Carpal tunnel decompression in primary care: what is the infection risk and is it effective?

V Palial¹, A Kheiran², S Siddiqui¹

¹Trauma and Orthopaedics, Kettering General Hospital NHS Foundation Trust, Kettering, UK

²Trauma and Orthopaedics, University Hospitals of Leicester NHS Trust, Leicester, UK

ABSTRACT

INTRODUCTION The demand for elective hand surgery in England is predicted to double by 2030 compared with 2011. With such increase in demand, the UK must seek strategies to reduce costs of treatment while still maintaining standards of care. Carpal tunnel decompression performed in a treatment room rather than in theatre may provide a safe alternative setting. As yet, there are no UK-based studies that identify the risk of infection following surgery performed in a treatment room and there are no studies whatsoever assessing the qualitative outcomes of patients undergoing hand surgery outside a theatre environment. Our aim was to assess whether carpal tunnel decompression performed in the community is safe, in terms of infection risk, and effective.

MATERIALS AND METHODS Patient outcome measures were prospectively recorded following carpal tunnel decompression in one single primary care centre performed by one surgeon from 2012 to 2017. Infection following surgery was evaluated for retrospectively.

RESULTS A total of 460 patients underwent carpal tunnel decompression within the study time period. There were three superficial infections identified, giving an infection rate of 0.65%. There were no deep infections identified. There was a statistically significant improvement in both symptom and functional outcomes following surgery, with results comparable to other studies where surgery was performed in theatre.

DISCUSSION We believe that carpal tunnel decompressions performed in a treatment room is both safe, in terms of infection risk, and effective. Surgeons should consider this location as an alternative setting to the main operating theatre.

KEYWORDS

Carpal tunnel syndrome – Carpal tunnel decompression

Accepted 23 February 2019

CORRESPONDENCE TO

Vishal Palial, E: Vishal.palial@gmail.com

Introduction

Carpal tunnel syndrome is the most common form of peripheral nerve entrapment with a prevalence of 7–16%.¹ In the UK, 281/100,000 patients per year present to their general practitioner with carpal tunnel syndrome.² Of these, 45–74/100,000 will go on to require a surgical decompression.³ Carpal tunnel decompression remains the most common hand operation carried out in the UK, with 53,000 procedures carried out in secondary care each year.⁴ With the increasing prevalence of predisposing factors such as diabetes and obesity and with an aging population, the demand for elective hand surgery in England is predicted to double by 2030 compared with 2011.⁵ With such increase in demand, the UK must seek strategies to reduce costs of treatment while still maintaining standards of care.

Several studies confirm the low incidence of infection following carpal tunnel decompression. Werner *et al* reported an overall infection rate of 0.32% in over 450,000

patients and highlighted younger age, male sex, obesity, tobacco use, alcohol use and medical comorbidities as independent risk factors.⁶ Harness *et al* reported an overall infection rate of 0.7% in 917 patients undergoing the procedure without the routine use of antibiotic prophylaxis.⁷ The infection rate following carpal tunnel decompression performed in a community setting is less well reported. LeBlanc *et al* highlighted their Canadian experience following a prospective study of over 1500 patients who underwent carpal tunnel surgery in a minor procedure room. The results of their study demonstrate a superficial infection rate of 0.4% and a deep infection rate of 0%.⁸

At present, no studies from the UK have reported the incidence of infection following carpal tunnel decompression performed in a community setting. Furthermore, no studies whatsoever have reported the qualitative outcomes following this procedure when performed in primary care. Humphreys *et al* published guidelines in 2011 on the facilities required for minor surgical procedures (including carpal tunnel decompression) carried out in the UK.⁹ By the

authors' own admission, there is an absence of good data on the risk of infection after minor surgical procedures performed in primary care and prospective surveillance is required.

Our aim in this study was to identify the incidence of infection following carpal tunnel decompression when performed in a primary care setting and to assess the qualitative outcomes following the procedure via patient reported outcome measures.

Materials and methods

All patients undergoing open carpal tunnel decompression in one single primary care centre performed by a single consultant orthopaedic surgeon between January 2012 and August 2017 were reviewed. The treatment room in this primary care centre did not have mechanical ventilation, only natural ventilation. Patients were seen on the day of the procedure by the operating surgeon. Symptoms and examination findings were corroborated with nerve conduction and electromyography studies, which were performed in all patients. All procedures were performed with the use of a tourniquet under local anaesthesia and without the use of antibiotic prophylaxis. The hand was prepared and isolated with field sterility. The surgeon was masked in addition to wearing a sterile gown and gloves. The operation was performed using single use sterile instruments. The skin incision was closed with a non-absorbable monofilament interrupted suture and patients were reviewed at their own general practice two weeks following surgery for removal of the sutures and wound assessment.

