

Ophthalmic astigmatism and slit apertures

Astigmatism is a refraction error of the eye in which there is a difference in degree of curvature in different axes of the cornea. Astigmatism occurs when the front surface of your eye (cornea) or the lens, inside your eye, has a slightly different surface curvature in one direction than in the other, being shaped like a football, instead of being evenly spherical and smooth in all directions.

Astigmatism causes difficulties in seeing fine detail, as lines viewed parallel with one axis of curvature will focus at a different distance than lines viewed parallel with the other axis. In some cases vertical lines and objects such as walls may appear to be trapezoidal, or leaning over. Astigmatism is quite common. Studies have shown that about one in three people suffers from it, and the prevalence of astigmatism increases with age.

There are a number of tests used during eye examinations to determine the presence of astigmatism and to quantify its amount and axis. One refraction technique involves the use of a stenopaic slit (a thin slit aperture) which is rotated in front of the pupil until the best image is achieved. The slit aperture acts as an elongated 'pin hole', only allowing light in the axis of the slit to enter the eye. When the slit is rotated to align with a principle axis of the astigmatic eye, the perpendicular axis focus is eliminated, thus allowing a clearer image to be formed.

For an astigmatic rifle shooter using peep sights, replacing the traditional round aperture with a rectangular or slit shaped aperture will have a benefit on the shooter's ability to see, if the slit is rotated to align with one of the principle axes of the eye. A rectangular or slit shaped aperture will in this regard, act similar to the stenopaic slit used during astigmatism diagnosis in the doctor's office.

Sources:

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