Original Article

Minimal Invasive Surgery by Wongsiri Technique versus Standard Open Carpal Tunnel Release: A Randomized Trial

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Objective: To study the results of carpal tunnel release in patients with carpal tunnel syndrome with Minimal invasive surgery by Wongsiri technique compared to the standard open technique.

Materials and Methods: Randomized trial in patients who released carpal tunnel into two groups with 20 patients each. The study group underwent minimally invasive surgery using the Wongsiri technique while the other group had the standard open surgery. Postoperative results at one month were compared for time to return to work, residual numbness, wound satisfaction, and complication such as hand stiffness, pillar pain, painful scar, and infection.

Results: There were no statistically significant difference between the two groups of patients in gender, age, occupation, and duration of preoperative symptoms. The results one month after surgery showed that patients in the minimally invasive surgery group returned to work faster than the standard open surgery at 7.32±1.85 and 17.45±5.45 days, respectively (p<0.001). There was no difference in residual numbness at 1.80±0.57 and 1.69±0.49 (p=0.170). Patients in the minimally invasive surgery group were more satisfied with the wound cosmetic at 4.78±0.50 and 3.90±0.32 (p<0.001). Hand stiffness was found less in patients with minimally invasive surgery at 1 and 5 (p<0.001). There was no difference in pillar pain, with one and two cases (p=0.556). There was no painful scar, or infection.

Conclusion: Minimally invasive carpal tunnel released by the Wongsiri technique is a surgical method that reduces hand stiffness. The patients returned to work quicker and were more satisfied with the wound cosmetic.

Keywords: Carpal tunnel syndrome; Standard open carpal tunnel release; Minimally invasive carpal tunnel released; Wongsiri technique

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Carpal tunnel syndrome is considered to be common in upper extremity neuropathy diseases. There is a 5% prevalence among the population aged 50 to 60 years, found in females more often than males at a ratio of 4 to 1[1-3]. The causes of the disease are factors such as thickening of the transverse carpal ligament from genetics and biological factor or environment, and occupation[4]. The main symptoms are numbness in the thumb, index finger, middle finger, and the inner half of the ring finger[5]. If left for a long time, it will cause atrophy of the thenar muscle, and weaken the hand when handling objects. The treatment can be conservative and includes medication, wrist support, and physical therapy, or a surgical procedure can be done. They both have different advantages and disadvantages[6,7].

The goal of surgery is to relieve symptoms, recover hand function, wounds well heal, and have no complications[8]. The standard open carpal tunnel release was found to have scarring problems, pillar pain, hand stiffness, and long time to return to work. The endoscopic carpal tunnel release surgery has significantly better outcomes but is more costly and have complications in the median nerve transections[9,10].

Minimal invasive carpal tunnel release with the Wongsiri technique is the solution to both of the above surgical problems[11,12]. Until now, there is no randomized control trial study to compare the minimal invasive carpal tunnel release surgery by Wongsiri technique and the standard open release surgery in Thailand. Therefore, the author conducted the present study. The results of the present study would lead to the development of standardized surgical techniques

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for treating carpal tunnel syndrome patients.

Materials and Methods

A randomized trial in patients who failed conservative treatment and decided to undergo released carpal tunnel surgery at Maharaj Nakhon Si Thammarat Hospital received a random surgical procedure. Forty patients were randomized into two groups. The odd number were for minimally invasive surgery and the even numbers for standard open technique, with 20 patients per group. The present study was performed between February and November 2021. The Ethics approval was obtained from the Institutional Review Board, Maharaj Nakhon Si Thammarat Hospital Ethics Committee: 8/2564.

The standard open release made skin incision 5 to 6 cm followed by sharp dissection straight down through fat and palmar fascia to the transverse carpal ligament, which was then divided. This technique took about 10 to 15 minutes for the surgery, under local anesthesia.

The Wongsiri technique for minimally invasive carpal tunnel release had been consistently performed in Songklanagarind Hospital with the purpose of being a minimally invasive surgery and minimizing soft tissue injury while simultaneously enhancing the surgical field above the transverse carpal ligament with a special retractor. The minimal invasive carpal tunnel release in the present research used the Wongsiri technique and a MiniSURE Kit® with a five-step surgery. The minimally invasive surgery started when the surgeon made a 1.0 to 1.5 cm incision, created a working space, inserted the visual tube of MiniSURE View, inserted the freer, and then cut the transverse carpal ligament by using the MiniSURE Cut[12]. This technique took about five minutes for the surgery under local anesthesia (Figure 1).

