Assessing and Utilizing Surgical Telescopes for the Ergonomic Practice of Dentistry

An Interview with Dr. Lance Rucker

A written interview requested and directed by B. Jin Chang, PhD, President of General Scientific Corporation, with Lance M. Rucker, DDS, FACD, professor at the University of British Columbia.

Dr. Lance Rucker has been a pioneer in developing and promoting the custom declination angle of surgical telescopes (often called surgical loupes) for the ergonomic practice of dentistry. For many years he has been called upon to do Ergonomic Practice Assessments (EPAs) for individuals, legal firms, worker compensation groups, and insurance organizations.

Q: What are the major ergonomic problems which are related to working postures?

A: Back, neck, and shoulder injuries are epidemic among dentists and dental hygienists throughout the world. Since the 1990s, most modern operatory equipment with fully articulating headrests can be utilized for balanced ergonomics but, by and large, most dental personnel (and more generally, surgeons) assume that the equipment will automatically work for them in the best possible way and they rarely give thought to optimizing the equipment they have. In short, if the equipment doesn’t work for the clinician, the clinician will most certainly work for their equipment! Sadly, most clinicians do work for their equipment to a greater or lesser extent, thereby perpetuating the epidemic of musculoskeletal symptoms.

During the past decade we have been gathering and publishing good evidence that the most common high-
risk profiles of clinicians (that is, those profiles which are associated with increased risk of experiencing pain and other musculoskeletal symptoms) can be identified and either reduced or eliminated entirely. Since 2002 we have had solid evidence that clinical practice can be (and should be) perfectly comfortable.

The same principles which apply to the selection, adjustment and best utilization strategies for dental support equipment (patient chairs, delivery units, seating for chairside personnel) and instruments also applies to the surgical magnification systems used by clinicians.

**A: What are the key selection factors of surgical telescopes for the ergonomic practice of dentistry?**

**Q:** There are three non-negotiable factors requisite for properly selected and properly adjusted surgical magnification systems, whether they be spectacles-mounted, headband-mounted, adjustable or fixed Through-The-Lens systems. While there are a multitude of features and options associated with such systems, from a plethora of manufacturers anxious to tap this large market, the three critical factors remain immutable:

1. The working distance and depth of field must include good resolution with the minimum magnification required for the distance from the clinician’s eye to the patient’s central maxillary incisors, and must extend to at least 5 cm beyond that. This allows for clear resolution from the central incisors to a reflected view of the most distal molars without having to compromise the head position of the clinician and without compromise to the optimal proprioceptive control relationship.

2. The declination angle of the scopes must fully accommodate the Head Declination of the clinician, and the Head Declination must have been carefully chosen in free space.

3. The oculars must be aligned so that they are perfectly in line with the clinician’s eye-to-oral-cavity line; that is the surgical loupes must be perfectly co-axial with the clinician’s free-space (unmagnified) sight line.

**Q:** There are many brands of loupes available today, but there are no regulatory standards controlling the quality of loupes. How can one assure they select the right surgical telescopes?

**A:** All selections and adjustments must be based upon a carefully selected and ergonomically self-conscious Optimal Control Point (OCP); that is, the clinician must know exactly where they will choose to operate in space with optimal proprioceptive control of the instruments.

Once this position (OCP) has been derived and specified, the clinician must identify the components of head declination and eye declination required to best visualize the area immediately surrounding the OCP (the area of the oral cavity) with the least strain to the musculoskeletal systems involved with each of these declinations (for the Head and the Eye). By this approach the clinician determines their optimal Head Declination angle.

The non-negotiable criteria can then be determined as follows:

1. Again, the working distance and depth of field must include good resolution with minimum magnification for the distance from the clinician’s eye to the patient’s central maxillary incisors (the OCP), and must extend to at least 5 cm beyond that.

