

Ergonomics

Care for Yourself to Improve Patient Care

By Peggy Denny, Contributing Writer

Far too many ophthalmologists suffer from musculoskeletal symptoms caused by the exams and procedures they perform each day. Five ophthalmologists who have firsthand experience with work-related pain share their insights.

MUSCULOSKELETAL DISORDERS have been reported among ophthalmologists since at least 1994, when a survey of ophthalmic consultants in the United Kingdom found that 54% of respondents had “significant attacks of back pain,” with the number and duration increasing with time in practice.¹

Since then, multiple studies have confirmed high rates of musculoskeletal (MSK) symptoms among ophthalmologists, with half or more of respondents reporting work-related pain in the neck, back, or upper extremities.²⁻⁴ Leading sources of pain include examining patients at the slit lamp, performing indirect ophthalmoscopy, and using the operating microscope.⁵ Some studies have also identified stress and female sex as contributing factors.²

Widespread Impact

“Musculoskeletal disorders definitely can have an impact on career longevity,” said Samuel Masket, MD, at the University of California, Los Angeles (UCLA). “There’s very good evidence in the literature that over 15% of ophthalmologists retire because of musculoskeletal disorders.”

Cumulative impact on older MDs. Dr. Masket’s symptoms of neck pain and finger tingling and numbness occurred when he was in his 70s. A magnetic resonance image taken at that time showing abnormal cervical spine curvature with significant spinal stenosis “has gone viral” among

ophthalmologists, he said, as it illustrates the cumulative toll of decades of anterior segment surgery (Fig. 1). (For more on Dr. Masket’s experience, see aao.org/senior-ophthalmologists/scope/article/ergonomics-is-everything.)

Impact on the digital generation. MSK pain is affecting younger ophthalmologists as well, with surgical trainees at particular risk for injury—a finding that does not bode well for their future wellness and careers.⁴

Camille V. Palma, MD, is both a retina specialist and a yoga teacher in Chicago. She attributes MSK problems in ophthalmologists in their 40s and younger to the increasing pervasiveness of technology beginning in childhood. “We’re the first generation to have technology in all aspects of our life, and I think that’s made a huge impact in how often and how early we’re seeing musculoskeletal pain,” she said. “Think about the ‘epidemic of sitting’—the amount of time we spend in front of a computer or bending over smartphones from an early age. People are already vulnerable by the time they start residency.”

Opting out of operating. Ergonomic issues also affect the types of procedures a surgeon performs. A substantial number of ophthalmologists “will stop operating because of their cervical spine problems or reduce the amount or types of cases that they do,” said Christopher D. Riemann, MD, at the Cincinnati Eye Institute.

He added that the older, most experienced sur-

geons may “shy away from performing longer, more difficult procedures such as complex diabetic retinopathy or proliferative vitreoretinopathy surgeries” given the ergonomic challenges inherent in these surgeries.

Seeking Solutions

What can ophthalmologists do to reduce the pain of practice? The following major themes emerged from discussions with the experts.

Modify as needed. Become aware of the elements of your working environment that are ergonomically unsatisfactory, and modify them whenever possible. Remember that the toll is cumulative: 30 seconds of awkward positioning at the slit lamp, for example, may seem trivial, “but as you practice for a few decades, those micro-injuries definitely add up,” said Sunir J. Garg, MD, at the Wills Eye Hospital in Philadelphia.

Make time for exercise and self-care. It may seem impossible to add anything to an already crunched schedule, but incorporating habits such as stretching or yoga can pay off in greater energy, focus, and comfort in your work. Simply taking several brief breaks in the day for stretching or mindful breathing can help (see “Embrace Exercise and Self-Care”).

Prioritize your own comfort whenever appropriate. “We all try to be respectful of our patient’s time, and we try to accommodate whatever is needed for their comfort during the exam or surgery,” Dr. Garg said. “Many of us sacrifice our own health and well-being for that. Too often we think, ‘Those extra 10 seconds of adjusting the chair height, well, maybe it’s not that important.’” Your health warrants reframing those thoughts: the patient may be uncomfortable for a minute or two, but you are performing potentially harmful actions many times a day.

Ergonomic Pointers for the Clinic

At the slit lamp. Align your head, neck, and torso vertically in a neutral posture; make sure that you are not craning your head forward or tilting your head up or down (Fig. 2).⁶ If warranted, consider purchasing inclined oculars, which can adjust the angle up to 20 degrees and reduce head tilt.

