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ORIGINAL ARTICLE

Long-term result and patient reported outcome of wrist splint treatment for Carpal Tunnel Syndrome

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Abstract

Carpal tunnel syndrome (CTS) is the commonest peripheral neuropathy presenting to specialist hand and wrist clinics. This study investigated the long-term outcome of carpal tunnel syndrome treated with isolated night wrist splint and the factors determining the likelihood of success of this intervention. Seventy-five patients referred to a specialist hand clinic with CTS were given night wrist splint treatment for 3 months as per a previous study protocol. Fifty-two patients from this cohort did not wish to have surgery after wrist splint treatment and were followed for a further 33-month period. Baseline pain and numbness levels were recorded on a Visual Analogue Scale (VAS) using a questionnaire upon first presentation. A further questionnaire at 36 months reassessed pain and numbness levels, patients' satisfaction with the treatment, and whether they had subsequent surgical decompression. Of the patients who completed the follow-up questionnaire 33 months after their period of conservative management, 43% were successfully treated with splint treatment alone. There was no difference in the VAS for pain or numbness at the baseline and at 36 months between successful and failed treatment groups. Patients successfully treated with wrist splinting alone reported a higher level of satisfaction with their treatment compared to patients who failed wrist splint treatment or had surgical decompression. The results reinforce the previous recommendation on wrist splinting as a first-line treatment in the Primary Care setting. Referral to specialist hand and wrist clinics should be reserved for patients with symptoms refractory to this initial measure.

Key Words: Carpal Tunnel Syndrome, wrist splint, long-term outcome, patient reported outcome measure, treatment satisfaction

Introduction

Carpal tunnel syndrome (CTS) is one of the commonest conditions referred to a specialist hand clinic in the UK, with treatment options varying from conservative management to surgical decompression [1]. A previously study by the senior author demonstrated that CTS can be accurately diagnosed by General Practitioners (GPs) [2]. In addition, most patients did not wish to have surgery after a 3-month period of conservative management using a prefabricated Futuro splint at night. It had been suggested that immediate provision of a wrist splint could potentially improve cost-effectiveness and avoid unnecessary referral to secondary care services.

There is a paucity of reports on the long-term success of wrist splinting, with no studies following patients up beyond a 1-year period [3,4]. In order to ascertain the long-term success of wrist splinting, we prospectively studied our previous cohort of patients with confirmed CTS who did not wish to have surgery after using night splints for 3 months. Long-term results of treatment with night wrist splints were deemed successful if patients had no desire for surgery after an additional 33-month follow-up period.

For a secondary outcome measure, we used a patient-rated outcome questionnaire, to allow patients to score their symptoms (pain and numbness) and treatment satisfaction on a Visual Analogue Scale (VAS). We compared scores of the successful and unsuccessful treatment groups at presentation and again at 36 months to identify potential features that might be predicative of long-term success with wrist splinting for CTS.

Materials and methods

The cohort of patients for this study were referred over a 3-month period in 2008 to our specialist hand and wrist clinic from Primary Care services. The 75 patients with a diagnosis of CTS were all provided with night wrist splints until their follow-up at 3 months, as per our previous study protocol [2]. Based on their symptoms after the use of splints, the patients were asked to decide whether they wished to have surgery. Figure 1 details the overview of this study.

Patients who were happy with the splint treatment and did not want surgery at 3 months were asked to complete a questionnaire 33 months after their initial treatment period. The questionnaire was used to assess the severity of symptoms and overall satisfaction at presentation and at 33 months after finishing wrist splintage, i.e. 36 months from the time of first presentation, whether patients had subsequent surgical decompression or not. A VAS scale (0–10) was used to register patient's responses on the questionnaire.

Inclusion criteria were subjective symptoms (e.g. history of paraesthesia or pain in median nerve distribution, nocturnal pain, and dysaesthesia that improves with shaking of the hand), with positive Tinel's sign, Phalen's sign, or Flick sign, and a nerve conduction study if the clinical signs of carpal tunnel syndrome were inconclusive.

