Outcome of carpal tunnel decompression: the influence of age, gender, and occupation

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Abstract The aim of this study was to investigate the effect of age, gender, and occupation on the outcome of carpal tunnel decompression. A total of 479 patients (342 females, 137 males) with a mean age of 56 years undergoing 608 carpal tunnel decompressions were prospectively studied. Outcome was assessed using the Brigham Hospital carpal tunnel questionnaire at two weeks pre-operatively and six months post-operatively. Cases were divided into four age categories (less than 40 years of age, 40–59, 60–79, and over 80 years of age) and two occupation (repetitive and non-repetitive) groups. The mean differences for both the symptom-severity and functional-status scores amongst the four age categories were similar and no significant difference was found. The mean differences for both the symptom-severity and functional-status scores between females and males and the two occupation groups were similar and no significant differences were found. The majority of the patient's symptoms improved following carpal tunnel decompression. However, we found no influence of age, gender, or occupation on the outcome of carpal tunnel decompression in our series of patients.

Résumé Le but de cette étude est d'analyser les effets de l'âge, du sexe et du travail sur l'évolution du patient ayant bénéficié d'une libération du canal carpien. Matériel et méthode: 479 patients (342 femmes, 137 hommes) d'âge moyen 56 ans ont bénéficié de 608 libérations du canal carpien, ceci au cours d'une étude prospective. L'évolution a été évaluée selon le questionnaire de l'hôpital de Brigham

à 2 semaines préopératoires et 6 mois post-opératoires. Les patients ont été classés en 4 catégories selon l'âge (moins de 40 ans, de 40 à 59 ans, de 60 à 79 ans et plus de 80 ans) et selon la gestuelle (répétitive ou non répétitive). Résultats: il n'y a pas de différences significatives selon l'âge ni selon le sexe. En conclusion la majorité de ces patients présentant un syndrome du canal carpien et bénéficiant d'une décompression ont été améliorés par ce geste chirurgical. Nous n'avons trouvé aucune influence de l'âge, du sexe ou de l'activité concernant ces patients et ceci dans chacune des séries.

Introduction

Carpal tunnel syndrome (CTS) is the most common peripheral compressive neuropathy in the United Kingdom and has considerable employment and healthcare cost implications [2]. Decompression of the median nerve for CTS was first described by Learmonth in 1933 [8]. Carpal tunnel decompression (CTD) is an established procedure for an increasingly prevalent condition in the elderly population [5] who tend to present with more severe CTS [3]. However, there remains disagreement amongst surgeons about the outcomes of carpal tunnel surgery with advanced age. Several recent studies have indicated that elderly patients seem to do well with carpal tunnel surgery [6, 7, 14, 16, 17], whereas others have found the contrary [12]. In addition, there is equivocal evidence demonstrating the association between different occupational groups and surgical outcome following CTD. Previous studies have also reported a greater pre-operative symptom score in females, but there does not seem to be a significant difference in outcomes between genders [6]. The aim of this study was to prospectively assess the influence of age,

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gender, and occupation on the outcome of CTD in a large cohort of patients from a single operator series.

Materials and methods

We prospectively studied all patients who underwent surgical decompression for CTS by a single operator over a 17 month period. The diagnosis of CTS was based on the presence of clinical symptoms of tingling in the thumb, index, middle or ring fingers, with or without episodic or persistent numbness, and signs of altered sensation in these digits associated with exacerbation of symptoms by sleep, repetitive action, or sustained arm or hand position [1]. In a small proportion of cases where the diagnosis was unclear, neurophysiological tests were performed. Exclusion criteria were pregnancy, previous carpal tunnel surgery on the same hand, a history of inflammatory joint disease, thyroid disease, diabetes mellitus, trauma in the preceding year, and an inability to fill in the self-administered outcome questionnaire.

The study was approved by the local ethical review committee.

Carpal tunnel decompression

Open carpal tunnel surgery was performed as a day case procedure under local anaesthesia without a tourniquet. Post-operatively, patients were encouraged to mobilise immediately, and the use of bandaging was limited to those patients on anti-coagulant therapy. Sutures were removed two weeks after surgery and patients were encouraged to return back to work as soon as possible after the procedure. Bilateral carpal tunnel decompressions were performed sequentially, at least six weeks apart, rather than simultaneously.

