Open Carpal Tunnel Decompression Under Local Anaesthesia for Treatment of Carpal Tunnel Syndrome (C.T.S)

Abdulrahman Saeed Ahmed (MBChB, FICMS)[1]

Abstract

Background: Carpal tunnel syndrome is an entrapment neuropathy of the median nerve at the wrist underneath the flexor retinaculum .It's widely more common in females than males, usually responding to conservative treatment and surgery indicated for severe cases unresponding to conservative line of treatment.

Surgery could be done under G.A., regional or local anaesthesia, however, nowadays mostly done under local anaesthesia.

Aim of the Study: To prove that this technique is reliably effective, easy, safe and remarkably cost-effective.

Patients and Method: All patients with C.T.S who had been diagnosed clinically and failed to respond to conservative treatment included in this study from 1st January 2003 to 31st December 2011 inclusive.

All the cases were submitted to open carpal tunnel decompression done under local anaesthesia using 5 ml of 1% lidocaine infiltrated at the site of the proposed incision with tourniquet applied to the upper arm.

This procedure had been done for all patients on an outpatient basis.

Results: Total number of the cases included in this study was 499 patients, 487 females and only 12 males. 450 patients had unilateral C.T.S, while 49 patients had bilateral C.T.S 99.96% of the cases were satisfied with this procedure.

Conclusion: This procedure found technically easy, safe, satisfactory for almost all the patients and highly cost-effective

Key words: Carpal tunnel, open decompression, local anaesthesia

[1] Ba'quba Teaching Hospital – Diyala - Iraq.

Introduction

C.T.S is the most common compression neuropathy in both sexes, with a remarkably higher preponderance in females, while with the females accounting for about 80% of the cases in some studies, and the mean age about 50 year [1].

It is commonly bilateral; C.T.S was first described in 1854 by Paget and also called (tardy Median nerve palsy) [2].

Carpal tunnel is a cylindrical inelastic cavity connecting the volar forearm with the palm.

It is bounded by the transverse arch of the carpal bones dorsally, hook of Hamate triquetrum and pisiform medially.

Scaphoid, Trapezium and Flexor Carpi Radialis sheath laterally, and the roof are formed by the Flexor retinaculum which is consisted of deep fascia of the forearm

proximally Transverse carpal ligament over the wrist and the aponeurosis between the thenar and hypothenar muscles distally.

The most ventral structure in the carpal tunnel is the median nerve, dorsal (deep) to the median nerve are the nine flexor tendons to the thumb and the fingers [2].

Concerning the surface anatomy, the Median nerve lies between the Palmaris Longus medially and Flexor Carpi Radialis tendon laterally [2, 3]

The palmar cutaneuos branch of the median nerve which gives sensory supply to the palm passes anterior to the retinaculum[3].

The increase in the carpal tunnel pressure >20-30 mmHg impedes the epineurial blood flow and impairs nerve function [2]

Clinically, the patient may present with the following:

- Pain in the hand radiating proximally to the shoulder, usually at night.
- Numbness and tingling in the three and half radial fingers.
- Tenderness at the wrist.
- In the advanced cases thenar muscles wasting and weakness [2, 4].
- Double crush phenomenon takes place when a compression lesion at one site lowers the threshold for tolerance of compression at a more distal site e.g cervical radiculopathy with C.T.S. [1].
- Three reproductive tests or signs, used to prove the diagnosis of C.T.S:

1- Tinel's sign, reproduction of the sensory symptoms by percussing over the median nerve at the wrist, it is usually positive in C.T.S.

2- Phalen's test, reproduction of the symptoms by fully flexing the wrist for less than 60 second.

3- Durkan's compression test by applying finger pressure on the nerve with the wrist flexed 20 degree for 30 seconds. This test is considered to be the most sensitive predictor for the diagnosis of C.T.S. [1,2]

EMG and NCS are reserved for cases with a typical symptoms and considered to be reliable confirmatory study with 90 % sensitivity and about 10 % false negative. [1,2,5]. The usual regime for treating C.T.S is the conservative one including NSAIDs, steroid injection locally, activity modifications, and splinting.

