

Evaluation of sleep position as a potential cause of carpal tunnel syndrome: preferred sleep position on the side is associated with age and gender

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Abstract

Purpose To test the hypothesis that an important step in a causative mechanism for carpal tunnel syndrome (CTS) is sleeping in a lateral position (sleeping on the side), we designed a cross-sectional survey to measure the association between sleep position, age, gender, and body mass index (BMI).

Methods and Findings We surveyed 247 patients in a primary care setting. Fifty percent of men and 73% of women prefer to sleep on their side ($p < .001$; unadjusted odds ratio, 2.7). In addition, the proportion of women who prefer to sleep on their side increased with increasing age ($p < .001$). There was no association between BMI and sleeping in a lateral position.

Conclusions This study supports the hypothesis that sleeping on the side is an important step in a causal pathway for CTS.

Keywords Carpal tunnel syndrome · Causation · Sleep position

Introduction

Carpal tunnel syndrome (CTS) is the most common compression neuropathy. An estimated 400,000 surgical procedures are performed in the USA per year to release this compression [6]. In spite of this large burden of illness and the volume of literature evaluating the cause of CTS,

the etiology of CTS has not been fully elucidated. There has been a great deal of discussion about the attribution of CTS to the workplace; however, a recent comprehensive review of the causation of CTS from available evidence supports the need for further evaluation and contemplation [9]. There are consistent and strong associations between CTS and gender, age, BMI, diabetes, pregnancy, and wrist morphology [1–4, 11, 13, 14]. In spite of this, no previous theory clearly linked these associations through a causative mechanism for CTS.

We have put forth a theory of causation of CTS that suggests sleeping in a lateral position causes the wrists to deviate into flexion or extension, increasing the pressure in the carpal tunnel and compressing the median nerve [10]. The resulting cellular and ultra-structural changes from compression that have been elaborated by Gupta leads to the development of the symptom complex we know as CTS [5]. After a review of the literature, our theory suggests that sleeping on the side is an important step in the causation of CTS. Our theory is testable in that we predict that women will sleep on their side more than men and that sleeping on the side increases with increasing age and increasing body mass index. We predict that patients with CTS would sleep on their side more than patients without CTS, and we predict that wearing a splint at night could prevent the development of CTS by preventing wrist flexion or extension.

The purpose of this study was to measure sleep position and its association to age, gender, and BMI. Sleep position varies through the night; however, many people have a preferred position, and based on a study by Kubota, the preferred sleep position is the actual position most assumed during sleep [8]. To evaluate the relationship between sleep position, age, gender, and body mass index, we proceeded with a cross-sectional survey.

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Method

We developed a short survey instrument that collected age, height, weight, gender, and favorite sleep position. Based on our review of the literature and future research plans, we also documented smoking history, presence of diabetes, night waking, an insomnia score, the subjective cause of any sleep problems, the presence of neck or back pain, and if the participants' employment included shift work. The study was reviewed and approved by the Institutional Review Board at the University. The target population was patients attending a primary care setting within a large urban health system. This population was chosen because it is the study base from which our CTS patients are referred and will be used as a control population for a later case-control study. Patients were asked to complete the short survey instrument by the receptionist who did not know our underlying hypothesis.

Statistical analysis included logistic regression, correlation coefficients, and chi square tests. Odds ratios were calculated where appropriate.

Results

Patient Population

Two hundred and forty-seven surveys were completed including 74.8% female with a mean age of 52.7 years. The BMI was normal in 71 (28.7%), overweight in 70 (28.3%), and obese in 88 (35.6%). One person was characterized as slim.

Fifty percent of men and 72.8% of women reported they preferred to sleep on their side. Using logistic regression, we found a significant effect of gender and an interaction effect of gender and age on the proportion of people who preferred to sleep on their side (Fig. 1). This was highly significant ($p < .001$) with an unadjusted odds ratio of women sleeping on their side of 2.7. The relationship of sleep position and age depended on gender with a strong association between sleep position and age in women ($p < .001$). There was no association between sleep position and age in men, and there was no association between BMI and sleep position.

The items in the insomnia index were highly correlated with each other, but there was no association between the insomnia score and sleeping on the side.

Discussion

We found that more women prefer to sleep on their side than men and that the proportion of women sleeping on their side increases with increasing age. Age and gender are

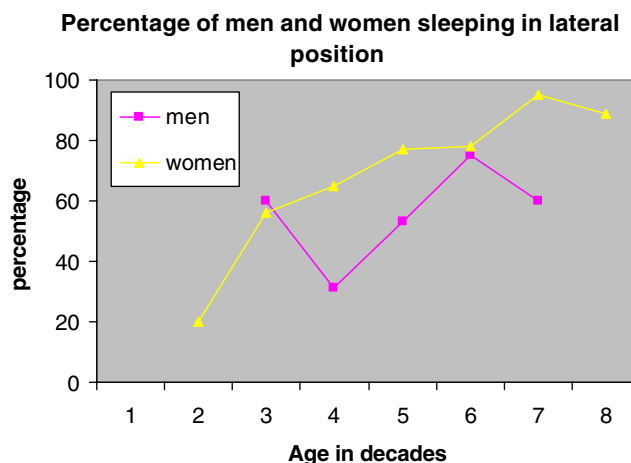


Figure 1 The proportion of women who prefer sleeping on their side is greater than men and increases with increasing age. The proportion of men sleeping on their side did not increase with increasing age.

two strong risk factors for CTS that have been repeatedly shown in the literature. This finding in our study linking age, gender, and sleeping on the side supports the hypothesis that sleeping on the side may be a step in a causative pathway for CTS. We did not find an association between increasing age and sleeping on the side in men.

Since CTS is associated with BMI, we expected to, but did not find, an association between sleeping on the side and BMI. The relationship between CTS and BMI seems to be complex. Bland has shown that BMI may be a risk factor for CTS until the age of 63 years after which it did not seem to have an influence [2]. Although we explored the association of sleeping on the side with BMI and age, we could not establish any association even in the younger patients less than 60 years of age. This may be the result of an insufficient sample, an inefficient measure of sleep position, or the true lack of an association. We will try to clarify the role of BMI in the causation of CTS with further research. Koltz recently reported that when morbidly obese patients with CTS lost weight through surgery or diet and exercise, a significant proportion had improvement of the CTS [7]. In contrast, Nathan found that patients who participated in a 10-month exercise program did not show improvement in their electrodiagnostic studies or specific symptoms of CTS [12].

BMI may not exert its influence on the development of CTS through sleep position. It is possible that the influence of BMI on the development of CTS is later in our hypothesized causative mechanism. We are interested in the interaction of wrist morphology, BMI, and wrist position during sleep. It could be that BMI and wrist morphology, known risk factors for CTS, exert an influence on the development of pressure in those people who sleep in a lateral position. We are exploring the association

between BMI, sleep position, and CTS in a case-control study.

We have shown that women sleep in a lateral position more than men and that, as age increases in women, the proportion sleeping in a lateral position increases. These are two characteristics that are known to be epidemiologic features of CTS, supporting our hypothesis that sleeping in a lateral position is an important step in a causative mechanism for CTS.

Conflict of Interest Declaration The authors declare they have no conflict of interest.

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