Magnification for the Dermatologic Surgeon

Hubert M. Chodkiewicz, MD; Aaron K. Joseph, MD

PRACTICE **POINTS**

- Ergonomic practice is paramount in preserving the longevity and productivity of the dermatologic surgeon.
- A magnification device may be a helpful addition for a dermatologic surgeon to achieve a healthier and more productive practice.

Ergonomic practice increases the productivity, quality, and longevity of the dermatologic surgeon. When used properly, magnification devices can be ergonomic and beneficial additions to the dermatologic surgeon's practice. Herein, we review the available magnification options for the dermatologic surgeon and evaluate the options based on cost, design, and functional advantages and disadvantages. Magnification for the dermatologic surgeon may be a useful tool for a healthier, more efficient, and higher-quality practice.

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Dermatologic surgeons are susceptible to work-related ailments given the nature of their working posture, the most common of which are pain and stiffness in the neck, shoulders, and lower back, as well as headaches.[1,2] Awkward posture and positioning, for the sake of getting a better view of the task at hand, puts the surgeon in ergonomically disagreeable positions. Because the prime working years for a dermatologic surgeon tend to coincide with the age of presbyopia onset, magnification may help reduce and thwart musculoskeletal problems and eye strain. Indeed, a multitude of surgical specialties and dentists use intraoperative magnification.[3] Knowledge and use of available magnification options can be a key addition to the dermatologic surgeon's armamentarium. We discuss the need for magnification and review magnification devices that are readily available to the dermatologic surgeon. Table 1 presents a summary of all magnification options discussed.

Need for Magnification

Presbyopia is a condition of aging in which one loses the ability to accommodate and focus at near distances. The estimated prevalence of presbyopia in North America is 83%, typically with onset by 45 years of age.[4] Individuals with presbyopia often hold objects farther away from their eyes to bring them into focus, causing eye strain, headaches, and musculoskeletal injury.

Use of intraoperative magnification allows for enhanced visualization of fine anatomic details and precise suture placement for the surgeon with or without presbyopia. Higher magnification produces a larger image; however, it also reduces field of view and depth of field (ie, the amount of depth that stays in focus without repositioning). The resolution and quality of the image are dependent on the optical

Dr. Chodkiewicz is from the Department of Dermatology, University of Texas Medical School at Houston, and the Department of Dermatology, University of Texas MD Anderson Cancer Center, Houston. Dr. Joseph is from Skin and Laser Surgery Associates, Pasadena, Texas.

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Correspondence: Hubert M. Chodkiewicz, MD (Hchodkiewicz21@gmail.com).

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Table 1.

Magnification Options for Dermatologic Surgeons

Device	Advantages	Disadvantages
One-piece bifocal magnifying safety glasses	Lightweight, easy to wear, various diopter options, eye protection	Minimal magnification, do not compensate for differences in vision between both eyes
Magnification visor	Magnification level ×1.5 to ×3.5, pivots out of way when not in use, may be worn over other glasses	Bulky to wear, poor resolution, cannot be customized
Magnification clips	Magnification level ×1.5 to ×3.5, lightweight, pivots out of viewing angle, clips on to existing glasses	Difficult positioning for optimum viewing angle, small field of view
Magnifier with frame/headband	Similar to magnification clips	Similar to magnification clips
Magnification stand	Does not need to be worn, freestanding	Not easily portable, cumbersome to use
Surgical loupes	Magnification level ×2.5 to ×4.5, good resolution and quality optics, can be customized	Takes time getting used to
Operating surgical microscope	Strongest magnification	Not easily portable, impractical in dermatologic surgery
Dermoscope	Magnification level ×10, handheld, helps with preoperative diagnosis	Minimal benefit during surgery because it is handheld with a small field of view

properties of the lens system. The ideal optic system is surgeon dependent and involves a combination of magnification level that will not result in dramatic loss of view and depth of field, while maintaining crispness and quality of image.

