

Prevalence of cubital tunnel syndrome among dock workers, Saint Sebastian, São Paulo, Brazil

Prevalência da síndrome do túnel cubital em trabalhadores portuários de São Sebastião, São Paulo

Regina Yumi Saito¹, Marcos Yoshio Yano¹, Luiz Carlos Angelini Júnior¹, Delcio Matos¹, André Vicente Guimarães¹, Luiz Carlos Angelini¹

ABSTRACT | Background: Ports play a substantial role in the Brazilian economy. Despite the large number of port workers, few studies report that the most common musculoskeletal disorders among them involve the upper limbs, including carpal tunnel syndrome, rotator cuff syndrome, cervicalgia and cubital tunnel syndrome. The latter is a neuritis caused by compression of the ulnar nerve at the cubital tunnel (CuTS) on the elbow. **Objective:** To estimate the prevalence of a suggestive diagnosis of CuTS among port workers. **Method:** Seventy-two independent port workers registered with the Labor Management Organ (Órgão Gestor de Mão de Obra — OGMO), Port of Saint Sebastian, were evaluated based on a semi-structured questionnaire and clinical examination, including investigation of pain on palpation of the middle area of the elbow and two maneuvers specific for CuTS, namely, the pressure provocation and maximal flexion tests. **Results:** The average age of the participants was 48.49 years old, and their average length in the job 23.13 years. Suggestive diagnosis of CuTS was established for five participants. In only two cases elbow pain had begun before, and in three after starting work at the port. **Conclusion:** The prevalence of a suggestive diagnosis of CuTS was 6.9%, and was higher among the participants with longer length in the job (over one year).

Keywords | cubital tunnel syndrome; port sanitation; disease prevention.

RESUMO | Introdução: Os portos brasileiros têm um papel importante na economia do país. Apesar de haver um número expressivo de trabalhadores, existem poucas pesquisas disponíveis envolvendo o ambiente portuário que relatem que as doenças musculoesqueléticas mais recorrentes correspondem as dos membros superiores, como síndrome do túnel do carpo, síndrome do manguito rotador, cervicalgia e síndrome do túnel cubital, esta definida como uma neurite causada por uma compressão do nervo ulnar no túnel cubital na região do cotovelo. **Objetivo:** Estimar a prevalência sugestiva da síndrome do túnel cubital no ambiente portuário. **Método:** Foram avaliados 72 trabalhadores portuários avulsos do OGMO do Porto de São Sebastião, São Paulo, por meio de um questionário semiestruturado, o exame clínico que incluiu a pesquisa de dor à palpação na região medial do cotovelo e a realização de duas manobras específicas para síndrome do túnel cubital, o teste provocativo de pressão e o teste de flexão máxima. **Resultados:** A idade média foi de 48,49 anos e um tempo médio de 23,13 anos de trabalho no porto; a síndrome do túnel cubital teve diagnóstico sugestivo em cinco dos avaliados, e apenas dois trabalhadores referiram dor no cotovelo antes e três depois do início do trabalho no porto. **Conclusão:** A prevalência do diagnóstico sugestivo da síndrome do túnel cubital foi de 6,9%, sendo maior entre os trabalhadores com maior tempo de trabalho (acima de um ano).

Palavras-chave | síndrome do túnel cubital; saneamento de portos; prevenção de doenças.

¹Universidade Metropolitana de Santos - Santos (SP), Brazil.

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INTRODUCTION

Ulnar nerve entrapment at the elbow — also known as cubital tunnel syndrome (CuTS) — is a common condition partly derived from the elbow anatomy¹. Repetitive and sustained elbow flexion might trigger inflammation of the ulnar nerve, and consequent development of CuTS¹⁻⁴. CuTS symptoms are exacerbated by repetitive elbow flexion^{5,6}.

The ulnar nerve originates in the medial brachial plexus cord, and travels distally along the arm running through the fiber-osseous space behind the medial epicondyle known as cubital tunnel. The nerve has both sensory and motor function. It innervates the hypothenar muscles, third and fourth lumbricals, dorsal and palmar interossei muscles, adductor pollicis muscle, and deep head of the flexor pollicis brevis muscle. The superficial branch of the nerve is responsible for the sensitivity of the ulnar side of the fourth and fifth fingers, both volar and dorsal^{1,5-8}. The ulnar nerve can be stretched to 4.5 to 8 mm (it is located behind the elbow axis of motion). The cubital tunnel cross-sectional area decreases in 55% of the cases as the intraneural pressure increases up to 20 times^{1,9-11}.

