Original Article

Nepal Journal of Neuroscience 2025;22(4):42-46

Symptom Chronicity and its Association with Functional Outcomes after Carpal Tunnel Release at a Tertiary Care Center: A Cross-Sectional Study

Ram Chandra Shrestha[1], Raj Kumar KC[2], Adarsha Mahaseth[3], Sameer Aryal[4]

[1 &3]Department of Neurosurgery, Nepal APF Hospital, Kathmandu, Nepal

[2] Department of Neurosurgery, Universal College of Medical Sciences, Bhairahawa, Nepal

[4] Department of Neurosurgery, National Academy of Medical Sciences, Bir Hospital, Kathmandu, Nepal

Date of Submission:3rd September 2025 Date of Acceptance: 30th October 2025 Date of Publication: 15th December 2025

Abstract

Introduction: Carpal tunnel syndrome is the most common entrapment neuropathy and has a substantial impact on occupational performance and quality of life. Carpal tunnel release is the standard treatment for moderate to severe cases, but the influence of symptom chronicity on surgical outcomes is not well established. Our objective was to assess the association between symptom chronicity and functional outcomes, patient satisfaction, return to work, and complication rates following carpal tunnel release at a tertiary care center.

Material and Methods: This prospective observational study included fifty patients undergoing carpal tunnel release. Participants were stratified into three groups according to duration of symptoms: less than six months, six to twelve months, and more than twelve months. Functional outcomes were measured using the Boston Carpal Tunnel Questionnaire before and six months after surgery. Patient satisfaction was assessed with the Patient Global Impression of Improvement scale. Electrophysiological recovery, complication rates, and time to return to work were also analyzed.

Results: Patients with symptom duration less than six months showed the greatest improvement in functional scores, highest satisfaction, and shortest return to work time. Longer symptom duration was associated with higher preoperative severity, lower postoperative satisfaction, slower recovery, and more complications. Electrophysiological improvement was observed across all groups, but was most pronounced in patients with shorter symptom duration.

Conclusion: Symptom chronicity significantly influences outcomes after carpal tunnel release. Early surgical intervention within six months of symptom onset results in better recovery, greater satisfaction, fewer complications, and faster return to work.

Key words: Carpal Tunnel Syndrome, Electrophysiology, Median Nerve, Patient Satisfaction, Recovery of Function, Treatment Outcome

INTRODUCTION

Carpal tunnel syndrome is the most common entrapment neuropathy, with a prevalence ranging from three to eight percent in the general population and a higher occurrence among women between 40 and 60 years of age.[1,2] It results from compression of the median nerve within the carpal tunnel, producing pain, numbness, tingling, and weakness in the hand, particularly affecting the thumb, index, and middle fingers.[3]

The etiology of carpal tunnel syndrome is multifactorial, involving anatomical, metabolic, and occupational factors. Diabetes mellitus, obesity, hypothyroidism, arthritis, pregnancy, wrist trauma, and repetitive hand use are recognized risk factors.[4–6] Beyond its clinical manifestations, carpal tunnel syndrome carries considerable socioeconomic consequences, including loss of productivity, prolonged absence from work, reduced career opportunities, and psychological distress.[7,8]

Diagnosis is primarily clinical and can be supported by electrophysiological studies. Management options range from conservative strategies such as splinting and corticosteroid injections to surgical decompression of the median nerve. [9–11] Carpal tunnel release, performed through open or endoscopic techniques, is considered the definitive treatment for patients with moderate to severe symptoms or those unresponsive to non-operative measures, with the aim of relieving symptoms, restoring hand function, and facilitating return to normal activities.[12,13]

While surgical decompression is widely effective,

Access this article online

Website: https://www.nepjol.info/index.php/NJN

DOI: https://doi.org/10.3126/njn.v22i24.85037

HOW TO CITE
Shrestha, R. C., KC, R. K., Mahaseth, A., & Aryal, S. Symptom Chronicity and its Association with Functional Outcomes after Carpal Tunnel Release at a Tertiary Care Center: A Cross-Sectional Study. NJNS. 2025;22(4)42-46

Address for correspondence:
Dr. Ram Chandra Shrestha
Department of Neurosurgery, Nepal APF Hospital, Kathmandu, Nepal
Email:dr.rcs7@yahoo.com

ISSN: 1813-1948 (Print), 1813-1956 (Online)

the duration of symptoms before surgery—termed symptom chronicity—may influence the extent of recovery and overall patient outcomes. However, evidence on this relationship remains limited in the regional context. This study was undertaken to evaluate the association between symptom chronicity and functional outcomes, patient satisfaction, return to work, and complication rates following carpal tunnel release at a tertiary care center.

