ACG CASE REPORTS JOURNAL

EDITORIAL

Ergonomics in Endoscopy: A Fellow's Perspective

Khushboo Gala, MBBS[1]

[1] *Division of Gastroenterology and Hepatology, Department of Medicine, Mayo Clinic, Rochester, MN*

Emotionally exhausted and fraught with cabin fever, I began running outdoors during the coronavirus disease 2019 pandemic. The meditative cadence and endorphin rush of a good run hooked me, and I started sprinting fast and for long distances, without paying adequate attention to form or rest. Soon, I started experiencing a sequence of musculoskeletal injuries—first my hamstrings, then my knee, then my foot. Exhausted with my misplaced enthusiasm, my partner (a life-long athlete) sat me down: "If you want to do this for a lifetime, train such that your body will be able to support you for a lifetime."

I started gastroenterology fellowship in 2021, eagerly awaiting my first endoscopy block. Like any new activity, I dove into it headlong, scoping long days without caring much for how I positioned myself or my scope. Sure enough, I started experiencing shoulder and wrist pain, even beyond the usual soreness that was to be expected while performing a new activity. That is when my partner's sage advice echoed in my mind—and I knew I had to understand and embrace endoscopic ergonomics.

ERGONOMICS: DEFINITION AND IMPORTANCE

Ergonomics is the study and design of equipment and devices to better fit the human body and its movement. Ergonomic design is present in almost every aspect of our life today, whether in the knives you use to make breakfast, the car you use to drive to work, or the chair you are sitting on in front of your desk.

The importance of ergonomics in endoscopy cannot be stated enough. Endoscopy is a major component of training and workload for most gastroenterologists, with recent American Society for Gastrointestinal Endoscopy data showing that most practitioners spend >40% of their time performing endoscopy. However, endoscopists are particularly prone to sustaining musculoskeletal injuries from their practice. Data from various countries show that 39%–89% of practicing endoscopists have endoscopy-related pain and/or injuries.[1] These injuries in some cases start as early as fellowship, with 1 of 5 gastrointestinal fellows developing endoscopy-related pain and/or injuries.[2] This strong association with musculoskeletal injuries is because of microtrauma caused from the repetitive motions, prolonged awkward postures, and sustained high pinch force during endoscopy. The current endoscope, duodenoscope, and colonoscope were not designed to accommodate the range of physician hand sizes and strength in mind, making endoscopy a physically taxing career for many operators.[3] The most commonly affected body parts include the back, neck, shoulders, and upper extremities, particularly the thumb, hand, wrist, and fingers.

Several risk factors for injuries have been identified and described. These include higher procedure volume (>20 cases per week), more time doing endoscopy per week (>16 hours per week), cumulative years performing endoscopy, female sex, small hand and wrist size, low muscle strength, improper body posture, and lack of an ergonomic room design.[4] Of these, a few are nonmodifiable. Speaking for myself, I certainly cannot change the fact that I am a woman wearing size "S" gloves. Being interested in an endoscopy-heavy career, it is highly likely that I will exceed the fairly low volumes that have been described to be risk factors for injuries. However, what I can attempt to modify is my own body posture and body strength and the design of the room I work in. This is where understanding the current state of and best practices in ergonomics in endoscopy comes in handy.

PRACTICAL TIPS FOR INCORPORATING ERGONOMICS INTO YOUR PRACTICE

The ergonomic or "athletic" stance is the easiest way I found to improve posture during endoscopy (Figure 1—adopted from the study by Singla et al).[5] It consists of holding a neutral neck and back position without hyperextension or flexion with shoulders back and chest out, having even weight distribution between both legs, avoiding knee hyperextension, and keeping feet hip width apart pointed at the endoscopy screen. Using this stance consistently can help decrease excessive neck, shoulder, back, and knee strain.

ACG Case Rep J 2023;10:e00984. doi:10.14309/crj.0000000000000984. Published online: May 10, 2023

Correspondence: Khushboo Gala, MBBS (gala.khushboo@mayo.edu).