The clinical presentation of CuTS is characterized by difficulty to flex the forearm. Intermittent paresthesia, numbness and formication on the fifth finger and ulnar side of the fourth finger are frequent early symptoms. With the progression of disease, these symptoms become more frequent, and patients might complain of pain on the medial area of the elbow and hand weakness. Atrophy of the intrinsic muscles of the hand is a sign of advanced disease¹. Patients with mild disease might not exhibit any symptom at the time of medical examination. Several provocation tests might facilitate diagnosis, such as the maximal flexion and pressure provocation tests^{1,9-10}. Diagnosis is based on signs and symptoms, orthopedic tests and electrophysiological investigation^{1,9-10}.

CuTS is the second most common nerve entrapment syndrome involving the upper limbs, even though its actual prevalence is unknown^{1,5-7,12-14}. Its incidence in the overall population is 20.9–30/100,000 people, and occurs more frequently at the end of the fifth decade of life^{1,5,13,15,16}. The more susceptible populations include telephone operators and workers who handle vibratory tools, such as dock workers¹⁷⁻²⁹.

Cherry et al.²² reported the results of the United Kingdom Musculoskeletal Occupational Surveillance Scheme (MOSS), which required rheumatologists to report work-related orthopedic disorders. The results for the first three years indicated that 66% of disorders involved the upper limbs, the elbows in 10% of the cases²². In 2006, Melchior et al. performed a study which included 80 occupational physicians from the Loire Valley, in France, and 2,656 workers. The results showed that the frequency of musculoskeletal disorders (MSD) involving the upper limbs was higher among the individuals who performed manual work compared to the ones who did not²³.

In a study conducted at Port of Saint Sebastian, São Paulo, Brazil, Angelini Junior found that dock workers are still indispensable despite the modernization and automatization of the port system. The limited physical capacity of human beings for repetitive manual work combined with aging is practically synonym with MSD. Dock workers are exposed to risk factors for MSD, such as strong sunlight, cold, rain, brute strength activities, and heavy weight on the back, shoulders, arms and hands. Their work activities might be a cause of illness. In the study by Angelini Junior, the prevalence of carpal tunnel syndrome was 11.1%, being more frequent among workers over 50 years old and more than one year in the job²⁷.

The Port of Saint Sebastian opened in 1955 to provide support to the Port of Santos^{17,18}. In Brazil, there are three categories of port workers: employees allocated to the management of the port infrastructure, terminal operators with formal employment relationship, and independent port workers (IPWs)^{19,21-24,27}. These workers are registered with and managed by the Labor Management Organ (Órgão Gestor de Mão de Obra — OGMO). OGMO is responsible for ensuring IPW supply, as well as of registering such workers²¹. The category of IPW is defined in article 40 of the Federal Law no. 12,815, June 5, 2013. As a function of their jobs (foremen, stevedores, cargo checking and repair) these workers are exposed to repetitive movements of the upper or lower limbs or spine, and might develop MSD.

The aim of the present study was to investigate the prevalence of a suggestive diagnosis of CuTS among workers at Port of Saint Sebastian, São Paulo, Brazil.

METHOD

The present was a cross-sectional epidemiological study conducted with 72 IPWs. Potentially eligible subjects were workers registered with OGMO, Port of Saint Sebastian, located in the northern coastal area of São Paulo, from October through December 2016.

The sample size was calculated based on the prevalence of MSD in the overall population, 69%, with 80% of power, 5% significance level and delta of 7% — i.e., the prevalence could vary from 62% to 76%. There were 141 IPWs registered with OGMO, Port of Saint Sebastian, as reported by the management. On these grounds, the sample size was estimated as 55 participants; an additional 20% was considered to compensate for possible losses, to a total of 65 participants.

All the participants were interviewed based on a questionnaire to collect data on: age, sex, occupation, related disorders, hand dominance, and particular aspects of elbow pain. Only the first author administered the questionnaires and performed physical examination. Interviews followed the order of arrival of ships to the port and the voluntary availability of port workers at OGMO — Saint Sebastian headquarters.

Participation was voluntary, and subjects were informed the interviews did not represent medical consultations. None of the participants had ever been subjected to clinical or diagnostic tests for CuTS or other upper limb disorders. However, some of them exhibited pain and other characteristics suggestive of CuTS at the time of assessment.

All the participants were subjected to physical examination, which included pain on palpation of the middle area of the elbow, and two specific maneuvers for CuTS, namely, the pressure provocation and maximal flexion tests.

On the pressure provocation test, the examiner placed his second and third fingers on the ulnar nerve immediately proximal to the cubital tunnel, and exerted pressure for 30 to 60 seconds, with the subject's elbow flexed to about 20° and the forearm supinated^{1,9,10}. The response was rated positive when symptoms appeared on the ulnar nerve territory. The response to the maximal flexion test was rated positive when symptoms pointing to ulnar nerve affection appeared after 30 to 60 seconds of keeping the elbow in maximal flexion, full supination and the wrist in neutral position^{1,9,10}. The parameters assessed on physical

examination were selected for being considered as the most sensitive and specific for diagnosis of CuTS in the literature. The specificity of the maximal flexion test is 0.9, and the one of the pressure provocation test 0.98^{9,10}. The data were collected in an ad hoc form, entered on an Excel 97-2003 spreadsheet, and subjected to statistical analysis.

