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Association Between Guyon's Canal Syndrome and Hypothenar Muscle Weakness Among Call Center Agents: A Cross-Sectional Study

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ABSTRACT

Guyon's Canal Syndrome is an ulnar nerve entrapment often caused by repetitive wrist use and poor ergonomics. **Objectives:** To investigate the association between Guyon's Canal Syndrome and hypothenar muscle weakness among call center agents. **Methods:** This cross-sectional study was conducted on 56 participants using convenience sampling. The study was completed within six months. Data were collected from call center agents in Lahore using Tinel's sign to assess ulnar nerve irritation, and testing of the hypothenar muscles, abductor digiti minimi, and opponens digiti minimi was performed using Manual Muscle Testing (MMT). **Results:** A positive Tinel test was noted in 83.9% of subjects. MMT revealed that 60.7% exhibited grade 4 and 35.7% displayed grade 5 strength in the abductor digiti minimi, while 66.1% showed grade 4 and 28.6% demonstrated grade 5 strength in the opponens digiti minimi. A notable negative correlation emerged between Tinel test outcomes and abductor digiti minimi strength ($r = -0.442$, $p < 0.001$), whereas the correlation with opponens digiti minimi strength was not statistically significant ($r = -0.190$, $p = 0.064$). **Conclusions:** The study found a significant negative correlation between Tinel test results and abductor digiti minimi strength.

INTRODUCTION

The evolution of the modern workplace into a digital and work-from-home environment has exposed millions of workers worldwide to work-related musculoskeletal disorders (WMSDs) [1]. Hypothenar muscle weakness occurs when the muscles on the side of the little finger—primarily the abductor digiti minimi, flexor digiti minimi brevis, and opponens digiti minimi fail to function properly; these muscles are supplied by the ulnar nerve and are essential for controlling little finger movements [2]. Repeated wrist flexion and extension, repetitive finger movements, and prolonged pressure from the palm on hard surfaces can cause ulnar nerve entrapment in Guyon's Canal, leading to progressive motor deficits of the

hypothenar muscles [3]. The call center sector, characterized by prolonged sitting, static wrist postures, extensive keyboard and mouse use, and telecommunication device handling, places employees at high risk for nerve compression syndromes such as carpal tunnel syndrome and Guyon's Canal Syndrome [1, 3]. Factors such as acute injury, repetitive minor trauma, and certain work demands may also predispose individuals to hypertrophy of variant muscles, further contributing to nerve compression [4]. Despite extensive research on WMSDs, limited studies have focused on ulnar nerve conditions like Guyon's Canal Syndrome. Call center employees' prolonged static wrist positions and repetitive



hand movements make them particularly susceptible to hypothenar muscle weakness due to ulnar nerve compression, highlighting the need to investigate the association between Guyon's Canal Syndrome and hypothenar muscle weakness in this population.

This study aimed to determine the association between Guyon canal syndrome and hypothenar muscle weakness in call center agents.

METHODS

This cross-sectional study was conducted over six months, from January 2025 to June 2025, after obtaining ethical approval from the institutional ethical committee of Hajvery University Lahore, Pakistan (Ref. No. HU-ECRB-DPT-2025-59). A total of 56 participants were recruited using convenience sampling, with the sample size calculated via Rao software [5]. Data were collected from call center agents in Lahore who were aged 25–40 years and had at least six months of work experience in the call center. Participants included those reporting symptoms of hand pain, numbness, or weakness. Informed written consent was obtained from all the participants. Exclusion criteria were a previous history of traumatic hand injuries, prior hand or wrist surgery, or refusal to participate. Assessment tools included Tinel's test and Manual Muscle Testing (MMT). Tinel's Sign was performed by gently tapping over Guyon's canal at the wrist, with a positive sign indicated by tingling or paresthesia along the ulnar nerve distribution (ring and little fingers). MMT was used to evaluate the strength of hypothenar muscles, specifically the abductor digiti minimi (ADM) and opponens digiti minimi (ODM). For ADM testing, participants abducted the little finger away from the ring finger while resistance was applied laterally at the fifth digit; for ODM testing, participants opposed the little finger toward the thumb while resistance was applied at the fifth metacarpal in a dorsolateral direction. Muscle strength was graded from 0 (no contraction) to 5 (movement against gravity with maximal resistance). Data were analyzed using SPSS version 26.0, and the Chi-square test was applied to determine the association between Tinel's test outcomes and hypothenar muscle strength (ADM and ODM), with p -values <0.05 considered statistically significant.

RESULTS

The research involved 56 individuals with an average age of 29.21 ± 4.75 years (Table 1).

Table 1: Demographics of Age

Variable	Mean \pm Sd
Age	29.21 \pm 4.75

Most participants were male (80%) and right-handed (75%). The majority had 1 to 5 years of professional experience

(66%) and spent 7 to 10 hours at work each day (75%). A positive Tinel test was observed in 83.9% of subjects. Manual muscle assessment showed that 60.7% exhibited grade 4 and 35.7% exhibited grade 5 strength in the abductor digiti minimi, while 66.1% showed grade 4 and 28.6% showed grade 5 strength in the opponens digiti minimi (Table 2).