MATERIALS AND METHODS

Study design and setting

This was a prospective observational study conducted at Nepal Armed Police Force Hospital over a period of two years. A total of fifty patients diagnosed with carpal tunnel syndrome who underwent carpal tunnel release were enrolled.

Study population

Patients aged between 18 and 70 years with a clinical and electrophysiological diagnosis of carpal tunnel syndrome were considered eligible.

Inclusion criteria

- Patients with a confirmed diagnosis of carpal tunnel syndrome requiring surgical release.
- Documented duration of symptoms before surgery.
- Willingness to participate and provision of informed consent.

Exclusion criteria

- Previous carpal tunnel release surgery on the same hand.
- Co-morbid conditions likely to affect hand function, such as rheumatoid arthritis or cervical radiculopathy.
- Incomplete follow-up or missing data.

Study groups

Participants were stratified into three groups according to

symptom duration:

- Group 1: less than six months
- Group 2: six to twelve months
- Group 3: more than twelve months

Data collection

Baseline data included age, sex, occupation, self-reported symptom duration, electrophysiological findings (motor latency), and preoperative functional status using the Boston Carpal Tunnel Questionnaire. At six months after surgery, patients were re-evaluated for functional outcomes using the Boston Carpal Tunnel Questionnaire, satisfaction using the Patient Global Impression of Improvement scale, time to return to work, and the occurrence of complications. Complications were classified as minor or major based on their clinical impact.

Outcomes measured

The primary outcomes were functional improvement and patient satisfaction. Secondary outcomes included electrophysiological recovery, complication rates, and time to return to work.

Ethical approval

Ethical clearance was obtained from the Institutional Review Committee of Nepal Armed Police Force Hospital, and written informed consent was taken from all participants.

Statistical analysis

Continuous variables such as functional scores and recovery time were expressed as means with standard deviation and compared using paired t tests or analysis of variance. Categorical variables such as satisfaction and complication rates were analysed using chi-square tests or Fisher's exact test where appropriate. A p-value less than 0.05 was considered statistically significant. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 26.

RESULTS

A total of 50 patients were included, with a mean age of 45.2 ± 12.3 years. Females accounted for 45 (90%) and males for 5 (10%). The distribution of symptom duration was 15 (30%) patients with less than six months, 20 (40%) with six to twelve months, and 15 (30%) with more than twelve months (Table 1).

Table 1: Demographic and baseline characteristics of the patients

Characteristic	Value
Total patients	50
Age (mean ± SD)	45.2 ± 12.3 years
Sex (Male/Female)	5/45
Symptom duration < 6 months	15 (30%)
Symptom duration 6–12 months	20 (40%)
Symptom duration > 12 months	15 (30%)

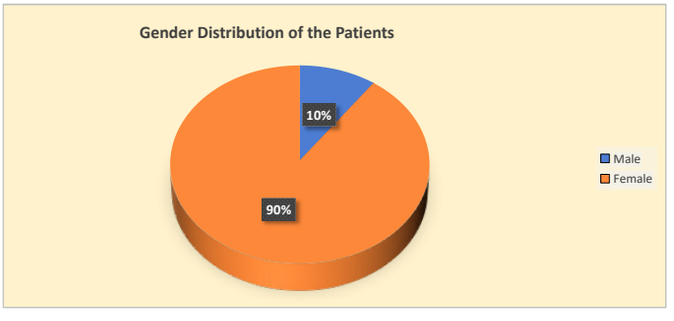

Figure1: Gender distribution of patients undergoing carpal tunnel release.

