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Original Article

Surgery vs. Local injections in Carpal Tunnel syndrome. Study in Routine Clinical Practice in a Primary Care Centre

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ABSTRACT

Background: Carpal Tunnel Syndrome (CTS) is a prevalent entrapment neuropathy that significantly impacts patients' quality of life. Traditional treatment modalities include local corticosteroid injections (I) and surgery (S), with varying degrees of efficacy reported in the literature. Despite numerous studies, the relative effectiveness of these treatments in routine clinical practice remains inadequately explored.

Objective: To compare the effectiveness of local injections versus surgery in the treatment of CTS within a primary care context, emphasizing the outcomes in a real-world clinical setting.

Methods: This prospective observational study included 160 naïve patients with idiopathic CTS treated in the 4th Sanitary Area of Madrid. Participants were allocated to receive either local injections of triamcinolone acetonide (I) or surgical treatment (S) based on patient-physician consensus. The primary outcomes measured were changes in the Visual Analogue Scale (VAS) for pain, Functional Status Scale, and Symptoms Severity Scale from baseline to 6 and 26 weeks post-treatment. Statistical significance was determined using Student's T-test and paired samples T-test.

Results: At baseline, both groups were comparable in terms of demographic and clinical characteristics. By the 6-week follow-up, the I group demonstrated a significant reduction in pain VAS (56.2, CI 50.9–61.6, p<0.001), improved functional status (1.25, CI 1.08–1.43, p<0.001), and decreased symptoms severity (1.97, CI 1.79–2.16, p<0.001) compared to the S group. However, at the 26-week follow-up, there were no significant differences between the two groups in pain VAS reduction (I: 52.8, CI 46.1–59.4 vs. S: 46.3, CI 39.3–53.3, p=0.196), functional status improvement (I: 1.16, CI 0.95–1.36 vs. S: 1.24, CI 0.99–1.48, p=0.601), or symptoms severity decrease (I: 1.88, CI 1.64–2.13 vs. S: 1.96, CI 1.70–2.21, p=0.662).

Conclusion: In the short term, local corticosteroid injections offer a significant advantage over surgery in alleviating the symptoms of CTS, as evidenced by improvements in pain, functional status, and symptoms severity. However, these differences diminish over time, with both treatments showing comparable effectiveness at 26 weeks. These findings highlight the importance of personalized treatment strategies in managing CTS and underscore the potential for early intervention in a primary care setting to effectively address this condition.

Keywords: Carpal Tunnel Syndrome, Local Injections, Surgery, Primary Care, Treatment Efficacy, Real-World Evidence.

INTRODUCTION

Carpal tunnel syndrome (CTS) represents the pinnacle of entrapment neuropathies, holding a notorious rank for its prevalence and impact on the quality of life. It manifests through hallmark symptoms of median nerve irritation as it courses under the transverse carpal ligament, encompassing numbness, pain in the hand, and particularly aggravated disturbances during nocturnal periods. These clinical manifestations not only deteriorate nocturnal rest, leading to consequential daytime fatigue, but also profoundly affect patients' overall well-being, potentially exacerbating or alleviating associated psychological burdens such as anxiety and depression

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(1, 2). The traditional therapeutic arsenal against CTS has predominantly featured local corticosteroid injections and surgical interventions, each carrying its merits and limitations in clinical practice (3, 4).

In the realm of evidence-based medicine, the comparative efficacy and safety of these treatments have been subjects of investigation. Notably, a pioneering randomized clinical trial conducted by our group in 2005 broke new ground by juxtaposing the outcomes of corticosteroid injections and surgical treatment in the management of idiopathic CTS. This landmark study, alongside a subsequent trial published within the same year, established a parity between the two interventions regarding their effectiveness and safety profiles at 6 and 12 months of follow-up (3-5). Despite these significant contributions, the translation of randomized controlled trial outcomes to routine clinical practice remains a chasm yet to be bridged comprehensively. This discernible gap underscores a compelling need for prospective studies to validate the generalizability of such findings in everyday clinical settings (5).

Addressing this imperative, we embarked on a meticulously designed observational study, tracking the clinical trajectories of 160 consecutive patients subjected to either corticosteroid injections or surgical treatment for CTS within the purview of routine practice. This initiative not only aims to scrutinize the real-world applicability of the aforementioned interventions but also endeavors to situate our findings within the broader context of existing randomized clinical evidence (4). Through this comparative analysis, our study aspires to elucidate the optimal therapeutic strategy for CTS, thereby enriching the corpus of knowledge with pragmatic insights that align with the dynamics of routine clinical practice.

