

압박 신경병증을 일으킨 결절종의 수술적 절제의 임상적 결과

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목적: 이 연구의 목적은 말단 신경을 침범하는 결절종을 가진 환자의 수술적 치료를 고찰하는 데 있다.

대상 및 방법: 1995년부터 2000년까지 결절종으로 인한 신경적 증상을 가지고 있었고 수술적으로 치료받았던 12예의 환자를 대상으로 하였다. 평균 나이는 44.3(15-71)세였다. 압박받았던 신경은 경골 신경이 3예로 가장 많았고 견갑상 신경, 총 비골 신경, 요골 신경, 척골 신경이 각각 2예, 정중 신경이 1예였다. 동통은 6명의 환자에서 있었고, 감각 이상이나 운동력 저하가 각각 7예의 환자에서 보였고 4명의 환자에서는 이 두 증상이 동시에 있었다.

결과: 술전 동통을 호소하였던 6명 모두 술후 동통은 소실되었다. 술전 감각 이상이 있었던 7명의 환자 중 5명에서 호전이 있었으며 술전 운동력 약화를 보였던 환자 모두 호전이 있었다. 술전 감각 이상과 운동력 약화를 동시에 보였던 환자 4명 중 2명만이 완전한 감각의 회복을 보였고 이는 불량한 예후 인자를 암시한다.

결론: 이러한 압박 신경병증을 일으키는 결절종의 정확한 조기 진단 및 절제는 우수한 임상적 결과를 보인다.

색인 단어: 결절종, 압박 신경병증

Introduction

A ganglion cyst is a common simple cyst, which originates from the joint capsule or the tendon sheath and which contains a mucous-like substance. Most of these cysts develop in the wrist area, but can occur in any part of the body. These cysts can result in pain and various neurologic symptoms in different degrees, in rare cases by invading

a peripheral nerve. Hartwell¹¹⁾ reported for the first time on the compression of the median nerve by a ganglion cyst and various studies have been followed up by different authors on these cysts invading peripheral nerves. The current authors reported the treatment results in 12 patients, who showed neurologic symptoms caused by ganglion cysts and who were treated at the author's institution.

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Patients and Methods

The current study was done on 12 patients who were treated for neurologic symptoms

caused by ganglion cysts at the author's institution from 1995 to 2000. There are six males and six females. The average age of these patients was 44.3 (15-71) years. The involved nerves were the tibial nerve in

Table 1. Data on 12 Patients with Ganglion Neuropathy

Patient	Age /Gender	Site/Nerve	Injury history	MRI/ EPS	Palpable Mass	Pain	Sensory	Motor
1	37/F	Elbow/ulnar nerve	+	-/+	+	-	Hypesthesia on fourth and fifth fingers	Normal
2	15/M	Fibular head/ common peroneal nerve	-	+/+	+	+	Mild hypesthesia on lateral aspect of lower leg	Normal
3	38/F	Ankle/tibial nerve	-	+/+	+	+	Intact	Normal
4	49/M	Shoulder/ suprascapular nerve	-	+/+	-	+	Intact	Normal
5	52/F	Wrist/median nerve	-	-/+	+	+	Paresthesia on first to third fingers	Normal
6	71/M	Popliteal fossa/ tibial nerve	-	+/+	+	-	Hypesthesia on sole of foot	Toe flexion: Good
7	60/F	Fibular head/ common peroneal nerve	-	+/+	+	+	Hypesthesia on lateral aspect of lower leg to greater toe	Greater toe dorsiflexion: Good
8	44/M	Popliteal fossa/ tibial nerve	-	+/+	+	-	Anesthesia on sole of foot	Toe flexion: Fair
9	39/F	Forearm/radial nerve	-	-/+	-	-	Intact	Finger extension: Fair
10	46/M	Shoulder/ suprascapular nerve	+	+/+	-	+	Intact	Shoulder external rotation: Good
11	29/F	Antecubital fossa/ radial nerve	-	-/+	+	-	Intact	Finger extension: Poor
12	52/M	Elbow/ulnar nerve	+	-/+	-	-	Hypesthesia on fourth and fifth finger	Finger abduction: Good

