*Review Article*

# The new wave of Carpal Tunnel Syndrome (CTS) Surgery

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Carpal tunnel syndrome (CTS) is the most common hand disease. The clinical prevalence in the general population is 3.8%.[1] From a study of Australian population, people younger than 25 had a 2.4% prevalence compared to an extremely high prevalence in 45 to 65 year-olds who had a 45.5% prevalence.[2] In all carpal tunnel syndrome cases, in patients who developed numbness, and experienced symptoms for more than 6 months or did not receive adequate conservative treatment needed further treatment of surgery (Figure 1). The incidence of surgery is high: up to 31% to 40% of patients with carpal tunnel syndrome.[3,4] If the patients had severe compression and develop thenar muscle atrophy, the treatment has to be performed and urgent decompression is necessary to enable potential full recovery.[5] Because carpal tunnel syndrome is the most common hand disease with the highest functional recovery of treatments, patients need to know and look for an update on treatment information. Nowadays, surgical treatment had been in continuous development in terms of minimal invasive surgery. There has been a great paradigm shift from standard large open surgery to minimal invasive surgery based on patients benefit and recovery. Also CTS is one of the beneficial changes with the concept of minimal incision because of minimal dissection of highly sensitive numerous nerve areas, minimal trauma, rapid recovery and less complications.

Carpal tunnel syndrome (CTS) is a condition of the compressed median nerve in the carpal tunnel of the wrist area. Although the exact cause of this common disease remains unknown, there are correlations with certain risk factors. However, in literature reviews there is a correlation with the elderly, hormones, arthritis, synovitis, repetitive work, and vibration related work.[6,7] The most common idiopathic group is 40 to 60 year-old women (four times more than men)[1] who had symptoms of numbness in the redial side of hand in the morning. The numbness is reduced by shaking the affected hands or putting hands in a warm water bath. Specific signs include: Tinel's sign, Phalen's test and Durkan's compression test. These are all used to confirm a diagnosis of CTS. However, thena muscle atrophy indicates severe compression and a need to perform decompression urgently.

Currently, CTS has treatment guidelines that are based on severity, progression and duration of symptoms. In cases of early and mild compression, patients can show good responses to conservative treatments such as medication to reduce inflammation and also warming up hands in a warm water bath for 10 to 15 minutes every day. In moderate compression cases, numbness will progress as often as 2-3 times a week and these cases clinically might not respond to medication and the warming up of the affected hand in a warm water bath. Corticosteroid injections or surgery may be considered to treat moderate compression. However, the effectiveness of corti-


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***Figure 1**: Carpal tunnel release*

***Figure 2**: Standard carpal tunnel release 3-5 cm. incision*

***Figure 3**: wound complications and painful scars*

***Figure 4**: wound complications and painful scars*

costeroid injection cannot be proven yet.[8] In serious cases, the risk of complete median nerve damage by injection is related to the experience of physicians and the anatomical distortion of each case. This is because the injection landmark is close to the median nerve. By contrast, a new method of minimal invasive carpal tunnel release has had promising results and reduced complications of previous surgical techniques. The minimal invasive carpal tunnel releases had many benefits not only with the severe compression group but also with the moderate compression group. This is because of less complications compared to serious permanent nerve damage after corticosteroid injections.

In the past, a standard carpal tunnel release treatment consisted of a long 3-5 cm wound incision (Figure 2). Because of the long incision and wide dissection, surgeries have to be operated under adequate general or regional anesthesia. The surgeries also had high levels of wound complications such as wound dehiscence, wound infection and painful scars (Figure 3). In 1989, the minimal invasive carpal tunnel release procedure using an endoscopic instrument was introduced and reduced prior wound complications.[9,10] Furthermore, wound complications had been diminishing by using the endoscopic technique but there are others problems. These include: difficult surgical techniques, difficult endoscope insertion and visualization of transverse retinaculum identification. In some literature, the endoscope had a higher incidence of incomplete release and nerve damage during the insertion of the endoscope (Figure 4).[11,12] A subsequent and better carpal tunnel release technique is the semi blind technique using a special knife such as the Indiana Tome (Biomet, Warsaw, USA), the KnifeLight (Stryker Instruments, Kalamazoo, Michigan, USA) and the **'Safeguard'** system (KMI, Inc., San Diego, USA). This not only reduces wound size but is more convenient to use. This change has reduced the operative time and the cost of anesthesia replaced by local anesthesia. However, the question of visualization makes the widespread use of the surgical knife very limited. To eliminate the weak points of the limitation of visualization, a novel minimal invasive enhancing visualization tool was proved to see 4.77 cm further than the 2.85 cm of the transverse carpal ligament.[13] Following the bright idea of visualization using a minimal invasive carpal tunnel release technique, MiniSure has developed a complete set for viewing and cutting. MiniSure view was designed to be used as the superficial scope. MiniSure

