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Case Report

The Effects of Acupotomy Therapy on Carpal Tunnel Syndrome: A Report of 4 Cases



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ABSTRACT

The aim of this report was to show the effects of acupotomy in patients with carpal tunnel syndrome. Four patients were treated with acupotomy twice. Visual analogue scale (VAS), Tinel's sign, Phalen's test, Boston carpal tunnel syndrome questionnaire (BCTQ), muscular strength test, and a cross-sectional area of median nerve was measured using ultrasound before and after treatment. In all 4 cases, the VAS score, BCTQ score and cross-sectional area of median nerve, all decreased and muscular strength test score increased. Tinel's sign and the Phalen's test changed from a positive to a negative in most cases. This report shows that acupotomy is an effective treatment for carpal tunnel syndrome. Further larger are needed to fully evaluate the beneficial effects of this treatment.

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Introduction

Carpal tunnel syndrome (CTS) is the most common of all entrapment syndromes [1]. It is a long-lasting disease that can lead to irreversible damage, scarring, fibrosis, loss of motor endplates and may cause muscular atrophy, all of which can affect daily physical activities [2].

Acupotomy is a treatment introduced by Zhu Hanzhang [3], developed to address the effects of soft tissues damage by removing adhesions, nodules and scars restore movement in the soft tissue through exfoliation of the adhesions and removal of attached tissues [4]. It causes not only a stimulation to the acupoint but also a release of the taut band in myofascial pain syndrome (MPS) [5]. It has the advantage of a faster recovery time and less pain is experienced compared with regular acupuncture [4].

In Korea, currently, there have been no reported studies observing the effect of acupotomy therapy on CTS using

musculoskeletal ultrasound.

In this present study, we examined the effects of acupotomy therapy in patients with carpal tunnel syndrome whilst using musculoskeletal ultrasound. This study was exempt from IRB deliberation (IRB No.: WKIRB 17-22).

Case Reports

Four patients who have CTS received acupotomy twice at Wonkwang University Gwangju Korean Medical Hospital. Before the treatment, sufficient information about the treatment involved was provided and patient consent was taken. Patients gave consent and were treated without anesthesia and their condition was monitored. Ultrasonographic observations of the wrist acupoints, Daereung (PC7), Sinmun (HT7), Taeyeon (LU9) identified the location of the nerves, blood vessels and periosteum ensuring that a risk of injury was minimized.

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Treatment methods

After observing the position of the nerve and blood vessels, 3 points were selected. One point was between the median nerve and the ulnar artery (A1), another point was between the median nerve and the radial artery (C1), and the third point was selected on the median nerve (B1). The practitioner disinfected the site and wore a disposable mask and surgical latex gloves.

The first site, A1, between PC7 and HT7, was selected as the safe area between the median nerve and the ulnar artery, and then the direction of the needle was stapled to the transvers carpal ligament in the A2 direction. The second acupuncture needle was inserted in the direction of B1 to A2 and C2 according to the method of Hapgok needling. Hapgok needling is an acupuncture method seen in Hwangjenaekyung. This method involves inserting the needle into the muscle of the affected area and withdrawing it to the surface, then the needle was thrust obliquely right and left like the feet of a chicken [6]. The third point is the C1 between PC7 and LU9, which was selected as the safe area between the median nerve and the radial artery. The needle was then inserted into the transverse carpal ligament in the C2 direction.

After the acupotomy therapy, bloodletting was performed with a disposable cup for 3 minutes. After disinfecting the site again, an adhesive bandage was attached. On the treatment day, the patients were instructed not to clean the site or allow foreign objects to come into contact with the site.

Evaluation

The visual analogue scale (VAS), Tinel's sign, Phalen's test, the Boston carpal tunnel syndrome questionnaire (BCTQ), muscular strength test, and cross-sectional area of median nerve were all measured before and after treatment.