All identified patients within the study period were asked to complete the Boston Carpal Tunnel Syndrome questionnaire (BCTQ). The BCTQ is a validated patient-based outcome measure of symptom and functional status specific to patients with carpal tunnel syndrome.¹⁰ This was completed before surgery and again at six months following surgery via postal questionnaire. Patients who had bilateral procedures, either on the same day or in two separate episodes, were asked to complete separate questionnaires relating to each hand. To avoid disproportionate weighting of results from patients who had bilateral procedures, the scores for each hand were combined and then averaged before inclusion into the results. Age at surgery, sex and handedness were also collected.

Infection rates were retrospectively collected using SystmOne (Phoenix Partnership). SystmOne is an online national clinical information system used to track patients' clinical activities and treatments. A log of an antibiotic prescription within six weeks following surgery was deemed secondary to a postoperative infection. Additionally, all patients who underwent the procedure were screened using the hospital's electronic medical records system and theatre administrative database. This was to identify patients admitted to hospital who required intravenous antibiotics or who underwent surgical debridement in theatre. A superficial infection was defined as an infection treated by antibiotics, either enteral or intravenous. A deep

infection was defined as a collection requiring surgical debridement in theatre. Patient consent to participate in the study was obtained at the time of surgery. All patients undergoing the procedure within the study period were included. Patients who could not be identified on SystmOne were excluded from the infection rate aspect of the study. Patients who returned incomplete questionnaires at six months were excluded from the qualitative aspect of the study. Independent and paired t-test statistical analysis using SPSS version 23 was performed to test significance of qualitative outcomes.

Results

A total of 460 consecutive carpal tunnel decompression cases were identified from January 2012 to August 2017. All patients were able to be identified on the SystmOne database. Of these, three superficial infections requiring treatment with antibiotics were identified resulting in a superficial infection rate of 0.65%. There were no deep infections identified.

A total of 318 patients had responded to the post-surgical questionnaire at six months. This provided a response rate of 69% of total recruited patients. Of the total, 17 patients had bilateral procedures. The average age at time of surgery was 59 years (range 26–94 years). Seventy per cent of cases were female. Sixty-two per cent of patients had surgery on their dominant hand.

The BCTQ scores, both pre- and postoperatively, in addition to the overall improvement in scores, are shown in Table 1. The results show a statistically significant improvement in both the symptom and functional severity scores. The mean symptom severity score preoperatively was 3.11 (1 no symptoms, 5 most severe). This improved to 1.66 postoperatively (paired t-test; $P < 0.0001$). The mean functional severity score preoperatively was 2.79, which improved to 1.63 postoperatively (paired t-test; $P < 0.0001$). Increasing age at time of surgery revealed a trend of decreasing improvement in overall score. After the age of 60 years, the improvement following surgery was statistically less compared with surgery undertaken in patients younger than 60 years (independent t-test; $P = 0.012$). Combined symptom severity and functional improvement scores by age and gender are tabulated in Table 2.

Discussion

Our infection rates from primary care based carpal tunnel decompressions are comparable with other published reports both from secondary care institutions and minor treatment room settings. This case series underpins that carpal tunnel decompression is inherently safe, even when performed in a treatment room without mechanical ventilation found in operating rooms. Furthermore, our case series highlights the low infection rates without the routine use of antibiotic prophylaxis. Although establishing safety in terms of infection risk has been addressed in this study, other variables that would also confer safety such as risk of nerve injury, reoperation rate, and postoperative complex

Table 1 Symptom and functional severity scores pre- and postoperatively and improvement in scores.

Score	Preoperative		Postoperative		Improvement	
	Mean ($\pm$ SD)	Range	Mean ($\pm$ SD)	Range	Mean ($\pm$ SD)	Range
Symptom	3.11 ($\pm$ 0.68)	1–4.91	1.66 ($\pm$ 0.79)	1–4.73	1.44 ($\pm$ 0.77)	–0.73–3.36
Functional	2.79 ($\pm$ 0.77)	1–4.75	1.63 ($\pm$ 0.78)	1–4.50	1.17 ($\pm$ 0.74)	–0.75–3.25
Total	5.90 ($\pm$ 1.35)	2.64–9.41	3.30 ($\pm$ 1.52)	2–9.23	2.61 ($\pm$ 1.39)	–1.48–6.61

Table 2 Combined mean improvement score in relation to age and sex.

