OPTICS AND REFRACTION

CHANGES IN DIMENSION OF THE GLOBE DURING GROWTH

The analogy of the eye to a camera is useful because both are optical systems governed by optical laws. It follows that accurate vision depends on the optical system of the eye being co-ordinated during growth and ideally requires a flexibility which will focus close up as well as in the far distance. Although both the eye and the camera consist of a series of refracting surfaces focusing light on a sensitive membrane, the camera is made to specification whereas the eye develops and grows and therefore might be expected to exhibit disorders arising from disorderly growth. It is one of the more mysterious manifestations of nature, especially when we are considering a millimetre as a very influential degree of deviation, that the complex relationships of the corneal curvature, anterior chamber depth, lens surface curvatures and its thickness together with the total axial length of the eye ball usually start their postnatal existence so that normal vision is possible. Growth is so co-ordinated that postnatal developmental divergences from normality, though the biggest sources of abnormal vision, are still comparatively rare.

The term refraction is not easy for everyone to understand, but some idea of its meaning is essential for knowing how the eye functions. Refraction is the power of a transparent structure to bend light rays.

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The development of vision

This power depends largely on the curvatures of the surfaces and in a complex system like the eye also on the distances of the surfaces from each other. Each surface is a component in the total refraction of the eye. With constant curvature of the anterior part of the eye it is the length of the anteroposterior axis which determines whether the eye is long sighted or short sighted (Figure 15). This is probably the most important single dimension, but cannot be considered in isolation. In clinical practice it is the total refraction of the eye which is the quantity

Figure 15  Dimensions determining long and short sight. This illustrates that the anteroposterior axis (A–B) is greater in myopia than in hypermetropia

62