Guyon’s canal in the wrist is the passage of the ulnar nerve located at the base of the wrist and it is a structure that extends from the proximal aspect of the palmar carpal ligament to the fibrous bow of the hypothenar muscle. Because the ulnar nerve is divided into the superficial sensory branch and the deep motor branch within Guyon’s canal, the extent of motor impairment and sensory loss may vary depending on which part of Guyon’s canal is damaged.

Scar formation after tissue injury is an essential part of wound healing. The injured peripheral nerve often thickens the nerve endothelium, forms scar tissue around the nerve, and scar tissue induces adhesion between the surrounding critical structures. It can then progress to chronic retraction and permanent nerve compression due to peripheral nerve compression and retraction.

In this paper, we report a case where we successfully performed a surgical technique of nerve wrapping using a silicone tube when performing neurorrhaphy in order to prevent neuropathy caused by scar formation after

Neurorrhaphy of Ulnar Nerve with Silicon Wrapping in Guyon’s Canal to Prevent Neuropathy: A Case Report

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An 18-year-old female patient presented with complaints of motor function and sensory impairment of the ulnar nerve on the 9th day after primary repair with a laceration of the right palm. We performed nerve wrapping with silicone tube after primary nerve repair to prevent neuropathy due to scar formation. As a result of surgical treatment, motor function and sensory impairment of ulnar nerve were improved significantly without complication until 2 years postoperatively. Nerve wrapping with silicone tube can be widely used in patients who underwent primary repair of ulnar nerve and patients who have undergone surgical decompression due to other causes of Guyon’s canal syndrome. This surgical technique is expected to prevent neuropathy caused by scar formation.

Key Words: Ulnar tunnel, Ulnar nerve, Ulnar neuropathies
performing nerve repair to treat a deep laceration at the area of the Guyon’s canal in the wrist, and we present the case report with a review of the literature.

**CASE REPORT**

An 18-year-old female patient visited the emergency department after she fell in the bathroom and suffered a deep laceration of the right palm at the sharp part of the tile floor. The patient was discharged after debridement and primary repair. On the 9th day after the injury, she visited the hospital for outpatient treatment and complained of sensory impairment in the outer half of the fourth and fifth digits of the hand and motor function disturbance. The patient was diagnosed as having clawhand deformity at the time of the physical examination (Fig. 1). Physical examination revealed that the patient did not spread the fingers of the injured hand apart or draw them together well, and the results of Froment’s sign were positive (Fig. 2). The results of simple radiographs of the hand were normal findings. Ulnar nerve injury was suspected in the electromyogram and nerve conduction study performed on the 12th day after the injury. On the 23rd day after the injury, the skin was incised along the sutured wound using general anesthesia and tourniquet, and the Guyon’s canal was exposed, and it was found that the ulnar nerve and ulnar artery were completely cutted and adhered to the surrounding tissues (Fig. 3). After finding the severed ulnar nerve and artery, adhesions with the surrounding tissues were resolved, and neurorrhaphy was performed on the deep and superficial branches of the ulnar nerve. At the same time, a commercially available silicone tube (Silicone tube; Sun Medical Co., Seoul, Korea) was used to wrap the ulnar nerve in the area where there was a possibility of adhesion with surrounding tissue or compression (Fig. 4). After performing arteriorrhaphy, the wound was sutured and a short arm splint was applied for 2 weeks after surgery. Before entering operating room, written informed consent was obtained from the patient after informing rare possibility of complications caused by implantation of foreign substances.

Fig. 1. On physical examination, claw hand deformity is observed.

Fig. 2. On physical examination, finger abduction and adduction is abnormal on the right hand.
The results of the Hand Grip Power and Dexterity test performed on the 18th postoperative day showed a significant improvement in muscle strength and motor function compared with the results of the same test on the 8th day (Table 1, 2). At 8 months postoperatively, the electromyogram showed a significant improvement compared to the preoperative level. When the Jebsen-Taylor Hand Function Test was performed 9 months after surgery, the results were similar to the normal values in most of the items (Table 3). The patient did not develop any complications including discomfort, which is most common complication of silicone tube during the follow-up period of 2 years and showed continuous improvement of motor and sensory function through rehabilitation.

**DISCUSSION**

Because the ulnar nerve is located relatively close to the skin when passing through the elbows and wrists, it is very likely to be damaged in these areas. Shea and McClain\(^2\) classified the injuries of the ulnar nerve in the wrist into three categories according to the injury location. Type 1 is sensory and motor deficit due to the injury of the area proximal to or in the canal of Guyon, Type 2 is motor impairment due to the injury of the deep branch.

