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HOW I DO IT

# A Simple and Innovative Technique to Offload the Microsurgical Loupe

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## ABSTRACT

Loupes have long been an integral part of the microsurgeon's arsenal, playing an instrumental role in the provision of intricate details. The prismatic lens of the spectacle model may exert enormous and prolonged pressure upon the delicate skin of the nasal bone which lacks a sufficiently thick layer of subcutaneous fat. A simple yet brilliant innovation has been developed that incorporates the principle of offloading to integrate a corn cap into a soft nasal support. This simple technique could prove invaluable to microsurgeons suffering from nasal discoloration or pain following prolonged use of prismatic loupes. The pressure exerted on the nose is reduced by 42% with this technique.

## INTRODUCTION

Loupes play an essential role in the arsenal of a microsurgeon, since they allow for fine details to be observed under the loupes [1]. Presently, two types of loupe lenses are available for microsurgeons, prismatic loupes and Galilean loupes. The weight of a prismatic loupe ranges between 100 and 160 grams, which is significantly more than the weight of a Galilean loupe. In plastic surgery, prismatic loupes are more preferred over Galilean loupes for their higher precision and enhanced focus when performing repair of extremely intricate structures [2].

The prismatic loupe can be classified into two types. The first is a headband, while the second is a pair of spectacles [3]. Although the headband model is advantageous in that it does not readily cause fogging of the lens, it can cause headaches for certain individuals because of its bulkiness. While the spectacle model is smaller and more compact, its greatest disadvantage is that the majority of the weight for the lens system is located near the proximal part of the lateral wall of the nose.

A pair of prismatic spectacles exert considerable pressure on the delicate skin surrounding the nasal bone, which lacks a sufficient covering of subcutaneous fat. Numerous surgeons find that after wearing prismatic spectacles continuously for a lengthy period of time, they develop permanent signs of pressure-induced deformation and discoloration of the skin (as in the case of the author). This causes certain aspiring plastic surgeons to develop a subconscious aversion to loupes when undergoing prolonged surgery. An additional issue with this model is that it can cause users to experience frontal headaches after prolonged use.

There may be a benefit to using nose pads to alleviate the problem of loading caused by microsurgical loupes. The most commonly available nose pads that are intended for use with regular spectacles are made of silicone rubber. However, the sheer weight of the loupe may make the nose pads ineffective at providing adequate relief from pressure pain on the nose. Another issue faced by the majority of surgeons is the necessity to replace the nose pads on a frequent basis.

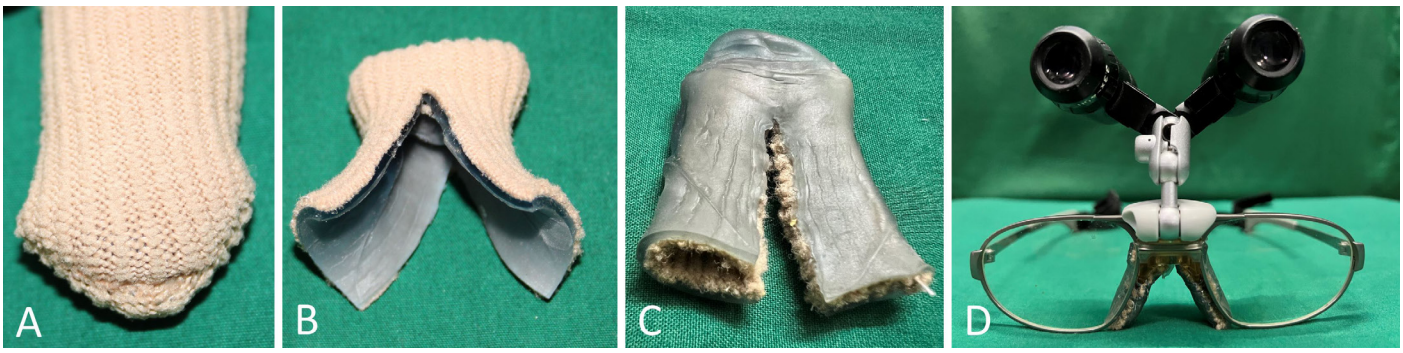


**Figure 1.** Device design. (A) A corn cap with an inner lining made of silicone sheet and an outer covering made of cloth. (B) Approximately 75% of the mid-anterior and mid-posterior surfaces of the corn cap are cut away. (C) Sewing the cut edges of each segment together forms two tubes with a common base cut open at one end. (D) The nose pads of the loupe are covered by an inverted silicone corn cap.

