

Paper

Open Carpal Tunnel Release – still a safe and effective operation

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ABSTRACT

Background: Carpal tunnel syndrome is a common cause of neurological symptomatology. Surgical decompression remains the treatment of choice in patients not responding to conservative therapies. The aim of this study was to assess the effectiveness of standard open decompression by analysis of symptomatic and functional improvement and to assess whether a general surgeon can still perform this operation safely.

Patients and methods: Patients undergoing standard open carpal tunnel release by a single general surgeon were recruited. A self-administered Boston questionnaire was used to assess symptom severity and functional status pre- and post-surgical intervention.

Results: Forty-seven patients (51 hands) underwent carpal tunnel release and 32 patients completed the questionnaire. 88% had a significant reduction in the symptom severity score, while improvement in function status score was achieved in 79% of patients. Mean symptom severity score improved from 3.41 points preoperatively to 1.85 ($p < 0.0001$) points at the last follow up examination, while the mean function status score improved from 2.73 to 1.99 points ($p < 0.0001$). Outcome was poor in six patients with slight worsening of either symptom or function status score. Three patients were treated conservatively for minor wound infection without long-term sequelae.

Discussion: Standard open carpal tunnel release still provides efficacious symptomatic relief with a low risk of associated complications when performed by a general surgeon.

Key words: Carpal tunnel release, symptomatic, functional, improvement

INTRODUCTION

Carpal tunnel syndrome is a common focal peripheral neuropathy. A raised intracarpal canal pressure results in median nerve compression and impaired nerve perfusion that leads to discomfort and paresthesia in the one or both hands¹. Traditional treatment modalities include physiotherapy, steroid injections and various surgical options²⁻⁴. Surgery is generally preferred in severe cases of carpal tunnel syndrome and should be considered when carpal tunnel syndrome does not respond to conservative measures. The standard surgical approach uses a palmar curvilinear incision to facilitate division of the transverse carpal ligament and its overlying structures. Recent modifications to this approach have been developed in an attempt to attenuate scar formation and to facilitate an earlier return to normal daily activities and the workplace⁴⁻⁶. There is, however, no consensus on the most effective method of treatment. We reviewed symptom resolution and functional improvement in patients following standard carpal tunnel release.

PATIENTS AND METHODS

All patients who had carpal tunnel release performed by a single surgeon from January 2001 to December 2004 were included in the study. Age was expressed as median and range. Previous studies have reported a plateau in symptomatic and functional improvement approximately six months post-carpal

tunnel release when assessed by a validated questionnaire.⁷ For this retrospective study, a nine month follow-up period was adopted to ensure full capture of any aspect of patient improvement.

A review was made of the case records of all the patients for predisposing conditions, pre-operative investigations, operative procedure and the post-operative complications. The Boston carpal tunnel questionnaire was used to evaluate patient outcome⁸. This is a patient oriented and self-administered questionnaire with strong internal consistency, reproducibility and validity⁸. As the study was retrospective in nature, the patients completed the pre-operative and post-operative questionnaires by recall.

The symptom severity scale includes 11 items from six clinical areas critical to evaluation of carpal tunnel syndrome, such as pain, numbness and nocturnal symptoms. Each item score ranges from 1 (mild) to 5 (severe). The functional state scale evaluates hand function with respect to eight daily routine activities, such as driving, sports and working with

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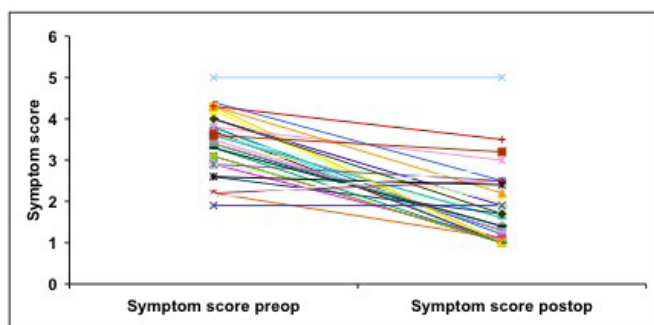


