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Ergonomic Loupes: the Essential Tool for Precision and Comfort in Medical Procedures

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Received Date: March 01, 2024

Published Date: March 11, 2024

Summary

Nearly all loupe wearers consider loupe ergonomics as one of the important factors in selecting loupes. Despite this, we find that many of the loupes sold as “ergonomic loupes” do not meet ergonomic requirements. This is why SurgiTel’s mission has been to improve the way medical, dental, and veterinary professionals’ work. We strive to enhance our clients’ health through providing the best products which support the best working posture and comfort, alleviating all too common neck and back strains, and helping them provide their patients with the best care. This article will review basic ergonomics related to loupes so that non-ergonomic loupes can be easily identified.

Why Non-Ergonomic Loupes are Prevalent

Before we discuss why non-ergonomic loupes are accepted by many, we should first think about our natural behavior. When we look down on objects, we tend to tilt our heads rather than rotate our eyes. Ergonomic postures are a learned behavior, like an effective tennis or golf swing. You may unknowingly work with a non-ergonomic posture for many years without experiencing serious neck pain. Initially, working with non-ergonomic loupes will feel more natural than working with ergonomic loupes. Learning to work safely with ergonomic loupes is a short process, usually the adjustment period is 2 to 3 weeks, but it is very beneficial in the long term [1-4]. So, we should remember that ergonomic postures are at first not a natural behavior and expect an adjustment period.

There are several reasons why non-ergonomic loupes are still accepted as ergonomic:

1. Industry safety regulations focus on the health and comfort of patients and health care workers, but not on the professional tools clinicians use every day. These tools include

their loupes, LED headlights, and seating. Unfortunately, there are no ergonomic and safety standards for these tools, so many non-ergonomic loupes have been marketed as ergonomic.

2. Poor management of working pain created by non-ergonomic loupes. We have spoken with many clinicians who blame a bad night’s sleep or years-old sports injuries for their constant neck pain. We hear stories every day of clinicians treating their symptoms instead of examining their working posture and finding ergonomic loupes that support a comfortable and safe neck posture.

3. Dental, medical, and veterinary professionals assume pain is part of the job. Accepting working pain as an inevitable part of working can result in permanent injury or force clinicians to leave their careers.

4. There is a lack of information about ergonomics and misinformation. Only recently have educational programs begun to incorporate ergonomic education into their lesson plans, so there are generations of clinical professionals learning

about the dangers of improperly fitted loupes only after they develop a physical problem. Working pain can take five to ten years to develop, so without proper preventative education, clinicians are at risk every day of developing debilitating working pain and injuries due to the use of non-ergonomic loupes. In response to the increased knowledge and importance placed on ergonomics, nearly every loupe company has added the word “ergonomic” to their marketing materials. Indeed, the use of loupes does allow the clinician to work farther away from their patient which reduces lower back pain, but loupes without proper viewing angles (also known as declination angles) can cause poor neck posture which leads to chronic pain and injury.

Making Sure Your Loupes are Ergonomic

Ergonomic loupes are not a “one-size fits all,” that is why SurgiTel carries three different types of ergonomic loupes: Through-The-Lens (TTL), Front-Lens-Mounted (FLM), and deflection loupes

(ErgoDeflection™). You must seek ergonomically correct tools, different facial features may need different styles of loupes.

The Ergonomic Gap

The Ergonomic Gap is defined by the difference between the current working neck tilt angle and the safe neck tilt angle of less than 20-degrees [5]. In order to find ergonomic gaps, you should first start by asking yourself these questions:

- Do I hunch to improve my vision? Getting closer to objects helps us to see better, but working in hunched postures will create chronic neck and back pain.
- Am I tilting my head too much? Do my loupes force me to excessively tilt my head? The recommended head tilt to prevent neck pain and injuries is less than 20-degrees [5]. Most traditional loupes may force you to excessively tilt your head (Figure 1).