**Table 1.** The Contact Area Between the Lateral Nasal Wall and the Nasal Pad With and Without Silicone Cushioning

| | Length (mm) | Breadth (mm) | Area (mm²) |
|---|---|---|---|
| Without the silicon cushioning (A1) | 21 | 8 | 168 |
| With the silicon cushioning (A2) | 24 | 12 | 288 |

A1, area 1; A2, area 2; mm, millimeter; mm², square millimeter.

## DEVICE DESIGN

The author demonstrates one simple innovation that incorporates the offloading principle and integrates a corn cap onto the soft nasal support in this article (Figure 1). As the corn cap is inverted, the layer of cloth is on the inner side, and the sheet of silicone is on the outer side. In the following step, the inverted corn cap is divided longitudinally on a midline so that it is split into two equal segments all the way up until it reaches the base in such a way that the segments are attached to the base. The segments of the corn cap are now sewn individually onto the nose pad of the loupe, with the base lying in the midline between the two supports. As opposed to a standard nasal pad or support, the three-sided nasal support system is designed with a larger surface area and better molding flexibility. A corn cap is also able to distribute the weight evenly and prevent skin discoloration and pain because of the pliability of silicone.

Over the last five years, the author has employed this homemade innovation technique for circumventing iatrogenic nasal pressure sores for approximately 38 hours a week. This corn cap has proven to be extremely comfortable to wear and has not yet required any modification or replacement of the silicone material.

As these silicone caps are gel sheets, they conform to the shape of the nose. The silicone sheets act as a sponge when pressed against the rigid surface of the nose. This allows the silicone sheets to increase the surface area and decrease the pressure per unit surface area. A mathematical equation can be used to estimate the weight of the loupe on the lateral wall of the nose.

$$W = \sum pA\cos\theta = \overline{p}\ \sum A\cos\theta = \overline{p}\ A'$$

W : Weight
$\sum$ : The summation of small areas A over the lateral wall of the nasal bridge
$\theta$ : The inclination of the normal to the vertical
p : Pressure
$\overline{p}$ : Mean pressure over the entire surface area of contact of the nasal support of the loupe
$A' = \sum A\cos\theta$ : Surface area of contact projected on a horizontal plane

It has been found that pressure for a given weight is inversely proportional to its projected area. To facilitate calculations, the projected surface area of contact of the nasal support was determined in both cases, with and without the cushion. We employed a simple method whereby the nasal pad was dipped in paint and placed on a graph sheet fitted snugly against the lateral nasal wall. On the graph sheet, the nasal pad was positioned similarly to its position on the nasal walls. Paint was applied on the nasal pad to mark the area of contact. A portion of the paint-marked graph sheet was used to calculate the area of contact by counting the number of millimeter squares. After applying an inverted corn cap, the difference in the area of contact was calculated in a similar manner (Table 1).

On the basis of the equation provided above, pressure (P) is inversely proportional to contact surface area (A), which yields P2/P1 = A1/A2 = 168/288 = 7/12. Taking into consideration the pressure drop, the percentage reduction is equal to (12-7)/12 x 100 = 42%. For microsurgeons using prismatic loupes with nasal pads, this invention might prove extremely useful as a means to support their performance.

## LIMITATIONS

With this device, some limitations may be encountered. It is not possible to employ this technique in loupes with headbands, as well as in models without nasal support. It is also worth noting that the silicone caps increase the height of the loupe glass by 1 to 2 mm. Therefore, this feature limits the use of these loupes for individuals with fixed or non-adjustable lenses.

## CONCLUSION

The inverted corn cap offers a simple and inexpensive solution to preventing nasal pigmentation and headaches that may result from long hours of microsurgery performed with loupes. The design of the corn cap conforms to the shape of the nose and distributes the weight of the loupe over a large surface area, thereby reducing pressure and sensations of discomfort on the nose.

## ARTICLE INFORMATION

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