Fig 1. Symptom Score of 34 patients

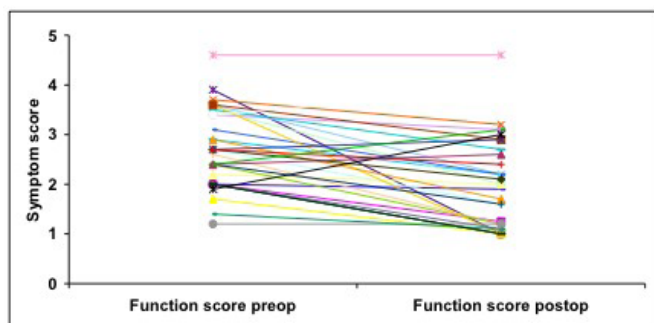


Fig 2. Functional Score of 34 patients

tools, Each item score ranges from 1 (no difficulty) to 5 (can not perform the activity). Each summative score is calculated as the mean with standard deviation of the scores of individual items⁸. Severe impairment is indicated by a high score. A post-operative change in the Boston questionnaire score was then determined and subsequently compared to the pre-surgical initial score. At the end of the questionnaire patients were asked to rate their contentment with the surgery as being very satisfied, satisfied, neither satisfied nor dissatisfied, or dissatisfied.

Response to clinical change was assessed by comparison of the pre-operative and post-operative scores. The scores are expressed as mean and standard deviation. The ability of the questionnaire to detect change was expressed as the effect size. This effect size, as used elsewhere with the questionnaire, was calculated by determining the mean difference between the pre-operative and post-operative scores and then dividing this difference by standard deviation of the difference. Therefore a large effect size indicated a more significant improvement in the clinical condition of the patient, compared to a small effect size.

RESULTS

All patients in the study had a clinical diagnosis of Carpal Tunnel Syndrome (CTS), which was defined as the presence of two subjective symptoms (numbness, tingling in the median nerve distribution). Physical examination included Phalen's and Tinel's Test. A pre-operative nerve conduction study was diagnostic of CTS in all patients. A total of 17 patients had one or more associated predisposing factors or conditions (renal failure = 2; rheumatoid arthritis = 7; diabetes = 8; thyroid dysfunction = 4).

Forty-seven patients (10 male) underwent the procedure during the study period, with 4 having bilateral surgery on

separate occasions. The median age was 59 years (range 34 - 96 yrs), with a mean follow-up period of 17 months (range 9 to 36 months). Decompression of the carpal tunnel was performed using a standard open technique, which involved a 3-4cm curvilinear incision. The palmar fascia and flexor retinaculum was then divided under direct vision, taking care to protect the recurrent motor branch. Three patients developed minor wound infection postoperatively and were treated conservatively with good healing and no long-term sequelae.

Thirty-two of 47 patients (68%) successfully completed both pre-and post-operative Boston questionnaires and were included in the final study analysis. Two patients had bilateral surgeries and each procedure was considered independently during data analysis. The pre-operative symptom severity score was 3.41 points (± 0.72). The score improved post-operatively to 1.85 points (± 0.89) indicating substantial response to clinical change ($p < 0.0001$). Therefore the difference resulting from surgery, as expressed by the effect size was 1.55. The symptom score improved in 88%, while it remained unchanged in 6% and worsened in 6% (Fig. 1). The preoperative functional status score was 2.73 points (± 0.80), compared with post-operative score of 1.99 points (± 0.94) and the effect size was 0.83 ($p < 0.0001$). The functional score improved in 79% of patients, was unchanged in 6% and deteriorated in 14% (Fig. 2).

