

# Ophthalmologists raise awareness of workstyle-related ergonomic problems

Musculoskeletal disorders are a frequent occupational problem among physicians, and ophthalmologists are one of the subgroups with the highest prevalence. Lower back pain, neck pain, pain or numbness in the hands, wrists and legs, and carpal tunnel syndrome come as a consequence of improper work ergonomics. Both in the office and in the OR, reiterated bad postural habits and repetitive motions progressively affect the musculoskeletal system, leading to musculoskeletal imbalance and eventually musculoskeletal disorders.

“For years you may have no symptoms, and when they appear, the damage is already disabling and sometime irreversible,” **Inder Paul Singh, MD**, said.

Many of Singh’s colleagues have developed disabling issues at some point in their careers and have had to go through physiotherapy, occupational therapy or even surgery.

“It is important to raise awareness that a correct posture is fundamental to well-being and that there are little things we can do in the office to help decrease the chances of long-term issues. Simple changes make the difference in the long run,” Singh said.



The effects of bad postural habits are progressive and may not produce symptoms for years. When they do appear, the damage can be disabling and sometimes irreversible, according to Inder Paul Singh, MD.

*Source: Inder Paul Singh, MD*

## Task force

In 2005, a survey of 697 ophthalmologists in the northeastern U.S. revealed that symptoms of neck, upper body or lower back pain were present in 52% of respondents, with 15% having to limit their work as a consequence. In 2012, a survey completed by 94 ophthalmologists and optometrists and a control group of 92 family doctors at the University of Iowa and Mayo Clinic showed that the risk for neck, hand and wrist, and lower back pain is two to three times higher among eye care professionals. Repetitive tasks, prolonged or awkward/cramped positions, and bending/twisting were listed among contributory factors.

“Similar reports from all over the world show that U.S. ophthalmologists are not alone, and interest in work ergonomics and [musculoskeletal disorders] is growing everywhere,” **Jeffrey L. Marx, MD**, said.

In 2010, the American Academy of Ophthalmology Board of Trustees commissioned a task force composed of ophthalmologists and ergonomic specialists with the mission of educating ophthalmologists on ergonomic issues and trying through education to decrease risk and encourage prevention. Chaired by Marx, the group over 3 years

developed a slide set for presentations at ophthalmology meetings, launched an online CME course and held a successful ergonomics symposium yearly at the AAO meeting, with standing-room-only groups of physicians.

“I think awareness has increased following these actions. I have seen more and more courses being organized on this topic around the country, more and more presentations at meetings, and I often receive emails from colleagues around the world asking for advice on how to decrease risks. Systems to quantitate motion and postures are used now in several clinics, and research grants on ergonomics in ophthalmology are offered by several universities,” Marx said.

### **Effect on ophthalmologists worldwide**

In the United Kingdom, a survey carried out in 2015 among members of the Royal College of Ophthalmologists, as a follow-up of a previous survey from the 1990s, found that back pain and neck pain were present in, respectively, 50.6% and 31.8% of respondents.

“Neck and back pain are common in the general population but more so among ophthalmologists. We did not identify a significant difference between subspecialties but found that there is an increased relative risk with the more surgery-oriented specialties — oculoplastics, vitreoretinal and anterior segment,” **Jonathan N. Hyer, MD**, said.



**Jonathan N.  
Hyer**

Specific predisposing or protective factors were not found, and Hyer and colleagues did not identify any significant association between amount or type of exercise and the prevalence of pain.

“At our hospital in Maidstone, we discussed the results of the study with a physiotherapist who recommended appropriate positioning of chairs, so that the knees are bent at 90° with feet flat on the floor. Once the seating position is correct, the height of the slit lamp, operating table or microscope should then be adjusted to ensure that the back and neck are maintained in a neutral position to avoid flexion or extension. We have also improved our education for trainees, making them aware of the risk of neck and back pain and encouraging them to adopt good postural habits from the start,” he said.