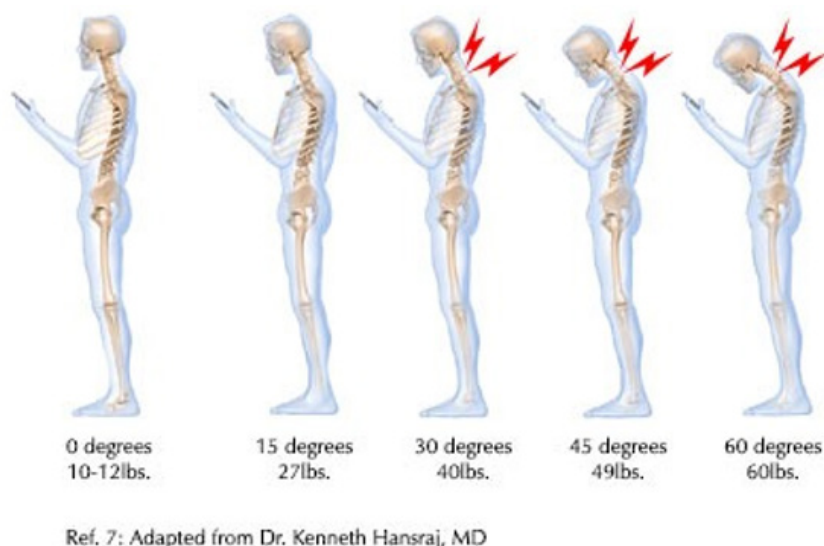


Figure 1: Neck posture and spinal stress.

- Does my stool help me work with a neutral posture? If you sit for procedures, the selection of the right ergonomic stool is very important for neutral lower back posture support.

Three Essential Ergonomic Factors When Purchasing Loupes

Working Distance

Working distance is defined as the distance from the eyes to the work area [6, 7]. The most common problem that Dr. Bethany Valachi encounters with her clients is that the distance is often measured too short, which results in excessive neck flexion or hunching [8]. Working distance should be tailored to the individual, for example, the working distance for a shorter clinician will be smaller when compared to the working distance of a very tall clinician. On average, we have found that someone who is 5' 1"

will have a working distance of 15", someone who is 5' 8" will have a working distance of 18", and someone who is 6' 1" will have a working distance of 20". A discrepancy of just a few inches can have a significant impact on your comfort and health.

Declination Angle

Declination angle is the angle that your eyes are inclined downward toward the working area. This angle should be steep enough to help you attain a comfortable working position with a minimal forward head posture of 20-degrees or less. The farther the head is positioned forward to see through the loupes, the greater the strain on the neck muscles and discs [6, 9, 10]. The predominant problem that Dr. Valachi encounters regarding declination angles is insufficient, small angles that force the operator to assume an unhealthy working posture [6].

To avoid this insufficient declination angle, have your local representative take a side view photo of you while you are looking at the operating site through the demo loupe when you are ordering your new loupes. You want to see yourself with a more upright posture, looking downward at a steeper angle. Even though declination angle is one of the three essential ergonomic factors when purchasing loupes, most clinicians do not know how to correctly measure it. This allows many companies to incorrectly

measure the declination angle by using the angle between the axis of loupes and the temple arms. However, the true declination angle is measured between the axis of the loupes and a line connecting the top of the ear and the corner of the user's eyes. Therefore, without a user, the true declination angle cannot be determined. Figure 2 shows how some companies use a temple arm reference line to overinflate their achieved declination angle.

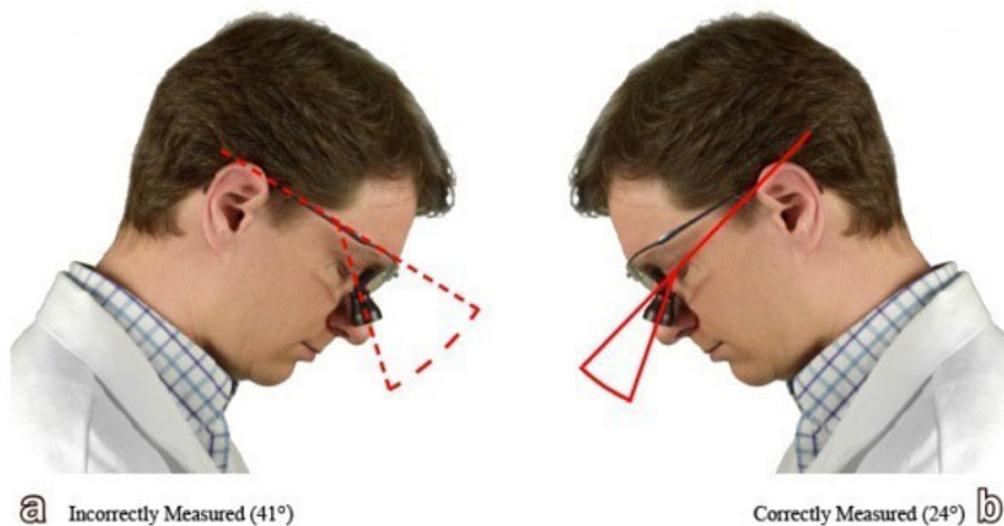


Figure 2: Misrepresented declination angle claims.