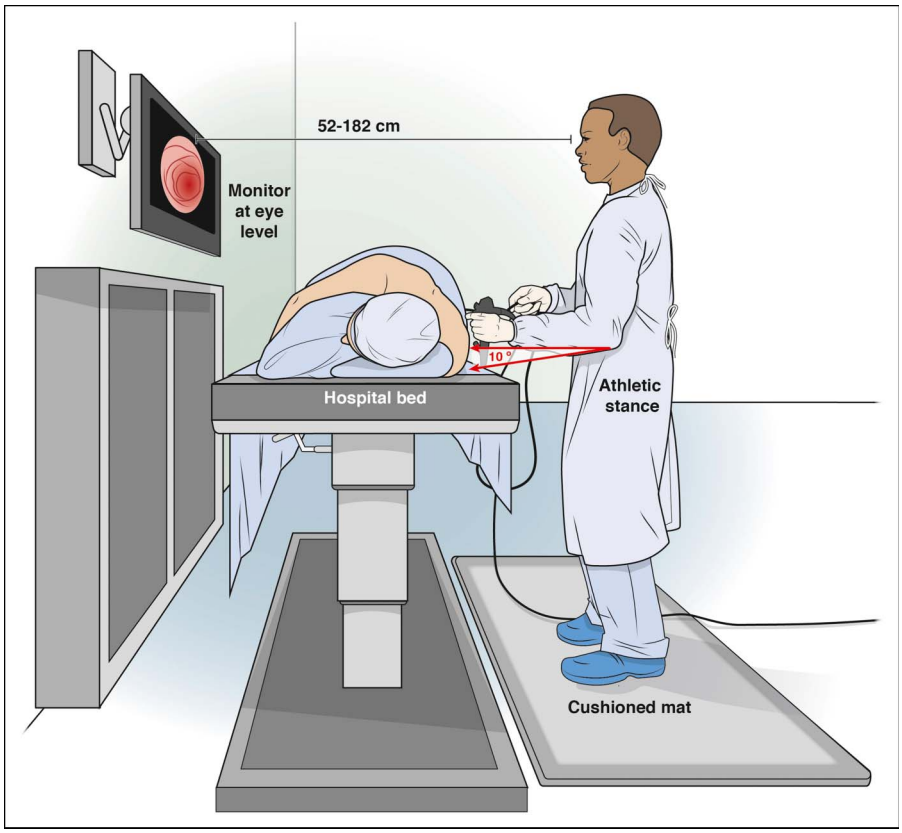

Figure 1. A physician in ergonomic or "athletic" stance during endoscopy procedure.

Many personal accessories can be useful to prevent the burden of long days on your feet. Compression stockings may increase circulation during long procedures. Cushioned support mats with down sloping edges have been shown to decrease back strain and leg discomfort. If not available, cushioned insoles encourage postural changes and can be used to provide comfort during prolonged standing.[6]

Room setup is an equally, if not more, important task that can improve the ergonomics of endoscopy. Adjusting the height of the bed is easy, such that it is approximately between elbow height and 10 cm below elbow height. It should be adjusted to minimize forward flexion or shoulder abduction. Adjust the floor pedals for cautery and water such that they are easily accessible and within reach without straining. If possible, adjust the monitor such that it is located directly in front of you to minimize neck torsion. If able to be adjusted, the height should be 20 cm lower than the height of the endoscopist, with the center of the screen should fall at 15 to 25 degrees below the eye level and accommodate the resting eye angle. As with all screens, the distance between the monitor and the proceduralists should also be optimum. The favorable distance is estimated between 52 and 182 cm, which is a wide range—but the takeaway here is that it should not be too close or far. Oftentimes, the monitor may not be completely adjustable in premade rooms; however, this is certainly something to consider while looking for your future home (the endoscopy suite in your first job).

Finding the most ergonomic and neutral way of holding the scope is extremely important; however, this is probably the hardest part of incorporating ergonomics in your practice during training. I keep some of these tips in mind as I am scoping, understanding that I am still on a learning curve and may not be able to incorporate all these actions consistently. The most central concept taught to me is to keep the scope straight and in the most neutral position possible—this serves to improve the efficacy, efficiency, and ergonomics of the procedure. Although easier said than done while learning colonoscopy, reducing loops (both internal and external) consistently is key. Using gauze or a washcloth to reduce grip pressure is a small tweak in practice that I found extremely helpful. Although some of my attendings suggest otherwise, using a left-hand pinky grip technique can help reduce right-hand strain. Keeping your elbow bent at a 90-degree angle and trying to use a finger grip to grasp the scope is also important.

How to remember to do all these things, especially while you are still gaining competence in endoscopy? Performing a brief ergonomic time out before procedures can be extremely helpful. This entails performing a mental (or verbal) check for 60 seconds or less: reviewing your stance, bed, and monitor height and pedals. Consider taking a microbreak for a few seconds during a tough case, when you rest the scope and shake out your hands. A recent meta-analysis showed that microbreaks reduced upper limb pain during long surgical procedures.[7] Between cases or at

the end of the day, consider performing stretching exercises for a few minutes. There are many good short videos online describing some exercises (links provided below).

