Contrast acuity testing continues to be paramount now that presbyopic correction is part of our clinical armamentarium. Key is how much the correction of presbyopia degrades distance visual function. Until now, this question has not been answered adequately. In general, I am astounded that we embarked on keratorefractive surgery 25 years ago but still do not have a clinically relevant, widely accepted method of documenting a patient's functional acuity in an effort to compare the outcomes of the various methods of refractive surgery.

Contrast acuity testing is the means for such documentation and comparison. It is similar to the Snellen test, simple to administer, and easy to interpret. Moreover, testing can be clinically relevant. This article describes the system of functional contrast acuity testing that Rick Baker, OD, of Houston and I are formalizing. Certainly, other systems can be devised. The strong imperative, however, is to institute such a system universally and quickly, or else we will continue to perform surgery without an objective means of describing its result.

THE FUNCTIONAL CONTRAST ACUITY TEST

One determines an individual's functional contrast acuity by using a Snellen chart (92% contrast) and a Snellen-type contrast acuity chart of 12.5% contrast (Figure 1). Rick and I believe that 25% contrast is not sufficiently sensitive to easily delineate a loss of functional contrast. We use a light box that provides a constant luminance. The semidarkened room with a light box creates moderate pupillary dilation, which allows the 12.5% contrast acuity test to correlate with functional nighttime acuity.

We record the results as a series of three numbers (eg, 20/25/40). The first number represents the testing distance (20 feet). The second number indicates the result of the Snellen test at 20 feet (20/25), and the third number stands for the result of the contrast acuity test using 12.5% contrast (20/40). We expect that the young, unoperated emmetrope with 20/20 acuity will lose zero to one line from Snellen to 12.5% contrast and that patients over 45 to 50 years of age will normally lose up to one-and-a-half lines, approximately. The next installment of Nordan's Perspective will include some of our preliminary findings.

The clinician calculates the functional contrast acuity score (FCAS) by adding the Snellen fraction as a percentage to twice that of the 12.5% contrast Snellen fraction and then dividing the total by three.

\[
FCAS = \frac{\text{Snellen} + 2 \times (12.5\% \text{ contrast Snellen})}{3}
\]

For example, an FCAS of 20/20/40 would represent

\[
\frac{20/20 + 20/40 + 20/40}{3} = \frac{100 + 50 + 50}{3} = 66.7
\]

An easy conversion chart is provided in Figure 2. One simply finds the Snellen score on the horizontal scale and moves upward until reaching the 12.5% contrast acuity. Moving horizontally to the left shows the FCAS on the vertical scale.

One of the great strengths of the 12.5% contrast testing
is that the reason that the eye lost contrast sensitivity does not matter; only the loss' occurrence does. Whether the cause is halos, glare, or a residual refractive error, the functional contrast acuity describes how the patient functions and correlates well with that person's nighttime functional acuity.

**CLINICAL RELEVANCE**

The important aspect of functional contrast acuity is a conversion of Snellen numbers into a single value based on 100% that represents normal functional visual acuity. By applying this value to everyday tasks, one can make a legitimate evaluation of the functionality of a patient's visual acuity. All comparisons of devices or procedures should be done eye to eye. In order to determine a patient's true functional acuity, the clinician may perform a functional contrast acuity test (Vectorvision, Greenville, OH) on both eyes without correction. Best-corrected functional contrast acuity will reveal any degradation in functional acuity caused by an intervention. Of course, the FCAS can be correlated to driving simulation studies and other laboratory tests, but it is doubtful that anything but a simple test that can be administered to every patient will ever become a useful tool for describing a patient's real-world visual function.

**FUNCTIONAL CORRELATION**

**What Is Normal?**

The determination of normalcy can be achieved by testing a large number of patients. Various categories should include age, existing refractive error, and BCVA. For example, Rick and I expect that the 20/20 Snellen acuity created by soft contact lenses may provide some significant findings using the 12.5% contrast acuity test.
Correlation and Update of the FCAS
We have proposed the first edition of the FCAS with a correlation to everyday tasks (Figure 3). Continuing to use daytime and nighttime driving as a convenient and universal functional acuity standard seems appropriate.

Rick and I propose that a panel of experts convene once per year in order to review and update the correlation of the FCAS to other important tasks. The definition of normal must always be reviewed as well.

If new data suggest that any of the prior assumptions have changed for a given population, then the corresponding correlation or definition of normal can be changed easily and smoothly by the majority vote of a group widely representative of the eye care profession. This aspect of the functional contrast acuity program is important, because an FCAS may have a profound effect on certain professionals such as truck drivers and pilots, who must function at a high level in a nighttime setting.

CONCLUSION
Certainly, we are long overdue in creating a test that can objectively measure the results of keratorefractive and presbyopia-correcting surgery. Such a test must be universally acceptable and easy to administer, and it must describe individuals’ visual functionality under both daytime and nighttime conditions. Rick and I think that functional contrast acuity and the FCAS would allow all eye care specialists to meet these crucial objectives.

Lee T. Nordan, M.D., is a technology consultant for Vision Membrane Technologies, Inc., in Carlsbad, California. Dr. Nordan may be reached at (760) 431-1846; laserltn@aol.com.