***Figure 5**: Local anesthesia*

***Figure 6**: Open incision*

***Figure 7**: Insert navigator tip*

***Figure 8**: Insert visual tube*

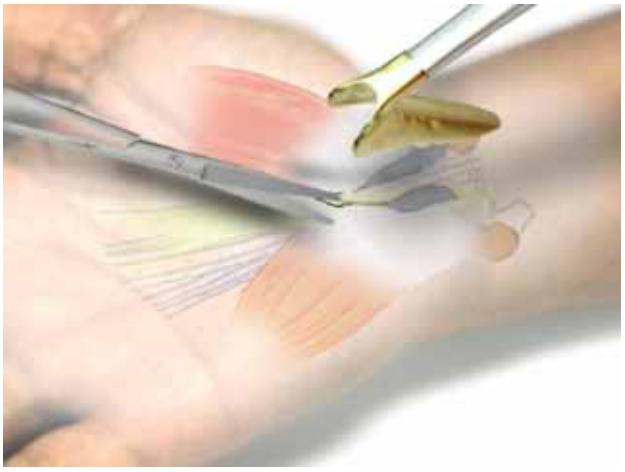

***Figure 9**: TCL release*

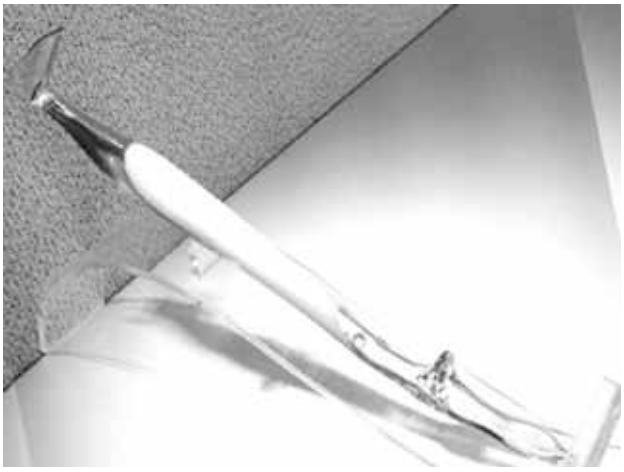

***Figure 10**: MiniSure view*

For the new method of using the concept of minimal invasive enhancing visualization, Wongsiri developed a simplified 5 steps protocol of surgical techniques.[14] Wongsiri techniques is composed of: 1). Local anesthesia (Figure 5), 2). Open incision (Figure 6), 3). Insert navigator tip (Figure 7), 4). Insert visual tube (Figure 8) and 5). TCL release (Figure 9). Because of this simplified steps approach, the surgeon can improve operative time to under 10 minutes. The volar wrist sensation is supplied from the cutaneous nerve plexus of the volar wrist, supplied from the median nerve and the ulnar nerve. These must be avoided to prevent injury during surgery.[15] Beneath the Palmaris longus and Above Retinaculum (BPLAR) is a good approach to protect and avoid the tiny plexus of the median cutaneous nerve by approaching beneath the Palmaris longus and the cutaneous nerve. BPLAR is a safe approach because it stays on top and above the transverse reticulum. This is the proper way to perform carpal tunnel


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***Figure 11**: MiniSure cut*

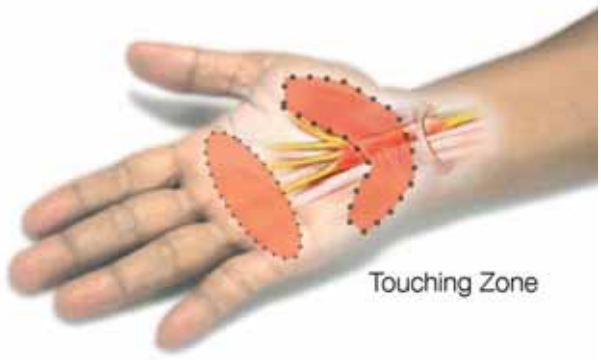


***Figure 12**: Touching zone*

Table 1: Comparisons of different carpal tunnel release techniques.