VAS is a 10 cm scale measurement to determine the patient's severity of pain; 0 being no pain, through to 10, the worst imaginable pain. The VAS score was used to indicate pain at the

time [7]. Tinel's sign is a test whereby the median nerve on the palmar wrist is tapped. When radiating pain occurred, it was reported as a positive [8]. The Phalen's test requires that the forearm must be vertically erect and the wrist fully flexed and this position must be maintained for 1 minute. The patients with abnormal sensation in the median nerve area reported a positive result [9]. The BCTQ is a specialized questionnaire for CTS patients, divided into a symptom severity scale with 11 questions and a functional status scale presenting 8 questions. For each question, the most severe symptom was assigned 5 points and no symptoms was assigned 1 point. The average score indicates the final score [10]. This test was performed on patients with CTS (Appendix 1).

The muscular strength test was conducted 3 times using a hand dynamometer (DHS-176, DETECTO, Missouri, USA) and it recorded the average value. A musculoskeletal ultrasonography (Ezono 4000, Jena, EZONO, Germany. Or Venue 40, GE, Wauwatosa, USA) was used to examine a cross-section of median nerve by placing an ultrasonic probe on the proximal carpal crease. The average value of 3 measurements were recorded.

Case 1

Case 1 was a 38-year-old female whose chief complaint was finger numbness in the right hand (1st, 2nd, 3rd, 4th fingers). The date of onset was April 2017, and there was no past medical history. The finger numbness developed after overuse of her wrist that month. She was clinically diagnosed with CTS at a local clinic and was prescribed medicine but it was ineffective. For this reason, she visited Wonkwang University Gwangju Korean Medical Hospital that following month (May 9, 2017). Treatment progress and ultrasonic images are shown in Table 1; Fig. 2.

Case 2

Case 2 was a 70-year-old female whose chief complaint was that she had both hand pain and numbness. The year of onset was

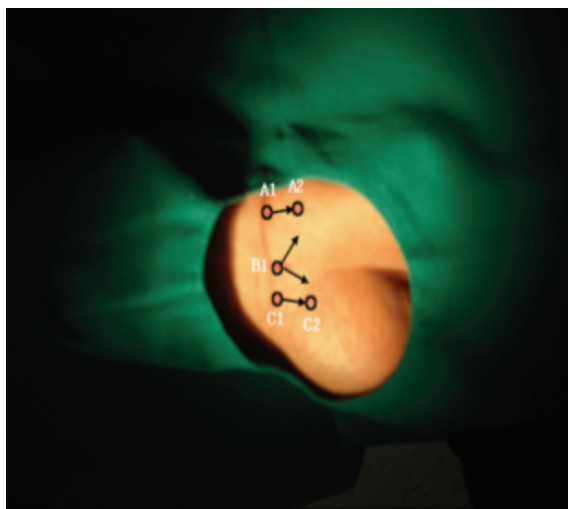


Fig. 1. Acupotomy site and direction.

Table 1. Change in the VAS, BCTQ, Tinel's Sign, Phalen's Test, Muscular Strength Test, and Cross-sectional Area of the Median Nerve (Case 1).

	Before Treatment (May 9)	After one treatment (May 13)	After two treatments (May 20)
VAS	8	4	3
BCTQ	54/55 32/40	32/55 18/40	22/55 16/40
Tinel's sign	Positive	Positive	Negative
Phalen's test	Positive	Positive	Positive
Muscular strength test	6.67	8.7	14.3
Cross sectional area of median nerve	9mm ²	7.7mm ²	7mm ²

BCTQ, Boston carpal tunnel syndrome questionnaire; VAS, Visual analogue scale.

