

## BIOMECHANICAL ANALYSIS APPLIED TO THE EVALUATION OF POSTURE IN LAPAROSCOPIC SURGERY

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**KEY WORDS:** Biomechanics, WRMSDs, laparoscopic surgery, posture, EMG.

**INTRODUCTION:** Laparoscopic techniques allow less-invasive treatment of common surgical problems in the field of Sports Medicine and Orthopaedics. Laparoscopic instruments have been reported as being uncomfortable, leading to musculoskeletal disorders (pain, stiffness and numbness) during and after the work, due to the forced posture that surgeons have to adopt for long periods (Berguer, *et al.* 1999; 2001). These muscular disorders are work related (WRMSDs) because of the remote visualization of the surgical field and the deficient design of the laparoscopic instruments. Even if several studies have been developed to obtain information in this field, there is still lack of research findings concerning the surgical procedures developed in the "real world" of the operating room conditions. The main aim of this study in progress, is to establish objective criteria concerning the design and use of laparoscopic instruments using the Ergonomics methodology. Besides, research findings could support the training process of the surgeons. To this purpose there is a need for developing a feasible methodology to detect the presence of risk factors on the surgeons' health.

**METHODS:** The Nordic Questionnaire has been adapted in order to carry out the epidemiological study. Fifty-two surgeons ( $7.31 \pm 3.3$  years of experience in laparoscopic techniques who operate  $12.89 \pm 6.74$  hours per week) fulfilled the questionnaire giving information concerning the frequency, prevalence, severity and the location of the disorders they suffer during the laparoscopic procedures and/or during their "everyday" activities. The used measurement chain consists of a video-based optoelectronic system that allows the reconstruction of the 3D coordinates of the body landmarks and an EMG system with surface electrodes to register the intervention of the left and right side of the Deltoid and Trapezius muscles. Twenty-three surgeons (7 female and 16 male) were recorded in the operating room of the Minimally Invasive Surgery Centre. Kinematic analysis of the obtained data allowed the evaluation of their adopted posture for an hour of surgical operation. The EMG data have been obtained according to the recommendations for the standardization of lead positions cited by Zipp (1982), at the sampling rate of 1200 Hz.

**RESULTS AND DISCUSSION:** The analysis of the epidemiological study results revealed that surgeons are afflicted by frequent musculoskeletal disorders located in the neck (43.1%), shoulders (32%) and the upper extremities (30.8%). These disorders are distributed during the realization of the surgical tasks as follows: neck (38%), shoulders (34%) and upper extremities (32%). They also mentioned that their posture was uncomfortable (46%). EMG data revealed that muscular fatigue was present in at least one of the measured muscles in a higher percentage than 82% of the subjects.

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