Clinical Study

Fascia Wrapping Technique: A Modified Method for the Treatment of Cubital Tunnel Syndrome

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Variations of the anterior transposition of the ulnar nerve for cubital tunnel syndrome include subcutaneous, submuscular, intramuscular, and subfascial methods. We introduce a modification of subfascial transposition, which is designed to facilitate nerve gliding by wrapping the nerve with fascia. Twenty patients with wrapping surgery following the diagnosis of cubital tunnel syndrome were reviewed retrospectively. Preoperative electrodiagnostic studies were performed in all patients and all of them were rechecked postoperatively. The preoperative mean value of motor conduction velocity (MCV) was 37.1 ± 6.7 m/s within the elbow segment and this result showed a decrease compared to the result of MCV with 53.9 ± 6.9 m/s in the below the elbow-wrist segment with statistical significance (P < 0.05). Postoperative mean values of MCV were improved in all of 20 patients to 47.6 ± 5.5 m/s (P < 0.05). 19 patients of 20 (95%) reported good or excellent clinical outcomes according to a modified Bishop scoring system. The surgical treatment methods for cubital tunnel syndrome have their own advantages and disadvantages, and the preferred method differs depending on the surgeon. The wrapping method of anterior transposition is a newly designed alternative method modified from subfascial transposition. This method could be an alternative option to treat cubital tunnel syndrome.

1. Introductions

Ulnar nerve compression at the elbow region, which is named cubital tunnel syndrome, is the second most common compressive neuropathy of the upper limb after carpal tunnel syndrome [1]. Multiple surgical options have been recommended in the literature and reflect the controversy surrounding the surgical treatment of cubital tunnel syndrome. The surgical management is broadly divided into three types of procedures [2]: simple decompression [3, 4], medial epicondylectomy [5, 6], and anterior transposition of the ulnar nerve. Also variations of anterior transposition of the ulnar nerve have been proposed; these include subcutaneous [7–9], submuscular [10–12], intramuscular [13–15], and subfascial [2, 16] methods. A subcutaneous transposition is a simple and reliable procedure that facilitates an early postoperative mobilization. However, it is more vulnerable to trauma and hypersensitivity. A submuscular or intramuscular transposition is well protected as it lies deeply under a substantial amount of soft tissue. However, it has the disadvantages of prolonged postoperative elbow immobilization and potential subsequent contracture. A subfascial transposition protects the transposed nerve and avoids problems like scarring, recurrence, and elbow contracture [2, 16].

The method we are introducing in this study is a modified method of subfascial transposition. The method of subfascial transposition has merits as mentioned above, but whether the nerve would not adhere between the fascia and the muscle and gliding would be facilitated was doubted, and there was a difficulty in fixing the fascial flap to the muscle after elevation since the muscular tissue was friable [17, 18]. In addition, if there is a defect on a region like dorsum of hand for which tendon gliding is necessary, to cover it with temporoparietal fascia free flap to facilitate tendon gliding after coverage and conduct split thickness skin graft is a widely known method [19–21] based on which we thought that wrapping the nerve with fascia would cause less adhesion and be helpful for gliding. Thus this new method is designed to facilitate
nerve gliding by wrapping the nerve with fascia. Here, we summarize and report the surgery method as well as the result of surgery.

2. Patients and Method

Twenty patients who had surgery with the wrapping method due to the diagnosis of cubital tunnel syndrome were reviewed retrospectively. The study patient pool consists of patients who had a surgical operation at a single centre in Uijeongbu St. Mary’s Hospital from January 2008 through January 2012. All operations have been conducted by the corresponding author, Sung-No Jung. Diagnosis of cubital tunnel syndrome was made on a typical history of pain. Sensory deficit according to the distribution of ulnar nerve was measured by static and dynamic 2-point discrimination tests. And the loss of intrinsic bulk and weakness of grip strength were measured as well using a hand grip dynamometer and compared with that of the normal part on the opposite side. Preoperatively, the condition of the ulnar nerve was graded according to severity, based on Dellon’s classification [22]. Preoperative electromyography of the flexor carpi ulnaris, abductor digiti minimi, and first interosseous muscle was done in all patients. Also we evaluated the preoperative motor conduction velocity (MCV) of the ulnar nerve in the segments of below the elbow-wrist, above the elbow-below the elbow, and axilla-above the elbow in all patients. A section survey was simultaneously applied between 4 cm distal and 6 cm proximal to the medical epicondyle under general anesthesia and tourniquet control. The fascia was divided between the medial intermuscular septum to the postcondylar groove, releasing Osborne’s band, which is an aponeurosis located between the two heads of flexor carpi ulnaris muscle. The feeding artery vessel of the nerve should be saved (Figure 1). An anterior transposition of the ulnar nerve was conducted followed by dissection to achieve a sufficient release without compression of the nerve (Figure 1). Superficial fascia belonging to the flexor pronator muscle group was elevated as a broad fascia flap with a width exceeding approximately 3 cm and a position of 1-2 cm apart from the medical epicondyle origin. Unlike the existing subfascial transposition, which is located in the nerve between muscle and fascia after elevating fascia flap, we conducted the wrapping procedure by locating the ulnar nerve over the fascia and very loosely rolling the ulnar nerve with the elevated fascia flap (Figures 2 and 3). The elevated fascia flap was firmly anchored onto the fascia located to the side of medial epicondyle through a continuous

Figure 1: Nerve release and anterior transposition. (a) Feeding artery vessel (arrow) of nerve must be saved. (b) Anterior transposition of the ulnar nerve was conducted followed by dissection to achieve sufficient release without compression of the ulnar nerve.
The average follow-up period was 24 months (ranging from 9 to 32 months) and a postoperative electrophysiological study was assessed about one year after the surgery in all patients. The mean value of MCV had improved from 37.1 ± 6.7 m/s to 47.6 ± 5.5 m/s (P < 0.05) with statistical significance. Subjective symptoms were also improved in all patients one year after the surgery. 19 patients of 20 (95%) reported good or excellent clinical outcomes according to a modified Bishop scoring system (Table 3). There were no complications, recurrence, or subluxation of the ulnar nerve.