Outcome measurement

Outcome was assessed two weeks pre-operatively and six months post-operatively using the Brigham Hospital carpal tunnel syndrome questionnaire (Boston Carpal Tunnel

Score; BCTS). The BCTS has been shown to be a reliable and valid outcome measure for the assessment of carpal tunnel syndrome [13]. It consists of subjective variables classified into two categories: an 11-item symptom-severity score and an eight-item functional-status score [10]. Each item is scored by the patient from one point (mildest) to five points (most severe). The score for each category is then calculated by dividing the total score by the number of questions answered by the patient. The differences between the pre-operative and post-operative scores for both the symptom-severity and functional-status scales were calculated for each procedure performed. An effect size of 0.5 between the pre- and post-operative scores was considered to be the minimally clinically important difference [9].

Age and gender

The age and gender of the patients were recorded pre-operatively. The patients' ages were then categorised into four groups: less than 40 years of age, 40–59, 60–79, and greater than 80 years of age. A total of 479 patients were involved in our study, with more females ($n=342$) than males ($n=137$), undergoing 608 primary carpal tunnel decompressions. Of the 608 procedures, 432 were performed on females and 176 on males with 335 on the right side and 273 on the left side. The mean age at operation was 56 years (range 24–93). The greatest frequency of cases was in the 40–59 age group with the least in the over 80 years old age group (Table 1).

Occupation

The occupations of employed patients were recorded pre-operatively and then classified into either repetitive or non-repetitive groups according to Dias et al. [4]. Occupations in the repetitive group included builders, joiners, fitters, farmers, factory workers, and hairdressers. Non-repetitive occupations included accountants, solicitors, managers, nurses, teachers, policemen, and postmen. Patients that were retired, unemployed, and disabled were excluded. Of the 479 patients recruited in our study, 297 patients were

Table 1 Pre- and post-operative scores for each age category

Age category	Number of procedures	Symptom-severity score		Functional-status score	
		Pre	Post*	Pre	Post*
< 40	$n=100$	3.3 (0.57)	1.6 (0.61)	2.7 (0.84)	1.4 (0.59)
40 to 59	$n=289$	3.4 (0.60)	1.6 (0.74)	3.0 (0.80)	1.5 (0.68)
60 to 79	$n=169$	3.3 (0.61)	1.5 (0.64)	3.0 (0.84)	1.5 (0.61)
> 80	$n=50$	3.3 (0.56)	1.7 (0.82)	3.2 (0.87)	1.8 (0.98)

Standard deviations given in parentheses

* Post-operative scores were at six months

Table 2 Pre- and post-operative scores for gender

Gender	Number of procedures	Symptom-severity score		Functional-status score	
		Pre	Post*	Pre	Post*
Females	432	3.4 (0.61)	1.6 (0.71)	3.0 (0.84)	1.6 (0.70)
Males	176	3.2 (0.55)	1.6 (0.69)	2.8 (0.79)	1.4 (0.64)

Standard deviations given in parentheses

* Post-operative scores were at six months

employed and their occupations were recorded. Of the excluded patients, five patients were unemployed, three were disabled, and 174 were retired. Of the 297 patients included in the analysis, 222 were females and 75 were males. The majority of patients were categorised into the non-repetitive group (223) compared to 74 categorised into the repetitive group. A total of 389 CTD were performed with 214 on the right side and 175 on the left side. The mean age at operation was 48 years (range 24–76). In the non-repetitive group, 287 procedures were performed, with 102 in the repetitive group.

Statistical analysis

Statistical analysis was performed using STATA 9.2 (STATA Corp, Texas, USA). A power calculation was performed and this showed that 54 patients in each group were required to demonstrate a significant difference between the groups at a level of 5% significance with 80% power. Each procedure was considered independently for the analysis. The Kruskal-Wallis test was used to assess the differences in the mean scores between the different age groups. To test for differences between gender and occupation, the Mann Whitney-U test was used.

Results

Age and gender

The mean pre- and post-operative scores for the symptom-severity and functional-status scales for each age category

are provided in Table 1. Patients less than 59 years of age had the largest improvement in the symptom-severity score (mean score change 1.8), whereas, patients from 40 to 79 years of age had the largest improvement in the functional-status score (mean score change 1.5).