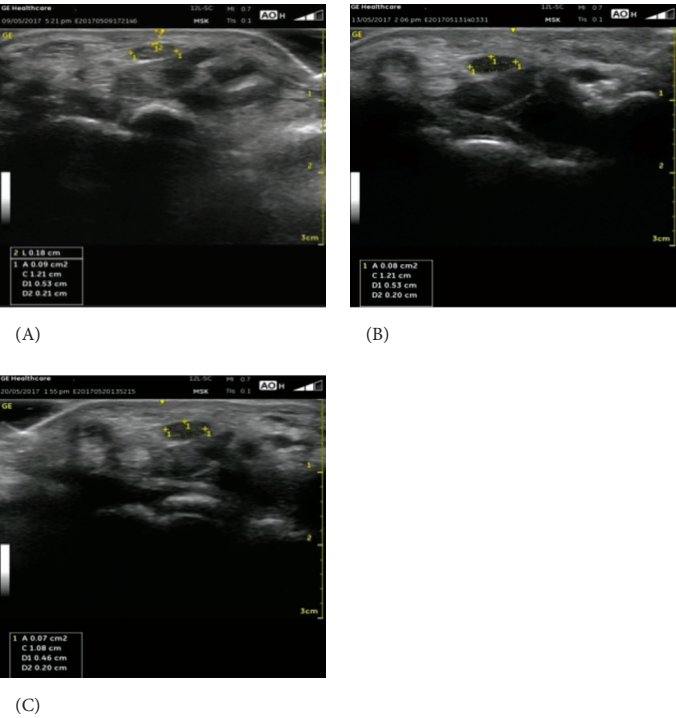


Fig. 2. Change of cross sectional area of median nerve from the Case 1: (A) May 9, 2017, (B) May 13, 2017, (C) May 20, 2017.

2016, and there was no past medical history. The symptoms were chronic, and worsened recently without a known cause. In May 17, 2017, she was diagnosed with CTS by a nerve conduction velocity test (NCV) at a local neurosurgery. She first visited Wonkwang University Gwangju Korean Medical Hospital on May 19, 2017. Treatment progress and ultrasonic images are shown in Table 2; Fig. 3.

Table 2. Change in the VAS, BCTQ, Tinel’s Sign, Phalen’s Test, Muscular Strength Test, Cross Sectional Area of the Median Nerve (Case 2).

		Before treatment (May 19)	After one treatment (May 22)	After two treatments (May 27)
VAS		6	6	2
BCTQ		19/55 10/40	17/55 8/40	13/55 8/40
Tinel’s sign		Negative	Negative	Negative
Phalen’s test		Negative	Negative	Negative
Muscular strength test	Right	13.37	17.33	17.63
	Left	13.17	18.07	16.3
Cross sectional area of median nerve	Right	14mm ²	11mm ²	9.9mm ²
	Left	11mm ²	9mm ²	8mm ²

BCTQ, Boston carpal tunnel syndrome questionnaire; VAS, visual analogue scale.