| Results | Open Technique | Endoscopic Technique | Limited Technique | Wongsiri Technique |
|---|---|---|---|---|
| 1. Quick service, no hospital admission, saves operative time | | | | |
| 2. Reduces wound size | | | | |
| 3. Reduces pain and complications | | | | |
| 4. Less staff & tools (anesthetist, assistants, anesthetic & surgical tools) | | | | |
| 5. Less surgical cost | | | | |
| 6. Short recovery time | | | | |

release. The visual field is enhanced during BPLAR by approaching with MiniSure view (Figure 10). Then carpal tunnel decompression can be performed under a special knife named MiniSure Cut (Figure 11). In the preliminary report at the 11th Triennial Congress of the IFSSH, Korea, the new equipment and surgical techniques were introduced and compared to the standard approach.[16]

From Table 1, Carpal tunnel release techniques were compared and showed that the Wongsiri techniques have more benefits. Firstly, fast surgery and quick service; the Wongsiri techniques have simplified the surgical steps with user-friendly new surgical tools. Moreover, minimal invasive surgery leads the way for out-patients services. Patients can be discharged after surgery in less than an hour. This saves time, not only for surgeons but patients too. Because of the minimal incision, Wongsiri techniques have a better outcome of pain reduction and less complications especially with wound problems. Most patients complained of wound problems, especially those that involve quality of life during work, painful scars and pillar pain of the volar wrist area, these effects are commonly reported after open techniques. Even though some surgeons try to use minimal incisions without the proper assisted tool, most of them use the volar incision of touching the area of the volar wrist zone, that makes the complex of cutaneous nerve more susceptible to injury and triggers neuropatic pain (Figure 12). Wongsiri techniques are more distal to avoid the complex cutaneous nerve that is correlated to less pillar pain and less painful scars.

Nowadays, several approaches also change the incision to be more distal and have reduced pain problems also.[17] However, these approaches still had the limitation of visualization because of the lack of a proper visualization tool. The risks of nerve injury during the insertion of the tool in the blind spot area are increased. The minisure view has been designed for the purpose of visualization and for better safety standards during surgery. Even though the endoscopic carpal tunnel release technique uses the concept of minimal invasive surgery with the internal visualization during surgery, visualization still can be a major problem in terms of clear vision. In fact, the transverse carpal ligament is not suitable for a clear internal observation because of the all around coverage of synovitis. Not surprisingly, the results from the latest literature show a higher incidence of recurrence and incomplete release in the endoscopic group and also in the less experienced group of surgeons. Moreover, serious complications when using the endoscope include injury of the median nerve that occurs during the insertion of the endoscopic tools. The recommendation to use an endoscope is not advised for surgeons if they feel any tightness during the insertion of tools because over compression of the endoscope tool against the nerve might occur. Finally, the new development of MiniSure and Wongsiri techniques has been reducing the problem of over compression of the median nerve and painful scars. MiniSure and Wongsiri techniques had better and more promising outcomes with early recovery and fewer complications.

Because MiniSure and Wongsiri techniques use minimal resources of assistants and equipment, costs can be saved, including hospital stay costs, anesthesia costs, operating room costs and medication. Compared to the other operations of carpal tunnel release, MiniSure and Wongsiri techniques can be safer. Health care systems in the USA spend more than USD 2 billion a year on carpal tunnel release.[18] In the same way, Thailand has spent a lot of resources and money on the old carpal tunnel release system. Thailand can benefit from medical tourism, and offer a new technique of carpal tunnel release with MiniSure at Bangkok Hospital branches. This could become one of the most internationally popular surgeries. The Bangkok Hospital disposes of world class surgeons and facilities including well trained orthopedists and surgeons who are familiar with a new surgical technique using an innovative tool.

In conclusion, CTS is a common disease and is easily treatable and cured. Initial and early stages of carpal tunnel syndrome can be treated with medications and a warm bath. However, with moderate to severe cases, there is a need to perform surgery. The most developed techniques of minimal invasive carpal tunnel release, the Wongsiri Technique with MiniSure, has had promising results: helping to minimize complications, saving time and costs (Figure 13).

Please look out for the next article on surgical tips and the Wongsiri techniques of minimal invasive carpal tunnel release in the future volumes of the Bangkok Medical Journal.

***Figure 13**: Minimal invasive carpal tunnel release performed on 15 hands in 2 hours with minimal resources of equipment and nurses team.*


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