

## Short-Term Outcomes after Median Nerve Release for Carpal Tunnel Syndrome

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### ABSTRACT

**AIM:** To study the short-term (considered as a 1-month period after surgery) outcomes experienced by patients following median nerve release due to carpal tunnel syndrome.

**MATERIAL AND METHODS:** A longitudinal cohort study was

performed between September 2013 and October 2014. Inclusion criteria included suffering from CTS for at least six months confirmed by clinical and electromyographic criteria and undergoing median nerve release. Exclusion criteria were pregnancy, patients with acute CTS and patients who were not able to read or non-Spanish speakers. All participants completed the questionnaires DASH, SF-36 and a Visual Analogue Scale for Pain, preoperatively and one month after surgery.

**RESULTS:** Thirty patients were included, 22 women and 8 men. DASH and VAS showed statistical significant differences before and after surgery ( $p < 0.05$ ) whereas SF-36 did not show significant differences.

**CONCLUSION:** This study shows that median nerve surgical release for CTS has satisfying outcomes in only one month from surgery.

**Key words:** Carpal tunnel release; Short term outcomes; SF-36; DASH; Functional outcomes

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### INTRODUCTION

The American Academy of Orthopaedic Surgeons (AAOS) defines carpal tunnel syndrome (CTS) as “symptomatic compressive neuropathy of the median nerve at the wrist.”<sup>[1,2]</sup> CTS is the most frequent compression peripheral neuropathy in the hand. It is estimated to affect 3.8% of the general population<sup>[3]</sup> with an incidence of 276: 100,000 a year<sup>[4]</sup>. It occurs more frequently in women, with a prevalence of 9.2% among women and 6% in men<sup>[2,5]</sup>. CTS is the most popular and common form of compression of the median nerve<sup>[1,6-8]</sup> and it makes up for 90% of all compression neuropathies<sup>[9]</sup>.

Symptoms of compression of the median nerve at the wrist were first described by Sir James Paget in 1854, in a patient who had suffered a fracture of the distal radius<sup>[10,11]</sup>.

It is known that surgical release of median nerve can decrease pain, improve grip strength and furthermore, patients' expectations meet with the surgical outcomes<sup>[12-14]</sup> this results can be evaluated even one week after surgery<sup>[15]</sup>.

Functional results are usually evaluated in medium term being 3, 6 and 12 months after surgery the most common periods<sup>[15-19]</sup>.

Due to the high prevalence of CTS, the present study aimed to study the short-term outcomes experienced by patients following median nerve release. Short-term was considered as a 1-month period after carpal tunnel decompression.

## MATERIAL AND METHODS

A longitudinal cohort study was performed between September 2013 and October 2014 using repeated measures of the outcomes experienced by patients. All participants were informed that data regarding their case would be used for further research and agreed to. Oral and written informed consent was obtained from all patients.

Inclusion criteria included suffering from CTS for at least six months confirmed by clinical and electromyographic criteria and undergoing median nerve release. Exclusion criteria were pregnant women, patients with acute CTS and patients who were not able to read or non-Spanish speakers.

Patients in the present study underwent local anaesthesia with 3 ml of 2% Mepivacaine applied one / two centimetres proximal to the radiocarpal joint between the palmaris longus muscle and the flexor carpi radialis, plus 1ml subcutaneous in the incision area (Madden technique). The flexor retinaculum was identified and opened, checking the absence of any tumour that could be favouring the nervous compression. Neurolysis was not associated in any case. The surgical procedure was done without tourniquet. The same surgical team always carried out this intervention. After closing with nonabsorbable sutures a compressive bandage was placed. One week after surgery both the sutures and the compressive bandage was removed.

All participants completed the questionnaires DASH<sup>[20,21]</sup>, SF-36<sup>[22]</sup> as well as a Visual Analogue Scale for Pain (VAS Pain) preoperatively and one month after surgery.

The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, translated and validated into Spanish<sup>[20]</sup>, is a specific measurement of quality of life related to upper limb problems, being 0 no disability at all and 100 the highest disability possible. Thus, the higher the score, the greater disability experienced by the patient.

The SF-36 questionnaire, translated and validated into Spanish<sup>[22]</sup>, provides an overview of the quality of life of the patient, easily filled out by the patient and evaluated by a standard statistical system. It contains 36 questions that address different aspects of daily life and are grouped and measured in 8 sections that are assessed independently and lead to 8 dimensions measured by the questionnaire. Scores for each of the 8 dimensions of the SF-36 have values ranging between 0 and 100. The higher the score the better the health is. These 8 scales are grouped into two aspects, physical and mental.

### Statistical Analysis

Paired data from pre and post-surgical questionnaires were collected and the analysis was performed using the SPSS V20 program.

A descriptive study of the variables degree of upper limb disability, quality of life both physical and mental and pain was performed.