EPS: Electrophysiologic study (Electromyography / Nerve conduction study)

three patients: the suprascapular nerve, common peroneal nerve, radial nerve, and ulnar nerve were involved in two patients each; and the median nerve was involved in one patient. The neurologic symptoms reported by patients on presentation to the hospital were pain, sensory disturbance, and motor weakness. The evaluation of motor weakness was done by dividing the muscle strength into six grades: normal, good, fair, poor, trace, and none. Electrophysiology study was done in all patients to confirm the involved nerve. Magnetic Resonance Imaging (MRI) was done in seven patients (58.3%) to determine the accurate shape of the masses and their relationships with the

surrounding tissue (Table 1). Surgical excision was done in all patients. At the time of surgery, efforts were made to excise the cyst completely, and to keep the wall intact, because this ensured complete excision. However, when a cyst was too taut to separate from an adjacent nerve, the cyst was excised after being incised and partially decompressed. Cysts were excised in all patients without damaging the nerve being compressed. All cases were confirmed by histological examinations. Patients were followed up for pain, sensory disturbance, and motor weakness for an average of 49.4 (12-109) months.

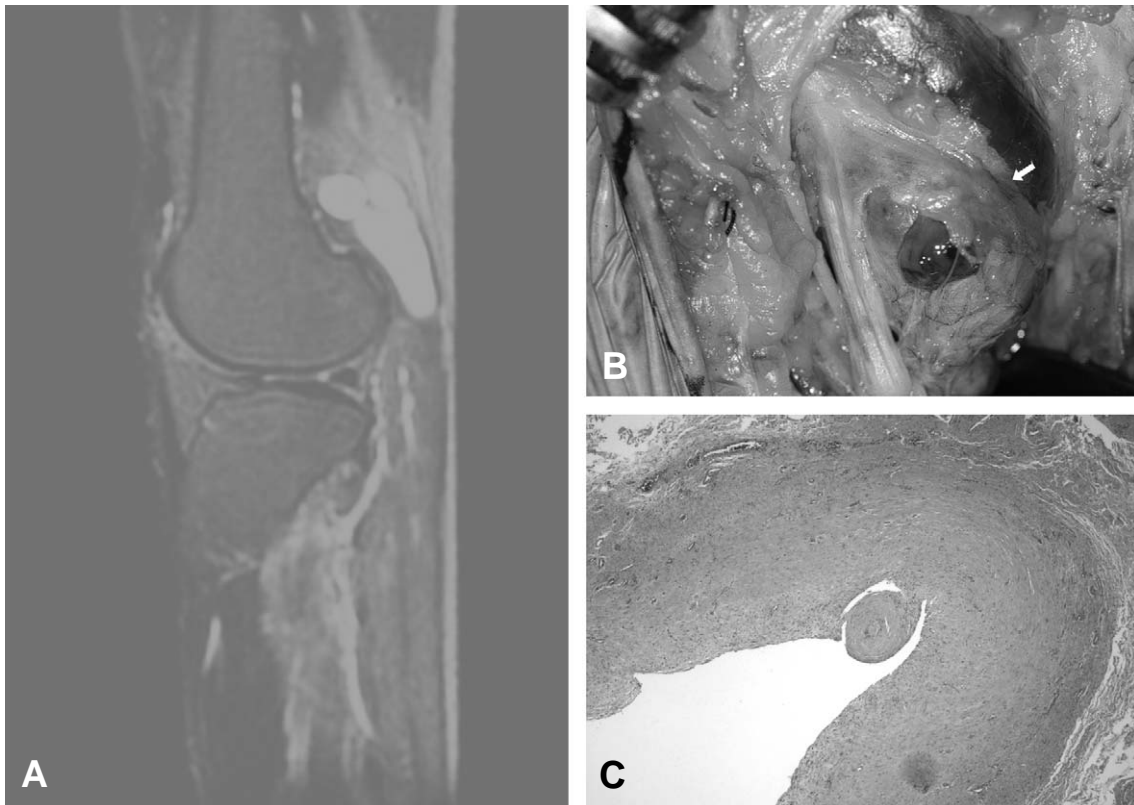


Fig. 1. Patient no. 8. (A) A T2-weighted MRI view showing a high signal homogeneous multilocular lesion measuring 5×3 cm at the popliteal fossa. (B) Surgical exposure shows severely compressed tibial nerve (arrow) by ganglion cyst. (C) Lower power view ($\times 20$) of the cyst showing thick walled cystic space and focal myxoid change in the matrix (hematoxylin and eosin).