Table 2: Frequency and Percentage of Gender, Dominant Hand, Years of Experience, Working Hours, Tinel Test, and MMT (N = 56)

Variables	Category	Frequency (%)
Gender	Male	45 (80%)
	Female	11 (19.6%)
Dominant Hand	Right	42 (75%)
	Left	14 (25%)
Years of Experience	1–5	37 (66%)
	6–10	17 (30.4%)
	10–15	2 (3.6%)
Working Hours/day	2–6	5 (8.9%)
	7–10	42 (75%)
	11–16	9 (16.1%)
Tinel Test	Positive	47 (83.9%)
	Negative	9 (16.1%)
Abductor Digiti Minimi (ADM)	0 – No contraction	0 (0%)
	1 – Flicker	0 (0%)
	2 – Movement with gravity eliminated	0 (0%)
	3 – Movement against gravity	2 (3.6%)
	4 – Movement against resistance	34 (60.7%)
	5 – Normal strength	20 (35.7%)
Opponens Digiti Minimi (ODM)	0 – No contraction	0 (0%)
	1 – Flicker	0 (0%)
	2 – Movement with gravity eliminated	0 (0%)
	3 – Movement against gravity	3 (5.4%)
	4 – Movement against resistance	37 (66.1%)
	5 – Normal strength	16 (28.6%)

A notable negative correlation was found between Tinel test outcomes and abductor digiti minimi strength ($r = -0.442$, $p < 0.001$), whereas the correlation with opponens digiti minimi strength was not statistically significant ($r = -0.190$, $p = 0.064$) (Table 3).

Table 3: Association Between Tinel Test and Hypothenar Muscle

Muscle	r-Value	p-Value
Abductor digiti minimi	-0.442	<0.001
Opponens digiti minimi	-0.190	0.064

DISCUSSION

The present study investigated the association between Guyon's Canal Syndrome and hypothenar muscle weakness, as assessed by Tinel's tests, among call center agents. Although the Tinel's sign was positive in a large number of cases (83.9%), suggesting potential involvement of the ulnar nerve, our results showed an inconsistent correlation with motor strength, where the

correlation with abductor digiti minimi was moderate and significant, whereas with opponens digiti minimi it was weak and not statistically significant. These findings indicate that the level and/or presence of motor weakness is low even when sensory symptoms are present. This is consistent with previous reviews indicating that sensory impairments, including numbness and tingling, are the most frequently described and consistent symptoms in early-stage entrapment syndromes, whereas motor deficits, including weakness or atrophy, occur later and in fewer affected patients [6]. In early-stage entrapment syndromes such as GCS, the sensitivity of manual muscle testing may be insufficient to detect subtle neuromuscular compromise [6]. Repetitive biomechanical exposures have been significantly associated with ulnar nerve abnormalities diagnosed by nerve conduction studies (NCS); however, clinical signs such as muscle weakness are often less clear and inconsistent in patients with early-stage nerve injuries, suggesting that nerve conduction abnormalities and subjective complaints can be present without obvious motor deficits [7]. Despite being the second most common focal peripheral neuropathy after carpal tunnel syndrome (CTS), the prevalence of ulnar neuropathy at the elbow (UNE) in the general population is rarely reported. Population-based studies indicate that the crude annual incidence rate of UNE is approximately 24.7 cases per 100,000 person-years, with a higher incidence in men than in women, and increasing with age, highlighting occupational exposure as a significant risk factor. UNE incidence is about one-thirteenth that of CTS, emphasizing its relative yet clinically important impact, especially in populations performing repetitive upper limb activities [8]. Distal compression at the wrist, as seen with GCS, may result in less severe or gradual motor dysfunction compared with proximal entrapments [9]. Work-related musculoskeletal symptoms and ergonomic factors have been widely reported among call center and home-based office workers. Multicomponent ergonomic interventions have been shown to reduce musculoskeletal symptoms, mental workload, and fatigue among call center workers [10], while ICU nurses and other office populations report predictors of WRMSDs related to prolonged repetitive tasks [11]. Longitudinal studies during the COVID-19 pandemic have shown associations between working from home and musculoskeletal pain in the neck, back, and upper extremities [12-15]. Ergonomics knowledge and posture management have been identified as factors reducing musculoskeletal risk [16-18]. Interventions to reduce sedentary behavior in contact centers have also demonstrated feasibility [19]. Additionally, characteristics of surgically treated Guyon canal syndrome have been documented in multicenter studies [20].

CONCLUSIONS

The study found a significant negative correlation between Tinel test results and abductor digiti minimi strength. No significant correlation was observed with opponens digiti minimi strength.

Authors Contribution

Conceptualization: FM, IZ, TF

Methodology: MR, TF

Formal analysis: FM, IZ, MR, TF

Writing review and editing: FM, IZ, MR, TF, EG, AA, RT

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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