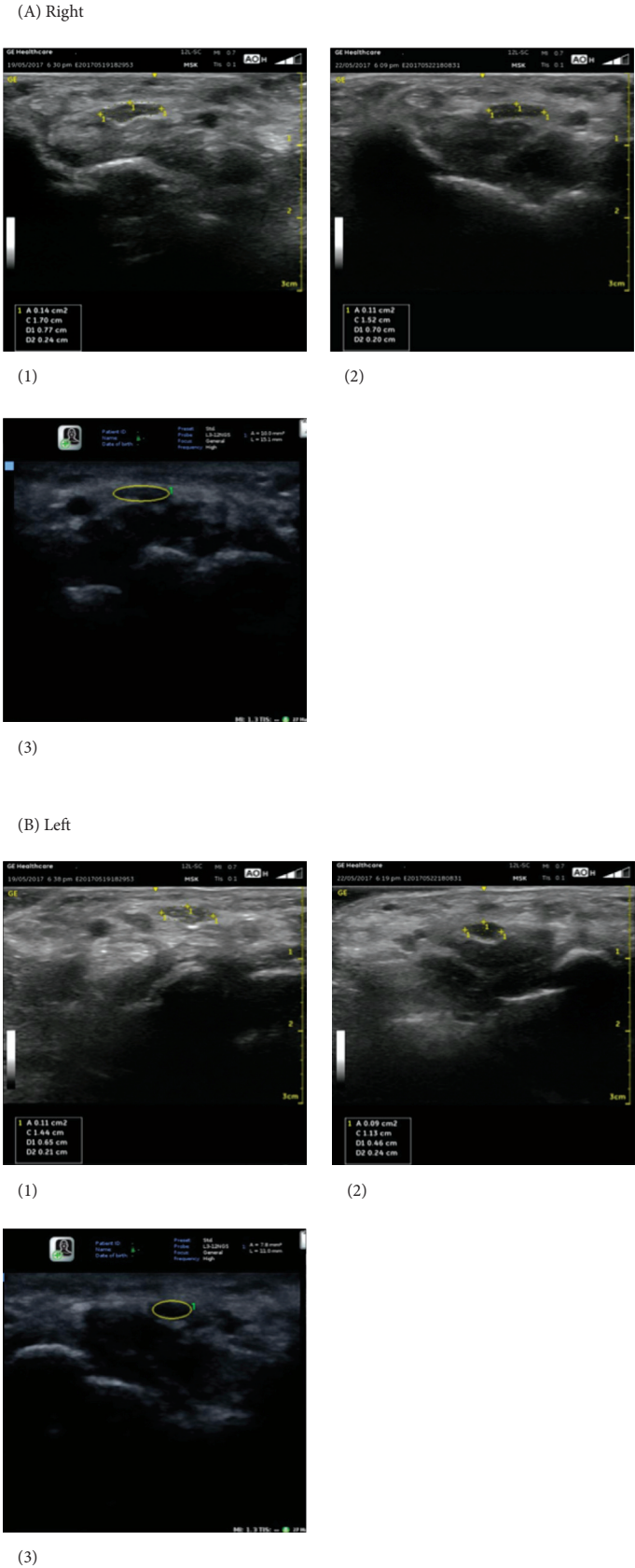


Fig. 3. Change of cross sectional area of median nerve from the Case 2: (A1), (B1) May 19,2017, (A2), (B2) Mau 22, 2017, (A3), (B3) May 27, 2017.

Case 3

Case 3 was a 55-year-old female whose chief complaint was pain and numbness in her fingers (2th, 3rd, and 4th fingers). The date of onset was March 2016, and there was no past medical history. She suffered pain and numbness in her fingers following overuse of

her wrist in March 2016. In July 2016, she was clinically diagnosed with CTS at a local clinic where she was prescribed neurotherapy twice. She first visited Wonkwang University Gwangju Korean Medical Hospital on May 23, 2017. Treatment progress and ultrasonic images are shown in Table 3; Fig. 4.

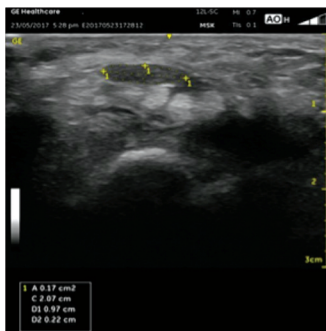
Table 3. Change in the VAS, BCTQ, Tinel's Sign, Phalen's Test, Muscular Strength Test, and Cross Sectional Area of the Median Nerve (Case 3).

		Before treatment (May 23)	After one treatment (June 13)	After two treatments (July 4)
VAS		6	3	2
BCTQ		34/55 9/40	13/55 9/40	13/55 8/40
Tinel's sign		Positive	Positive	Negative
Phalen test		Positive	Positive	Negative
Muscular strength test	Right	24.7	25.2	28.9
	Left	21.9	23.7	24.2
Cross sectional area of median nerve	Right	16.33mm ²	11.35mm ²	11.3mm ²
	Left	15mm ²	9.5mm ²	8.9mm ²

BCTQ, Boston carpal tunnel syndrome questionnaire; VAS, visual analogue scale.