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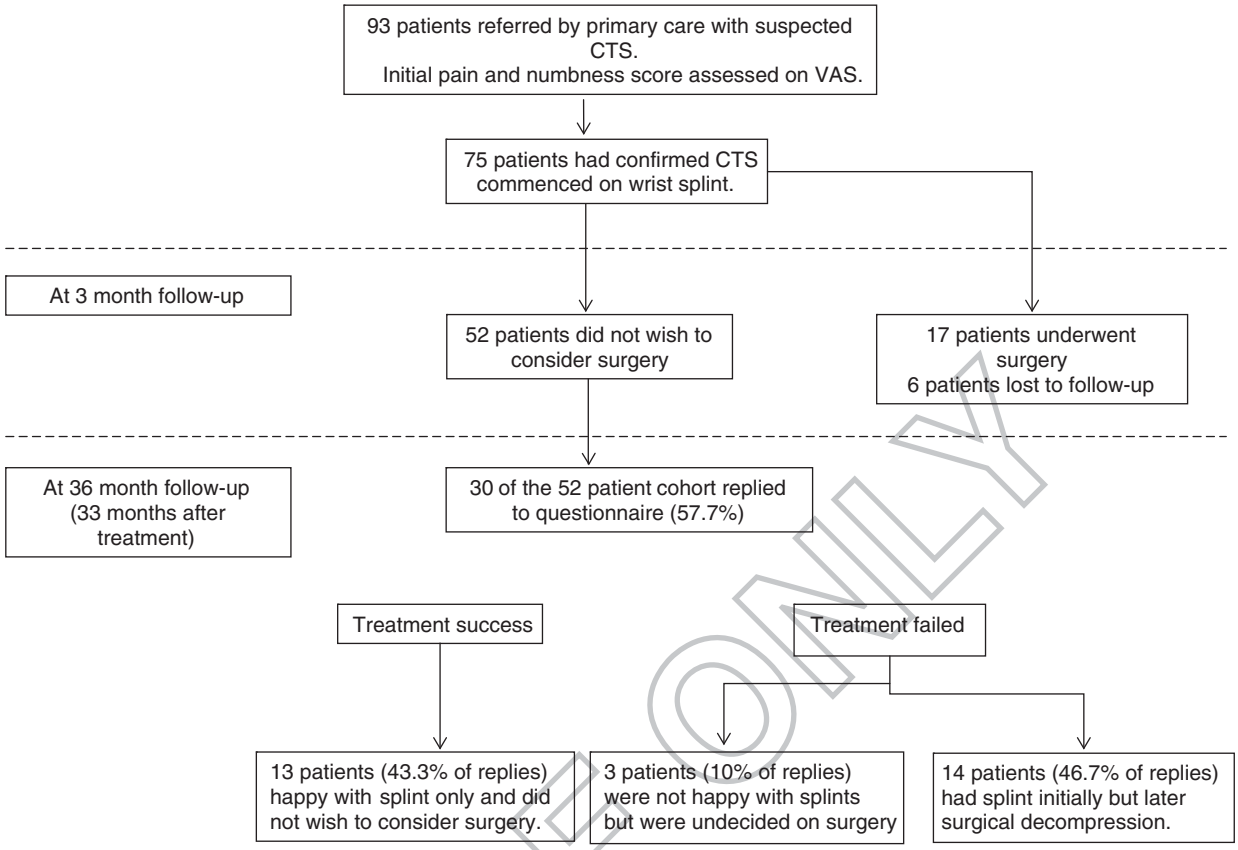

Figure 1. A flow diagram of the study.

Patients excluded from the study were those with underlying metabolic disorders including diabetes mellitus and thyroid disease, rheumatoid arthritis, previous history of steroid injection to the carpal tunnel, severe thenar atrophy, and pregnant women.

The mean scores for pre- and post-treatment pain and numbness as well as patient satisfaction ratings were analyzed using Mann-Whitney U-test (SPSS, IBM Inc.) to compare patients who were successful using splint treatment with those who failed.

Results

A total of 93 patients with suspected CTS were referred by Primary Care services to our specialist clinic over a 3-month period in 2008. CTS was confirmed by primary clinical signs or a nerve conduction study in 75 patients. The VAS scores on the severity of their pain and numbness were recorded and initially all patients were treated with wrist splinting. At the 3-month follow-up 52 of the 75 patients (69.3%) were satisfied with the results of wrist splinting and declined surgery.