The author collected the patients' data about gender, age, occupation, and duration of preoperative symptoms. There was a follow-up for symptoms after surgery in both groups for one month. Collected patients' data about time to return to work meant returning to their original occupation, residual neuropathic pain assessed on a visual analog scale (VAS) 1 to 10, and wound satisfaction. The satisfaction was divided into five levels, 1 being the least and 5 being the most. The complication such as hand stiffness, being unable to clench, and unable to open the hand as much as the other unaffected hand, and pillar pain which is a frequent symptom following carpal tunnel release, were collected. The pain located at the base of the hand in the palm, within the muscles at the thumb base (thenar eminence) and within the muscles at the base of the small finger (hypothenar eminence), as well as painful scar, and infection were recorded.

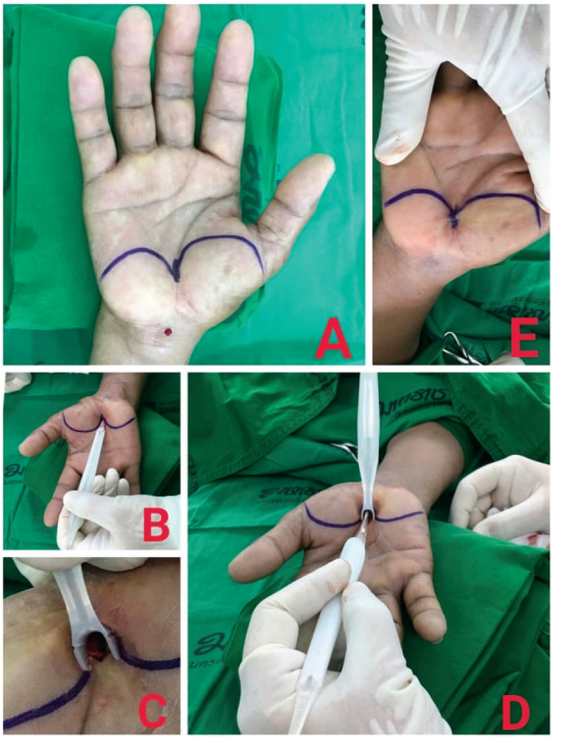

Figure 1. Minimal invasive carpal tunnel release using the Wongsiri technique and a MiniSURE Kit® with 5 steps[14].

A: Makes a 1.0 to 1.5 cm incision; B: Creates a working space; C: Inserts the visual tube of MiniSURE View; D: Inserts the freer, and then cuts the transverse carpal ligament by using the MiniSURE Cut; E: Suture wound 1 to 2 stitch

All data were presented as frequencies and percentages, or means and standard deviations, as appropriate. T-tests was performed to examine the mean and differences between groups. Chi-square test and Fisher's exact test in statistics analysis for categorized data such as sex, occupation, post-operative hand stiffness, and post-operative pillar pain. All statistical analyses were conducted using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA). A p-value of less than 0.05 was considered statistically significant.

Results

There were no statistically significant differences between the two groups of patients in gender, age, occupation, and duration of preoperative symptoms (Table 1).

The results one month after surgery showed that

Table 1. Patient demographic data of minimally invasive carpal tunnel release and standard open carpal tunnel release groups (n=40)

Parameters	Minimally invasive carpal tunnel release (n=20)	Standard open carpal tunnel release (n=20)	p-value
Sex; n (%)			0.361
Male	3 (15.0)	5 (25.0)	
Female	17 (85.0)	15 (75.0)	
Age (years); mean±SD	54.02±11.06	55.84±11.30	0.481
Occupation; n (%)			0.792
Agriculture	8 (40.0)	7 (35.0)	
Merchant	2 (10.0)	3 (15.0)	
Government and private officer	3 (15.0)	5 (25.0)	
Laborer	7 (35.0)	5 (25.0)	
Duration of preoperative symptoms (month); mean±SD	10±3.44	10.11±3.97	0.902