Frame Size/Shape

The lower that a manufacturer can place the ocular in relation to your pupil, the better the declination angle they can generally provide for you [6, 8]. Note: SurgiTel has patented suspended

magnification technology which secures the magnification oculars at the very bottom of a sweep or open lens type. This, along with the pantoscopic tilt of our lenses allows us to achieve a steeper declination angle than any other company.

The Difference Between Hybrid Loupe, Deflection Loupe and Straight TTL

Deflection Loupes

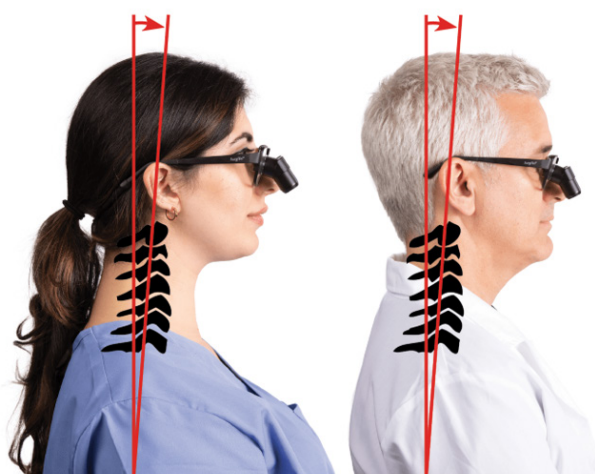


Figure 3: Example of posture while wearing ErgoDeflection loupes.

Deflection loupes are highly effective in controlled environments, offering precise magnification and an ideal neck tilt of less than 20-degrees (Figure 3). In an office setting your level of control is greatly reduced due to the unpredictable nature of patients and their varying ability to sit in the ideal viewing position for the clinician.

These loupes can be advantageous for students who are honing their skills, as they can precisely position the typodont for optimal visibility. This controlled setup facilitates a focused and ergonomic working posture for the student, setting them up for a pain-free career.

However, the real challenge arises in the dynamic environment of a clinical practice. Patients, with their diverse physical conditions and constraints, may present difficulties in achieving the ideal viewing angle. In such cases, clinicians often find themselves in situations where they must contort into non-ergonomic working postures to gain a clear view into the patient's mouth.

The paradox emerges when these clinicians, equipped with ergonomic loupes designed to promote a comfortable and sustainable working posture, find themselves forced into non-ergonomic positions. This compromise not only affects the practitioner's physical well-being but also undermines the very purpose of using ergonomic loupes in the first place.

Straight TTL Loupes

One of the key benefits to the straight TTL is the declination angle that allows for an ergonomic neck tilt of 20-degrees or less (Figure 4). This neck angle minimizes strain on the neck and upper body, promoting a more comfortable and sustainable working posture. This ergonomic advantage is crucial for professionals to have a pain-free and healthy career. Another benefit is coaxial vision, which ensures that the line of sight through the loupes aligns with the optical axis of the lenses. This alignment results in a clear and undistorted view, enhancing the precision and accuracy of the clinician's work.