Reduce the distance between you and the patient. “For example,” Dr. Garg said, “all of our slit-lamp chairs have wheels, and if the footrest on the patient’s chair is close to the ground, the

wheels come in contact with the footrest, forcing the examiner that much farther away from the patient. If you raise the patient up a few inches, you can slide your chair underneath their footrest to get closer. Or you can lift the footrest up and out of the way.

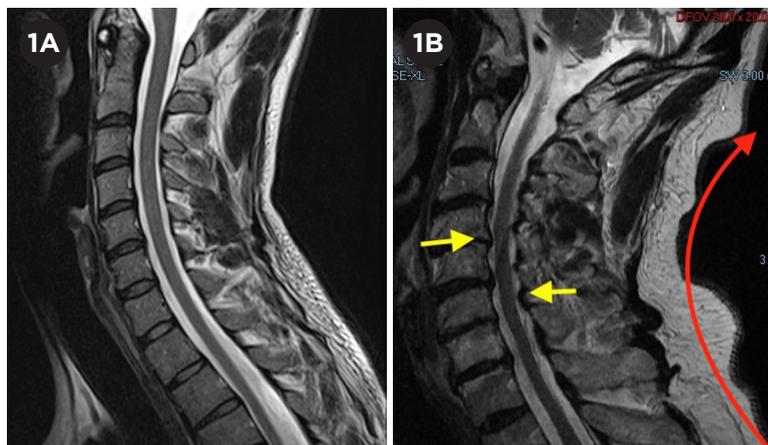
Moreover, Dr. Garg pointed out, “many slit-lamp tables are much larger than necessary, which adds more distance. Look for smaller tables when choosing equipment.” Some clinicians modify existing tables or have them custom made.

Mona Kaleem, MD, at the Wilmer Eye Institute in Baltimore, recommended making sure that patients scoot forward to reduce how much you lean in. If they are elderly or otherwise unable to do it themselves, she said, “have an assistant or family member support their head or their shoulders from behind to get them more forward.”

At the computer. Electronic health records have greatly increased ophthalmologists’ time at the computer. Adjust the chair, table, monitor, keyboard, and mouse so that you sit in a neutral position, with feet flat on the floor, arms close to your side, and elbows at a 90-degree angle or larger.

Dr. Kaleem noticed a correlation between keyboard use and pain in her fingers and wrist, even though, as a tennis player, she regularly performed forearm stretches. An orthopedic surgeon whom she consulted provided some simple, practical suggestions. For example, when she goes from room to room in the clinic, she now carries her mouse and mouse pad to minimize the need for any adjustments at different computers.

Of course, the exam room computer set-up is rarely ideal (Fig. 3). In order to remain engaged with the patient while looking at the chart and entering data, Dr. Garg said, “I’m functionally sitting sidesaddle, with my knees and my feet pointing



CERVICAL SPINE CONSEQUENCES. (1A) An MRI of a normal cervical spine. (1B) In contrast, the MRI of Dr. Masket’s cervical spine shows extreme curvature and areas of spinal stenosis (arrows).

toward the patient and doing a 90-degree twist of my torso and my head to look at my screen.” A possible solution is to ditch the fixed screen and use a laptop on a swinging arm, “but retrofitting your office for such things can be challenging,” he said. “We really need to rethink how we set up the office to adapt to our changing workflow and technology.”

At the indirect ophthalmoscope. Retina specialists frequently use the indirect ophthalmoscope, and “the examiner ends up tilting their head side to side and moving their body in awkward positions in order to see the retinal periphery,” Dr. Garg said.

Try elevating the patient’s chair so that the patient’s head is at your eye level, and recline the chair to 45 degrees. Reduce your own contortions by tilting the patient’s head in various directions when viewing out to the periphery of the retina.⁶

Improve the Surgical Experience

Get started right. The operating microscope, chair, foot pedals, and patient bed all contribute to the surgeon’s ergonomic status. Carefully adjust each of these elements to an optimal position before starting the procedure. As with the slit lamp, surgeons often stretch their necks and lean forward at the operating microscope, depending on their individual height and girth.