Intraoperative magnification yields ergonomic benefits by promoting a safer neck flexion angle by increasing the working distance to a more ideal position (Figure). In doing so, it improves posture and minimizes eye and musculoskeletal strain secondary to awkward positioning and presbyopia.[1,5] Stationary working position and neck flexion and rotation with precise and repetitive tasks are risk factors for strain and injuries that dermatologic surgeons often encounter.[1] Magnification devices are tools that the dermatologic surgeon can utilize for a more ergonomically sound practice. Indeed, magnification has been shown to improve posture in the dental literature, a specialty with similar occupational risk factors to dermatologic surgery.[6-8] Ergonomic practice reduces occupational injuries and improves work quality and productivity, thereby having a favorable effect on both the patient and the physician.

Improved Outcomes With Magnification

There are many examples of improved surgical quality and outcomes with magnification in other specialties. Hart and Hall[5] illustrated the advantage of magnification in laceration repairs in the emergency department. In one study, increased magnification resulted in a substantial decrease in positive surgical margin rates in open radical retropubic prostatectomy.[9] Schoeffl et al[10] demonstrated that the microsurgical success of fine surgical procedures was directly related to optical magnification strength when comparing the unaided eye, surgical loupes, and the operating microscope. The dental literature also has numerous examples of magnification producing improved quality dentistry.[11-13] Although magnification is not a novel concept to dermatologic surgery, little has been written about its use in the dermatologic surgery literature.

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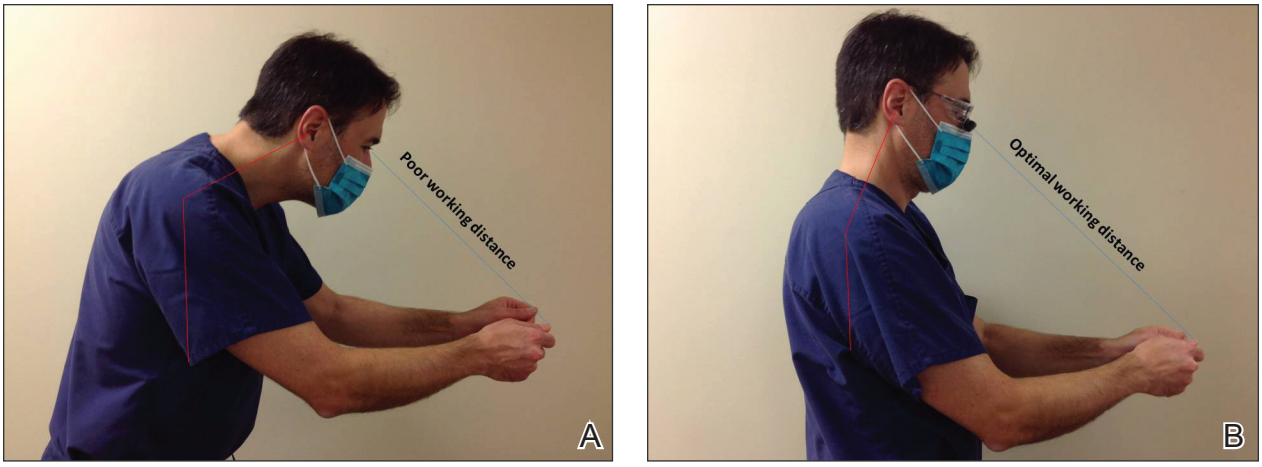

Dermatologic surgeon working distance. A poor working distance with a strained neck angle and an ergonomically disagreeable position (A). An optimal working distance with a safer neck angle and a more ergonomic position with the aid of magnification (B).

Magnification Options

One-Piece Bifocal Magnifying Safety Glasses—Bifocal magnifying safety glasses are polycarbonate safety glasses made with lenses in which the lower half is a magnifying lens. They are available in +1.5, +2.0, +2.5, and +3.0 diopter strengths. The total magnification power is calculated as follows: (diopter/4) + 1. The glasses are lightweight, easy to wear, inexpensive, and protect the eyes; however, they provide minimal magnification and do not compensate for differences in vision between both eyes.

Magnification Visor—The magnification visor is a headband visor with magnification lenses. It comes in various levels of magnification ranging from ×1.5 to ×3.5. It can be worn over prescription or safety glasses, may be pivoted out of the way when not in use, and is inexpensive. Conversely, it may be bulky to wear, cannot be customized, and does not offer the best resolution.

Magnification Clips—Magnification clips are hard-coated magnifying lens plates that fasten to eyeglass frames and range in level of magnification from ×1.5 to ×3.5. They can be pivoted out of the viewing angle, are lightweight, and are inexpensive; however, positioning may be difficult for ideal working distance and viewing angle.