Table 1: Patient data.

| Total patient number | 20 patients (M: 15 and F: 5) |
|----------------------|------------------------------|
| Average age          | 49 years (range: 33–68)      |
| History of trauma    | 8 patients (40%)              |
| Sensory decrease     | 20 patients (100%)            |
| Intrinsic atrophy    | 11 patients (55%)             |
| Tinel's sign         | 17 patients (85%)             |
| Weakness of grip strength | 17 patients (85%)        |
| Abnormal motor nerve conduction velocity (<50 m/s) | 20 patients (100%) |
Figure 2: Wrapping procedure. Wrapping procedure was conducted by locating the ulnar nerve over the fascia and very loosely rolling the ulnar nerve with the elevated fascia flap. Closure could be tightly made together with the fascia.

Figure 3: Schematic illustration of the wrapping procedures.

They assumed that autologous vein graft with its smooth inner surface should improve the gliding function of the nerve and reduce scar formation around the nerve.

A further advantage for this surgical method is that the nerve can be placed in a more superficial position than the fascia. It is less likely that there will be problems of nerve kinking or iatrogenic compression on the new surgery site because the nerve plane is placed on the same plane before surgery, above the fascia. In the classical subfascial transposition method, there is the potential that compression on a certain region between the two heads of the FCU, which is mainly the distal part, can developed, or compression can worsen because the plane is changed from suprafascia to subfascia. For this reason, the confirmation and release of six anatomic compression sites of ulnar nerve should be completed when an anterior transposition is conducted [33]. By our wrapping method, the nerve is pre- and postoperatively moved on the same plane so the compression potential can be reduced.

Finally, the last benefit of this surgical method is that it is simple to fix the fascia. Fascia Z-plasty or step ladder incision that sutures the fascia together is used for conduction of subfascia nerve transposition due to the high potential of loosening when fascia is fixed onto muscle that is friable after nerve transposition [17, 18]. In this situation, a dissection has to be done more on the radial side. On the contrary, the wrapping method can provide simple and firm immobilization by elevating the fascia only, placing the nerve on the fascia, turning over the elevated fascia, and finally suturing the fascia together.

The limitation of our study is that we were not able to objectively analyze the surgery results of the wrapping method compared with the classical subfascia method by a control group. This study has left much to be desired and, therefore, we are looking forward to a comparative analysis between the wrapping method and subfascia method to achieve more interesting and significant results.
Table 2: Dellon’s classification.

|                    | Mild (I) | Moderate (II) | Severe (III) |
|--------------------|----------|---------------|--------------|
| Sensory            | Intermittent paresthesia | Intermittent paresthesia | Permanent paresthesia |
| Motor              | Measurable weakness     | Measurable weakness     | Palsy         |
| Patients in this study | 2 (10%)   | 11 (55%)      | 7 (35%)      |

Figure 4: Motor conduction velocity (MCV) result. The preoperative mean value of motor conduction velocity (MCV) was 37.1 ± 6.7 m/s within the segment (above the elbow-below the elbow) and this result showed a decrease compared to the result of MCV with 53.9 ± 6.9 m/s in the below the elbow-wrist segment with statistical significance (P < 0.05). Postoperative mean values of MCV were improved in all of 20 patients to 47.6 ± 5.5 m/s (P < 0.05).

Table 3: A modified Bishop scoring system.

|               | Dellon I (n = 2) | Dellon II (n = 11) | Dellon III (n = 7) | All |
|---------------|------------------|--------------------|--------------------|-----|
| Bishop-rate   |                  |                    |                    |     |
| Excellent     | 2                | 7                  | 2                  | 11 (55%) |
| Good          | 0                | 4                  | 4                  | 8 (40%) |
| Fair          | 0                | 0                  | 1                  | 1 (5%) |
| Poor          | 0                | 0                  | 0                  | 0    |

5. Conclusions

The surgical treatment methods for cubital tunnel syndrome have their own advantages and disadvantages, and the preferred method differs depending on the surgeon. The wrapping method of anterior transposition as reported in this study is a newly designed alternative method modified from subfascial transposition. This method provides better immobilization and requires less dissection than a subfascial transposition. This method could be an alternative option to treat cubital tunnel syndrome.

Conflict of Interests

The authors have no financial interests or commercial association with any of the subject matter or products mentioned in this paper.

Authors’ Contribution

Hyun Ho Han, M.D., planned mechanical model of the paper and collected data and wrote a significant portion of the paper. Hae Won Kang, M.D., collected data and wrote a significant portion of the paper and designed illustration. Jun Yong Lee, M.D., collected and analyzed data. Sung-No Jung, M.D., Ph.D., performed the procedures, analyzed data, and wrote a significant portion of the paper.

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