MATERIAL AND METHODS

The methodology section outlines the framework of a prospective observational study conducted within a primary care setting in the 4th Sanitary Area of Madrid, aiming to evaluate the effectiveness of surgery versus local injections in the treatment of Carpal Tunnel Syndrome (CTS) under routine clinical practice conditions. Ethical approval was granted by the Ethics Committee at "Ramón y Cajal" Hospital (ID: GANDHI 04/01), ensuring adherence to ethical standards and informed consent was obtained from all participants, reflecting the study's commitment to ethical integrity.

The study population consisted of naive patients aged 18 and older, presenting with symptoms indicative of idiopathic CTS for a minimum duration of three months, and who had shown an inadequate response to initial conservative treatments, including splinting and nonsteroidal anti-inflammatory drugs (NSAIDs) for at least two weeks. Exclusion criteria were established to omit cases with severe or secondary CTS, including factors such as thenar atrophy, previous carpal tunnel release surgery, prior local injections, pregnancy, diabetes mellitus, hypothyroidism, inflammatory arthropathy, polyneuropathy, or concurrent ulnar nerve affection as detected in electrodiagnostic testing.

All participants underwent a comprehensive evaluation conducted by a single investigator, incorporating a detailed clinical history and physical examination tailored to diagnose CTS. This was followed by neurophysiological assessment performed by a designated neurophysiologist, adhering to Kimura's criteria for CTS confirmation. The diagnostic criteria included specific thresholds for motor latency and sensory conduction velocity deviations from the norm, ensuring a rigorous and objective diagnosis (6).

Upon neurophysiological confirmation of CTS, patients were presented with treatment options, selecting between surgery (S) or local injections (I) based on a thorough discussion of the advantages and limitations of each approach. For patients with bilateral symptoms, only the more severely affected wrist was included in the study. Surgical interventions were uniformly executed via a limited palmar incision technique by the same plastic surgeon, emphasizing standardization and consistency in the surgical approach. Local injections involved the administration of triamcinolone acetonide by the investigating physician, ensuring uniformity in the non-surgical treatment methodology as well. The study employed widely recognized tools for assessing CTS outcomes, including the Visual Analogue Scale (VAS) for pain and the Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ), encompassing both symptom severity and functional status subscales. These instruments facilitated a comprehensive evaluation of therapeutic effectiveness across multiple dimensions of patient experience (7-8).

Participants were monitored through a series of follow-up visits at 6, 14, and 26 weeks post-treatment, allowing for a dynamic assessment of treatment outcomes over time. Statistical analyses employed included Student's T-test for independent samples to compare baseline characteristics between groups and paired samples T-test to evaluate within-group progress, adopting a significance threshold of $p < 0.05$.

RESULTS

The study meticulously contrasts the baseline characteristics and efficacy of surgical (S) versus injection (I) treatments for Carpal Tunnel Syndrome (CTS), across two pivotal timelines: 6 weeks and 26 weeks post-treatment. Let's distill this rich dataset into a coherent narrative and a refined tabulated format for enhanced comprehension.

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The baseline comparison between the two cohorts—surgical and injection treatments—reveals a striking homogeneity in demographic and clinical attributes. Both groups exhibit a mean age of approximately 55 years, with a predominantly female demographic (S: 87.9%, I: 87.2%). Bilaterality of symptoms was similarly high in both cohorts, and the median duration of symptom evolution stood at 24 months for both groups. The functional status scale, symptoms severity scale (with a 95% confidence interval), and the visual analogue scale (VAS) for pain at baseline did not show statistically significant differences, emphasizing the comparability of the groups at the outset.

At the 6-week mark, the treatment efficacy was evaluated based on changes in the pain VAS, functional status, and symptoms severity from baseline. The injection group showcased superior improvements across all parameters when compared to the surgical group. Specifically, the reduction in pain VAS, improvement in functional status, and alleviation in symptoms severity were all statistically significant in favor of the injection treatment.

By the 26-week follow-up, the distinctions in treatment efficacy between the surgical and injection groups had largely equalized. The differences in pain VAS reduction, functional status improvement, and symptoms severity alleviation from baseline were no longer statistically significant, indicating comparable outcomes between the two treatment modalities over a longer term.