2. The declination angle of the scopes must fully accommodate the Head Declination of the clinician toward the OCP, which has been carefully derived in free space before donning surgical loupes.
3. The oculars must be aligned so that they are perfectly co-linear with the clinician’s eye-to-OCP line; that is, the surgical loupes must be perfectly co-axial with the clinician’s free-space (unmagnified) sight line. This is most simply tested with a pencil or intraoral mirror handle held with its tip in the exact center of the circle/oval of the magnified field, extending laterally along either a 3:00 or 9:00 radial (i.e. to the right or left). If the unmagnified (off-field) extension of the pencil or instrument is perfectly in line with the magnified part while the tip in the center of the field, then the oculars are co-axial. If not, they must be adjusted (bearing in mind the requisite declination angle) so that they become perfectly co-axial. If the oculars cannot be vertically set/reset, co-axiality is unlikely to be achievable. Studies are currently underway to determine what percentage of clinicians are using surgical loupes which are not perfectly co-axial. Non-co-axial oculars are associated with color aberrations, linear aberrations, and other sometimes subtle distortions. Even worse, such mal-aligned scopes result in unwitting loss of control of instruments by the clinician as they move instruments on and off of the surgical operating field.

Q: It is difficult to teach students a dedication to ergonomic practices because ergonomic problems are only developed after a long period of time. How are you training your dental students?

A: More and more universities all over the world are beginning to incorporate basic integrated clinical ergonomics education as part of their clinical skills training from the outset of professional education. The student tool set is augmented by the use of such assessment tools as the ClinErgoAssess format, which allows a relatively ergonomically unsophisticated clinical faculty to quickly calibrate their observational abilities and feedback to students, who can use their basic toolset to correct out-of-balance postures and positions, both pre-clinically and clinically. Because assessment grades are assigned to the process as well as the more traditional assessments of clinical end-products, students attend carefully to the learning of ergonomically sound strategies for clinical performance.

We have used an integrated foundation program in clinical ergonomics dental and dental hygiene students (as well as for graduate students) for over 20 years with great success. The initial orientation, self-derivation exercises, and acquaintance of the students with their ergonomics problem-solving tool set requires 3-4 sessions of 3-4 hours each (~12 hours total as part of the regular curriculum). Thereafter, the tool set can be engaged and re-enforced throughout the undergraduate and graduate programs in both simulation and clinical work.

Q: Can injured clinicians be rehabilitated by training with ergonomically correct loupes?

A: Surgical loupes which are correctly selected and properly adjusted are usually a key element in the rehabilitation of clinicians who have been injured. I have worked with clinicians whose injuries were from primary work-related musculoskeletal compromises as well as those with work-exacerbated motor vehicle injuries or sports injuries. Whether or not the clinicians had worked with surgical loupes prior to their injury(ies), the three non-negotiable criteria must be carefully determined and carefully met. As part of this process, the clinicians often require careful reappraisal of how their existing operatory equipment is laid out and used by them in order to assure that they are making their equipment work optimally for them. More often than not, adjustable (front-mounted-loupes) are far preferable as injured clinicians move through the rehabilitation period so that they can periodically adjust their magnification systems to match subtle (and not-so-subtle) changes they make in their clinical ergonomics as they return to full and comfortable clinical work. However, not all adjustable surgical loupes can meet the three critical criteria for clinicians. Most important is that the oculars can be vertically adjustable as well as angularly adjustable, in order to achieve and maintain true co-axiality once the declination angle of the clinician has been properly matched.
Q: Doctors recommend that we invest for our health while we are healthy. What is your advice to students and young clinicians for the ergonomic practice of dentistry?

A: Unfortunately, students and young clinicians tend to think that physical injuries will not happen to them personally, despite the statistics to the contrary, and despite the warnings during their professional education from a majority of clinicians who will give testimony to what so often happens to compromise the health and resilience and lifestyles of dental and surgical professionals.

Mounting concerns about the economic disasters which can attend early loss of practice has combined in the past decade with increased internet information traffic and social media buzz among dental students across North America. As a result, more dental schools have begun to advertise on student blog-sites their ergonomics programs in the hopes of attracting a higher caliber of conscientious student. We have had proof for over a decade that integrated clinical ergonomics education correlated statistically with less risk of low back pain among our recently graduated practitioners. Not surprisingly, students are now actively seeking out schools with integrated ergonomics education for simple economic reasons: protecting their lifetime income potential.

My advice to young clinicians is simple. You have chosen to be a professional clinician. You have only one body in this life. Take care of that body very carefully. Protect it. Concern for your health is not a matter of selfishness. Your optimal health is in the very highest interest of your patients, both current and future. It is one of the most important contributions you will make as part of your professional calling.

For More information on these topics, see these other articles by Dr. Lance Rucker:


For Dr. Lance Rucker’s full publication list and Curriculum Vitae, please visit www.ergonomicsdental.com/biographs/