![Fig. 3. In intraoperative exploration, total rupture of ulnar nerve and ulnar artery is observed.](image)

![Fig. 4. Neurorrhaphy is performed on the deep branches and superficial branches of the ruptured ulnar nerve. Nerve wrapping with silicone tube after primary nerve repair is performed.](image)

**Table 1.** Hand grip power test, after postoperative 8 days and 18 days

<table>
<thead>
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<th>Variable</th>
<th>Right</th>
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<td>Grip</td>
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<td>Tip</td>
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<tr>
<td>Postoperative 18 days</td>
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<td>2.5</td>
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</tbody>
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**Table 2.** Hand dexterity test, after postoperative 8 days and 18 days

<table>
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<td>Box and block (60 s)</td>
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<td>Postoperative 18 days</td>
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<td>75 s</td>
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of the ulnar nerve, and Type 3 is sensory loss due to the injury of the distal part of the ulnar canal where the superficial branch of the ulnar nerve is located.

Perineural scar formation and adhesion can be induced by traumatic injury, hemorrhage of the surgical site, chronic inflammation, or a simple surgical operation. Scar formation after neurorrhaphy is considered to be inevitable. After undergoing decompression because of carpal tunnel syndrome, 20% of the patients reported recurrence of the symptom because of scar tissue formation, and it has been reported that adhesion of the nerve and surrounding tissue recurs in most patients even after secondary neurolysis.

If perineural scar formation occurs, the nerve is compressed and the compressed nerve causes irreversible damage as well as ischemic changes, resulting in symptoms such as sensory deficit, muscle atrophy, functional disability, and chronic pain. In addition, nerve regeneration is interfered by scar tissue itself.

For this reason, previous studies continued to investigate various surgical techniques and pharmacological treatments to minimize scar formation around the nerve after neurorrhaphy. In order to minimize scar formation, methods such as microsurgery, endoscopy, nerve transposition, and fat graft have been performed. In some cases, the operation site was irradiated with radiation after surgery, and methods using laser irradiation, fibrin glue, and the like have also been used as an attempt to reduce foreign body reaction by the suture material itself. In addition, since the use of triamcinolone acetonide and cis-hydroxyproline for suppression of scar formation after neurosurgical operations in the 1960s, various medicines such as amniotic fluid and hyaluronic acid have been used with the expectation that they would help suppress scar formation after neurorrhaphy. However, previous studies on the surgical procedures and pharmacological treatments described above did not provide a consistent and satisfactory result, and the ultimate treatment for prevention of scar formation after neuronal surgery has not been presented yet.

Nerve wrapping was derived from the concept of suppressing over-activated fibroblast reaction after a neurosurgical operation by placing a biologic barrier consisting of fascia, fat, and vein graft around the damaged nerve. Actually, nerve wrapping using the saphenous vein has been performed in cases of chronic median nerve compression. Recently, silicone tubing has been successfully used for peripheral nerve repair and major complications have not been reported.

In respect of the case described in this paper, we performed neurorrhaphy for the patient whose ulnar nerve injury was not detected immediately but found later, and additionally tried the surgical technique of nerve wrapping with a commercial silicone tube, employing the concept of nerve wrapping used to prevent neuropathy caused by scar formation after neurorrhaphy. After surgical treatment, motor and sensory deficits due to ulnar nerve injury were significantly improved, and the patient recovered without complications until 2 years postoperatively. Continuous follow-up is needed to confirm that there are no complications, including nerve compression and foreign body reactions. However, wrapping the nerve with a silicone tube is expected to prevent the occurrence of scar-induced neuropathy not only in patients who have

<table>
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<th>Postoperative 9 months (s)</th>
<th>Normal (s)</th>
<th>Postoperative 9 months (s)</th>
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<td>7.1</td>
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<td>3.5</td>
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undergone nerve repair because of ulnar nerve injury as in the case reported in this study but also in patients undergoing surgical treatment such as nerve decompression because of Guyon’s canal syndrome due to other causes.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

REFERENCES

신경병증을 방지하기 위해 실리콘 튜브를 이용한 척골관 안에서의 신경 접합술: 증례 보고

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18세 여자 환자가 오른 손바닥의 열상으로 일차 봉합술을 시행받은 후 수상 9일째 척골신경의 운동 기능 및 감각 기능 소실을 호소하며 내원하였다. 절단된 척골신경에 대해 신경 봉합술을 시행하였고, 2차적인 반혼 형성으로 인한 신경병증을 예방하고자 상용화된 실리콘 튜브를 이용하여 신경 봉합 부위를 감싸주었다. 이후 척골신경 손상으로 저하되었던 근력 기능 및 감각 기능이 현저히 호전되는 것을 확인할 수 있었다. 향후 척골관 내에 척골 신경을 손상받은 환자에게서 실리콘 튜브를 이용한 신경 감싸기는 반혼 형성으로 인한 신경병증의 발생을 예방할 수 있을 것으로 기대된다.

색인단어: 척골관, 척골 신경, 척골 신경병증

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