Surgery is indicated after failure of the conservative treatment especially when the symptoms are severe, or there are overt signs of nerve damage e.g muscle wasting seen at the first encounter with the patient.

Surgical decompression is of two types:

1- Open decompression.

2- Endoscopic decompression

Each of the above procedures has its own advocates, and still no one of them proved to be superior to the other.

The proponents of the endoscopic release prefer it for its minimal incision and then minimal scar and earliest recovery and rehabilitation. But the opponents found it to be associated with higher risk of iatrogenic nerve injury especially the median nerve and even vascular injury e.g injury of the superficial palmar arch [2,3,4].

Both of these procedures are done nowadays mostly under local anaesthesia [5].

Local anaesthesia may be wrist block, field block or median nerve block at the elbow however regional anaesthesia e.g Bier's intravenous anaesthesia or brachial plexus block may be used.

Wrist and field block are prefered for being easy (can be done by the surgeon himself), safe and performed in a shorter time, and the patient control of the arm movement is preserved so it allows for shorter postoperative hospital stay [6, 7].

Tourniquet is usually used in the surgical decompression of C.T. and it is considered to be a necessity and not a luxury step.

The ideal one is the pneumatic gauged tourniquet, but the elastic Esmarch tourniquet is still in use in some areas of the world [2].

It is found that in operation on the upper limb done under local anaesthesia, the tourniquet can be used safely and without extreme discomfort for up to (30) minuets [2]. Surgical decompression of the C.T. in cases of C.T.S provides quick and effective cure [4].

The longer the nerve is squeezed in the tunnel which is damaged more and this may lead to intraneural scar formation with secondary thenar muscle wasting.

Thus, the pressure on the median nerve is relieved sooner which is better chance for recovery [2, 4, 5]. So in the severe and old cases the symptoms may not go away completely after surgery.

Neurolysis of the median nerve was not found to have any significant effect [2, 4].

Following surgery, soreness around the incision may last for weeks or months.

The numbness and tingling may disappear quickly or slowly. [1, 4]

Patients and Method

In the period between 2003 and 2011 carpal tunnel open decompression using local anaesthesia (local infiltration) with tourniquet was performed on (548) wrists of (499) patients (487) female and only (12) male with F/M ratio of about 40:1

The age of the patients was ranging from 17year to 82 year and the mean age was 36.7 year.

314 cases were right-sided wrists, 185 cases were left-sided wrists and 49 cases were bilateral.

Most of the cases selected for surgery were diagnosed and assessed on clinical basis depending on the history and physical examination, and the decision on surgery had been taken after failure of at least (3) months period of conservative treatment .

But when the symptoms were intolerably severe, or there were signs of median nerve damage e.g thenar muscle wasting, the surgery had been done without delay.

The provocative tests; phalen's test, Tinel's sign and Durkan's compressive test were used in the physical examination, but we found the Durkan's test was the most sensitive one.

EMG and NCS were not a routine tests otherwise they were reserved for cases with a typical presentation.

The whole number of cases for which we request EMG and NCS was (23) cases (4.6%)

At the first encounter with the patient we decided to operate, we tell the steps of our procedure, the view to make her psychologically reassured, and to ensure an optimum cooperation of the patient.

About (5 ml) of 1 % lidocaine is the usual and most effective amount and concentration used for infiltration at the site of the proposed incision, which lies on a line passing along the radial border of the ring finger. starting just proximal to the palmar wrist crease and directed distally for about 5-6 cm length and about 2 cm width, using 23G syringe the anaesthetic is infiltrated into the skin, S.C. tissue and deep into the retinaculum in proximal and distal direction ; meanwhile we ask the patient to alarm us when she feels any electric shock – like sensation, if so, we slightly pull the needle out changing its direction away from this area shifting slightly towards the ulnar side to avoid the median nerve.

Immediately after that, we apply the elastic Esmarch tourniquet which is used instead of

the pneumatic one because of the inavailability of the later. Always we use extensive layers of cotton and cloth wrapping underneath the tourniquet to obviate the occurrence of intolerable tourniquet discomfort.