Table 1 Baseline Characteristics and Efficacy Outcomes

Parameter	Surgery	Injection	P-Value (6 weeks)	P-Value (26 weeks)
Mean Age (years)	55.3	55.5	NS	-
Female (%)	87.9%	87.2%	NS	-
Bilaterality (%)	95.5%	92.6%	NS	-
Time Evolution (months)	24	24	NS	-
Functional Status Scale	2.74	2.63	NS	-
Symptoms Severity Scale	3.35	3.41	NS	-
Pain VAS	57.7	68.4	0.002	-
Difference in Pain VAS (6 weeks)	27.1 (21.1 – 33.1)	56.2 (50.9 – 61.6)	<0.001	-
Difference in Functional Status (6 weeks)	0.48 (0.28 – 0.69)	1.25 (1.08 – 1.43)	<0.001	-
Difference in Symptoms Severity (6 weeks)	1.20 (0.95 – 1.45)	1.97 (1.79 – 2.16)	<0.001	-
Difference in Pain VAS (26 weeks)	46.3 (39.3 – 53.3)	52.8 (46.1 – 59.4)	-	0.196
Difference in Functional Status (26 weeks)	1.24 (0.99 – 1.48)	1.16 (0.95 – 1.36)	-	0.601
Difference in Symptoms Severity (26 weeks)	1.96 (1.70 – 2.21)	1.88 (1.64 – 2.13)	-	0.662

NS: Non-significant

This detailed breakdown and refined tabulation illustrate the nuanced outcomes of the two predominant CTS treatments, underlining the immediate superiority of injections over surgery at the 6-week interval. However, by the 26-week mark, the effectiveness of both interventions aligns, suggesting comparable long-term benefits. This nuanced understanding aids clinicians and patients alike in making informed treatment decisions tailored to individual patient profiles and temporal expectations.

DISCUSSION

In an unprecedented endeavor conducted in routine clinical practice, this study embarked on a comparative analysis of the two most prevalent treatments for Carpal Tunnel Syndrome (CTS)—surgery (S) and local injections (I). The initial assessment underscored a parity among participants across various demographics and clinical measures, with the singular exception of the baseline Visual Analogue Scale (VAS) for pain, which was notably higher in the injection group. This discrepancy likely reflects a bias towards selecting a treatment perceived to offer quicker symptomatic relief, particularly among patients experiencing more severe pain, hence the larger cohort opting for injections over surgery (9).

The effectiveness of both treatments was markedly evident, yet the 6-week follow-up heralded a clear advantage for the injection group in terms of pain reduction and improvements in both functional status and symptom severity, as measured by the Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ). This trend, however, converged by the 26-week mark, illustrating a comparable efficacy between the two modalities over a longer timeframe. Despite its novel insights, the study acknowledges inherent limitations, notably its non-randomized design inherent to clinical practice settings, and the short duration of follow-up, which capped at 6 months. The higher baseline pain VAS in the injection group, a potential confounder, underscores the nuanced interplay between patient symptomatology and treatment choice, warranting cautious interpretation of the early advantage seen with injections (10).

The study's strengths are multifaceted, boasting a robust sample size drawn from a substantial patient pool, and the consistency of

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care and treatment delivery by dedicated practitioners. This homogeneity, along with the inclusion criteria's focus on naïve patients, lends credibility and relevance to the findings (10-13).

Drawing parallels with earlier randomized trials, this study's outcomes resonate with the established narrative of both surgeries and injections as highly effective CTS treatments. Notably, the injection group's superior early outcomes align with expectations, given the immediate relief often associated with corticosteroid injections, juxtaposed against the delayed recovery trajectory inherent to surgical interventions due to postoperative factors such as scarring (14-17). The convergence of efficacy observed at the 26-week juncture aligns more closely with this study's precedent findings rather than divergent outcomes reported in other specialized settings, suggesting the influence of patient selection and care environment on treatment outcomes. The comparison with Hui's study, involving a different patient recruitment strategy, highlights the potential variability in treatment response based on the clinical setting and patient population (18).

This comprehensive analysis, set against the backdrop of real-world clinical practice, not only reinforces the value of local injections as a pivotal treatment strategy for CTS but also posits these findings as particularly applicable to primary care settings where CTS presentations are often less severe and of shorter duration (19). The corroborative evidence from this and previous studies underscores the utility and efficacy of corticosteroid injections in the CTS treatment paradigm, thereby enriching the clinical dialogue and informing practice in primary care environments (20).

CONCLUSION

The study illuminates the efficacy of both local corticosteroid injections (I) and surgery (S) in treating Carpal Tunnel Syndrome (CTS), with the former showing superior short-term benefits at 6 weeks, which then align with the outcomes of surgery at the 26-week evaluation. This underscores the importance of a personalized treatment approach, taking into account the complexity of CTS, which involves an interplay of clinical manifestations and individual patient circumstances. The findings advocate for further exploration through randomized clinical trials and practical studies across diverse geographic and clinical settings, emphasizing the role of primary care in initiating early treatment. Such research could transform the current paradigm, potentially reducing the duration of patient suffering and obviating the need for specialist intervention in certain cases, thereby having profound implications for healthcare delivery and patient quality of life.

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