(A) Right

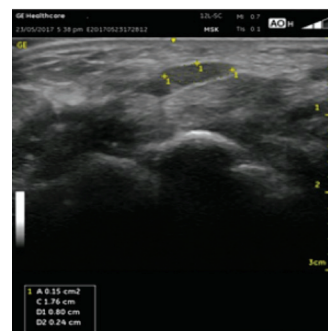
(B) Left



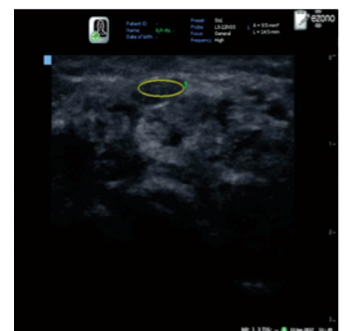
(1)



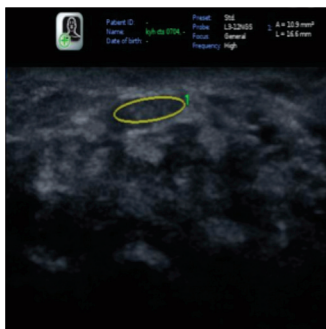
(2)



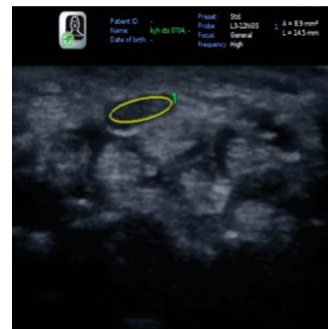
(1)



(2)



(3)



(3)

Fig. 4. Change of cross sectional area of median nerve from the Case 3 (A1), (B1) May 23, 2017, (A2), (B2) June 13, 2017, (A3), (B3) July 4, 2017.

Case 4

Case 4 was a 60-year-old female whose chief complaint was right hand numbness. The date of onset was April 2017, and there was no past medical history. She suffered from right hand numbness following overuse of her wrist in April 2017. She was clinically diagnosed with CTS at a local clinic in April 2017. She first visited Wonkwang University Gwangju Korean Medical Hospital on July 11, 2017. Treatment progress and ultrasonic images are shown in Table 4; Fig. 5.

Table 4. Change in the VAS, BCTQ, Tinel's Sign, Phalen's Test, Muscular Strength Test, and Cross Sectional Area of the Median Nerve (Case 4).

	Before treatment (July 11)	After one treatment (July 18)	After two treatments (July 24)
VAS	7	2	1
BCTQ	22/55 20/40	17/55 18/40	12/55 10/40
Tinel's sign	Positive	Positive	Positive
Phalen test	Positive	Negative	Negative
Muscular strength test	9.77	14.33	15.03
Cross sectional area of median nerve	11.87mm ²	9.57mm ²	8.33mm ²

BCTQ, Boston carpal tunnel syndrome questionnaire; VAS, visual analogue scale.