A study of normality of variables was performed using the Kol-

mogorov-Smirnov test, obtaining that variables 'preoperative VAS Pain', 'preoperative DASH', 'preoperative SF-36 Mental', 'preoperative SF-36 physical' and 'postoperative SF-36 physical' do not follow a normal distribution. On the other hand, variables 'postoperative VAS Pain', 'postoperative DASH' and 'postoperative SF-36 Mental' do follow a normal distribution.

Nonparametric tests were used for those variables that did not follow a normal distribution. Inferential analysis of the data was performed using the Wilcoxon test testing for DASH, SF-36 and VAS Pain preoperative and postoperative.

Results were considered significant at  $p < 0.05$ .

Within the sample size, a group of 30 patients was chosen to detect with 70% strength and odds ratio of 3.5, using Chi-squared test and an estimated 5% for statistical significance.

## RESULTS

Thirty patients met the inclusion-exclusion criteria and were included in the present study, 22 women and 8 men. There was no exclusion in the 30 patients selected at first.

Figure 1 shows the statistically significant values of DASH questionnaire before and after surgery, measuring the degree of disability. Figure 2 and 3 show the outcomes observed within the SF-36 questionnaire, with no significant differences before and after surgery. Pain measured with VAS showed significant differences one month after surgery (Figure 4).

Figure 1. DASH outcomes before (PreOp) and after (PostOp; one month) surgery. Statistically significant differences ( $p < 0.0001$ ) were observed one month after the procedure. Having an average value before surgery (pre) of 49.25 (SD 25.06) and one month after surgery (post) of 23.89 (SD 20.00).

Figure 2. Outcomes for the SF-36 Mental component before (PreOp) and after surgery at one month (PostOp). No significant differences were observed ( $p = 0.069$ ), being the preoperative score of 42.87 (SD 8.7) and the postoperative of 40.52 (SD 7.29). A trend towards improvement of the mental SF-36 exists within one month after surgery.

Figure 3. SF-36 Physical component before (PreOp) and after surgery at one month (PostOp). Non-significant differences ( $p = 0.136$ ) were observed between the preoperative score (42.87; SD 8.7) and one month after surgery (45.55; SD 14.20).

Figure 4. Pain measured with VAS before (PreOp) and one month after surgery (PostOp). Significant differences ( $p < 0.0001$ ) were observed.

## DISCUSSION

CTS surgery represents an early improvement to the patient in terms of specific quality of life questionnaires (DASH and VAS). The present study aimed to study that decompression surgery of the median nerve improves the quality of life of patients suffering CTS in the short term.

As abovementioned, surgical release of the median nerve has a high rate of patients' satisfactory results 3, 6 months and 1 year after surgery<sup>[16-18]</sup>. Some series show satisfactory results at one and three weeks after surgery<sup>[13,15]</sup>.

However, our aim was to go one step further evaluating how soon the patient actually experiences this improvement. Thus, the purpose of the present study was to evaluate, if any, the possibility of any change in quality of life of patients after only one month.

Our patients frequently demand a very early incorporation to their work duties. Given the observed outcomes in the present study, with

satisfactory outcomes in less than a month, we can suggest reincorporation to work duties in a short period of time.

One month after surgery there is a significant difference in the VAS Pain and DASH, whereas the SF-36 does not show significant differences either on the mental or physical group, at least not in just one month. Among the most important findings of our study, the scales show the impact that surgery has at a specific level only one month after surgery. Pain as well as degree of disability of the person improves in a short-term period. However, the effect on the quality of life however, may need some more time.

Ralph compared SF36, DASH and CTQ and it concluded that DASH and CTQ were much more sensitive to change at 12 weeks of follow-up. CTQ and DASH seems to have good correlation in 6 weeks follow up but SF36 does not<sup>[23]</sup>. Also Uchiyama show similar results<sup>[3]</sup>.

These results are in line with those published by Amirfeyez *et al.*, who evaluated at 6 weeks after surgery using the DASH questionnaires, with significant improvement in their series<sup>[24]</sup>. Our aim is to see whether this improvement can be evaluated at 4 weeks.

Recent studies show the high correlation between the DASH questionnaire and resolution of pain and paraesthesia<sup>[25]</sup>. The validation studies into Spanish show great validity in their construction with a great sensibility to change in pain<sup>[26]</sup>. The study of Gay *et al* even advised to have the DASH performed as a single test, in a study at 6 and 12 weeks of evaluation<sup>[23]</sup>.

Other publication observed that SF36 has limitations in capturing upper extremity disability<sup>[27]</sup> Amadio *et all* shows that 3 months after surgery of the nine SF-36 scales studied, significant changes occurred in three: the physical role, emotional role, and pain scales. Each of these scales changed in the direction of improved health status after carpal tunnel release. The largest effect was in the pain scale. Their results with the SF-36 show effect sizes in the pain and physical role scales (preoperative to postoperative change, as measured in standardized differences) similar to those reported by Ware *et al* for heart surgery<sup>[28]</sup>, Kantz *et al* for knee replacement<sup>[29]</sup>, Liang *et al* for hip replacement<sup>[30]</sup>, and Lansky *et al* for back pain<sup>[31]</sup>. The magnitude of the preoperative SF-36 physical role scale deviations from norms lies between those reported by Ware *et al*<sup>[28]</sup>. For minor and major medical conditions.