Two patient's hand symptoms remained the same even after the surgery. Functional status slightly worsened (difference in functional scale < 0.3) after the operation in six patients, although the symptoms improved in three of these, giving a mixed picture. Four individuals had a history of either rheumatoid arthritis involving the hand, renal failure, diabetes mellitus or gout. All patients stated they were either satisfied or very satisfied with surgery except three for whom functional status failed to improve after the operation.

DISCUSSION

Carpal tunnel decompression with division of the transverse carpal ligament is a successful procedure for the treatment of carpal tunnel syndrome^{9,10}. Controversy still exists regarding the choice of surgery for this condition. Three different surgical techniques have been described in the literature – the classic or standard approach, endoscopic approach either single or multiport, and limited incision approach^{4,12}. The traditional approach with long palmar incision has been criticised for greater scar tenderness and longer time to return to work^{3,4}. In an effort to overcome this, endoscopic and limited incision approaches have emerged.

Although the endoscopic carpal tunnel release has been demonstrated to reduce recovery time, a previous study raised concerns about an increased rate of complications¹¹. However with the improvement in the endoscopic techniques, fewer complications, such as persistent weakness and scar tenderness have now been demonstrated^{5,6,11,13,15}. Klein *et al*¹³ conducted a prospective study to evaluate the safety and functional outcome of limited incision technique and concluded that this procedure is an effective method for releasing standard carpal tunnel syndrome and is associated with significant symptom relief, minimal scar tenderness and an improvement in overall hand function. However it has

the limitation of not able to perform additional procedures, if required with inadequate exposure after conversion to a longer incision.

Surgical success for carpal tunnel release is achieved in most cases, but subjective evaluation appears to provide the best outcome measures for carpal tunnel syndrome¹⁶. We used the Boston Questionnaire scales, which have been demonstrated as a valid and reliable assessment tool for hand dysfunction, having previously been used to study the effectiveness of the open carpal tunnel release⁸.

The Boston questionnaire symptoms showed an overall improvement in 88% of hands. In general the effect sizes for symptomatic improvement are considered moderate when greater than 0.5 and those of more than 0.8 indicates a large effect as indicated previously⁸. The symptom scale had a very large effect size revealing a significant post-operative improvement and the function scale showed medium responsiveness. Although this may be surprising the presence of significant co-morbidities in some of these patients may explain the lack of apparent success in the function change.

Three patients developed minor wound infection after the operation and were treated conservatively by their own doctor. Seventeen patients in our study were diagnosed to have one or more than one associated predisposing conditions. Four of those with poor outcome had at least one associated predisposing conditions. There are mixed reports with diabetic patients exhibiting a trend towards less pain relief post operatively¹⁸. Mondelli *et al*¹⁹ compared the results of carpal tunnel release in patients with diabetes mellitus and idiopathic carpal tunnel syndrome and concluded that the patients with diabetes have the same probability of positive surgical outcome as patients with idiopathic carpal tunnel syndrome.

A Cochrane review concluded that there is no strong evidence supporting the need for replacement of standard open carpal tunnel repair by existing alternative surgical procedures¹⁷. None of the existing alternatives to standard open carpal tunnel release offer better relief for carpal tunnel syndrome in the short term or the long term and there is conflicting evidence about whether endoscopic carpal tunnel release results in earlier return to work and / or activities of daily living.

The limitations of this study are the small patient numbers and that the data on preoperative status were obtained retrospectively, and thus recollections will be less accurate than prospectively collected data. This weakens the nature of the evidence produced as it leaves potential for recall bias, thereby limiting the strength of the conclusions. However, it appears that greater satisfaction with the result was associated with greater improvement in the score, for both the severity of symptoms and functional status. Patients dissatisfied with the operation had worsening of the scores after the operation.

CONCLUSION

Standard open carpal tunnel release remains a safe and effective method of treatment. It is not very technically demanding, results in satisfied patients and can be performed safely by general surgeons with experience.

The authors have no conflict of interest

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