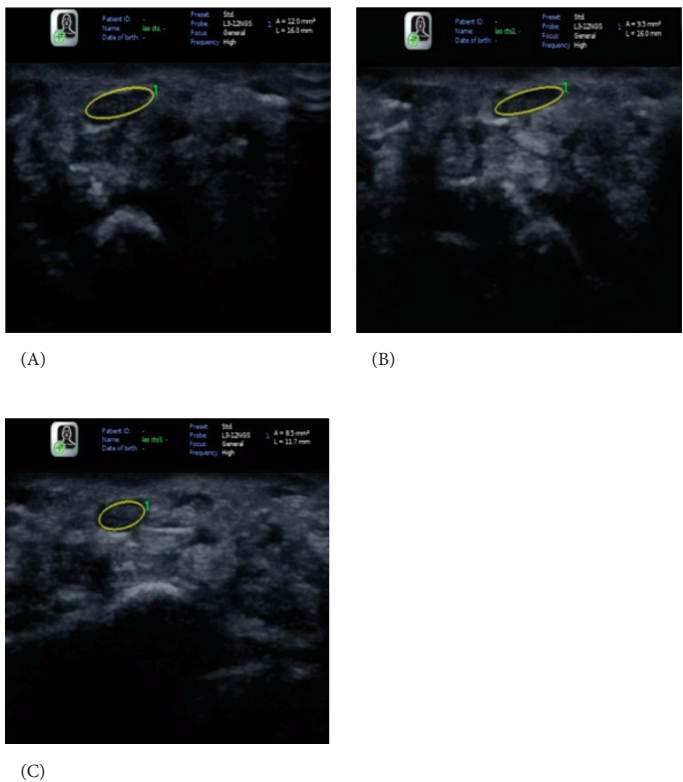


Fig. 5. Change of cross sectional area of median nerve from the Case 4: (A) July 11, 2017, (B) July 18, 2017, (C) July 24, 2017.

Discussion

Carpal tunnel syndrome is a common symptom with a 10% lifetime risk and an annual adult incidence of 0.1% [11]. It causes pain, paresthesia, numbness, weakness and atrophy of the median nerve root. The pain often radiates out to the median nerve sensory distribution of the thumb, index and middle finger, but the pain radiating proximally to the wrist, is often reported [12].

Western medicine offers a conservative treatment for mild symptoms; such as splinting the wrist, steroid injection into the site, and the use of oral anti-inflammatory drugs to improve symptoms. But, in many cases, surgery to dissect the transverse carpal ligament and exfoliation of the median nerve is necessary [13]. The success rate of surgical intervention ranges from 70% to 90%. However, open decompression frequently results in postoperative complications leading to decreased hand strength, and persistent tenderness at the site of incision. Endoscopic decompression has also been reported to have associated complications such as injury to the median nerve or ulnar nerve, arterial injuries, or flexor tendon injury [14].

Release technique of acupotomy combines the remedial function of acupuncture and microinvasive operation [15]. It may provide pain relief of pain for a substantially long period where adhesive soft tissues between the tendon sheath and the periosteum are released [16]. Acupotomy-needles have a flat blade shape tip that has the potential to damage important nerves and blood vessels. To minimize this risk, ultrasound equipment is required. Ultrasound imaging shows internal tissues to aid diagnosis. Ultrasound waves emit at 1-10 Hz into the body and the reflected waves returning from the interface of the tissue are measured, and it is harmless and non-invasive. It can be used to identify the location of the vessels and nerves during acupotomy to ensure a safe procedure [17].

Diagnosis of CTS is mainly based on clinical symptoms and electromyography. Recently, it has been reported that high resolution ultrasound can be used at low cost and can be quickly used for diagnosis of CTS [18]. Ultrasonography is helpful in diagnosis because it shows changes in the median nerve, transverse carpal ligament and changes in other carpal tunnel structures [19]. In CTS, the median nerve is compressed and becomes thin and flat. So, if the cross-sectional area, measured by proximal carpal crease, is 10mm² or more, a diagnosis of CTS can be made [20].

In this study, ultrasonography was used before acupotomy in CTS patients to define the location and depth of nerves and blood vessels. Then acupotomy was performed, after disinfection of the site. After treatment, acupotomy for CTS showed effective and satisfactory treatment results compared with the cross-sectional area of the median nerve using ultrasound and other evaluation tools.