Of particular interest is the responsiveness of two subscales of a general instrument such as the SF-36 to the unilateral impairment of the upper extremity caused by carpal tunnel syndrome. The magnitude of change suggests that the health impact of carpal tunnel syndrome is considerable. This responsiveness permits SF-36 and AIMS2 to assess the relative impact of carpal tunnel syndrome compared with that of other pathologic processes<sup>[19]</sup>.

As we can see SF36 is useful in the follow-up but it has limitations for very short term outcomes. The results can be observed at least one month after surgery. Other scales must be used before that month.

Several limitations of the study must be taken into consideration when reviewing the current study. First, its limited number of patients, with a larger sample it is possible that smaller variations could have been detected. The design limitation is the fact that we have sought differences in just one month, maybe in three months the quality of life has a significant difference. Also, we do not know if the fact that patients have had to suffer CTS for at least six months can be a factor and alter somewhat the SF-36, it was observed that the SF-36 of this subgroup of patients was altered compared to the normal population<sup>[32]</sup>, some authors do not recommend using the SF-36 to monitor the state of health in individuals who undergo trauma surgery<sup>[33]</sup>, a new and more specific scale could be designed for these

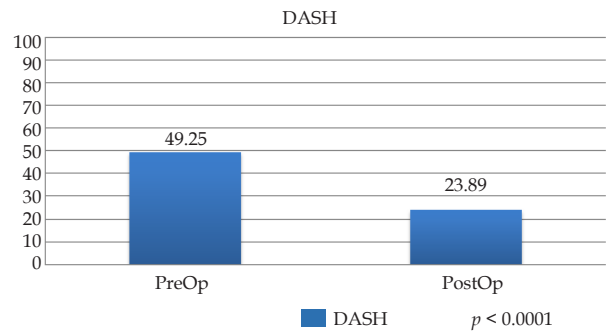


Figure 1 DASH outcomes before (PreOp) and after (PostOp; one month) surgery.

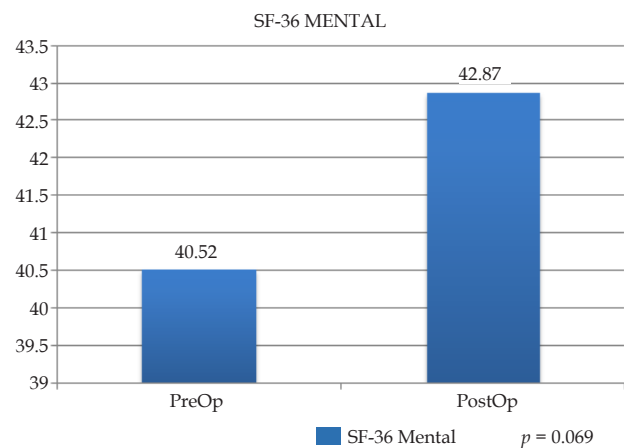


Figure 2 Outcomes for the SF-36 Mental component before (PreOp) and after surgery at one month (PostOp).

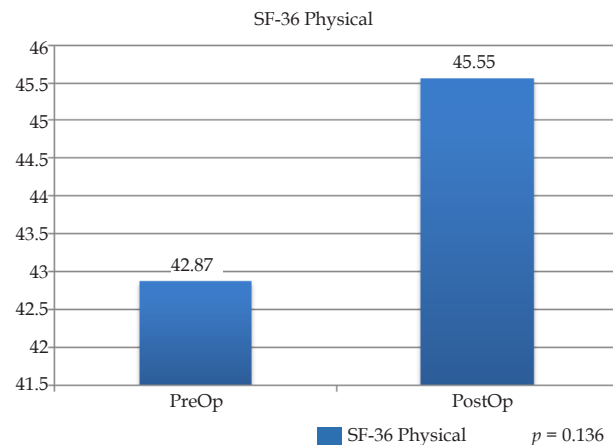


Figure 3 SF-36 Physical component before (PreOp) and after surgery at one month (PostOp).

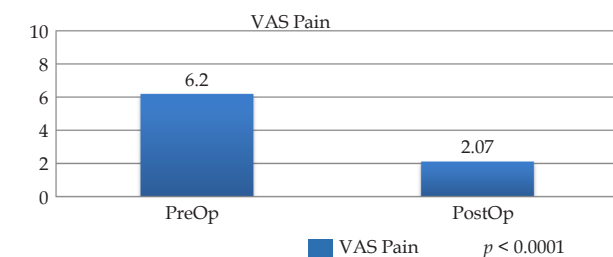


Figure 4 Pain measured with VAS before (PreOp) and one month after surgery (PostOp).

patients.

The most powerful prediction factor of satisfaction in the CTS release is the improvement of the symptoms, and these carry an increased optimism and improvements in patients expectations<sup>[34]</sup>.

## CONCLUSION

This study shows that median nerve surgical release for CTS has satisfying outcomes in only one month from surgery.

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