However, being aware of what is best for you and growing out of bad postural habits is not easy, Hyer said.

“When you are stressed, your shoulders come up, your muscles are tense, you lean toward your patient, and your posture is the last thing you think about,” he said.

In 2017, a survey assessed the prevalence and severity of back and neck pain among members of the All India Ophthalmological Society. There were 651 respondents, of which 50% were aged 21 to 40 years. Presence of symptoms was reported by 70.5% and classified as intolerable by 7% of the respondents. For about one-quarter of respondents, chronic back pain had resulted in a reduction of the time given to the ophthalmic practice, with up to 5 hours per week lost to persistent pain.

“Minimal interventions can make a difference, such as adjusting the height of the slit lamp and moving it forward, or moving the eye piece of the operating microscope 20° to 25° toward the surgeon and adjusting the operating chair height. These simple changes allow the physician to sit erect rather than leaning forward and to keep the neck straight,” **Santosh G. Honavar, MD**, said.

He also said manufacturers should be given user-driven information to improve ergonomics and provide adjustability in the instruments they produce.

“The ophthalmologists themselves should drive this change, conscious of the impact that it might have on personal well-being and quality of life, as well as on reduction of human error, workflow efficiency and increased productivity,” he said.

The idea of an ergonomic clinic and OR environment will entail important paradigm changes in the traditional concepts of health care interior design and hospital architecture, he said.

### **Slow, insidious progression**

The effects of bad posture habits are cumulative. Young people tend to underestimate the small but progressive changes that will become symptomatic later in life.

“Progression of [musculoskeletal disorders] is slow and insidious. Our body can adapt very nicely, and for years we don’t even realize. One example is spinal stenosis, very common with our profession, in which the vertebrae and disc spaces collapse due to compression. Symptoms can be very mild for years until you get to the stage of myelopathy, in which muscles and nerves are permanently damaged,” Singh said.

He discovered he had spinal stenosis by chance, after he fell off a ladder and hit his head 6 months ago, losing consciousness for 10 seconds. When he woke up, he could not move from the neck down for about 1 minute.

“I was completely paralyzed for a minute, then it turned into diffuse paresthesia, and after 5 minutes I was fine. I went to the ER, had an MRI and luckily it was confirmed there was no traumatic injury, but incidentally discovered I had spinal stenosis at the C4/5 and C5/6 level. It was because I was so stenotic in that area that when I fell, the spinal column was momentarily compressed, which caused the transient symptoms,” said Singh, who did not develop a myelopathy or permanent deficits.

Anterior cervical discectomy and fusion was performed, to separate the discs and stabilize the spine, so that further stenosis and collapse could be prevented.

“I was lucky to find out before I developed any problem. If I had waited longer, there was a chance this could develop into permanent loss of function,” he said.

### **Small changes make a difference**



**Jeffrey L. Marx**

Since then, Singh has been focused on awareness and prevention. Fifty percent to 70% of doctors have neck and back issues; some complain of transient paresthesia to the fingertips but tend to ignore these symptoms.

“Detect symptoms early. Take them seriously,” he said.

He is currently expanding his office and redesigning it with ergonomics in mind. All details are being addressed in the examination rooms and the OR.

“I want now to have both the computer and the patient in front of me, so that I don’t have to turn my head right and left. I am buying ocular extenders for the slit lamp and customizing tables to allow the slit lamp to sit at the edge of the table, to avoid bending forward, and I take care of adjusting forearm rests at the right height to allow the shoulders and wrists to be relaxed,” Singh said.

As a result of site observations, the AAO Ergonomics Task Force reviewed risk factors and released practical recommendations for improvement.

“Take the time to position yourself and the patient correctly in office and OR,” Marx said.

He suggested raising the patient's examination chair so that the wheels of the doctor's chair can slide underneath the footrest to avoid the doctor bending forward. The back should rest against the backrest, and the elbows should be supported to decrease the stress on neck, elbows and shoulders.