There are a number of adjustable features on operating microscopes, Dr. Masket pointed out. “The question is, ‘Do the users take the time to adjust the microscope, and do they know how best to adjust it for their own body structure?’” Unfortunately, the answer is probably “No,” he said. His recommendation: “Get to know the adjustments,



AT THE SLIT LAMP. (2A) Poor positioning, with Dr. Garg hunched over and craning neck up. (2B) Dr. Garg has moved closer to patient and is sitting upright. His position could be further improved with a narrower table.

and if possible, ask a colleague to observe your posture at the microscope.” For some surgeons, ocular extenders are a worthwhile accessory to reduce neck strain.⁴

Adjust to changes during the procedure. Even if you start with a neutral posture, you may need to make adjustments during surgery. Patients may move their heads during the procedure, and if you move the microscope to follow, be sure to move the chair as well to avoid leaning forward or to the side. Alternatively, you may reposition the head rather than moving the scope.⁴

In addition, in some procedures, the patient’s head needs to be tilted partway through, requiring subsequent tilting of the microscope and adjustment of the chair.

Some surgeons tend to tense their shoulders and upper back while concentrating or under

Promoting Awareness and Education

Although exercises and self-care may be helpful for the individual, it is also critical to raise awareness of ergonomic problems and, especially, to educate ophthalmologists in training. But Dr. Kaleem said that she is not aware of any formal training on ergonomics and related wellness issues at any residency program. So, as a mentor to trainees at Wilmer, she said, “Every time I operate with someone new, I have to teach them how to adjust their chair and the patient’s bed or the microscope. I want to make trainees comfortable so that they are set up for success for their case.”

Similarly, Dr. Masket said that one of his goals is not only to raise the awareness of his colleagues but also to raise the awareness of

those responsible for training younger physicians, as this is “where we can really make a difference for the future.” His hope is to “get enough traction on the importance of this subject through the Association of University Professors of Ophthalmology, and I feel good that the conversation has now begun.”

Dr. Palma fully supports this concept, but she thinks that it needs to start earlier: “We come into residency with bodies that are already deconditioned” from the rigors of medical school. She advocates for a “movement toward better wellness in medical education,” in which residents and medical students have time to attend to their own health during their training.



COMPUTER CHALLENGES. *Layout of the exam room forces Dr. Garg to twist sideways to communicate with the patient while he is seated at computer.*

stress—leading to pain and more tension. Break that cycle by listening to your body and relaxing as much as the situation allows.⁴

Abandon the microscope altogether? And there’s a new option: screen-based or other heads-up surgical systems (see “3D Heads-Up Viewing—An Alternative”).

Embrace Exercise and Self-Care

“I think there’s a tendency to overlook how important our own physical conditioning and training is,” said Dr. Masket. He suggested Pilates or yoga to improve flexibility and maintain good health.

Dr. Kaleem agreed, citing an observation from Dr. Palma: “When we do surgery and when we see patients with a slit lamp, we’re performing. So, just as athletes stretch before they perform, we should be stretching before we go to the OR.” Thus, Dr. Kaleem said, “I have a regular practice of doing yoga the night before I operate, and on the mornings of my clinics I go to the gym and stretch just to get ready, and I’ll take a break at midday.”

When Dr. Garg started developing back pain as a second-year resident after a full day in the OR, he began taking Iyengar yoga classes, “which has been transformative [not only] for my physical health, but also for my mental health and well-being, and that has had multiple benefits for my OR experience.” He still does yoga two or three times a week to ward off back pain.

Dr. Garg also noted that, as he has gotten older, he has more chronic discomfort in his neck and lower back, and he is proactive about addressing this issue with other modalities, such as therapeutic

massage. As he noted, his goal is “to try to help keep my body limber and pain-free so that I can continue to do this profession that I love so much for many years to come.”

On the mind-body front, Dr. Palma said, “It’s essential to have some kind of physical practice; for me, that’s yoga, and that’s what I teach to other doctors.” She also noted that she teaches a mindful breathing exercise “that you link to standing or sitting with good posture, with the theory being that the more time you spend in good posture, the more that becomes your body’s neutral stance.”

Ergonomics is not just “Where is your mouse, where is your computer screen, and how are you sitting?” Dr. Palma added. “That’s just one piece of the puzzle of physical wellness. You have to take little breaks throughout the day—you can’t sit with bad posture all day and then do five exercises at the end of the day and think that you’re protecting your spine.” She has developed a series of stretches that can be done in short breaks in the office (see aao.org/eyenet/article/try-yoga-sequences-for-ophthalmology?july-2019).