As per the calculated sample size, we included 72 eligible workers, considering an additional 5% to compensate for possible losses or exclusion along the study period. All the considered variables were subjected to simple and descriptive analysis. Qualitative variables were expressed as absolute and relative frequencies. Quantitative variables were expressed as measures of central tendency and dispersion, and presented in tables (age, professional category, length of work in the job, hiring conditions, elbow pain before or after starting work at the port, distribution of IPWs with elbow pain and clinical signs, hand dominance, and pain site)^{30,31}.

Pearson's χ^2 test was used to investigate associations between qualitative variables. Quantitative variables were compared between groups by means of the Mann-Whitney U test, as they did not exhibit normal distribution (Kolmogorov-Smirnov test) or homogeneous variance (Levene's test). The significance level was set to 5%. All the analyses were performed with Statistical Package for the Social Sciences (SPSS) 17.0 for Windows³¹.

The present study was registered in Brazil Platform, CAAE no. 61.48.1516.8.0000.5509, on 14 October 2014. All the participants signed an informed consent form through which they agreed to respond the questionnaire for analysis and diagnosis of upper limb disorders. We complied with the guidelines and norms in the National Health Council (Conselho Nacional de Saúde — CNS) Resolution no. 196/1996. The authors ensured the confidentiality of the data, and declare they have no conflict of interest. Neither invasive procedures nor diagnostic tests were performed.

RESULTS

We interviewed 72 IPWs, all of them male, and with age 22 to 67 years old, mean 48.49, standard deviation 9.73.

The sample included 27 dock foremen, 42 stevedores, 1 employee charged of cargo checking, and 2 ship watchmen; no participants was allocated to blocks or cargo repair.

The participants' average length in the job was 23.13 years, varying from 7 months to 42 years, as shown in Table 1.

We found that the participants' length in the job differed as a function of the mode of hiring, namely, resulting from public calls or not. For the workers hired after a public call, the maximum length in the job was 7 months; this group was designated as group A (Table 2).

The other group — group B — was composed of workers with effective job positions, having been named by acquaintances, or handed down from fathers to sons (and thus had been much longer in the job). In this group the minimum length in the job was 11 years (Table 3).

Two participants reported elbow pain before the onset of work as IPW (Table 4).

Five participants reported current pain (one also with history of pain previous to work as IPW) (Table 5). Three of them complained of pain on the right, and two on the left elbow. Statistically significant difference was not found (McNemar's test).

One participant in each group reported elbow pain before the onset of work at the port.

Comparative analysis of occurrence of pain between the groups showed that group B — with longer length in the job — exhibited a greater trend for elbow pain compared to group A — with shorter length in the job. However, this difference was not statistically significant. This fact did not hinder the comparisons made or results obtained.

On physical examination, one of the participants with elbow pain reported pain on palpation of the left elbow. Three elbows, one right and two left, tested positive on the pressure provocation test. The maximal flexion test was positive for four elbows, two right and two left.

Table 1. Length of work at the port (years), Port of Saint Sebastian, northern coastal area of São Paulo, Brazil, October through December 2016 (n=72).

Mean	23.1375
Median	25.0000
Standard deviation	10.17557
Minimum	0.58 (7 meses)
Maximum	42.00

DISCUSSION

The health of port workers has increased in relevance in the past decades, as is also the case of the attempts at understanding the relationship between work and the health–disease process.

Our investigation of the prevalence of diagnosis suggestive of CuTS among IPWs at Port of Saint Sebastian

Table 2. Distribution of length in the job and age of independent port workers, Saint Sebastian, São Paulo, Brazil, 2016 (n=72).

	Length in the job (years)	Age
Mean	0.77	36.10
Median	0.71	33.50
Standard deviation	0.16	14.693
Minimum	0.58	22
Maximum	1.00	65

Table 3. Distribution of length in the job and age of group B of independent port workers, Saint Sebastian, São Paulo, Brazil, 2016 (n=72).

	Length in the job (years)	Age
Mean	26.80	50.44
Median	26	48
Standard deviation	4.87	7.06
Minimum	11	40
Maximum	42	67

Table 4. Elbow pain before onset of work at the port, Saint Sebastian, São Paulo, Brazil, 2016 (n=72).

