Commentary: Renewed interest in off-axis retinoscopy and peripheral refraction for it's role in control of myopia progression

We all know that vision is a combination of optical input and neural processing. Traditionally, retinoscopy has remained the benchmark for the assessment of refractive errors for the optical input that is perceived by the eye and then processed by the brain. Conventionally, it has always been known that "on the visual axis" (on-axis) retinoscopy gives a more accurate estimate of refractive error compared to retinoscopy that is done off the visual axis (off-axis).

However, in practical terms, retinoscopy is frequently performed slightly off the visual axis and there are situations in which on the visual axis retinoscopy is difficult or even impossible. These include retinoscopy in uncooperative children or when the subject has been anesthetized. Chaurasiya *et al*.[1] in their current study on "refractive changes during off-the-axis retinoscopy in myopia" and many other researchers, over the years have tried to quantify the error in the quantum of refractive error when this is measured with "off-axis" retinoscopy in routine clinical practice. Ferree *et al*.[2] in 1931 measured peripheral refraction with the Zeiss parallax refractometer (Carl Zeiss, Jena, Germany). Rempt *et al*.[3] was the first to perform eccentric retinoscopy and introduced the skiagram to categorize different peripheral refractive error patterns. Jackson *et al*.[4] examined off the visual axis retinoscopy in eight adults (spherical equivalent <±2.5 D) who had undergone cycloplegia. The degrees of the eccentricity of up to 20° along the temporal horizontal field were examined and they found a myopic shift of 5% in spherical equivalent and an increase in cylindrical power of 3% for every degree of eccentricity. In the present study, the authors have noted an increase in myopic shift with approximately 7 and 18% for 10 and 20° of eccentricity, respectively, in the mean spherical equivalent refraction of 10° myopic patients.

What is traditionally believed and agreed upon is that the error in refraction, which is noted in off-axis retinoscopy, is generally small and clinically insignificant when the deviation of axis and the quantum of refractive error is small, and more often than not, this error is eliminated in the process of subjective refraction which follows retinoscopy. However, this error in retinoscopy can become significant if the deviation of the axis of retinoscopy from the visual axis is large or if the quantum of refraction being measured is large, for example, as in high myopia.[5]

Of late, there has been renewed interest in the measurement of peripheral refraction as it is increasingly believed that peripheral refractive defocus plays a role in myopia

progression by inducing axial growth of the eye. Animal studies have shown that depending on the location of the image relative to the retina, axial elongation can be stopped or triggered. Experiments in chickens and monkeys whose vision were defocused either with negative spectacle lenses (hyperopic defocus) or positive lenses (myopic defocus), showed that their visual system was altering their refractive state by accelerating or slowing axial elongation in order to compensate for the imposed defocus.[6] This applies both in the fovea and in the periphery of the retina. Originally, it was believed that only foveal optical errors could regulate eye growth, but it is now believed that peripheral image quality can also modify ocular growth even in the presence of a sharp foveal image.

This is the reason that many researchers have advocated the use of bifocal or progressive addition lenses (PAL) for children as a strategy to retard the progression of myopia, but as of now, there is no consensus regarding their clinical efficacy.[7] Studies with PAL have typically shown a small but clinically insignificant effect on slowing myopia progression as noted in Cochrane review 2020.[8] A meta-analysis noted small reductions in myopia progression (0.25 D) and axial elongation (−0.12 mm).[9]

So, there is indeed a value in studying the variation of refractive error assessment between the on-axis and off-axis retinoscopy but more work needs to be done to have more clarity regarding the clinical application of this work, especially in control of myopia progression.

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