SD=standard deviation

* Significant, p<0.05

Table 2. Postoperative results at 1 month

Variables	Minimally invasive carpal tunnel release (n=20)	Standard open carpal tunnel syndrome (n=20)	p-value
Time to return to work (days); mean±SD	7.32±1.85	17.45±5.45	<0.001
Postoperative residual neuropathic pain (VAS); mean±SD	1.80±0.57	1.69±0.49	0.170
Satisfied the wound cosmetic (level 1-5); mean±SD	4.78±0.50	3.90±0.32	<0.001
Postoperative hand stiffness; n (%)	1 (5.0)	5 (25.0)	<0.001
Postoperative pillar pain; n (%)	1 (5.0)	2 (10.0)	0.556
Postoperative painful scar; n (%)	0 (0.0)	0 (0.0)	-
Postoperative infection; n (%)	0 (0.0)	0 (0.0)	-

VAS=visual analog scale

* Significant, p<0.05

the patients in the minimally invasive surgery group returned to work sooner than the standard open group at 7.32±1.85 days and 17.45±5.45 days, respectively (p<0.001). There was no difference in postoperative residual numbness at 1.80±0.57 and 1.69±0.49 (p=0.170). Patients in the minimally invasive surgery group were more satisfied with the wound cosmetic than in the standard open group at 4.78±0.50 and 3.90±0.32, respectively (p<0.001). Postoperative complications such as hand stiffness were found in one patient in the minimally invasive surgery group and five patients in the standard open group (p<0.001). One patient had pillar pain in the minimally invasive surgery group and two patients in the standard open group, with no statistically significant difference (p=0.556). There were no painful scars or infections in either group. In the sample group of 40 patients, there was no lost to follow-up (Table 2).

Discussion

The standard open carpal tunnel release has a surgical wound of approximately 5 cm. In a meta-analysis study, 10.2% of the results were poor. Complications of standard open carpal tunnel release surgery include an unattractive scar, painful scar, pillar pain, hand stiffness, and took long time to rehabilitate the hand to return to normal function[9,10]. Endoscopic carpal tunnel release is a highly effective surgical procedure. The endoscopic technique helps to eliminate complications found in the standard open technique and patients returned to use their hands significantly sooner[8,9]. However, the most serious complication seen in the endoscopic carpal tunnel release includes median nerve transection, which is rare but unacceptable[13]. In addition, endoscopic carpal tunnel release requires expensive equipment and the surgeon who performs the surgery requires experience and training.

Therefore, orthopedic surgeons have developed minimal invasive carpal tunnel release techniques to achieve complete carpal tunnel release and reduce complications found in the standard open

technique and endoscopic technique. A highly effective surgical technique should have a low cost but produce satisfactory results. The Faculty of Medicine Prince of Songkla University has invented a tool called MiniSURE Kit® and developed the Wongsiri technique for minimal invasive carpal tunnel release surgery. This technique has been performed to treat patients with carpal tunnel syndrome in Songklanagarind Hospital. The results of the procedure were good. Patients could return to work in 7.3 days[14].

The author used the Wongsiri technique and a MiniSURE Kit® to perform minimal invasive carpal tunnel release in patients with carpal tunnel syndrome at Maharaj Nakhon Si Thammarat Hospital. The authors do not have any conflicts of interest with the manufacturer and inventor of the MiniSURE Kit®. The results after the surgery were better than the standard open technique. Patients could return to work sooner and were more satisfied with the cosmetic of the wound. Hand stiffness was found in one patient, who had an anxiety disorder, and refused to move her hand after surgery. However, the present study was limited due to the sample size was too small. In the future, there should be more studies collecting more samples. This can be done by also increasing the time duration of the study or conducting studies in multi-centers.

Conclusion

Minimally invasive carpal tunnel released by the Wongsiri technique is a surgical method that reduces postoperative hand stiffness. The patients can return to normal work sooner and are satisfied with the wound cosmetic. This method provides better treatment results than the standard open carpal tunnel release. Furthermore, the procedure is not complicated, and the cost is not high.

What is already known on this topic?

The results after minimal invasive carpal tunnel release were better than standard open technique, which has various techniques. However, minimal invasive carpal tunnel release surgery requires expensive equipment and the unique abilities of a surgeon.

What this study adds?

Minimal invasive carpal tunnel release by Wongsiri technique is a surgical method that was invented by Thai people. It uses inexpensive equipment and provides better treatment results than standard open surgery technique.

Conflicts of interest

The authors declare no conflict of interest.

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