Outcome of Open Carpal Tunnel Release Surgery for Carpal Tunnel Syndrome
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ABSTRACT
Background: Carpal tunnel syndrome, the most common compressive peripheral neuropathy of the upper limb, failed to conservative treatment, needs surgical management. Objective: To find out the role of open carpal tunnel release surgery in the form of relieve of symptoms and complications in carpal tunnel syndrome. Material & Methods: It was a prospective descriptive study conducted at the department of Neurosurgery, Lady Reading Hospital MTI, Peshawar from 1st July 2016 to 30th June 2017. A total of 96 patients (108 hands) were included in the study, which underwent Open Carpal Tunnel Release surgery for median nerve compression after applying the inclusion and exclusion criteria. Results: Out of total 96, 12 patients were having bilateral Carpal Tunnel Syndrome, so the total number of hands were 108. Female were 89 (92.7%) and male were 7 (7.3%). Mean age of the patients was 35 ± 7 years. Right hand, the dominant hand, was involved in 57 (52.8%) cases. After Open Carpal Tunnel Release Surgery improvement in symptoms was noted in 95 (87.96%) and 97 (89.81%) cases after 2 and 6 weeks of surgery respectively. The infection was noted in 3 (2.78%) and 1 (0.92%) hands, and joint stiffness in 2 (1.85%) and 1 (0.92%) hands after 2 and 6 weeks. Conclusion: Open Carpal Tunnel Release Surgery is very helpful in terms of improvement of patients’ symptoms and having fewer complications. Keywords: Surgical Outcome, Carpal tunnel syndrome, Open carpal tunnel release.

INTRODUCTION
Carpal Tunnel Syndrome (CTS) is a compressive neuropathy caused by the median nerve entrapment at carpal tunnel.¹ It is the most common entrapment neuropathy of the upper limb.²,³ CTS is caused by increased pressure within the carpal tunnel, which leads to the decreased function of the median nerve. Clinically patients present with hand pain, tingling and numbness in the median nerve distal distribution (thumb, index, middle and radial side of the ring finger) and decreased hand function and grip strength.¹,⁴ Patients often awaken at night and shake out their hands to get pain relief.²,³ This phenomenon is called flick sign, which is 96% specific and 93% sensitive for CTS.³

CTS is mostly bilateral in diabetics, hypo thyroids, and rheumatoid arthritis patients.⁴ Temporary CTS have seen in late pregnancy.⁵ This syndrome caused by repeated movement and more common in manual workers.⁵ Moreover, females are mostly affected than males.¹ A proper history, Target oriented clinical examination and provocative tests like Phallen and Tinel tests guide towards the correct diagnosis.¹,⁴ However, Nerve Conduction Studies (NCS) is considered gold standard for diagnosis, although it also has false positive and false negative.¹

Treatment of CTS is based on severity, mild to moderate cases are treated conservatively, while surgical decompression is reserved for severe cases not responding to conservative treatment.¹,³⁴ There are many options like splinting, Non Steroidal Anti-Inflammatory Drugs (NSAIDs), vitamin B₆, and B₁₂, local corticosteroids injection and physical therapy (carpal bones mobilization, therapeutic ultrasound and yoga).¹,³ Surgical decompressions can be achieved by open or endoscopic techniques, both are equally effective.³ Moreover, no difference was noted in return to work in patients operated by open or endoscopic technique.⁵

Surgical treatment gives a good outcome up to 12 months in terms of symptoms relief and normalization of NCS but has more complications risk.⁶ The improvement in symptoms does not depend on the socio-demographic state and clinical presentation of the patients.¹ In addition to it, open carpal tunnel release (OCTR) is as much successful in diabetics as in non-diabetics, both insulin-dependants and insulin non-dependants patients.⁸ However, there are observations on long
term outcome (2 years or more after surgery), specially the risk of recurrence and persistent abnormal NCS.\textsuperscript{9}