Repeat questionnaires were sent out to the 52 patients, 33 months after their period of conservative management. Thirty patients (19 females and 11 males) replied to the questionnaire and were therefore included in this study. One patient with bilateral CTS completed all but the satisfaction rating. Twenty-nine patients, representing 38 individual cases of CTS, returned completed questionnaires regarding severity of pain, numbness, and overall satisfaction scores at 33 months after wrist splintage.

Thirteen patients, representing 17 cases of CTS, were successfully treated with 3 months of conservative measures and did not wish to be considered for surgical intervention at any point. One patient from this group reported complete symptom resolution in both wrists (scoring zero for pain and numbness), but did not complete satisfaction rating on the questionnaire. In concordance with our criteria we calculated the treatment success rate to be 43.3% in patients who replied to the questionnaire after 33 months. Assuming treatment failed in patients who did not reply to the questionnaire after 33 months, a minimum of 25.0% of the 52 patients were successfully managed conservatively.

In the group of 17 patients where conservative management was deemed to be a failure, 14 patients (representing 20 cases of CTS) underwent surgical decompression between 3–36 months after their initial treatment with wrist splinting and three patients (with three cases of CTS) who were dissatisfied with the splint treatment could still not commit to surgery after 33 months.

The mean scores for all patients were 6.4 for pain and 6.2 for numbness at the first clinic appointment. These reduced to 3.8 and 3.1 for pain and numbness, respectively, at 36 months. Tables I and II illustrate the mean scores for pain and numbness in patients who had successful and unsuccessful treatment outcomes. Patients who were successfully treated with conservative management had mean pre-treatment scores for pain and numbness of 6.3 and 5.4, respectively. At 33 months after splintage these were 3.8 and 2.7 for pain and numbness, respectively. In patients who were considered to have failed conservative management, the mean pre-treatment scores for

Table I. Patient reported mean pain scores at presentation and 33-month after wrist splint treatment between successful and failed treatment groups.

			Treatment failed		
Pain (VAS 0–10)	All patients (n = 30)	Treatment success, wrist splint only (n = 13)	All treatment failures (n = 17)	Undecided on surgery and dissatisfied with treatment (n = 3)	Wrist splint and subsequent surgical decompression (n = 14)
At presentation	6.4	6.3	6.5	4.7	6.8
At 33-months after wrist splint treatment	3.8	3.8	3.9	4.3	3.8

Table II. Patient reported mean numbness scores at presentation and 33-months after wrist splint treatment between successful and failed treatment groups.

			Treatment failed		
Numbness (VAS 0–10)	All patients (n = 30)	Treatment success, wrist splint only (n = 13)	All treatment failures (n = 17)	Undecided on surgery and dissatisfied with treatment (n = 3)	Wrist splint and subsequent surgical decompression (n = 14)
At presentation	6.2	5.4	6.8	3.3	7.4
At 33-months after wrist splint treatment	3.1	2.7	3.4	4.3	3.2

Table III. Patient reported mean satisfaction scores 33-months after wrist splint treatment between successful and failed treatment groups.

			Treatment failed		
Satisfaction (VAS 0–10)	All patients (n = 30)	Treatment success, wrist splint only (n = 12*)	All treatment failures (n = 17)	Undecided on surgery and dissatisfied with treatment (n = 3)	Wrist splint and subsequent surgical decompression (n = 14)
At 33-months after wrist splint treatment	8.0	9.2	7.1	1.0	8.1

*One patient did not complete satisfaction rating.

pain and numbness were 6.5 and 6.8, respectively. These decreased to 3.9 and 3.4, respectively, at 36 months, mostly in the operated sub-group.

There was no statistical difference in the initial pain score ($p = 0.934$) or subsequently at follow-up ($p = 0.901$) between the successful and failed treatment groups. Similarly, there was no statistical difference in the numbness scores between the two groups at baseline ($p = 0.175$) and at 36 months ($p = 0.618$).