Patients (n) ^a		Improvement	
		Mean ($\pm$ SD)	Range
Age (years):			
< 40	29	1.33 ($\pm$ 0.63)	0.03–2.92
41–50	62	1.55 ($\pm$ 0.54)	0.76–3.31
51–60	84	1.41 ($\pm$ 0.58)	0.31–3.00
61–70	57	1.27 ($\pm$ 0.62)	–0.11–2.63
71–80	53	1.33 ($\pm$ 0.66)	–0.02–3.09
> 80	33	1.06 ($\pm$ 0.53)	–0.7–1.91
Sex:			
Male	96	1.26 ($\pm$ 0.63)	–0.35–2.56
Female	222	1.30 ($\pm$ 0.70)	–0.74–3.31

^aN = 318.

regional pain syndrome have not been considered. It is the authors' suggestion that these individual parts that make up the overall safety profile of carpal tunnel decompression is related more to the treatment itself rather than the setting in which it is delivered.

There are, however, limitations in the study design which makes the true incidence of infection difficult to establish. As patients were seen in their own general practice following surgery and not by the operating surgeon, the threshold of prescribing antibiotics for a suspected infection maybe different among general practitioners from that of the surgeon themselves. The lack of a single decision maker when diagnosing an infection introduces subjective bias, which was not adjusted for in this study. In addition to the biases in diagnosing an infection, difficulties were encountered in the collection of data itself. SystemOne captures prescriptions from general practitioners and walk-in-centres but not prescriptions issued from other hospitals. If a patient were to present to a hospital other than the local hospital where data collection was being performed the infection rate recorded will be an underestimation. It is the authors' suggestion that the likelihood of this is low and will have little overall impact to the results observed.

Our case series is the first to consider the symptom and functional improvement scores in this group of patients. Our results show a statistically significant improvement in both symptom and functional severity scores in this operated group. Our results are favourable when compared with other published reports using the BCTQ as an outcome measure.¹¹ Patients beyond the age of 60 years were found to have more minor improvement in scores. It is the authors' suggestion that this could be due to confounding comorbidities in the hand that are probably not related to the setting of treatment.

The cost effectiveness of this model of treatment is outside the scope of this study. Establishing true costs is difficult as staff costs and overheads are difficult to quantify. Rationing theatre time for patients who require a theatre 'team' including an anaesthetist rather than part of the list consumed by surgery performed under surgeon-delivered local anaesthesia would probably increase theatre efficiency and costs.

The NHS is under significant financial pressure with a net deficit for the 2015/16 financial year of £1.851 billion.¹² As alluded to earlier, the burden of elective hand surgery in the UK is set to increase significantly. Transferring the setting of care from the operating room to a treatment room, be it in primary or secondary care, is likely to reduce its burden to the NHS. Further prospective research to further validate this study's findings and to explore the cost effectiveness of this model of treatment in the UK is suggested.

References

1. British Society for Surgery of the Hand, British Orthopaedic Association, Royal College of Surgeons of England. *Commissioning Guide: Treatment of Carpal Tunnel Syndrome*. London: RCS; 2017.
2. Latinovic R, Gulliford MC, Hughes RA. Incidence of common compressive neuropathies in primary care. *J Neurol Neurosurg Psychiatry* 2006; **77**(2): 263–265.
3. Aroori S, Spence RA. Carpal tunnel syndrome. *Ulster Med J* 2008; **77**(1): 6–17.
4. NHS Digital. *Hospital Episode Statistics 2011/12*. Leeds: Information Centre NHS; 2012.
5. Bebbington E, Furniss D. Linear regression analysis of Hospital Episode Statistics predicts a large increase in demand for elective hand surgery in England. *J Plast Reconstr Aesthet Surg* 2015; **68**(2): 243–251.
6. Werner BC, Teran VA, Deal DN. Patient-related risk factors for infection following open carpal tunnel release: an analysis of over 450,000 Medicare patients. *J Hand Surg Am* 2018; **43**(3): 214–219.
7. Harness NG, Inacio MC, Pfeil FF, Paxton LW. Rate of infection after carpal tunnel release surgery and effect of antibiotic prophylaxis. *J Hand Surg Am* 2010; **35**(2): 189–196.

-
8. Leblanc MR, Lalonde J, Lalonde DH. A detailed cost and efficiency analysis of performing carpal tunnel surgery in the main operating room versus the ambulatory setting in Canada. *Hand (N Y)* 2007; **2(4)**: 173–178.
 9. Humphreys H, Coia JE, Stacey A *et al*; Healthcare Infection Society. Guidelines on the facilities required for minor surgical procedures and minimal access interventions. *J Hosp Infect* 2012; **80(2)**: 103–109.
 10. Leite JC, Jerosch-Herold C, Song F. A systematic review of the psychometric properties of the Boston Carpal Tunnel Questionnaire. *BMC Musculoskelet Disord* 2006; **7**: 78.
 11. Reid MJ, David LA, Nicholl JE. A one-stop carpal tunnel clinic. *Ann R Coll Surg Engl* 2009; **91(4)**: 301–304.
 12. NHS Confederation. NHS statistics, facts and figures. www.nhsconfed.org/resources/key-statistics-on-the-nhs (cited March 2019).