Then after preparing the field, we do our incision on the anaesthetized area with the dimension and direction mentioned above which was planned to avoid injury to the median nerve and its palmar cutaneous branch and the motor recurrent branch supplying the thenar muscles.[6,8]

After incising the skin and S.C. tissue we use self-retaining retractor to open the field but with care to avoid injury to the neighbouring ulnar nerve and artery, then we identify the flexor retinaculum creating an opening by the knife in the retinaculum. Through this opening we introduce a Mcdonald's dissector to protect the median nerve.

Then by a long curved blunt-ended scissors we release the proximal part of the retinaculum; keeping the scissors on the ulnar side of the nerve to avoid injury to its palmar cutaneous branch which arises from the ventral aspect of the median nerve just proximal to the retinaculum and passing anterior to it .[3]

Then the distal end of the retinaculum and the palmar aponeurosis are released carefully and under vision to avoid injuring the superficial palmar arterial arch and possibly the recurrent motor branch of the median nerve which sometimes penetrates the retinaculum and injuring this branch could be avoided by keeping the cut of the retinaculum to the ulnar side of the median nerve not in front of it.

After completion of the flexor retinaculum release we close the skin and apply dressing with a bulky amount of cotton and firm bandaging to prevent the possibility of haematoma formation.Then the tourniquet is released.

Usually the tourniquet time in this procedure not exceeds (15) minutes (between 10 to 15 minutes)

The patient usually is allowed to go home within about one hour postoperatively with analgesia on need.

The antibiotic is usually given in two doses. We usually give cefotaxime 1gm immediately preoperatively and another 1gm injection after 8 hour.

The first change 0f dressing after (2) days and the stitches are removed after 8-10 days, and the patient is allowed to return back to her usual work after about one month; which coincides with a usual third visit. Then we ask the patient to visit us for any unexpected events like recurrence of pain or parasthesia or late infection plus two further regular visits ; one after 6 months from the time of operation and the other after one year from that time .

Results

- All the patients experienced transient and tolerable pain at the site and time of local anaesthesia infiltration .
- No allergic reaction or systemic effects of local anaesthesia had been faced.
- The procedure had been done in all the patients without any complaint except (4) patients (0.7 %) who had exhibited bad tolerance for the tourniquet near the end of our procedure, but we had succeeded to solve this problem by Psychological reassurance .
- In the first post-operative visit usually after (2) days, only (2) patients (0.4 %) were dissatisfied with this technique stating that they would have preferred to have been a sleep throughout the procedure. While the remainder of the patients (99.6 %) would have been happy to have the other C.T.S decompressed in the same way when necessary.

All the patients got relief of their symptoms partially or completely within the first few postoperative days.

We found the earlier the operation had been done the better would be the result.

Only (5) patients (0.9 %) had superficial wound infection, they were managed successfully by antibiotics. (2) Patients had delayed wound healing they were diabetic patients. (28) Patients had tenderness at the scar of the operation which had faded up within a maximum period of three months.

(14) Patients (2.6 %) got recurrence of symptoms within about (6-12) months in (6) out of those (14) patients the diagnosis of the recurrence was confirmed by EMG and NCS. (Table -1)

The diagnosis of the remainder (8) patients was overt clinically without any doubt.

All the recurrent cases were submitted to conservative treatment using NSAIDs and or local steroid injection. (4) of them were relieved within one month.

In (7) cases we resort to revision of the surgical procedure using the same technique with good results, throughout a follow-up period of about (3) months.

In (3) of the recurrent cases, we lost the follow-up after the commencement of the conservative treatment.

Discussion

Open carpal tunnel decompression under local anaesthesia found to be very effective as all the patients got complete or at least partial relief of symptoms postoperatively with recurrence rate of about 2.6 %. This approximates to that rate reported by Langloh and Linscheid which was (1.7 %) after primary release. [2]

The decompression also found to be easy, with the anaesthesia offered by the surgeon not by the anaesthetist, so we disburden the anaesthetists for a considerable duty especially we have a remarkable shortage in their number.