It is also notable, that MRI can be used with NCS for post operative evaluation or in recurrent cases.\textsuperscript{10} MRI with gadolinium enhancement can shows the signs of median nerve dysfunction and the presence of fibrosis, and also can help regarding the surgical planning.\textsuperscript{10} To my knowledge there are very few studies in this aspect in our area. We conducted this study to evaluate the short term surgical outcome after 2 and 6 weeks after OCTR surgery for CTS in terms of symptoms relief and risk of complications. The data will not only help the local health care providers to properly know and manage CTS, but it will also make a future path for additional studies on this disease.

MATERIALS AND METHODS

It was a prospective descriptive study performed in the department of Neurosurgery Lady Reading Hospital, MTI Peshawar, Pakistan. The duration was one year from 1\textsuperscript{st} July 2016 to 30\textsuperscript{th} June 2017. The total number of patients was 96, out of which 12 patients were having bilateral CTS. The total number of hands was 108. So, sample size of 108 was obtained using non-probability purposive sampling.

We included all those patients who have probable diagnosis of CTS on clinical examination and confirmed by NCS. Patients of either gender, age group of 21 to 60 years and patients having severe CTS, not responding to conservative treatment were included. On the other hand, patients with redo cases, post traumatic cases and patients having mild to moderate CTS responding to conservative treatment were excluded.

Patients fulfilling the inclusion criteria were enrolled through the Out Patient Department. An informed written consent was taken from the patient before the surgical intervention. The socio-demographic information like name, age, gender, address, handedness and occupation was recorded. The patients were also investigated through history and medical records regarding any health problem like diabetes, hypothyroidism and rheumatoid arthritis. An approval from ethical committee of the hospital was taken.

All the patients were operated through OCTR as outdoor patients, re-evaluated after 2 and 6 weeks of surgery to record improvement in symptoms and complications. The data was analyzed in SPSS version 20.

Patients were operated as, the patient is put in supine position. A local anesthesia is given at the site of incision. The hand is scrubbed and draped. Incision of 2-3 cm is made along imaginary line between 3 and 4 digits from distal crease to Kaplan's cardinal line. The skin edges are opened and the undersurface of the transverse carpal ligament is separated to protect the nerve and tendon below. A longitudinal cut is made in the ligament to open the tunnel and release the median nerve, wound is thoroughly wash and close in reverse order, antiseptic dressing is applied.

RESULTS

Out of total 96 patients, female was 89 (92.7\%) and male were 7 (7.3\%), with female to male ratio of 12.71:1. The mean age of the patients was 35 years with a range of 21-60 years (Table I). Right hand was affected in 57(52.8\%) cases, while left hand was involved in 51(47.8\%) cases. A total of 12 (2.5\%) patients were operated for bilateral CTS. Out of these 12 patients 7 (58.3\%) were diabetics.

Symptoms (pain, numbness and paraesthesia in the hand) post operatively, improved in 95 (87.96\%) and 97 (89.81\%) cases after 2 and 6 weeks. The hands did not improved were 10 (9.26\%) and 8 (7.4\%) after this duration. Worsening of symptoms was documented in 3 (2.78\%) hands (Table II). We encountered complications in the form of (Table III); infection, joint stiffness and wound dehiscence.

\begin{table}[!h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
S. No. & Age (years) & No. of patients & Percentage (\%) \\
\hline
1. & 21-30 & 10 & 10.4 \\
\hline
2. & 31-40 & 41 & 42.7 \\
\hline
3. & 41-50 & 29 & 30.2 \\
\hline
4. & 51-60 & 16 & 16.7 \\
\hline
Total & & 96 & 100 \\
\hline
\end{tabular}
\caption{Table I = Age Distribution}
\end{table}
DISCUSSION

CTS is the entrapment of median nerve in carpal tunnel.\textsuperscript{1} It is the most common type of compressive neuropathy.\textsuperscript{2,3} Prevalence is 0.6% among men and 5.8% among female.\textsuperscript{2} Common risk factors for CTS are obesity, hypothyroidism, rheumatoid arthritis, diabetes mellitus and pregnancy.\textsuperscript{3} Moreover, repetitive wrist movements is the common cause of CTS, therefore it is more common in manual workers.