Finally, maintaining a level of physical fitness helps tremendously to keep with long days of endoscopy. Endoscopy can be physically taxing, and hence, having good stamina and physical strength can oftentimes make a big difference in how you hold up. Although it can be tough to find consistent time for exercise as a fellow, I try to remember that perfect is the enemy of good—if I can make it to the gym or track even a few days a week, that is better than nothing at all. Many experienced endoscopists have told me that doing yoga or consistent stretching has served them well.

FINAL THOUGHTS

For most of us, endoscopy is the longest marathon we will ever run, probably spanning your entire career of a few decades. We are the generation of physicians who will likely see exciting endoscopic innovation during our lifetime—endoscopes designed keeping in mind the wide variety of operators, improved hand-tool interaction, and involvement of robotic tools. In the meantime, we must learn how to do our best with the tools we have—hence, during fellowship, we should be learning not just how to perform endoscopy but how to perform it such that we minimize the injury to ourselves. Many trainees make the argument that they are still learning endoscopy and hence will defer learning about and incorporating ergonomics once they are more proficient. Unfortunately, this may not work very well. Endoscopy is highly repetitive, and from an early stage in training, muscle memory can develop in relation to endoscopy-related ergonomics. Hence, if trainees are adopting wrong postures, these can be difficult to correct later. Finally, investing in disability insurance if not independently wealthy is a safeguard against catastrophes. Many scientific meetings, fellow groups, and websites have detailed information on how and when to obtain disability insurance (links provided below).

Happy scoping!

USEFUL LINKS

Stretching exercises:

- https://youtu.be/PT4MNCTQvPM
- https://youtu.be/bLAeVbBjZV0
- https://www.videogie.org/article/S2468-4481(17)30065-6/fulltext#appsec1
- https://learn.asge.org/Public/Catalog/Details.aspx?id=vU4KuIMa78hGWTWg9aRahw%3d%3d&returnurl=%2fUsers%2fUserOnlineCourse.aspx%3fLearningActivityID%3dvU4KuIMa78hGWTWg9aRahw%253d%253d

Disability insurance:

- https://www.ama-assn.org/medical-residents/medical-residency-personal-finance/understanding-disability-insurance-physicians
- https://www.whitecoatinvestor.com/what-you-need-to-know-about-disability-insurance/

DISCLOSURES

Author contributions: K. Gala wrote and edited the manuscript and is the article guarantor.

Financial disclosure: None to report.

Received October 6, 2022; Accepted January 16, 2023

REFERENCES

1. Yung DE, Banfi T, Ciuti G, Arezzo A, Dario P, Koulaouzidis A. Musculoskeletal injuries in gastrointestinal endoscopists: A systematic review. *Expert Rev Gastroenterol Hepatol*. 2017;11(10):939–47.
2. Austin K, Schoenberger H, Sesto M, Gaumnitz E, Teo Broman A, Saha S. Musculoskeletal injuries are commonly reported among gastroenterology trainees: Results of a national survey. *Dig Dis Sci*. 2019;64(6):1439–47.
3. Shergill AK, Rempel D, Barr A, et al. Biomechanical risk factors associated with distal upper extremity musculoskeletal disorders in endoscopists performing colonoscopy. *Gastrointest Endosc*. 2021;93(3):704–11.e3.
4. Ridtitid W, Cote GA, Leung W, et al. Prevalence and risk factors for musculoskeletal injuries related to endoscopy. *Gastrointest Endosc*. 2015;81(2):294–302.e4.
5. Singla M, Kwok RM, Deriban G, Young PE. Training the endo-athlete: An update in ergonomics in endoscopy. *Clin Gastroenterol Hepatol*. 2018;16(7):1003–6.
6. Shergill AK, Pedrosa MC, Farraye FA, et al. Minimizing occupational hazards in endoscopy: Personal protective equipment, radiation safety, and ergonomics. *Gastrointest Endosc*. 2010;72(2):227–35.
7. Sweeney K, Mackey M, Spurway J, Clarke J, Ginn K. The effectiveness of ergonomics interventions in reducing upper limb work-related musculoskeletal pain and dysfunction in sonographers, surgeons and dentists: A systematic review. *Ergonomics*. 2021;64(1):1–38.