Results

Pain at the involved site was present in six patients (50%), sensory disturbance or motor weakness was present in seven patients (58.3%) each, sensory disturbance and motor weakness were present simultaneously in four patients, and either sensory disturbance or motor weakness was present in three patients each. On physical examination, authors found masses in eight patients (66.7%) by palpation, but not in four patients, in which the masses were present in the scapular, forearm, and elbow areas (Table 1).

Intraoperative gross findings showed that a cyst originated from the adjacent joint capsule compressing the nerve in eight patients, a cyst originated from and compressed the nerve in three patients, and the cyst origin could not be determined in one patient. All excised cysts were diagnosed as ganglion cysts by histological examination (Fig. 1).

No patients had worsening of neurologic symptoms after surgery. Pain improved or resolved in all six patients who complained of preoperative pain. Of the seven patients who had severe preoperative sensory disturbance, complete recovery was seen in the five patients. But two patients; the common peroneal nerve was involved in one patient (patient 7) and the tibial nerve was involved at the popliteal fossa (patient 8), were not. These patients had severe sensory disturbance preoperatively, and although the duration of the symptom was relatively short, 3 and 2 months respectively, they still had sensory disturbance at 40 and 31 months postoperative respectively. Motor weakness improved in all seven patients who had preoperative motor weakness. Although

having severe motor weakness before surgery, the patient in whom the tibial nerve was involved at the popliteal fossa (patient 8) and the patients in whom the radial nerve was involved at the forearm (patient 9) and antecubital fossa (patient 11), recovered completely after surgery. Although complete sensory recovery was seen in all four patients who had preoperative isolated sensory disturbance, sensory recovery was seen two of four patients who had postoperative sensory disturbance and motor weakness, which indicated a poor prognosis. No recurrence was seen after surgery.

Discussion

A ganglion cyst involving a peripheral nerve is rare and many hypotheses have been proposed regarding the cause. The hypotheses include cystic degeneration of the neurilemmoma, herniation of the joint synovium, and traumatic intraneural hemorrhage^{5,15,22}.

Although a ganglion cyst involving the peripheral nerve is connected to the adjacent joint capsule in most cases, some cases do not show a clear connection. Some authors have claimed that this is caused by stress induced metaplastic changes within the nerve cells themselves^{2,8,16}. Scherman et al.²¹, through an electron microscopy study, proved that cells forming the ganglion cyst wall were myofibroblast, similar to the cells found in ganglia arising from joint capsule. Therefore, although the site of origin in these intraneural ganglion cysts is in question - that is joint capsule versus perineural tissue, the resultant ganglion cyst is the same. The current authors found that in eight patients, the cyst originated from the

joint capsule and in three patients, the cyst originated from the nerve itself, indicating that the hypotheses claimed by previous authors were applicable.

Many authors have reported that the distribution of ganglion cysts compressing peripheral nerves originated from the major joints in the upper and lower extremities^{4,12,17,19,20}. A predilection for the common peroneal nerve at the head of the fibula has been documented repeatedly with some authors, however others reported different results, so the reported incidences are as much as 16–78% of all ganglion cysts occurring in the body^{2,3,5,21}.

In the majority of the early reported cases of ganglion cyst causing suprascapular neuropathy, the diagnosis was not made until the time of surgical exploration. Recent developments in MRI and its use in the evaluation of shoulder disorders has allowed for the diagnosis to be made preoperatively^{10,25}, which has prompted many studies of ganglion cysts invading the suprascapular nerve. Beyond the MRI, Akgun et al.¹ proposed that electrophysiologic study (electromyography and nerve conduction study) should be performed to confirm the diagnosis of entrapment neuropathy of the suprascapular nerve. Many studies have reported ganglion cysts invading various other nerves in the upper extremity^{12,14,18,24}, in the current study, ganglion cysts invading the radial and ulnar nerves were seen in two patients each, and invading the median nerve was seen in one patient.

For the diagnosis, the possibility of nerve compression by a ganglion cyst must be considered in those patients who complain of pain and neurologic symptoms limited to the extremities. Accurate physical examinations of neurologic symptoms, electrophysiologic

study, and a detailed history are needed. Especially electrophysiology study is helpful for diagnosing the location of cysts causing the neurologic symptom, and could provide data for the evaluation of postoperative results. Furthermore, imaging studies are necessary for a more accurate preoperative diagnosis and surgery plan. Imaging study methods include arthrography, ultrasonography, computed tomography (CT) scanning and MRI. MRI, in particular, provides the most accurate data on ganglion cysts and their relationship with the surrounding structures. Compared with muscles, ganglion cysts have a low signal intensity on T1 Weighted MRI scans and a high signal intensity on T2 Weighted MRI scans as a multilocular, nonenhancing lesion.