During surgery, the patient should be positioned to reduce neck flexion for the physician, and the microscope should be set up so that the neck is slightly flexed downward but not overly so.

"Position your pedals so that they are not uneven from the floor. Keep them leveled to avoid tilting your back to one side," Marx said.

### **Pioneering ergonomics**

For 40 years, in his books and to his fellows, as well as in his projects for robotic systems and technologies, **Steve Charles, MD**, has highlighted the importance of an ergonomic approach to improve surgical dexterity.

While seated, the back should be supported by a backrest to avoid lumbar forward flexion, and no armrests should be used, as they force the arms forward, he said. The neck should be kept straight and free of any extra weight, such as head-mounted displays.

"Over 50% of vitreoretinal surgeons have cervical spine problems. It is less common now because we do so much medical retina and we look at the OCT on a computer screen, but for the first 50 years of retina practice, we have been wearing an indirect ophthalmoscope on our head," Charles said.

Upper back muscles react dramatically to stress, leading to chronic tightness in the neck and upper back. Attention should be paid to keeping shrug muscles relaxed, shoulders back and down, and upper arms vertical.

"Any deviation from vertical requires the shoulder muscles to contract, which decreases dexterity, causes muscle fatigue and, possibly, rotator cuff issues. Just keep your upper arms in their natural vertical posture, as no force to counteract gravity is required," Charles said.

The elbows should form an angle of 90° or greater, and the wrists should be kept in the neutral position, in straight alignment with the forearms, allowing no flexion or extension, and no varus or valgus deviation.

"Your surgical dexterity is diminished if your wrist is kept at an angle forward or backward. If the patient moves, you cannot respond and your hand becomes a limit to your motion. The second thing that happens is fatigue and cramping. If your hand is in the wrong position for a long time, it is more likely to cramp and get tired, and tired people don't perform well," Charles said.

Instruments should not be gripped harder than necessary, and to allow a loose grip and reduce fatigue, they should be as light as possible. Some years ago, Charles used an ergonomic approach to design a new disposable vitreous cutter with hourglass-shaped handles, short enough to minimize bending forces and lighter and more comfortable in the hand.

Following these recommendations will improve dexterity, decrease fatigue and improve surgical outcomes, he said.

"You won't get tired halfway through the day and underperform because the back, neck, shoulders and wrists are uncomfortable. A lot of surgeons sit too low and then assume what I call the praying mantis posture. That's why I make a huge point about your elbow at a 90° angle and your wrist neutral, not flexed," Charles said.

### **Involving manufacturers**



Initially, one of the goals of the ergonomic task force was to drive equipment manufacturing to an ergonomics standard by involving ophthalmic industries. This objective, however, was perhaps too ambitious for the time.

“There is not yet a sufficient demand from ophthalmologists, who would not be prepared to accept the extra cost. Since they may not have symptoms for years, they would not go out there and purchase something that may make a difference for them but in the long run,” Marx said.

Yet, it is up to ophthalmologists to become more ergonomically conscious, set ergonomics as a priority and drive companies to invest in ergonomic solutions. With growing volumes and demands, musculoskeletal injuries are increasing, and awareness is increasing, too. Other specialties, such as dentistry, are ahead, and it is time for ophthalmologists to catch up, Marx said.

“Some companies, including Zeiss with the 3-D operating microscope and Alcon with the Ngenuity system, are already oriented toward improving posture during surgery. Next step is the office, where we spend most of our time,” Singh said.

The advantage of the Ngenuity system is better visualization rather than better ergonomics, according to Charles.

“It decreases light exposure for the patient’s eye while providing a highly contrasting bright image for the doctor and increasing depth of field by 2.5 to 5 times. That’s what Ngenuity is about — it is better visualization,” he said.

“Heads-up surgery” is a misnomer that has been used often but should not have been coined in the first place. It implies that surgeons bend their neck forward when they do surgery, which is not true because the eyepiece of the operating microscope is adjustable to individual eye level, he said.