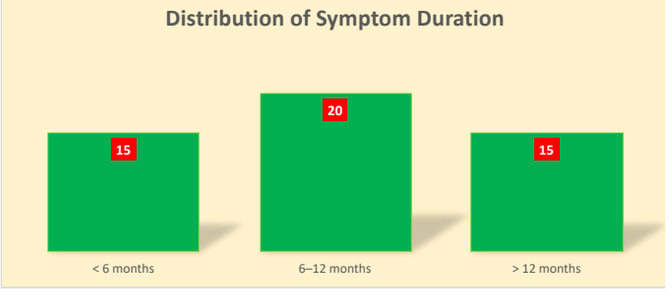

Figure 2: Distribution of patients according to duration of symptoms before carpal tunnel release.

Functional outcomes improved significantly in all groups. Patients with shorter symptom duration (< six months) had the lowest preoperative scores and greatest postoperative improvement compared with those with longer duration (Table 2).

Table 2: Functional outcomes (Boston Carpal Tunnel Questionnaire scores) based on symptom duration

Symptom duration	Preoperative score (mean ± SD)	Postoperative score at 6 months (mean ± SD)	p value
< 6 months	3.5 ± 0.5	1.2 ± 0.3	< 0.05
6–12 months	3.8 ± 0.6	1.5 ± 0.4	< 0.05
> 12 months	4.2 ± 0.7	2.0 ± 0.5	< 0.05

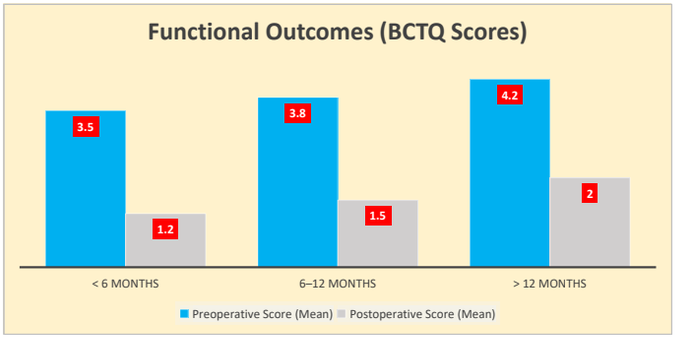

Figure 3: Comparison of preoperative and postoperative Boston Carpal Tunnel Questionnaire (BCTQ) scores according to symptom duration.

Patient satisfaction was highest among those with less than six months of symptoms (93.3%) and lowest in those with more than twelve months (66.7%) (Table 3).

Table 3: Patient satisfaction (Patient Global Impression of Improvement scale) based on symptom duration

Symptom duration	Satisfied (1–2)	Neutral (3–4)	Dissatisfied (5–7)	p value
< 6 months	14 (93.3%)	1 (6.7%)	0 (0%)	< 0.05
6–12 months	16 (80.0%)	4 (20.0%)	0 (0%)	< 0.05
> 12 months	10 (66.7%)	5 (33.3%)	0 (0%)	< 0.05

Electrophysiological improvement, measured by reduction in motor latency, was observed in all groups, with the greatest change in patients with shorter duration (Table 4).

Table 4: Electrophysiological improvement based on symptom duration

Symptom duration	Preoperative motor latency (ms)	Postoperative motor latency (ms)	Percentage improvement	p value
< 6 months	4.2 ± 0.5	3.0 ± 0.4	28.6%	< 0.05
6–12 months	4.5 ± 0.6	3.2 ± 0.5	28.9%	< 0.05
> 12 months	4.8 ± 0.7	3.5 ± 0.6	27.1%	< 0.05

Complication rates increased with symptom duration. Minor complications occurred in 5 (33.3%) patients in the < six months group and 10 (66.7%) in the > twelve months group. Major complications were rare but most frequent in the > twelve months group (13.3%) (Table 5).

Table 5: Complication rates based on symptom duration

Symptom duration	Minor complications	Major complications	p value
< 6 months	5 (33.3%)	0 (0%)	0.12
6–12 months	8 (40.0%)	1 (5.0%)	0.08
> 12 months	10 (66.7%)	2 (13.3%)	0.04

Return to work was significantly delayed in patients with longer symptoms. The mean time was 4.5 ± 1.2 weeks for those with < six months of symptoms, 6.8 ± 1.5 weeks for six to twelve months, and 9.2 ± 2.1 weeks for > twelve months (Table 6).