Magnifier With Frame/Headband—The magnifier with frame is similar to magnification clips, but the magnification lens plate comes with a frame. It can be used with or without glasses and comes in magnification levels of ×1.5 to ×3.5. It is light, inexpensive, and may be pivoted out of sight, but similar to magnification clips, positioning for the right viewing angle and working distance may be difficult.

The magnifier with headband is essentially the same as the magnifier with frame. The only difference is the magnification plate is attached to a headband as opposed to a frame. It has similar benefits and limitations as the magnifier with frame.

Magnification Stand—The magnification stand comes as a large magnification lens with a flexible arm attached to a stand. It is a basic magnification tool and does not need to be worn; however, the stand is not easily portable and may be cumbersome to use.

Surgical Loupes—Surgical loupes are a robust magnification choice and the mainstay in magnification for the dermatologic surgeon. Loupes have proven to have comparable results in some procedures to the powerful operating surgical microscope.[14-17] Factors to consider with loupes include brand, design, lens, magnification, resolution, optimal working distance, field depth, and declination angle.[18]

The 2 surgical loupe designs—flip-up loupes and through-the-lens loupes—differ in the mounting of the optic lenses on safety glasses. Flip-up loupes have the optics mounted to the bridge of the frame, whereas through-the-lens loupes are fixed in the lenses.

There are 3 different optical systems for surgical loupe magnification: simple, compound, and prismatic. Simple lenses consist of one pair of positive meniscus lenses similar to reading glasses. Compound lenses are made of 2 magnification lenses. Prismatic lenses magnify using a prism that folds and lengthens the light path.[19,20]

Loupes range in magnification level from ×2.5 to ×4.5. Compared to other magnification modalities, they can be customized and offer better resolution

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Table 2.

Comparison of Surgical Loupes

Type	Advantages	Disadvantages
Flip-up loupes	Use on various frames, may be flipped out of view, adjustable declination angle, inexpensive	Narrower field of view, heavy and bulky
Through-the-lens loupes	Customized, larger field of view, lightweight	Fixed to a specific frame, nonadjustable, expensive

with quality magnification. Additionally, loupes can be fitted with a light source; however, they are expensive and surgeons need time to get used to the increased magnification as well as wearing the loupes.

There are advantages and disadvantages to the different loupe designs (Table 2). Flip-up loupes are more versatile, allowing for use on various safety glasses. They can be flipped out of view, and the declination angle may be altered; however, flip-up loupes have a narrower field of view and are heavier and bulkier than through-the-lens loupes. Through-the-lens loupes are lighter and have a larger field of view, as the optics are closer to the eye. They are customized to the declination angle and working distance of the surgeon. Conversely, through-the-lens loupes are more expensive and cannot be adjusted or moved from the line of vision.

Operating Surgical Microscope—The operating surgical microscope is not practical in the dermatologic surgeon's practice. It is expensive and provides unnecessarily powerful magnification for dermatologic surgery. This tool usually is used in the operating room for suturing nerves and vessels with sutures sized 8-0 and smaller. Most skin procedures require size 6-0 and larger sutures.

Dermoscope—Dermoscopy, also known as epiluminescence microscopy, is a technique utilizing a handheld device made up of polarized light and a ×10 magnifying lens to evaluate skin lesions. In skilled hands, dermoscopy allows for the examination of characteristic patterns and morphologic features of skin lesions to enhance the clinician's diagnostic accuracy.[21] It may aid the dermatologic surgeon in identifying the surgical margins of difficult-to-define skin cancers. It is small and mobile; however, it has minimal benefit to the dermatologic surgeon during surgery because it is handheld and has a small field of view.

Conclusion

Good ergonomic practices facilitate a healthier and prolonged career for the dermatologic surgeon. When used properly, magnification devices can be a beneficial adjunct to the dermatologic surgeon by promoting better posture, preventing eyestrain, and providing enhanced visualization of the operating field and instruments. Use of magnification devices has been demonstrated to improve patient outcomes in other specialties. There are opportunities for further research specific to magnification improving dermatologic surgery outcomes given the high level of precision and accuracy needed for Mohs micrographic surgery, wound reconstruction, nail surgery, and hair transplantation.

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