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EDITORIAL

New Insight into Endoscopic Work-Related Musculoskeletal Disorders (WRMD): Why Repeated Motions Damage

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Endoscopes used to visualize the gastrointestinal tract have evolved over time from simple lighted rigid tubes to the current sophisticated flexible video endoscopes [1]. Since Wolff and Shinya published the first description of a fiberoptic colonoscopy using a flexible endoscope in 1969, there have been significant advancements, most notably conversion to video from fiberoptic imaging. It is estimated that over 15 million colonoscopies are performed annually in the USA with the average gastroenterologist performing several hundred colonoscopies each year [2]. Due to the repetitive nature, large physical forces and non-neutral postures required to maneuver the endoscope, microtrauma to joints, tendons, and ligaments occurs, initiating a cascade of continual inflammation and injury. This leads to degenerative changes in the involved joints, muscles, and related structures. Over time, this cumulative stress increases the risk of work-related musculoskeletal disorders (WRMD) [3]. Survey-based studies have reported that 39–89% of endoscopists experience WRMD [4, 5]. An increased risk of WRMD correlated with higher procedure volumes, a greater number of hours per week spent performing endoscopy, and the total number of years performing endoscopy [6]. These WRMDs are not just limited to the endoscopist but impact the ancillary staff as well [7].

The impact of these injuries cannot be underestimated. As a mentor said to a fellow: "you are the most expensive piece of equipment in this room to replace". This impact is manifest in the observation that approximately 15.9% of high-volume endoscopists surveyed had to reduce procedures and 9.9% took time off work as a result of WRMDs. Further, 35.8% of the respondents reported medical therapy for WRMDs including analgesic use, physiotherapy and surgical treatment [2]. The impact of WRMDs is not only limited to work-related activities but also affects physician quality-of-life outside of work with 36.4% of respondents reporting an impairment of leisure activities as a result of WRMDs [2].

In order to better understand and therefore mitigate this trauma, recent initiatives have addressed the risk factors associated with these injuries and have devised steps to mitigate them. Several muscle groups are affected during colonoscopy [4]. In a pilot study, three endoscopists were evaluated by monitoring several individual muscles using a tactile pad and surface electromyography (EMG) [8]. The study found high mean right thumb and forearm peak pinch forces, which exceeded the injury threshold. Further strenuous activity exceeding the American Conference of Industrial Hygienists hand activity level was noted in the left abductor pollicis longus, left extensor carpi radialis, and right extensor carpi radialis [8].

Interventions to reduce WRMDs have focused mainly on the endoscopist and endoscopy setup including pre-procedure stretching, cushioned floor mats, adjustable monitors, and appropriate patient positioning. In this issue of *Digestive Diseases and Sciences*, Shiang et. al interestingly looked beyond these elements, evaluating individual patient factors that correlated with increased provider strain [9]. They evaluated 23 endoscopists while performing 97 colonoscopies (on average 4 cases per endoscopist), to objectively evaluate the patient factors leading to ergonomic strain. They utilized surface wireless EMG sensors to measure the activity of specific muscles including bilateral upper trapezius, medial deltoid, and anterior and posterior forearm muscle groups. A NASA Task Load Index (NTLX) survey was also used to evaluate each physician's perception of physical, mental, and temporal demand prior to (baseline) and during each case. The authors found that procedures performed on female patients and patients with BMI < 25 kg/m^2 were

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associated with more ergonomic strain on the muscles of the right side of the body including the posterior forearm, trapezius, and deltoid muscle, with no significant difference in any of the left-sided muscles [9]. This however did not take into account the endoscopists hand dominance. Analysis of NTLX survey data corroborated these findings with a greater perception of physical demand in these patients. Although associated with increased feelings of frustration on the NTLX survey data, other patient factors such as age and bowel preparation quality were not associated with increased muscle strain on the EMG data. Furthermore, a history of prior abdominal surgery did not have any impact on the EMG or NTLX data. This study highlights approaches aimed at reducing WRMDs beyond modifications of the equipment used, perhaps anticipating and planning a more balanced daily colonoscopy schedule based on these risk factors. It is therefore imperative to implement strategies aimed at reducing repetitive trauma and lengthening the careers of endoscopists while providing exemplary care for our patients whether it is by instituting ergonomic interventions in endoscopy equipment and the way that it is arranged, or by better understanding patient factors associated with trauma and balancing our schedule to accommodate for challenging cases.

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