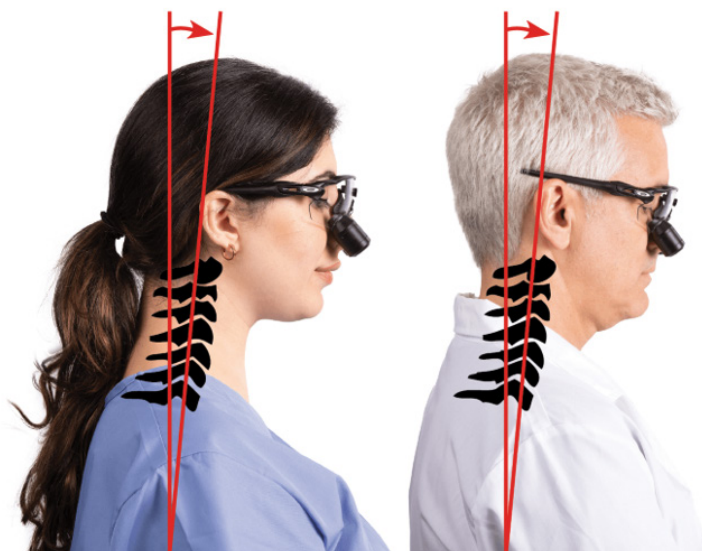


Figure 4: Example of posture while wearing straight TTL loupes.

Furthermore, the straight TTL design fosters coaxial vision or natural vision. This allows the magnified vision to be coaxial with peripheral vision. Coaxial vision helps to foster a more natural direct hand-eye coordination and allows clinicians to track where the tools are. This synchronization is instrumental in tasks that require fine motor skills and precision, such as dental procedures.

The compact straight prism design offers a slightly broader field of view and increased depth of field compared to deflection loupes. The magnification options in the prism ocular include 2.5x, 3.0x, 3.5x, 4.5x, 5.5x, 6.5x, 8.0x* and 10.0x* (*only available on Ergo Max 2.0 and Aero frames) providing a versatile range to cater to diverse magnification needs.

Hybrid TTL Loupes

Hybrid TTL loupes are the integration of the advantages offered

by both straight TTL loupes and deflection loupes, providing practitioners with a versatile and practical tool for their daily work. The hybrid TTL loupe allows clinicians a great deal of vision over the loupe so they can see their surroundings and the monitor clearly with no interference from the ocular. SurgiTel's patented suspended magnification and the pantoscopic tilt of our frames play a pivotal role in enhancing the functionality of the hybrid loupes. By utilizing the patented suspended magnification technology, it means that SurgiTel is the only company that is able to produce hybrid loupes.

Benefits of Hybrid TTL (Through The Lens) Loupes

Hybrid loupes combine the advantages of both deflection and straight TTL loupes. One standout feature of hybrid loupes is their steep declination angles, which closely rival those of deflection loupes (Figure 5). The incorporation of SurgiTel's patented

suspended magnification and the pantoscopic tilt of the frames contributes to achieving this notable declination angle. This design innovation allows clinicians to maintain a comfortable and ergonomic head posture, minimizing strain on the neck and upper

body during prolonged procedures. The combination of a steep declination angle and ergonomic design ensures that practitioners can work with precision while protecting themselves from pain due to a non-ergonomic posture.

