Carpal tunnel syndrome caused by synovial osteochondromatosis of the finger flexor tendon
A case report

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Abstract
Rationale: Carpal tunnel syndrome (CTS) is the most common peripheral nerve neuropathy resulting from compression of the median nerve as it traverses the carpal tunnel. The pathophysiology of this condition is multifactorial, and majority of cases of CTS are idiopathic. We report cases of CTS caused by synovial osteochondromatosis (SOC), which has rarely been reported.

Patient concerns: A 45-year-old female was admitted to the clinic due to right hand tingling sensation for 4 months. On physical examination, the patient’s symptoms and signs corresponded to the median nerve entrapment at wrist. However, there is mild swelling and tenderness around the second metacarpal bone. Pain was aggravated during wrist and finger flexion.

Diagnoses: An electrodiagnostic study revealed CTS. She was advised to begin splinting the hand using a wrist brace and to undergo physiotherapy. After 2 weeks, the tingling sensation decreased slightly. However, mild swelling and tenderness around the second metacarpal bone did not improve. Ultrasonography showed multiple echogenic foci. Magnetic resonance imaging (MRI) revealed a nodule at the proximal metacarpal level with synovial thickening, enhancement, and a calcified shadow close to the flexor tendon. After confirming the presence of an osseous nodule with synovial thickening, the patient underwent surgery.

Interventions: Carpal tunnel release and mass excision with synovectomy of the adjacent structures were performed. Histologically, the lesion was compatible with a diagnosis of SOC.

Outcome: The symptoms have improved.

Lessons: CTS due to SOC on finger flexor tendon is rare but should be considered for possible etiology. Appropriate clinical examination, plain radiography, ultrasonography, and MRI will help physicians to diagnose this condition. In this paper, we report the successful diagnosis and treatment of CTS caused by SOC within the finger flexor tendon.

Abbreviations: CTS = carpal tunnel syndrome, SOC = synovial osteochondromatosis.

Keywords: carpal tunnel syndrome, etiology, synovial osteochondromatosis

1. Introduction
Carpal tunnel syndrome (CTS) is the most common peripheral nerve neuropathy resulting from compression of the median nerve as it traverses the carpal tunnel. The pathophysiology of this condition is multifactorial. Channas et al classified etiology of CTS as idiopathic and secondary CTS. Majority of cases are classified as idiopathic cases. Less frequently, benign tumors that affect nerve itself have been reported. Lipofibroma of median nerve was common among tumors, and neurilemmomas and hemangioma have been reported. Here, we present a case involving synovial osteochondromatosis (SOC) of the hand flexor tendon sheath. SOC may result in symptoms of pain, swelling, and limited motion of the affected joint. We also report the diagnostic and treatment process for CTS due to SOC within the finger flexor tendon.

2. Case presentation
A 45-year-old woman presented at our institution with a 4-month history of tingling sensation on her right hand. There was no history of trauma. Sensory nerve conduction studies revealed prolonged distal latency (4.38 ms) with reduction in the amplitude (11.5 μV) of the right median sensory nerve action potential. Motor nerve conduction studies revealed a prolonged distal motor latency (5.73 ms) across the carpal tunnel with reduced amplitude (9 μV). The patient was diagnosed with CTS. She was advised to begin splinting the hand using a wrist brace to prevent prolonged flexion or extension and to undergo physiotherapy. After 2 weeks, the tingling decreased slightly. Despite treatment, the mild swelling and tenderness around the second metacarpal bone did not improve. Pain was aggravated during wrist and finger flexion. Ultrasonography showed multiple echogenic foci with shadowing at the proximal metacarpal level of the flexor tendon of the index finger measuring 11.9 x 9.6 mm in diameter (Fig. 1). A bone scan
demonstrated increased uptake of the right second metacarpal bone that was ascribed to a recent fracture or osteomyelitis as a differential diagnosis. Magnetic resonance imaging (MRI) revealed a nodule at the proximal metacarpal level with synovial thickening, enhancement, and a calcified shadow close to the flexor tendon.

After confirming the presence of an osseous nodule with synovial thickening, the patient underwent surgery. Intraoperative exploration showed that the nodule was attached to the flexor tendon of the index finger. The flexor tendon sheath appeared to be swollen with adhesions between adjacent structures. There was migration of the mass into the carpal tunnel during finger flexion. We excised the mass with synovectomy of the adjacent structures and released the carpal tunnel. Histologically, the lesion was composed of calcified nodules. A mineralized chondroid nodule, covered by fibrous tissue, was also visible. These features were compatible with a diagnosis of SOC (Fig. 2).

After the operation, the patient experienced complete resolution of her symptoms. At the follow-up 2 months after surgery, the patient remained symptom-free with no recurrence of the mass.

### 3. Discussion

SOC is a rare condition caused by metaplasia of the subsynovial connective tissue and involves the development of cartilage in the synovial membrane of bursae, joints or tendon sheaths. This condition typically involves the monoarticular joint, with large joints being frequently affected. 60% to 70% of cases involve knee joint and the shoulder, elbow, and hip follow with respect to frequency of involvement. However, SOC rarely affects the temporomandibular joint, spinal facet joint, acromioclavicular joint, metatarsophalangeal/interphalangeal joint, wrist joint, ankle joint, or biceps tendon and so on.

In this case, SOC affected the flexor tendon sheath with the patient complaining of a tingling sensation in the thumb and index finger. It appeared that a swelling associated with the lining of the flexor tendon resulted in changes to the carpal tunnel. Intraoperative findings revealed a mass that was entrapped during finger flexion and thickening of the transverse ligament. The clinical features of SOC are known to include pain, swelling, mechanical symptoms, and reduced joint function caused by compression of the mass and the development of loose bodies. In our current case, the patient complained about tenderness and mild swelling. Diagnosis of SOC is confirmed by histopathology, hyaline cartilage nodule under the synovial tissue of the tendon sheath. Pathological changes can be identified in the radiograph, ultrasound, and MRI. In general, X-ray examination shows multiple calcified nodules. However, our X-ray examination did not reveal any alteration. An ultrasound examination revealed a nodule at the proximal metacarpal level with synovial thickening and an osteochondral fragment surrounding the second flexor tendon. MRI showed a nodule at the proximal metacarpal level with synovial thickening, enhancement, and a calcified shadow close to the flexor tendon.
examination revealed osteochondral nodules with hyperechoic foci and acoustic shadowing.\textsuperscript{[5]}

Treatment options usually involve the removal of loose bodies with or without removal of the synovial membrane. Existing literature currently recommends synovectomy with removal of loose bodies in the presence of active synovitis.\textsuperscript{[8]} The recurrence rate after surgery ranges from 3.2\% to 22.2\%.\textsuperscript{[10]} In our current case, we performed excision of the mass and released the carpal tunnel. At the 2-month follow-up, the patient reported no recurrence of symptoms. However, previous studies have reported recurrence at 18 months after the initial mass excision and synovectomy, and recurrence at 5 years after removal of loose bodies with synovectomy.\textsuperscript{[11,12]} Therefore, our patient may require regular follow-up.

In summary, although SOC in the hand is an extremely rare condition, such cases should not be neglected as a potential case of median nerve compression in the carpal tunnel. Appropriate clinical examination, plain radiography, ultrasonography, and MRI will help physicians to diagnose this condition. In this paper, we report the successful diagnosis and treatment of CTS caused by SOC within the flexor tendon.

4. Method

This was a case report. Ethics committee or institutional review board approval was not obtained. It was not necessary for the case report. The patient signed informed consent for the publication of this case report.

Author contributions

Conceptualization: Dong Rak Kwon.
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