Table III demonstrates the degree of patients' satisfaction with their treatment. The mean score for all 30 patients at 36 months was 8.0 out of 10 (with 10 being most satisfied). Of the 13 patients who had successful treatment with wrist splinting, one did not complete the questionnaire. In the remaining 12, the mean score was 9.2 out of 10.

Patients who failed conservative treatment had an overall satisfaction rating of 7.1, which was lower than the successful group and was statistically significant ($p < 0.05$). In addition, patients who were successfully treated with wrist splinting reported a higher level of satisfaction (9.2) compared to those who failed conservative treatment and subsequently needed surgical decompression (8.1). Patients with failed splint treatment but who could still not commit to surgery were the least satisfied (1.0).

Patients who were dissatisfied with their splint treatment but could still not commit to surgery after 33 months had, unsurprisingly, experienced worsening in the level of numbness (Table II). Their mean post-treatment score for numbness increased to 4.3 from a baseline of 3.3. Interestingly, their mean score for pain improved slightly from 4.7 to 4.3 (Table I).

Discussion

Our results demonstrate that 52 of 75 patients referred to our clinic with CTS were satisfied following 3 months of wrist splinting alone and13 of 30 patients followed up at 33 months after splinting treatment had good long-term results, both in terms of symptomatic relief and satisfaction. There does not appear to be a significant difference in pain or numbness between patients who were successfully treated with splints, compared with those who subsequently chose to undergo surgical decompression.

A previous study by Povlsen and Raymond [2] had shown that GP's are usually correct in clinically diagnosing CTS. Yet, a study by Wildin et al. [1] showed that there had been an increase in CTS referrals from GPs, and another by Burke et al. [5] highlighted that, among patients referred to specialist clinics with CTS, only 22.8% had received any prior non-operative treatment from their GPs. Many treatment modalities have been suggested for CTS, including the use of wrist splints, local steroid injection, oral steroid, and surgical decompression [6-11]. Previous studies have shown varying success rates in using these treatment options in isolation or in combination, with limited evidence for long-term success [4,6,11,12].

While surgical decompression of the carpal tunnel is indicated for severe cases, this has associated risks such as allodynia and neurovascular complications [13-15]. There is a recent trend in offering "One-stop" CTS clinics where patients are assessed by surgeons and neurophysiologists, following which those with confirmed CTS would have same-day surgery [16,17]. Although

this is targeted at alleviating the pressure on waiting lists, it is reported that the surgical complication rate could be as high as 21% [16].

In concordance with other studies [18-23], we thereby recommend wrist splinting as first line treatment for patients with all but the severest symptoms of CTS, in order to protect patients from the potential risks relating to decompression surgery and optimally manage secondary care resources. Those who are suspected to have CTS should be trialled with wrist splints by their GPs prior to their referral to the specialist clinics. For patients who were happy to continue with the wrist splints after the initial 3 months stage, the chance that this treatment alone would provide a satisfactory outcome could be as high as 43% after 3 years. However, it is also important to note that, in those who then demonstrate worsening levels of numbness, persevering with wrist splinting is likely to lead to dissatisfaction, and surgical decompression may be a more appropriate option at this stage.

Limitations of study

We acknowledge that there are limitations in this prospective cohort study. There were 22 patients lost to follow-up and this may have had an impact on the overall success rate of the treatment assuming that all missing patients had failed their treatment the revised success rate of splint treatment would drop from 43% to 25% after 3 years. Additionally, our questionnaire was developed within the department and therefore patient outcome evaluation was based on subjective findings. However, as all of these patients had CTS based on primary clinical signs with only a few needing nerve conduction studies, and the aim was to mirror resources immediately available to GP and in clinics, we feel that VAS was appropriate and adequate in this setting.

Conclusion

These results are the first to demonstrate the long-term success rate of wrist splinting in CTS, and they further support the recommendation that patients with signs and symptoms of CTS should have their initial management commenced at the Primary Care stage where they should be provided with wrist splints and booked for follow-up in order to review the clinical progress. If there is evidence of improvement in symptoms, conservative management can be continued. However, if the symptoms persist or worsen, patients can then be referred to hand surgery clinics for specialist consultations. This pathway that we propose is most likely to improve cost-effectiveness and reduce waiting times for specialist hand clinics.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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