Table 6: Time to return to work based on symptom duration

Symptom duration	Mean time to return (weeks)	p value
< 6 months	4.5 ± 1.2	< 0.05
6–12 months	6.8 ± 1.5	< 0.05
> 12 months	9.2 ± 2.1	< 0.05

DISCUSSION

This study demonstrated that symptom chronicity significantly influenced functional recovery, patient satisfaction, complication rates, and return to work following carpal tunnel release. Patients operated within six months of symptom onset had better functional outcomes, higher satisfaction, fewer complications, and faster return to work compared with those who presented later.

The female predominance in our study (90%) is consistent with global evidence indicating a higher prevalence of carpal tunnel syndrome in women. Krieger et al.[12] reported a distribution of 71% females and 29% males, Paterson et al. [14] observed 62% females, and Alimohammadi et al.[15] documented 77.6% females. Hormonal influences, anatomical differences in carpal tunnel dimensions, and occupational exposures are thought to contribute to this disparity.

The mean age of our patients (45.2 years) was slightly lower than that reported in other studies, where averages ranged from 50 to 54 years. [12,14–16]This may reflect demographic variation or referral practices. Younger age at presentation may also influence recovery, as younger patients tend to have better healing potential and greater occupational demands.

Functional outcomes, measured using the Boston Carpal Tunnel Questionnaire, improved significantly across all groups, but the greatest gains were seen in patients with shorter symptom duration. Similar findings have been reported by Masud et al., who observed faster and more complete recovery in patients treated within six months, while those with longer symptom duration had delayed or incomplete functional restoration.[17] These results reinforce the importance of timely surgical intervention before irreversible nerve changes occur.

Complication rates also correlated with symptom chronicity. In our study, patients with longer duration of

symptoms experienced higher rates of both minor and major complications. Louis et al.[18] reported neuromas, hypertrophic scars, dysesthesias, and stiffness as common complications, while Zhang et al.[19] documented a low overall complication rate of 1.2% in over one thousand cases. Palmer et al. highlighted significant risks associated with endoscopic release, including nerve, vessel, and tendon injuries.[20] These findings indicate that while complications are generally uncommon, delayed presentation and technical factors may increase the likelihood of adverse outcomes.

Return to work was influenced by symptom duration as well as occupation type. In our study, the average return to work was just over seven weeks, but patients with shorter symptom duration resumed work earlier. These findings are supported by recommendations of the Royal College of Surgeons, which suggest two to ten weeks, depending on the type of occupation.[21] Newington et al. [22] similarly reported shorter return to work intervals in desk-based occupations compared with manual labourers, while Miller et al.[23] found that surgical technique also played a role, with endoscopic release associated with earlier return. Recovery is therefore multifactorial, reflecting both surgical and patient-related determinants.

Our findings align with long-term outcome studies, which have consistently shown high rates of satisfaction and functional improvement following carpal tunnel release. Nancollas et al. [13] reported good or excellent results in 87% of patients at more than five years of follow-up, while Tang et al. [24] demonstrated sustained improvement after nine years in patients with bilateral severe disease. Systematic reviews also support surgery as superior to conservative treatment in terms of long-term functional recovery and symptom relief.[15,25,26]

Taken together, these results suggest that carpal tunnel release is an effective procedure with durable benefits. Importantly, early surgical intervention within six months of symptom onset appears to maximize recovery, minimize complications, and facilitate earlier return to occupational function.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the sample size was relatively small and drawn from a single tertiary care centre, which may limit the generalizability of the results to broader populations. Second, the study design was observational and non-randomized, which introduces the possibility of selection bias. Third, the follow-up period was limited to six months, preventing assessment of long-term outcomes, recurrence, or durability of recovery. Fourth, the duration of symptoms was self-reported, which may be subject to recall bias. Finally, occupational demands and psychosocial factors influencing return to work were not controlled for, which could have affected the variability in recovery times.

Despite these limitations, the study provides valuable evidence on the impact of symptom chronicity on outcomes after carpal tunnel release and highlights the importance of early surgical intervention.