3D Heads-Up Viewing—An Alternative

With the operating microscope implicated as a frequent source of neck and back pain, heads-up viewing systems have been developed as an alternative to oculars. In currently available systems, high-resolution digital cameras transmit images to an external monitor, which the surgeon views through 3D glasses. In a literature review of heads-up systems in ophthalmic surgery, visual outcomes and complication rates were found to be comparable to those achieved with traditional microscope ophthalmic surgery.⁷

Ergonomic benefits. Dr. Riemann worked with prototypes beginning in 2008 and published the first case series of this technology in vitreoretinal procedures in 2011.⁸ From the outset, he recognized several benefits.

“The first thing I noticed was how much better I felt at the end of a surgical day, even when doing longer and more complex cases.” Rather than hunching over the microscope, Dr. Riemann was able to adopt a comfortable, neutral sitting position and move his head while viewing the screen. He has performed all of his surgeries heads-up since the technology became commercially available in 2013, and he said that he is “absolutely convinced that having done so has extended my surgical career.”

To examine the physical effects objectively, Dr. Riemann and one of his residents, Arjan Hura, MD, placed electromyography (EMG) electrodes on the surgeon’s back and neck to compare patterns of muscle activation in vitreoretinal sur-



HEADS-UP SURGERY. (4A) 3D screen-based surgical viewing systems are currently available. (4B) Head-mounted systems are in development.

gery with a heads-up system versus an operating microscope. They found measurable differences in postural musculature EMG activation between conventional microscope and screen-based surgery.⁹ The study is “the first time we have generated objective data on what is happening in the ophthalmic surgeon’s body during surgery and represents an opportunity to expand this work to better define the ergonomic pinch points (pun intended) that lead to injury,” he said.

Visualization and signal processing benefits.

Dr. Riemann also finds the visualization superior to that of the operating microscope. “When you digitize the surgical field in 3D HD video, you can do signal processing to enhance the image.” Reported advantages include greater clarity and depth of field, as well as the ability to use lower levels of illumination, potentially reducing the risk of phototoxicity.⁷

Cost limitations. Dr. Riemann considers cost to be the greatest barrier. Dr. Masket concurred: “If you own a surgery center, it’s money out of your own pocket; at a hospital or a commercially owned center, the powers that be are not incentivized to switch microscopes unless you can convince them it will increase business.”

Device limitations. “Our current generation of heads-up display systems are retrofitted to our operating microscopes,” said Dr. Garg. “So the surgeon has to look around the microscope or lean to the side to see the display unit.” Dr. Masket added that the location of the screen and column can cause logistical difficulty for the surgical assistants and the anesthetist.

Additional considerations. When new procedures are introduced, “inertia is always an enemy,” said Dr. Masket. “Some surgeons fear a learning curve and possible complications.” And Dr. Riemann noted that it takes experienced surgeons about half a day of cases to become comfortable, but residents and fellows pick it up right away.

strength to sit with good posture in heads-up surgery. It may be better than the operating microscope, but it doesn’t eliminate the problems.”

Also, some surgeons find the operating microscope better for certain procedures. As Dr. Garg said, “For example, for retinal detachments, I think it helps me see the retinal breaks more easily.”

On the horizon. Borrowing from technology used by fighter pilots and video gamers, virtual reality-type goggles are being developed for the ophthalmic OR. And, Dr. Riemann said, “Purpose-built, purely digital next-generation microscopes are currently available in the neurosurgery space. The prospect of this technology moving to the ophthalmology OR is very exciting.”

Key Message: *Primum Non Nocere*

“One of the traditional teachings in medical school is *primum non nocere*, which means ‘First, do no harm,’” said Dr. Garg. “We need to apply it to ourselves as well as to our patients. We are going to be better doctors and able to help more patients for longer if we also take care of our own health and well-being, both physical and mental.”

He added, “The time is right for us as a profession to have more open discussions about this and to look for opportunities to redevelop our workflow, our equipment, and how we approach the physical aspects of patient care. I think it will be a great win for our patients as well as for ourselves.”

Dr. Garg’s practice has both traditional and heads-up equipment available. “Some folks find it quite a bit more comfortable to use the heads-up displays, whereas others find it not to be so helpful. I think it depends on people’s body habitus,” he said.

And even with heads-up technology, Dr. Palma added, “You still have to watch your posture. If you slouch in surgery with a microscope, you don’t have the muscle

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Meet the Experts



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