.2	10	73.1
Right	Median	Wrist	APB	2.7	16.8		
		Elbow	APB	6.6	16.3	24.5	62.8
Left	Median	Wrist	APB	3.1	13.4		
		Elbow	APB	7.3	12.2	24.6	57.9
Right	Radial	Forearm	EIP	1.4	10.6		
		Elbow	EIP	3.5	9.5	14	68.3
Left	Radial	Forearm	EIP	1.4	10.6		
		Elbow	EIP	3.3	9.8	14	73.7
Side	Sensory nerve	Stimulation	Recording	Onset latency (msec)	Amplitude (uV)		
Right	Ulnar	Wrist	V digit	2.2	43.6		
Left	Ulnar	Wrist	V digit	2.6	40.7		
Right	Median	Wrist	II digit	2.8	33.8		
Left	Median	Wrist	II digit	2.6	33		
Right	Radial	Forearm	1st web space	1.5	38.9		
Left	Radial	Forearm	1st web space	1.2	48		

NCV: nerve conduction velocity, BE: below elbow, AE: above elbow, ADM: abductor digiti minimi, APB: abductor pollicis brevis, EIP: extensor indicis proprius

Table 2. Needle Electromyography

Side	Muscle	Insertional activity	Spontaneous activity	Motor unit action potentials			IP
				Polyphasia	Amplitude	Duration	
Left	Paracervicalis	N	-				F
	Deltoid	N	-				F
	Biceps	N	-				F
	Triceps	I	F&P(+++)				F
	EDC	N	-				F
	FCU	N	-				F
	FDI	N	-				F
	APB	N	-				F
	ADM	N	-				F

IP, interference pattern; N, normal; I, increase; F, full; F&P, fibrillation potentials & positive sharp waves; EDC, extensor digitorum communis; FCU, flexor carpi ulnaris; FDI, first dorsal interosseous; APB, abductor pollicis brevis; ADM, abductor digiti minimi.

et al. [2] compared the firing patterns of the medial, lateral, and long head of the triceps muscles between patient and control groups to verify the hypothesis that snapping triceps syndrome is caused by abnormal firing patterns in each muscle segment. However, studies have shown no significant difference between the patient and control groups. Kang et al. [7] performed ultra-

sonographic and electrophysiologic evaluations of ulnar nerve instability and the triceps medial head position during elbow flexion in healthy subjects. They reported that the instability of the ulnar nerve increased with more elbow flexion, which was associated with triceps snapping. However, their study was conducted only in healthy subjects; the subjects did not have real

snapping symptoms or paresthesia in the ulnar nerve innervation area.

Snapping triceps syndrome accompanied by ulnar neuropathy was reported previously [3,8]. However, no abnormal findings of ulnar NCS were found in this case. The ulnar nerve was dislocated beyond the medial epicondyle tip in this case, but the snapped medial head of triceps did not compress it and the sonographic morphology of the ulnar nerve did not change. This might be the cause of normal NCS of the ulnar nerve in this case. Nevertheless, friction between the ulnar nerve and medial epicondyle caused by repeated elbow flexion and extension might have resulted in ulnar nerve irritation and associated paresthesia symptoms.

In the needle EMG of the patient, denervation potential was observed only in the left triceps muscle, not in the ulnar innervated muscles. To the best of our knowledge, there is no report concerning needle EMG findings in snapping triceps muscle, and this is the first report of denervation potentials in snapping triceps muscle. This denervation may be caused by radiculopathy due to left foraminal stenosis between the sixth and seventh cervical vertebrae. However, this explanation is unlikely because no other C7-innervated muscles and paracervical muscles showed denervation potentials. Another explanation may be direct muscle injury caused by repeated snapping between the medial epicondyle and medial triceps head. Denervation potentials from direct muscle injuries have been reported in several previous studies [9], including repetitive trauma in the foot intrinsic muscle of normal elderly people [10].

Treatment of snapping triceps syndrome is conservative, and consists of avoiding the activity of repeating elbow flexion as much as possible, using non-steroidal anti-inflammatory agents, and attempting corticosteroid injection around the triceps or ulnar nerve [3]. If the symptoms do not improve despite 3-6 months of non-operative management, surgical treatment could be considered [3]. Some surgical treatments have been reported and include excision of the medial head of the triceps muscle, transposition of the triceps, and medial epicondylectomy [3,8], but no consensus exists.

In this patient, abnormal findings were not observed in the NCS of the ulnar nerve and symptoms were alleviated by one month of oral medications: a nonsteroidal anti-inflammatory agent and pregabalin. And we observed denervation potentials in the triceps muscle that may be caused by friction between the medial head and medial epicondyle, suggesting that the friction caused by snapping may lead to significant muscle trauma. How-

ever, further studies are needed to confirm whether isolated denervation potential due to muscle injury occurs in other patients with snapping triceps muscle.

To the best of our knowledge, this is the first report of a patient with snapping triceps syndrome confirmed by ultrasonography and accompanied by denervation potentials in the dislocated triceps muscle.

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