EDITORIAL

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HOW CAN WE BEST ESTIMATE THE INCIDENCE AND PREVALENCE OF CARPAL TUNNEL SYNDROME?

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The study by Pourmemari *et al.*[1] in this issue provides a comprehensive assessment of the annual incidence, prevalence, and risk factors for carpal tunnel release (CTR) in Finland. Their work demonstrates once again that CTR (and, by inference, underlying carpal tunnel syndrome [CTS]) is common, and also confirms many of the risk factors identified in previous studies, such as age, female sex, obesity, and certain underlying medical conditions. Nevertheless, the study also raises (directly or indirectly) a number of persistent and challenging questions that are common in the CTS/CTR literature.

Despite CTS being the most common nerve entrapment disorder and CTR one of the most common surgical procedures, it is surprisingly difficult to come up with an accurate estimate of the incidence or prevalence of CTS.[2–5] CTS is a clinical syndrome without a clear "gold standard" for establishing the diagnosis. The clinical symptoms are often not classic in their presentation, and verification with nerve conduction testing or ultrasound imaging does not have the high sensitivity and specificity that is desirable.[2,6,7] Part of the problem with confirming CTS with electrophysiology or imaging is the lack of a gold standard, and part of the issue stems from a changing awareness of CTS from a time of under-diagnosis to perhaps over-diagnosis and/or earlier recognition.

The use of CTR surgery as a diagnostic standard, as done in the study by Pourmemari *et al.*,[1] creates a gold standard that is objective but does not necessarily clarify the incidence or prevalence of the underlying diagnosis of CTS. The rate of surgical intervention varies regionally (both between and within the countries) and has changed over time as well. The surgical rates in the United States are reportedly 3–4 times higher than in Germany or Canada.[8] Other studies have reported rates in the USA that are comparable to those in Europe.[4] Rates of surgery for CTS were found to vary among regions by 3.5-fold in the state of Maine, in the United States.[5] Rates of surgery for CTS in France were found to vary regionally by a factor of 5.[9]

It is not clear what influences the decision to have CTR. The only randomized, controlled trial that looked at surgery vs. conservative care (splinting) showed that surgical intervention was more effective.[10] In our experience, we found that many clinicians use these findings to justify surgery as a first-line, early intervention for CTS. At the same time, splinting was found to be effective in 65% of patients, so many have adopted a conservative approach as the first line of intervention, with surgery being considered only in those patients failing a trial of conservative care. The Gerritsen study[10] was done before the widespread use of steroid injections as another nonsurgical option. There have been several randomized, controlled studies comparing CTR and steroid injection, demonstrating that steroids can be as effective as CTR, although the procedure may need to be repeated.[11,12] What is frequently ignored in the discussion is the recurrence rate of symptoms after CTR, which can be as high when there is long-term follow-up.[13,14]

The demographic profile of the Finnish study population is strikingly different than that of the US population in terms of major risk factors for CTS. It has been long recognized that obesity is a risk factor for CTS and, more profoundly, for focal prolongation of the median nerve latency across the wrist (median mononeuropathy), regardless of symptoms.[15–17] This is particularly striking in view of the impact of obesity on other sensory nerves. All other sensory nerves demonstrate improved function with obesity, but median sensory latency across the wrist is more prolonged with increasing levels of obesity and there is a strong dose effect.[15,18]

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The percentage of obese subjects (body mass index ≥ 30) in a Finnish study was 22%, compared with an estimated rate of 38% in the US.[19] The hazard ratio (HR) for obesity was 1.6 in the current study and ranged from 2 to 4 in studies in the US. The lower rate of obesity in Finland likely impacts the incidence of CTS and would certainly lead to a higher estimate of CTS incidence in the US. Similarly, diabetes is an established risk factor for CTS in many studies, and, although the Pourmemari study did not find it to be a significant risk factor, the trend was in the same direction. This finding may suggest an issue regarding statistical power in the Pourmemari study due to the relatively low rate of diabetes in the sample. In the Pourmemari study from Finland, the rate of diabetes was 5.5%, compared with an estimated 12.2% in the US.[20] The HR for diabetes has been estimated to be 2–3 for most US studies. The much higher rates of obesity and diabetes in the US would suggest a much higher rate of incident CTS in the US compared with Finland.

The influence of gender was confirmed in the Pourmemari study and has been estimated to be as high as a 3–4-fold increase for women. This relationship has varied depending on the population studied. Several work-related CTS studies showed a much less pronounced influence among active workers.[17,21] In the work-related CTS studies, the relative risk was 1.2 for women, which may reflect a younger cohort. It is primarily older women that have the highest risk, which may be related to postmenopausal hormonal changes. The Pourmemari study reported that "lifetime prevalence" of CTR peaked at 50–59 years of age, which is somewhat unexpected as lifetime prevalence of irreversible conditions should typically increase monotonically with increasing age. The authors suggest that the decline in lifetime prevalence among those age 60 and older may be due to survivorship bias and recall bias.

Of the risk factors that influence incidence of CTS, many differ when comparing results from Finland and the US, yet some are concordant. The influence of age, gender, and occupational risk factors are similar, whereas obesity, diabetes, and rate of surgical intervention vary widely. We must be careful when reviewing the current literature regarding incidence and prevalence rates from differing studies. There are only a few true population-based studies on the incidence/prevalence of CTS (or CTR), and thus the Pourmemari *et al.*[1] study is a valuable addition to the literature. Some population-based studies were regional, such as the Gelfman study,[4] based on Olmstead County, Minnesota, which reflected regional differences in obesity, surgical rates, occupational risks, and age stratification. It has been noted that CTS is more common in the elderly and that the rate of surgical intervention for CTS also increases in the elderly.[4] Occupational risks also vary widely between countries and have regional differences within countries. The relative risk for CTS in the US for high-force/high-repetition jobs was estimated at 15-fold in the 1980s, but now is closer to a 2-fold increase in high-risk jobs (compared with low-force/low-repetition jobs).[22,23] This likely reflects the ergonomic changes in the US workplace to eliminate or modify very high-risk jobs and distribute the ergonomic risk factors more evenly across the assembly line. The relative risk for CTS is still very high in certain job categories and some low- and middle-income countries, similar to the high relative risk noted by Silverstein *et al.* in the US 30 years ago.[24]

With these issues in mind, we need more population-based studies to better understand the true incidence/prevalence of CTS in the US as well as worldwide. The use of a standardized clinical definition or the one described by Pourmemari and colleagues—a surgical decision as a surrogate for the clinical entity—needs to be used consistently across studies.

Ethical Publication Statement: We (the authors) confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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