CONCLUSION

Symptom chronicity was found to be an important determinant of outcomes following carpal tunnel release. Patients with shorter symptom duration demonstrated greater functional improvement, higher satisfaction, earlier return to work, and fewer complications compared with those who had longer-standing symptoms. These results highlight the clinical importance of early diagnosis and timely surgical intervention to optimise recovery and minimise risks. Further multi-centre studies with larger samples and longer follow-up are warranted to validate these findings and to explore additional prognostic factors influencing surgical outcomes.

REFERENCES

1. Yamaguchi DM, Lipscomb PR, Soule EH. Carpal tunnel syndrome. Minn Med. 1965 Jan;48:22-33. PMID: 14244290.
2. Lozano-Calderón S, Anthony S, Ring D. The quality and strength of evidence for etiology: example of carpal tunnel syndrome. J Hand Surg Am. 2008 Apr;33(4):525-38. doi: 10.1016/j.jhsa.2008.01.004. PMID: 18406957.
3. Scangas G, Lozano-Calderón S, Ring D. Disparity between popular (Internet) and scientific illness concepts of carpal tunnel syndrome causation. J Hand Surg Am. 2008 Sep;33(7):1076-80. doi: 10.1016/j.jhsa.2008.03.001. PMID: 18762100.
4. Chung KC. Current status of outcomes research in carpal tunnel surgery. Hand (N Y). 2006 Jun;1(1):9-13. doi: 10.1007/s11552-006-0002-3. PMID: 18780037; PMCID: PMC2517327.
5. Jugovac I, Burgić N, Mićović V, Radolović-Prenc L, Uravić M, Golubović V, et al. Carpal tunnel release by limited palmar incision vs traditional open technique: randomized controlled trial. Croat Med J. 2002 Feb;43(1):33-6. PMID: 11828556.
6. Okutsu I, Ninomiya S, Hamanaka I, Kuroshima N, Inanami H. Measurement of pressure in the carpal canal before and after endoscopic management of carpal tunnel syndrome. J Bone Joint Surg Am. 1989 Jun;71(5):679-83. PMID: 2732256.
7. Richman JA, Gelberman RH, Rydevik BL, Hajek PC, Braun RM, Gylys-Morin VM, et al. Carpal tunnel syndrome: morphologic changes after release of the transverse carpal ligament. J Hand Surg Am. 1989 Sep;14(5):852-7. doi: 10.1016/s0363-5023(89)80089-9. PMID: 2794405.
8. Mardanpour K, Rahbar M, Mardanpour S. Functional outcomes of 300 carpal tunnel release: 1.5 cm longitudinal mini-incision. Asian J Neurosurg. 2019 Jul-Sep;14(3):693-7. doi: 10.4103/ajns.AJNS_31_17. PMID: 31497086; PMCID: PMC6702990.
9. Genova A, Dix O, Saefan A, Thakur M, Hassan A. Carpal tunnel syndrome: a review of literature. Cureus. 2020 Mar 19;12(3):e7333. doi: 10.7759/cureus.7333. PMID: 32313774; PMCID: PMC7164699.
10. Sevy JO, Sina RE, Varacallo MA. Carpal Tunnel Syndrome [Updated 2023 Oct 29]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. Available from: https://www.ncbi.nlm.nih.gov/books/NBK448179/
11. Padua L, Coraci D, Erra C, Pazzaglia C, Paolasso I, Loreti C, et al. Carpal tunnel syndrome: clinical features, diagnosis, and management. Lancet Neurol. 2016 Nov;15(12):1273-84. doi: 10.1016/S1474-4422(16)30231-9. Epub 2016 Oct 11. PMID: 27751557.
12. Krieger Y, Ofri M, Sagi G, Moshe-Noach H, Raiden P,