The mean differences for both the symptom-severity ($p=0.21$) and functional-status ($p=0.29$) scores amongst the four age categories were similar and we found no significant difference.

The mean pre- and post-operative scores for the symptom-severity and functional-status scales for each gender are provided in Table 2. The mean difference in symptom-severity and functional-status scores were 1.8 (standard deviation=0.91) and 1.5 (standard deviation=0.98) for females and 1.7 (standard deviation=0.89) and 1.4 (standard deviation=0.93) for males, respectively. We also found no difference between the symptom-severity ($p=0.66$) and functional-status ($p=0.40$) scores between females and males.

Overall, there was an improvement with the difference between pre- and post-operative scores being greater than 0.5 in 553 (91%) cases (mean difference 1.8, standard deviation 0.91) in the symptom-severity score and in 492 (81%) cases (mean difference 1.4, standard deviation 0.97) in the functional-status score at six months post surgery.

Occupation

The mean pre- and post-operative scores for the symptom-severity and functional-status scales for each occupation group are provided in Table 3. The mean differences for both the symptom-severity ($p=0.77$) and functional-status ($p=0.32$)

Table 3 Pre- and post-operative scores for occupation

Occupation	Number of procedures	Symptom-severity score		Functional-status score	
		Pre	Post*	Pre	Post*
Non-repetitive	287	3.4 (0.60)	1.6 (0.70)	2.9 (0.84)	1.5 (0.66)
Repetitive	102	3.3 (0.54)	1.5 (0.73)	2.7 (0.71)	1.4 (0.61)

Standard deviations given in parentheses

* Post-operative scores were at six months

scores between the two occupation groups were similar and we found no significant difference. The mean differences in the symptom-severity and functional-status scores were 1.8 (standard deviation 0.90) and 1.4 (standard deviation 0.97) for the non-repetitive group, respectively. Whereas, the mean differences in the symptom-severity and functional-status scores for the repetitive group were 1.8 (standard deviation 0.84) and 1.3 (standard deviation 0.82), respectively.

Discussion

Carpal tunnel syndrome is a common nerve entrapment syndrome in the general population, and results of surgical treatment for symptomatic CTS show an improvement in 70–95% of cases [11] with the benefits of surgery within six months [10]. The prevalence of CTS in the elderly population continues to rise as the population continues to age [5]. Previous studies have postulated that the underlying pathophysiological processes associated with CTS in the elderly may be different than in younger age groups [6]. Prolonged neurotrauma of the median nerve that may occur in elderly patients may be less able to recover on decompression [15]. In addition, elderly patients, in whom CTS is secondary to osteoarthritis of the wrist joint, may have less satisfactory outcomes following surgical decompression [7].

The aim of our study was to investigate the influence of age, gender, and occupation on the outcome of CTD from a single operator series to limit potential confounding factors that may be associated with inter-operator variability. We prospectively studied a patient cohort and utilised the Brigham Hospital carpal tunnel questionnaire which is a disease-specific outcome tool that has been validated.

In our study, we found that the least change in the symptom-severity score was in patients aged over 80 years. Wilgis et al. [17], in a large prospective study, compared outcomes after CTD in differing age groups and found a comparable level of improvement in the most elderly patients (>80 years) compared with all other age groups. Others such as Hobby et al. [6] and Weber and Rude [16] also found satisfactory outcomes in patients older than 60 years following CTD.

With regards to gender, we found no difference between female and male outcomes following CTD. Other studies have also found similar results with no gender related differences in surgical outcomes following CTD [6, 12].

In a large prospective study of 749 patients, Dias et al. [4] reported no clear association between CTS and work. Similarly, we found no difference in surgical outcomes following CTD between patients with repetitive and non-repetitive occupations.

Some of the limitations of this study are that we excluded a large number of patients from the occupation analysis because they were retired. We also did not consider whether patients had recently changed occupations and how long they had been employed in their current occupation. In addition, we considered bilateral cases in the same patient as two independent entities because bilateral decompressions were performed sequentially instead of simultaneously. It may well be that bilateral CTS may introduce confounding bias into symptomatology and post-operative recovery which is not present in cases of unilateral disease. Finally, we did not confirm our clinical diagnosis by performing nerve conduction studies on a majority of our patients.

In summary, we found that surgical outcomes were not influenced by age, gender, or occupation and most of the cases improved following CTD in our series of patients.

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