Pain	n	%
No	70	97.22
Yes	02	2.78
Total	72	100

Table 5. Elbow pain after onset of work at the port, Saint Sebastian, São Paulo, Brazil, 2016 (n=72).

Pain	n	%
No	67	93.1
Yes	05	6.9
Total	72	100

fully belongs with the aforementioned context, especially upon considering the potential of this information to contribute to strategies for prevention of work-related diseases.

One of the explanations for the shortage of Brazilian and international scientific studies on port workers is the difficult access of investigators to the target population. This problem is perhaps due to the fear of trade unions, employers and the workers themselves that such studies might lead to losses and labor issues as a function of the possible results and their interpretation.

Also we had to deal with this difficulty. We met considerable resistance to collect data at Port of Santos. After much insistence, we were allowed to conduct the study at OGMO headquarters in Port of Saint Sebastian. OGMO managers offered much collaboration, and promptly understood our intention to conduct a strict sense investigation based at a graduate university program registered at the Brazilian Federal Agency of Support and Evaluation of Graduate Education (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior — CAPES), with the aim to contribute to the actions of the health professionals who provide care to port workers.

The size of the port, ship flow and total number of available workers for data collection were known at the onset of the study.

As Port of Saint Sebastian is rated small, because it can only service one ship at a time, we were aware of the study limitations in regard to the available participants. Nevertheless, we calculated the ideal sample size based on data retrieved from the literature, the variables considered and primary outcomes. The ideal number of participants calculated by means statistical methods was compatible with the effective sample size.

The results evidenced a suggestive diagnosis of CuTS in 6.9% of the sample. This rate is very similar to the one reported by Rijn et al.¹⁵. In a systematic review they performed in 2009, the rate of CuTS was 6.8% among floor cleaners. The prevalence of CuTS in the global population is unknown. In a cohort study of adults residing in the St. Louis metropolitan area, Missouri, USA, An et al.¹³ found that the prevalence of CuTS was 5.9%.

CuTS was the sixth most frequent disorder among workers at Port of Saint Sebastian. In the study by Roquelaure et al.²⁸ CuTS was the fourth most common MSD^{28,29}.

All the participants with suggestive diagnosis of CuTS belonged to group B, i.e., with longer time of work at the port; however, these data were not significant. The small sample size might have interfered with the results. In addition, no studies conducted with port workers addressed this variable, which hinders attempts at comparison.

One further aspect which might have interfered with the analysis of the data is that all the participants were male, while according to the literature CuTS preferentially occurs among women¹²⁻¹⁴.

The average age of the participants, 48.49 years old, is similar to the one reported for CuTS, i.e., higher frequency at the end of the fifth decade of life^{5,13,16,29}.

Early diagnosis is considerably relevant, as shown by the study by Juratli et al., from 2010³⁰. Conducted with workers with ulnar neuropathy in the state of Washington, USA, this study analyzed return to work among workers with CuTS subjected to surgical (26.1%) or conservative (73.8%) treatment. The odds to return to work were 13% higher for the workers diagnosed early, and 35% lower for the participants aged 50 or older at the time of diagnosis compared to the ones under 30 years old³⁰. Therefore, the efforts to achieve a precise diagnosis of CuTS among port workers and maximize their functional recovery should begin at the very first medical evaluation. In addition, older workers deserve special attention to improve their prognosis.

Early diagnosis is also relevant to avoid the progression of disease. According to Boone et al.⁸, patients with CuTS are four times more likely to present with the stigmata of advanced disease, such as muscle atrophy and diminished sensation. Untreated chronic CuTS might lead to permanent loss of sensitivity, muscle weakness and secondary joint contractures⁸. In the study by Bruder et al.⁵, from 2017, 48% of the patients who received surgical treatment exhibited muscle atrophy.

Early diagnosis might thus spare workers from functional disability to perform their job due to muscle atrophy.

The implications for practice of the present study are limited, as we did not find significant clinical or statistical differences. We detected some relationship between CuTS and length in the job, which might not only depend on age, but also on the type and intensity of work, frequency of efforts, or other causes. These findings agree with reports in the literature, which also lack methodological support as was mentioned above.

As for the implications for research, we suggest developing more rigorous methodological designs likely to lead to more reliable results. In addition, we call the attention to the major challenges opposing the attempts to implement more methodologically refined projects targeting populations engaged in this type of organizations and jobs.

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CONCLUSION

The prevalence of a suggestive diagnosis of CuTS among workers at Port of Saint Sebastian was 6.9%. Workers with longer length in the job (over one year) were at higher risk of developing CuTS.

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Correspondence address: Marcos Yoshio Yano - Rua Muniz de Souza, 492, apto. 94 - Aclimação - CEP: 01534-000 - São Paulo (SP), Brazil - E-mail: marcos_yano@yahoo.com.br