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LENTICULAR VS. SINGLE-CUT FOR LOW PLUS RGPS'S

Anne Dominguez, Nancy McNamara, John Pole, O.D., M.S.

ABSTRACT: The fitting characteristics of +0.50 DS Fluoroperm 60 rigid gas permeable lenses in lenticular and single-cut forms of the same parameters were evaluated on twenty-two eyes. Using autokeratometry readings, both lens types were fit "on K". Fluorescein patterns were then videotaped and the lens fit assessed. Results indicated the lenticular lens fit better than the single-cut on 13/22 eyes (59%). Either lens type was adequate on 5/22 eyes (23%). The lenticular did not provide an acceptable lens fit on 4/22 eyes (18%). There were no instances of the single-cut lens providing a better fit on an eye than the lenticular.

KEYWORDS: Lenticular, single-cut, low plus power, rigid gas permeable

In order to reduce the weight of a single-cut lens, various lenticular designs are often used to properly fit high plus (or minus) power rigid gas permeable lenses.[1] A standard lenticular design for a plus lens consists of a central optical portion on the front surface of the lens surrounded by a peripheral portion of much less curvature.[2] (Fig. 1) As a result, the center thickness and weight are reduced. Another lenticular design that can be used for plus lenses is known as a minus carrier. This

option can be used to give extra lens lift to low plus lenses which may ride low,[2] but may result in increased edge awareness.

Although lenticular designs are routinely used for higher positive powers, manufacturers generally supply low plus lenses in single-cut form unless the practitioner requests otherwise. One principle to consider, however, when fitting single-cut low plus (and minus) lenses is the "watermelon seed" effect.[3] When the edge is actually thinner than the center, the upper lid is unable to hold the lens properly and the pressure of the upper lid forces the lens out from under it.[3] The intention of this study is to determine whether low plus lenticular lenses, with less mass and decreased center thickness, actually center and fit the cornea better than single-cut lenses of the same parameters.

MATERIALS and METHODS: Fluoroperm 60 lenses were provided by Paragon Optical in single-cut and lenticular forms with base curves ranging from 7.4mm to 8.2mm in 0.1mm increments. All lenses were +0.50 DS and had overall diameters of 9.2mm.

Previous contact lens wear was not a requirement for this study, however, 3/11 subjects randomly selected were RGP wearers (4/11 soft lens wearers, 4/11 first time wearers). The subjects ranged in age from 18 to 64 years. Keratometry readings were taken on twenty-two eyes using the Topcon Autokeratometer. In order to reduce possible flexure variables due to corneal toricity, we established an upper limit of 2D corneal cylinder.

Each eye was fit "on K" with a single-cut lens. After an

initial adaptation period of 3 to 5 minutes, fluorescein was applied and the pattern initially assessed under slit-lamp biomicroscopy. We instructed the subjects to blink naturally, and the eye was videotaped. These steps were then repeated with the lenticular lens on the same eye. After all eyes were fit with both lens types, we reviewed the complete videotape to further assess and evaluate the fit of the lenticular and single-cut lenses.

Ideally, a contact lens should position slightly up under the upper lid after blinking and slowly drop approximately 1 to 2mm during the interblink period.[2,3] The lens should position centrally or slightly superiorly between blinks, avoiding significant inferior lens displacement and lower lid contact.[1,2] The fluorescein pattern should reveal minimum apical clearance and a smooth transition zone.[1] Therefore, when reviewing the videotape we considered the following factors in determining a proper lens fit: 1) Does the upper edge of the lens remain under the upper lid between blinks, or does the lens completely drop and rest on the lower lid? 2) Is the pupil completely covered at all times, and is the lens centered? 3) Is there adequate lens movement while blinking? 4) Is the fluorescein pattern sufficient?

RESULTS: Based on the factors listed above, we determined 5/22 eyes (23%) were successfully fit with either a lenticular or single-cut lens. The videotape revealed minimal variations

between the fitting characteristics.

The lenticular lens did not fit adequately on 4/22 eyes (18%). Most frequently the lens remained positioned too high, resulting in the lower pupil margin being nearly exposed. In addition, these eyes were not successfully fit with a single-cut lens.

The lenticular lens showed an overall better fit than the single-cut lens on 13/22 eyes (59%). The single-cut lens frequently fell to the lower lid between blinks whereas the lenticular lens remained under the upper lid while still maintaining proper lens movement and centration.

CONCLUSIONS: Because of the wide variations in physical factors such as lid position, lid tension, corneal diameter, corneal curvature and toricity, several lens parameters must also be considered in order to properly fit rigid gas permeable lenses. Among these are base curve, optic zone diameter, center and edge thickness, peripheral curve width and radii, as well as single-cut, aspheric or lenticular designs. Consequently, in fitting RGP's the practitioner has many variables to modify in order to achieve a desired fit on a given patient.

Lenticular designs are often chosen for higher plus powers in an effort to minimize weight and center thickness, however, they are not routinely used for low plus powers. Our study indicates lenticular RGP's can be a highly successful option for fitting low plus lenses as well, and should be considered for all

plus powers.

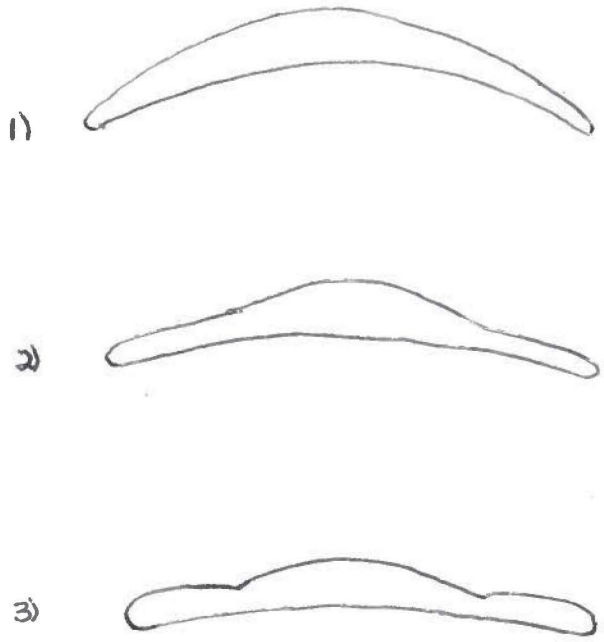

Figure 1. LENS DESIGNS: 1) Single-cut; 2) Lenticular carrier; 3) Minus carrier

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