COMPARISON OF SEVERAL PHOTOGRAPHIC FILM TYPES IN DEMONSTRATING DISCRETE OCULAR DETAILS

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Since today's photographic films are of higher quality, and more special types of film are available than in previous years, we wanted to research the possibility of using common films, special application films, and special photographic techniques to show details of the human eye that are not visible with routine clinical procedures.

Equipment and materials used:

Photo Ease camera with f34 frame
Nikon Zoom Photo Slit Lamp
Kodak Infrared Color Transparency film ASA 100
Kodak Infrared Black and White Negative film ASA 100
Kodak Panatomic-X Black and White Negative film ASA 32
Kodak Tech Pan 2415 Black and White Negative film any ASA
Kodak Plus X Black and White Negative film ASA 125
Kodak Wratten filters: light yellow, blue-green, #87 infrared
Neutral Density filters: .3, .6, .9

The best results were obtained on each type of film by following the manufacturer's recommended exposures, using the proper filter and proper film developing procedures. A wide variation of exposures were recorded on each roll with ½ stop changes between successive exposures. The better exposed transparencies were projected on a large screen to compare detail (resolution). The negatives were compared for detail and contrast by using projection and or by using a microscope to magnify small areas of the negatives. Kodak Kodachrome 25 (color transparency film) known for its extremely fine grain (high resolution) and excellent color saturation was used as the standard to judge color transparency films. The conjunctival blood vessels, limbus,

cornea, anterior chamber, and iris were examined under high magnification with each type of film. The f34 frame was used on the Photo Ease camera because it allowed all ocular structures between the outer canthus and inner canthus to be large enough to fill the whole frame.

After choosing the three best exposed Kodachrome slides, a roll of Kodak Color Infrared Transparency film was loaded into the camera. This type of film can not record thermal changes in biological structures. Thermal photography requires a special indirect process that is complicated and expensive. Infrared film has high light sensitivity and a narrow latitude of exposure of approximately ½ f stop. To withhold "blue" light, a light yellow filter should be placed over the camera lens for color transparency films. The Photo Ease camera is set up for 25 ASA film and infrared films are approximately 100 ASA so neutral density filters were needed. Several .3 N.D. filters were stacked to achieve varying exposures. The filters were necessary because the camera's maximum f stop is 45 which was not enough to prevent the film from being over exposed especially when photographing the sclera. The filters were placed over the flash units on the camera. The best exposures resulted in using the f34 frame with .6 N.D. filter over the flash. Skin tones appeared normal. A blue iris appeared light lavender, and a brown iris appeared black. Conjunctival blood vessels were varying shades of dark orange and cyan. We determined that

the superficial conjunctival vessels were those that appeared reddish-orange on the film. The vessels below the superficial ones appeared dark orange, and the deep vessels resulted in a cyan or blue appearance.

To complete the infrared film study, Kodak Black and White Infrared film ASA 100 was exposed. Kodak suggests using a blue-green filter over the flash unit and an opaque infrared filter like the Kodak Wratten #87. The best exposures were at f31 with a .6 N.D. filter, and a .9 N.D. filter with no blue-green filter. The resolution was not as good as in Kodachrome 25, but about the same as with the color infrared film. No difference in appearance of the conjunctival blood vessels was noted.

Since the infrared films were slightly grainy (poor resolution) we tried the finest grain (highest resolution) black and white film available in 35mm format. Kodak Panatomic-X ASA 32 is an extremely fine grain medium contrast film. The best exposures were at f31 with .3 N.D. filter and f34-40 with no N.D. filter. No extraordinary results were obtained using this film.

Next we wanted to try a high contrast film to see if any of the ocular structures would show up better. Kodak Black and White Tech Pan 2415 is a high contrast, high resolution film. The best exposures were at f31 with a .6 N.D. filter and at f40 with a .3 N.D. filter. The resulting negatives were high contrast but again no structures not

visible to the unaided eye were recorded.

Instead of trying to enlarge the finished negative, we enlarged the object being photographed. Kodak Plus X ASA 125 was exposed using a Nikon Photo Zoom Slit Lamp. The best exposures were at lamp settings of 8 using a large diameter illuminating circle at the limbus at 25X. For 35X, lamp settings of 6 or 7 produced the best exposed negatives. The negatives were blurred except in a small area due to the small depth of field and depth of focus from the highly curved ocular surfaces. No extraordinary results were obtained using the technique.

Even though photographic films have improved in the last decade or so, they still are not nearly as sensitive to detail discrimination as the human eye. The films that were used are excellent for showing gross structures of the eye and orbit for educational uses, but it is very difficult to reproduce the details visible through a slit lamp or opthalmoscope.