THE EFFECT OF DENTAL INSTRUMENTS ON GRIP STRENGTH

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ABSTRACT: ***Introduction:*** *Dentist work requires comfort and visibility, which sometimes causes an incorrect, maladjusted, and static posture, affecting mostly the upper limbs. It is due to prolonged work that oral health professionals are more susceptible to developing musculoskeletal disorders (MSDs) of the hand and wrist. The propose of this study was to evaluate and analyze the variation of grip strength in dental students. We also pretend to evaluate the incidence of signs and symptoms of MSDs.* ***Materials and Methods:*** *A clinical dental procedure was simulated using instruments of different design on phantoms to evaluate the palmar grip. Grip strength was measured with a dynamometer. The Nordic Musculoskeletal Questionnaire was conducted to assess the incidence of symptoms of MSDs.* ***Results:*** *The most prevalent symptoms in this population were neck, lower back, and shoulder pain. During the procedure, 43 participants found the ergonomic curette more comfortable. After scraping with the metallic curette, a lower palmar grip strength was observed. Women have a higher incidence of MSDs and lower grip strength.* ***Conclusion:*** *Participants should transform and improve clinical habits to promote better working conditions and decrease MSDs. It was concluded that the grip force exerted during root scraping depends on the design of the curette. Instruments with a larger diameter and lower weight are more ergonomic and require less grip force.*

1 INTRODUCTION

Dentistry is a demanding job both physically and mentally and oral cares providers should have a healthy musculoskeletal system, to prevent musculoskeletal disorders [1]. The dentist needs to work with the best comfort and visibility which sometimes results in an incorrect, maladjusted, and static posture, mostly affecting the upper limbs [2]. Additionally, they use excessive force and repetitive movements of the hand and wrist [3]. It is important to consider the ergonomics and design of the instruments themselves. changes in the shape of periodontal curettes will improve finger positioning and may reduce the grip force applied [4]. The aim of this study was to evaluate and analyze the variation of grip strength in dental students when simulating a clinical dental procedure using instruments of different design. As a secondary aim we intended to evaluate the

incidence of signs and symptoms of MSDs in 5th year dental students.

2 MATERIAL AND METHODS

This cross-sectional observational study involved dental students from the 5th year from the Faculty of Dental Medicine Portuguese Catholic University. The experimental procedure included two different instruments: a periodontal curette with a metal handle whose diameter is smaller and the weight greater and an ergonomic periodontal curette with a larger diameter and less weight to perform root scraping. A dynamometer (Biopac® Dynamometer - TSD121C) was used to measure palmar grip strength. The experiment was performed on a phantom with complete lower arch with simulated dental calculus.

3 RESULTS

The study sample consisted of 47 dental students of fifth year from the Faculty of Dental Medicine of Portuguese Catholic University. Among the participants students 59.6% (28) were women and 40.4% (19) were male. The students' age ranged from 22 to 44 years with a mean age of 23.9±22 years. The self-reported prevalence of musculoskeletal symptoms at various body regions were recorded according to the Standardized Nordic Questionnaire. The neck was the most affected site with 68.1% of prevalence during the preceding 12 months, followed by the lower back (66.1%), upper back (55.3%), shoulders (53.2%) and wrists/hands (36.2%).

According to the records during the experimental protocol it was observed that the mean initial grip strength of the participants in this study was 29.0±11.4 Kg. The mean force of after root scraping with the metal periodontal curette was 27.3±10.5 Kg. And after using the ergonomic periodontal curette the mean grip force was 29.0±10.7 Kg. By paired sample t-test, there were statistically significant differences between the initial force and the force after using the metal handle curette (29.0±11.4 vs. 27.3±10.5; p<0. 001). We found differences between the force after using the metal handle curette and after using the ergonomic curette (27.3±10.5 vs. 29.0±10.7; p<0.001).

4 CONCLUSION

The students that participated in this study showed a high exposure to workload that included remaining for a long period in the sitting or standing position and the use of vibration instruments. The fact of performing excessive force/pressure on the hands is associated with the presence of symptoms in the neck, upper back and wrists/hands. It was found in this study that the palmar grip force during root scraping depends on the diameter and weight of the curette. Women have higher incidence of musculoskeletal symptoms, mainly in the neck, lower back, and shoulders.

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