The two modalities of surgical treatment for patients with ganglion cysts are complete excision; and incision and drainage. The former could reduce the chance of recurrence and latter could reduce the risk of nerve damage during surgery⁷. Although complete excision is possible in most patients, it is difficult in a ganglion cyst presented within a nerve. In these patients, incision and drainage is better for preventing nerve injury during surgery^{2,8,16}. Allieu and Cenac² reported that incision and drainage does not increase the incidence of recurrence, although this opinion remains debatable.

Various prognoses are possible after the surgical treatment of ganglion cysts. Several studies reported complete resolution of pain or significantly reduced pain after surgery^{1,18}. However, recovery of muscle power varies due to preoperative factors, which include the degree of motor weakness, the duration of neurologic symptoms and the general medical conditions. Studies have showed that recovery is more difficult in

those patients in whom the neurologic symptoms are present for more than 1 year^{6,7)}. Although seven of the patients in the current study had severe motor weakness with a muscle strength grade of fair before surgery, complete recovery was achieved in all patients, who have the relatively short duration of symptoms, less than 3 months. Therefore, the authors suggest that the duration of symptoms has a greater affect on muscle strength recovery after surgery than the degree of preoperative muscle strength decrease. However, although the duration of symptoms of sensory disturbance was relatively short at less than 3 months, sensory recovery was slow after surgery in two patients who had severe sensory disturbance before surgery. Therefore, the authors suggest that the degree of sensory disturbance affects the postoperative prognosis more than symptom duration does.

The incidence of recurrence after surgery has been reported to be between 10% and 33% and some authors have reported no recurrence^{7, 23, 24)}. Generally, studies have reported that recurrence can be reduced when the connection between the cyst and joint capsule is blocked completely during surgery^{5, 7, 23)}. No patients in the current study had a recurrence.

Recently, according to the wide use of arthroscopic techniques, some authors reported that cyst occurring in specific sites could be treated arthroscopically. Ganglion cyst compressing suprascapular nerve, cysts of the proximal radioulnar joint causing radial tunnel syndrome are treated with arthroscopic decompression by some authors^{9, 13, 18)}.

An accurate history, physical examination, and other diagnostic modalities (MRI or electrophysiologic study etc.) are needed for the

preoperative diagnosis and treatment plan for patients with ganglion cysts causing compressive neuropathy. Some ganglion cysts can be treated with aggressive physical therapy, medication, and possibly activity modification in an attempt to resolve the pain. If the pain persists after nonoperative treatment or neurological symptoms aggravated, intervention is indicated in an attempt to relieve the symptoms. For surgical step, complete excision including the connection between the cyst and joint capsule is needed to reduce the recurrence. Although pain is expected to improve significantly after surgery in most patients, the degree of motor weakness after surgery is affected significantly by the duration of symptoms. Therefore, early accurate diagnosis and excision of ganglion cysts can result in good clinical results.

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Abstract

**Clinical Outcomes of the Surgical Excision
of the Ganglion Cyst Causing Compressive Neuropathy
- A Review of Twelve Collected Cases -**

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Purpose: The purpose of current study was to review the surgical treatment results in patients with a ganglion cyst involving peripheral nerves and to suggest the poor prognostic factor.

Materials and Methods: Twelve patients having neurologic symptoms caused by ganglion cyst were treated operatively between 1995 and 2000. The peripheral nerves involved were the tibial nerve in three patients, suprascapular nerve, common peroneal nerve, radial nerve, and ulnar nerve in two patients each, and median nerve in one patient. Pain was present in six patients, sensory disturbance or motor weakness was seen in seven patients each; and sensory disturbance and motor weakness were concurrently present in four patients.

Results: In all six patients who complained of preoperative pain, the pain was resolved after surgery. Improvements were seen in five of seven patients who had preoperative sensory disturbance and in all patients who had preoperative motor weakness. Complete sensory recovery was obtained in only two of four patients with preoperative sensory disturbance and motor weakness, indicating a poor prognosis factor.

Conclusion: Early accurate diagnosis and early excision of these ganglion cysts causing compression neuropathy could produce excellent clinical results.

Key Words: Ganglion cyst, Compressive neuropathy

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