“I was the first to buy the Ngenuity system in the U.S. but don’t go around saying the point of it is an ergonomic solution. It might be for the cataract surgeons because they sit by the side of the patient and the microscope body doesn’t block their view of the screen. But in retina, you sit at the head of the patient, with the microscope body holding the Ngenuity head over the patient and the screen off to the right. You have to turn your head, so the current version is not ergonomic,” Charles said.

He noted that Alcon is currently working at a solution, which cannot yet be disclosed.

### **The science**

We have now the technologies and methods for the scientific analysis of posture, movement and human behavior. Ergonomics can therefore become a true science, which means based on evidence, **Scott E. Olitsky, MD**, said.



**Scott E. Olitsky**

“Much of the furniture and equipment that are labeled as ergonomic don’t have the proper testing and the scientific evidence to really show they are, but things are changing. The science is almost there, and ophthalmologists are becoming aware of the need to protect their health for their own good and for the good of patients. Now it is time to demand that science is used to design and produce equipment that is better for us,” he said.

Ophthalmologists should more actively put forward their demands for ergonomic solutions to manufacturers, and manufacturers, in turn, should prove by proper science-based testing that their products are ergonomically optimized and therefore better for the user.

“You would not drive a new car with a new safety feature if this had not been proven by proper testing. Without proper testing, it would not be allowed to be on the road,” Olitsky said.

### **Only for a moment**

Pediatric ophthalmologists especially need interventions to preserve musculoskeletal health. Clinic design is important for those who work with small patients who may not be cooperative.

“We force ourselves into very bad postures many times a day and keep saying it is only for a moment. Tilting the head, twisting the back, leaning forward is only for a moment, but that moment is 40 or 50 times a day for 50 weeks in a year. We have to get out of that pattern and better position the patient, design our rooms better and no longer say to ourselves it is only for a moment because those moments add up over a career,” Olitsky said.

He retired last summer because of severe neck problems, and his message is do not wait until the symptoms appear, but be aware of the risks and prevent them.

“Too often we start taking care of ourselves when the problem is no longer reversible,” Olitsky said. “The best time to manage a problem is before you have it. Ergonomics should be part of the curriculum for residents, so that they know the risks and avoid them as much as possible.” – by *Michela Cimberle*

### **References:**

Al-Marwani Al-Juhani M, et al. *Occup Med (Lond)*. 2015;doi:10.1093/occmed/kqv132.

Chatterjee A, et al. *Eye (Lond)*. 1994;doi:10.1038/eye.1994.112.

Dhimitri KC, et al. *Am J Ophthalmol*. 2005;doi:10.1016/j.ajo.2004.06.091.

Honavar SG. *Indian J Ophthalmol*. 2017;doi:10.4103/ijo.IJO\_711\_17.

Hyer JN, et al. *Int Ophthalmol*. 2015;doi:10.1007/s10792-015-0036-z.

Kaup S, et al. *Eur J Ophthalmol*. 2018;doi:10.1177/1120672118815107.

Kitzmann AS, et al. *Ophthalmology*. 2012;doi:10.1016/j.ophtha.2011.06.034.

Marx JL. *Ophthalmology*. 2012;doi:10.1016/j.ophtha.2011.09.001.

Pearce ZD, et al. *J Am Osteopath Assoc*. 2017;doi:10.7556/jaoa.2017.146.

Shaw C, et al. *Can J Ophthalmol*. 2017;doi:10.1016/j.jcjo.2016.09.011.

Venkatesh R, et al. *Indian J Ophthalmol*. 2017;doi:10.4103/ijo.IJO\_344\_17.

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**Disclosures:** Charles reports he is a consultant for Alcon. Singh reports he is a consultant for Alcon, Allergan, Ellex and Glaukos. Honavar, Hyer, Marx and Olitsky report no relevant financial disclosures.

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