The procedure also found to be highly satisfactory to all the patients except four of them who suffered from tourniquet discomfort and this found coincidental with the result of a study by M. Altissimi, GB Mancin in Italy using the same technique on (124) wrists and faced difficulty in tourniquet tolerance in one patient only[9].

The patient satisfaction demand the surgeon to be well-experienced and mastering this technique to carry out the procedure within the time not exceeding that of the patient's tourniquet tolerance.

Ogufese, Giddins and Thom assessed the perception of arm tourniquet pain in 100 patients undergoing local anaesthesia procedure. They found in procedure of (20) minutes and less, 99 % of patients tolerated the tourniquet well. [2]

In fact in all of our cases the whole time of the tourniquet did not exceed (15) minutes in addition, we use bulky cotton and cloth underneath the tourniquet to reduce the discomfort of the patients.

The technique found safe, with neither systemic effect of local anaesthesia nor allergic reaction.

Routine test for allergy is not recommended as it is time-consuming and its value is doubtful. [10, 11]

However the adverse reaction to lidocaine used for infiltration is extremely rare when used in the recommended dose (0.5% maximum volume 40 ml), we used 5 ml of 1 % lidocaine.

Actually many patients who were considered to be unfit for General anaesthesia as we had (18) (3.3 %) exceeding the age of 60 year and they were with many medical problems e.g Diabetes Mellitus , Hypertension or Ischemic heart disease, they

had tolerated our procedure without any bad events.

Our procedure found remarkably cost-effective as it was done in all the cases on an outpatient basis without submitting the patient for the routine investigations used when the general anaesthesia is adopted ; so sparing the hospital resources, in addition when comparing the cost of local anaesthesia used for one patient to that of general anaesthesia used for one patient, there is very high difference in the cost, as that of local anaesthesia was about 50 I.D. only while the general anaesthesia ranging from 10000-25000 I.D. So the total cost of local anaesthesia for all our patients is about (25000 I.D.) while the general anaesthesia average total cost will be about 10 million I.D. (table -2). In addition we cancel considerable expenses by omitting the unnecessary laboratory, radiological and other preoperative investigation that might be done if the operation should be carried out under general anaesthesia.

In this technique we reduce the burden of the anaesthesits, especially we have a shortage in their number. Additionally we reduce the burden of the laboratory and radiological departments and saving these vital resources to some extent.

There is no need for preoperative fasting and the patient attends to the hospital on the same day of the operation even without attendants.

comparing this method to other regional anaesthesia including axillary, subclavian, scalene brachial plexus block and the i.v. regional anaesthesia, it is considered to be the safest, easiest, the most rapid technique, done by the surgeon himself and it allows the patient to be discharged sooner since inability to control the motor function of the arm is not encountered post operatively [6].

Endoscopic release of C.T. gained popularity in recent years, but because of absence of direct sight during the procedure makes this technique relatively difficult and prone to complication e.g. nerve and vascular injury [4, 12].

Table (1): complications**.**

Complications	**Number of cases**	**Total number of cases**	**%**
Infect ion	5	548	0.9
Delayed healing	2		0.36
Scar tenderness	28		5.1
Vascular injury	-		0
Nerve injury	-		0
Recurrence	14		2.6

Table (2): Cost of anaesthesia.

Type of anaesthesia	Cost for each case ID	Total cost ID
Local anaesthesia	50	25000
General anaesthesia	10000 - 25000	5000000-12500000

Conclusion

In conclusion the carpal tunnel open decompression under local anaesthesia for treating C.T.S. is:

- Easy technique
- Satisfactory for almost all the patients.
- Safe and suitable for nearly all the patients.
- Cost effective and saving the resources of the health services.
- Done on an outpatient basis so reducing the bed occupation rate.
- Tourniquet use in this technique is a vital necessity as it offers bloodless field and shortens the operation time, and its discomfort is usually well-tolerated when the surgeon is mastering the surgical technique and following the precautions for tourniquet application that was mentioned above.

In view of these advantages we extremely recommend this technique to the extent, that we think there is no necessity to do open decompression of C.T. under general anaesthesia.

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