In our study, the females were more than males with a ratio of 12.7:1, which matches to study conducted by Rahman KU et al. where female to male ratio was 13.92:1.\textsuperscript{11} The mean age in our study was 35 years, which matches to study conducted by Adam ML, where mean age was 36.6 years.\textsuperscript{12} Moreover, in our study the dominant hand (right hand) was mostly involved in 52.8% cases, as it is commonly used in repetitive manual work, which matches to study conducted by Khanzada et al. where right hand was involved in 58% cases.\textsuperscript{13} As the diabetes mellitus is one of the main risk factors for CTS, so we noted bilateral CTS mostly in diabetic patients.\textsuperscript{3}

We followed our patients after 2 weeks (on removal of stitches) and 6 weeks (one month after stitches removal). Patients symptoms was improved in 87.96% and 89.81% cases after 2 and 6 weeks, so it indicates that OCTR has good results in relieving symptoms, which matches to other different studies, where patients symptoms improvement was noted in 70-90% of cases.\textsuperscript{2,3,6,7,13} Moreover, we noticed worsening of symptoms in 3(2.78%) cases which is similar to Rehman et al. findings (3%).\textsuperscript{11}

Lichtman et al. study also showed 7% complications.\textsuperscript{14} Infection was seen in 3 (2.78%) cases after 2 weeks which is in the range of findings of study conducted by Eberlin et al. where infection was observed in 1-11% cases.\textsuperscript{15} Moreover, 2 of them were diabetic with poor glycemic control as hyperglycemia makes patients more prone to developed surgical site infection. Patients were advised local antibiotics and it was treated successfully in 2 hands at 6 weeks follow up. Joint stiffness was observed in 2 (1.86%) cases and in 1 case at 6 weeks and treated with physiotherapy. Moreover, wound dehiscence was noted only in 1(0.93%) diabetic female patient after removal of stitches which is very rare complication of OCTR surgery.

Our study has some limitations. We included only fresh cases in our study, which were not previously operated. We followed our patients for short term (2 and 6 weeks). Additionally, our sample size was also small (108 cases). Moreover, we did not advise either NCS or MRI to see the condition of median nerve and transverse carpal ligament post operatively, because of the limited resources and poor socio-economic condition of the patients. So, further studies are recommended to follow large number of patients for long term, and all patients should ideally be investigated through NCS and MRI after OCTR surgery.

CONCLUSION

Open Carpal Tunnel Release surgery is a better surgical option for severe CTS. It decreases the patient's symptoms and also increases the hand function. Moreover, it has less risk of complications.

\begin{table}[h]
\centering
\caption{Outcome}
\begin{tabular}{|c|c|c|c|}
\hline
Follow up & Improved Number of Patients & Not improved Number of Patients & Worsening of symptoms Number of Patients \\
& (%) & (%) & (%) \\
\hline
2 weeks & 95 (87.96\%) & 10 (9.36\%) & 3 (2.78\%) \\
6 weeks & 97 (89.81\%) & 8 (7.41\%) & 3 (2.78\%) \\
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\end{tabular}
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\begin{table}[h]
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\caption{Complications}
\begin{tabular}{|c|c|c|}
\hline
Complications & 2 weeks & 6 weeks \\
& Number of Patients (%) & Number of Patients (%) \\
\hline
Infection & 3 (2.78\%) & 1 (0.92\%) \\
Joint stiffness & 2 (1.85\%) & 1 (0.92\%) \\
Wound dehiscence & 0 & 1 (0.92\%) \\
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REFERENCES