Shoham Y, et al. Long-term functional outcomes and quality of life following carpal tunnel release surgery. Int J Environ Res Public Health. 2024 Sep 11;21(9):1203. doi: 10.3390/ijerph21091203. PMID: 39338086; PMCID: PMC11431222.
13. Nancollas MP, Peimer CA, Wheeler DR, Sherwin FS. Long-term results of carpal tunnel release. J Hand Surg Br. 1995 Aug;20(4):470-4. doi: 10.1016/s0266-7681(05)80155-x. PMID: 7594985.
14. Paterson PD, Kirsch MJ, Miller LE, Aguila DJ 3rd. Early return to work after carpal tunnel release with ultrasound guidance. Plast Reconstr Surg Glob Open. 2024 Feb 27;12(2):e5647. doi: 10.1097/GOX.0000000000005647. PMID: 38415102; PMCID: PMC10898665.
15. Alimohammadi E, Bagheri SR, Hadidi H, Rizevandi P, Abdi A. Carpal tunnel surgery: predictors of clinical outcomes and patients' satisfaction. BMC Musculoskelet Disord. 2020 Jan 28;21(1):51. doi: 10.1186/s12891-020-3082-2. PMID: 31992298; PMCID: PMC6988299.
16. Park JS, Yoo CJ, Chun YI, Kim WK, Lee SG, Park CW. Endoscopic release of carpal tunnel syndrome: temporal correlation between symptomatic and electrophysiological improvements. J Korean Neurosurg Soc. 2005;37(1):8-15. Available from: https://www.komci.org/GSResult.php?RID=1032JKNS%2F2005.37.1.8
17. Masud M, Rashid M, Malik SA, Khan MI, Sarwar SU. Does the duration and severity of symptoms have an impact on relief of symptoms after carpal tunnel release? J Brachial Plex Peripher Nerve Inj. 2019 Jan 22;14(1):e1-8. doi: 10.1055/s-0038-1668552. PMID: 30679941; PMCID: PMC6342680.
18. Louis DS, Greene TL, Noellert RC. Complications of carpal tunnel surgery. J Neurosurg. 1985 Mar;62(3):352-6. doi: 10.3171/jns.1985.62.3.0352. PMID: 3973703.
19. Zhang D, Blazar P, Earp BE. Rates of complications and secondary surgeries of mini-open carpal tunnel release. Hand (N Y). 2019 Jul;14(4):471-6. doi: 10.1177/1558944718765226. Epub 2018 Mar 20. PMID: 29557679; PMCID: PMC6760078.
20. Palmer AK, Toivonen DA. Complications of endoscopic and open carpal tunnel release. J Hand Surg Am. 1999 May;24(3):561-5. doi: 10.1053/jhsu.1999.0561. PMID: 10357536.
21. Royal College of Surgeons. Carpal tunnel release: helping you make a speedy recovery after carpal tunnel release [Internet]. London: Royal College of Surgeons; 2014 [cited 2025 Oct 3]. Available from: https://www.rcseng.ac.uk/patients/recovering-from-surgery/carpal-tunnel-release/returning-to-work
22. Newington L, Francis K, Ntani G, Warwick D, Adams J, Walker-Bone K. Return to work recommendations after carpal tunnel release: a survey of UK hand surgeons and hand therapists. J Hand Surg Eur. 2018 Oct;43(8):875-8. doi: 10.1177/1753193418786375. Epub 2018 Jul 13. PMID: 30005582; PMCID: PMC6140994.
23. Miller LE, Chung KC. Determinants of return to activity and work after carpal tunnel release: a systematic review and meta-analysis. Expert Rev Med Devices. 2023 May;20(5):417-25. doi: 10.1080/17434440.2023.2195549. Epub 2023 Mar 30. PMID: 36994789.
24. Tang CQY, Lai SWH, Tay SC. Long-term outcome of carpal tunnel release surgery in patients with severe carpal tunnel syndrome. Bone Joint J. 2017 Oct;99-B(10):1348-53. doi: 10.1302/0301-620X.99B10.BJJ-2016-0587.R2. PMID: 28963157.
25. Huisstede BM, van den Brink J, Randsdorp MS, Geelen SJ, Koes BW. Effectiveness of surgical and postsurgical interventions for carpal tunnel syndrome: a systematic review. Arch Phys Med Rehabil. 2018 Aug;99(8):1660-80.e21. doi: 10.1016/j.apmr.2017.04.024. Epub 2017 May 31. Erratum in: Arch Phys Med Rehabil. 2020 Sep;101(9):1665. doi: 10.1016/j.apmr.2020.05.007. PMID: 28577858.
26. Shi Q, MacDermid JC. Is surgical intervention more effective than non-surgical treatment for carpal tunnel syndrome? A systematic review. J Orthop Surg Res. 2011 Apr 11;6:17. doi: 10.1186/1749-799X-6-17. PMID: 21477381; PMCID: PMC3080334.