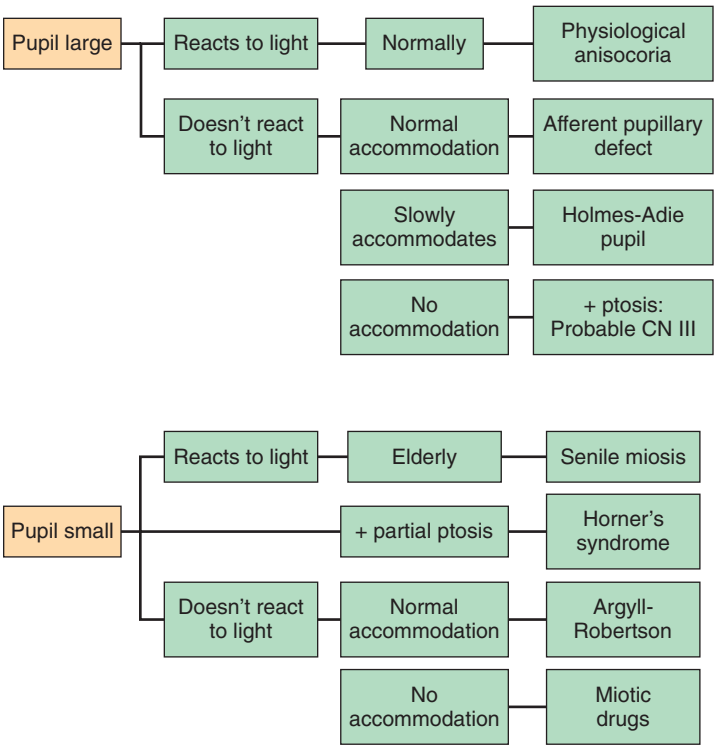

FIGURE 112-4 Algorithm for the approach to unequal pupils (anisocoria).

phenomenon. Figure 112-4 summarizes common pupillary abnormalities and their associated features.

Eye Movements

The history helps in evaluating the patient with diplopia. Is the diplopia primarily horizontal or vertical, or is it greater looking to the right or to the left? Double vision that varies during the day suggests myasthenia gravis. Is the diplopia maximal with near or distant vision? Greater difficulty with near vision suggests impairment of the medial rectus, oculomotor nerve, or convergence system, whereas abducens nerve weakness results in horizontal diplopia when objects are viewed at a distance. Diplopia that worsens on going down stairs may suggest a fourth nerve lesion. Monocular diplopia is usually caused by diseases of the retina or lens and is corrected by having the patient look through a pinhole, unless the cause is psychogenic.

The examination should begin by determining the position of the head and eyes with the eyes in primary gaze. There are four components to oculomotor function:

1. Pursuit eye movements: Smooth pursuit eye movements allow fixation on a moving object. Ask the patient to follow a moving target such as a pin in all directions of gaze.
2. Saccadic eye movements: These movements allow rapid switching of gaze from one target to another. Both horizontal and vertical saccadic movements should be checked.
3. Vestibulo-ocular reflex: This reflex enables fixation on an object even if the head is moving. It is assessed by using the *Doll's Eye Maneuver*.
4. Convergence Response: This tests the ability of the eyes to track an object as it is brought close to the limit of accommodation. Ask the patient to look into the distance and then at your finger held close to their eyes.

Both smooth pursuit and (voluntary) saccadic eye movements in horizontal and vertical directions are checked to determine whether the movements are conjugate or disconjugate. Disconjugate eye movements suggest a disorder of the brainstem (at the level of the ocular motor nuclei or their connections), the peripheral nerves (cranial nerves III, IV, or VI), individual eye muscles (ocular myopathy), or the neuromuscular junction (myasthenia gravis or botulism). A large deficit in the range of eye movements may provide sufficient diagnostic information. However, in many cases, although the patient complains of diplopia, no clear misalignment is visible on testing eye movements. The corneal reflection test may help identify misalignment in these cases. The patient is instructed to look at a light shining directly at the eyes. If the eyes are normally aligned, the light reflection will be about 1 mm nasal to the center of the cornea. If one eye is deviated medially, the reflection will be displaced outward; the reflection will be displaced inward if the eye is deviated outward.

The abducens (sixth cranial) nerve supplies the lateral rectus muscle. The trochlear (fourth cranial) nerve subserves the superior oblique muscle, which intorts the eye as well as depresses the eye in adduction (such as when a patient tries to look downstairs). All other muscles are supplied by the oculomotor nerve (Fig. 112-5). Abnormalities of the cranial nerves in the brainstem are usually accompanied by other signs, such as weakness, ataxia, or dysarthria. The abducens nerve has a long ascending course through the posterior fossa, where it is prone to compression at multiple sites and as a result of raised intracranial pressure; hence, a sixth nerve palsy may be a false localizing sign. Conjugate eye movement is regulated by supranuclear pathways from the cerebral hemisphere to the medial longitudinal fasciculus in the brainstem. A lesion in the cerebral hemisphere resulting from hemorrhage, infarction, or tumor disrupts conjugate gaze to the contralateral side, so that the eyes "look away" from the