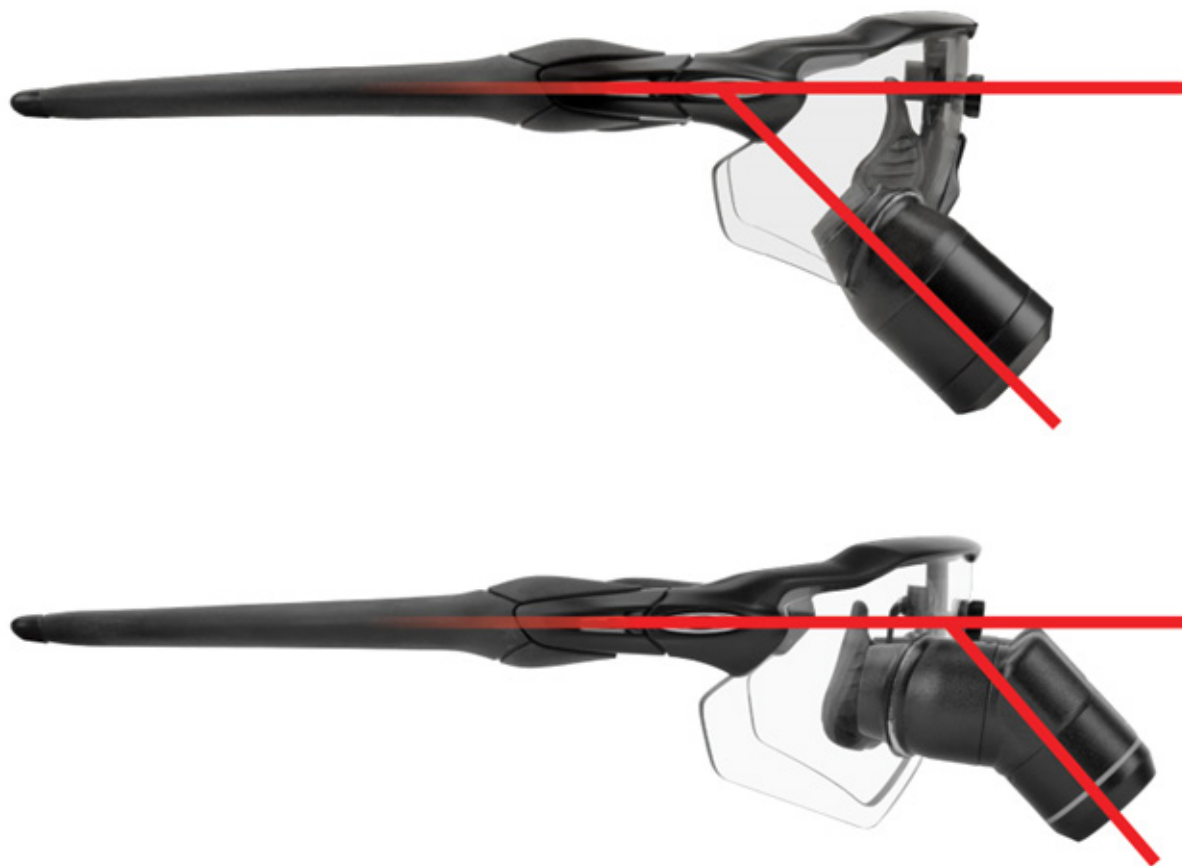


Figure 5: Comparable viewing angle of a Hybrid TTL loupe with suspended magnification technology (top) to a Deflection loupe (bottom).

The practicality of hybrid loupes is highlighted by their ability to address real-world clinical challenges. Being able to see if a patient is uncomfortable during a procedure is a crucial aspect of patient care. The hybrid design, like the straight TTL, allows clinicians to maintain good direct vision to their work environment.

Benefits of FLM (Front Lens Mounted) Loupes

SurgiTel's Front-Lens-Mounted (FLM) loupes (Figure 6) are the only customizable loupes with a full range of magnification powers, allowing customers to create a custom declination angle for their maximum neck comfort. FLM loupes are available either mounted to a frame or headband. FLM loupes and most SurgiTel TTL loupes

can deliver any declination angle to support the safe neck posture of less than a 20-degree head/neck tilt. The advantage of straight FLM loupes is that you can incrementally change your declination angle to gradually go from your current posture to a more upright position. After years of working in a bad posture, your spine and body may not be able to go from a hunched-over posture directly to an upright ergonomic posture. If you are a clinician that is operating on patients at different heights, FLM loupes also give you the ability to adjust the vertical direction to align with your operating area. Combining this feature with working distance caps, you can also change the distance that is in focus. With customizable FLM loupes, you can have the most flexibility and customization.



Figure 6: SurgiTel FLM (Front-Lens-Mounted) loupes shown with 2.5x Galilean oculars on Oakley Radar frame.

Ergonomic Consultants

Ergonomic consultants, some of whom are licensed physical therapists, proactively educate, and objectively evaluate work environments to identify ergonomic risk factors and expose any unforeseen workplace hazards [11]. Below is a list of ergonomic consultants who can analyze and improve your working posture.

Dental

Bethany Valachi - www.posturedentistry.com

Ergonomics Dental - <https://ergonomicsdental.com/>

Surgical

Dr. Geeta Lal - <https://surgicalergonomics.com/>

Society of Surgical Ergonomics - <https://www.societyofsurgicalergonomics.org/>

About SurgiTel

Over the past 30 years, SurgiTel loupe designs have greatly advanced to serve the demands of clinicians. SurgiTel is uniquely situated to provide higher magnification and greater flexibility than competitors. The traditionally designed non-ergonomic loupes are lacking features offered by next-generation SurgiTel patented loupes which allow for a more comfortable weight along with stable, quality vision. SurgiTel has local and international representatives to help clinicians get personalized support.

Acknowledgement

None.

Conflict of Interest

No conflict of interest.

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