In the present study, all 4 patients complained of pain and numbness in their fingers. The VAS score decreased in all 4 cases: from 8 to 3 in Case 1, 6 to 2 in Case 2 and 3, and 7 to 1 in Case 4. The BCTQ score also decreased in all cases: the symptom score decreased from 54 to 22 in Case 1, 19 to 13 in Case 2, 34 to 13 in Case 3, and 22 to 12 in Case 4. The function score decreased from 32 to 16 in Case 1, 10 to 8 in Case 2, 9 to 8 in Case 3, and 20 to 10 in Case 4. Furthermore, the cross-sectional area of median nerve decreased in all cases. Most of Tinel's signs and Phalen's test parameters changed from positive to negative, but Tinel's sign for Case 4 was positive after 2 treatments. Tinel's sign and Phalen's test for Case 2 were both negative before treatment. The muscular strength test increased in most cases with the exception of the person in Case 2. The left hand strength measured at Visit 3 was lower than the measurement at Visit 2.

A more objective evaluation like nerve conduction velocity and a long-term follow-up of the treatment effect would benefit future studies.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Appendix 1. Boston carpal tunnel syndrome questionnaire (BCTQ) [21].

I . Symptom

The following questions refer to your symptoms within a typical period of 24 hours, during the last two weeks.

(Choose one answer to each question)

1. How strong is the pain in your hand or wrist at night?

- 1) I feel no pain on hand or wrist at night
- 2) little pain
- 3) moderate pain
- 4) intense pain
- 5) severe pain

2. How many times did your hand or wrist pain wake you up in a typical night for the last two weeks?

- 1) never
- 2) once
- 3) two or three times
- 4) four or five times
- 5) more than five times

3. Do you usually feel hand or wrist pain during the day?

- 1) I never feel pain during the day
- 2) I feel little pain during the day
- 3) I feel moderate pain during the day
- 4) I feel intense pain during the day
- 5) I feel severe pain during the day

4. How often do you feel hand or wrist pain during the day?

- 1) never
- 2) once or twice a day
- 3) three to five times a day
- 4) more than five times a day
- 5) constant pain

5. On average, how long do daytime pain episodes last?

- 1) I never feel pain during the day
- 2) less than 10 minutes
- 3) from 10 to 60 minutes
- 4) more than 60 minutes
- 5) I feel constant pain during the day

6. Do you feel your hand dormant (loss of sensitivity)?

- 1) No
- 2) I feel little dormancy
- 3) I feel moderate dormancy
- 4) I feel intense dormancy
- 5) I feel severe dormancy

7. Do you feel weakness in your hand or wrist?

- 1) no weakness
- 2) little weakness
- 3) moderate weakness
- 4) intense weakness
- 5) severe weakness

8. Do you feel a tingling sensation in your hand?

- 1) no tingling sensation
- 2) little tingling sensation
- 3) moderate tingling sensation
- 4) intense tingling sensation
- 5) severe tingling sensation

9. How strong is dormancy or the tingling sensation at night?

- 1) never feel dormancy or tingling sensation at night
- 2) little
- 3) moderate
- 4) intense
- 5) severe

10. How often did dormancy or the tingling sensation wake you up during a typical night for the last two weeks?

- 1) never
- 2) once
- 3) two or three times
- 4) four or five times
- 5) more than five times

11. How difficult is it to take and using small objects, such as keys or pens?

- 1) not difficult
- 2) a little difficult
- 3) moderately difficult
- 4) very difficult
- 5) severely difficult

II . Function

In a typical day for the last two weeks, have your hand or wrist symptoms brought difficulty in performing the activities listed below?

(Please circle the number that best describes your ability to perform the activity)

Activity	Degree of Difficulty				
Writing	1	2	3	4	5
Buttoning clothes	1	2	3	4	5
Holding a book while reading	1	2	3	4	5
Holding the telephone receiver	1	2	3	4	5
Housekeeping	1	2	3	4	5
Opening a glass vial cap	1	2	3	4	5
Carrying market bags	1	2	3	4	5
Bathing and dressing	1	2	3	4	5

No difficulty.....1

Little difficulty.....2

Moderate difficulty3

Intense difficulty4

Cannot perform the activity at all due to hands and wrists symptoms5