

Dissociated Vertical Deviation

Dissociated vertical deviation (DVD) is an innervational disorder found in more than 50% of patients with infantile strabismus (esotropia or exotropia). It is typically associated with other sequelae of deficient binocular vision, including fusion maldevelopment nystagmus syndrome and inferior oblique overaction. There are 2 theories to explain the origin of DVD:

1. The vertical vergence movement of DVD is harnessed to dampen fusion maldevelopment nystagmus syndrome and thereby improve vision, with the oblique muscles playing the principal role (Video 10-3).
2. Deficient fusion allows the primitive dorsal light reflex, which is prominent in other species, to emerge.



VIDEO 10-3 DVD and fusion maldevelopment nystagmus syndrome.

Courtesy of Guyton DL. *Ocular torsion reveals the mechanisms of cyclovertical strabismus: The Weisenfeld Lecture. Invest Ophthalmol Vis Sci. 2008;49:847–857.*



Brodsky MC. Dissociated vertical divergence: a righting reflex gone wrong. *Arch Ophthalmol.* 1999;117(9):1216–1222.

Guyton DL. Ocular torsion reveals the mechanisms of cyclovertical strabismus: the Weisenfeld lecture. *Invest Ophthalmol Vis Sci.* 2008;49(3):847–857.

Clinical Features

Dissociated vertical deviation usually presents by age 2 years, whether or not any underlying horizontal strabismus has been surgically corrected. Either eye slowly drifts upward and outward, with simultaneous extorsion, when occluded or during periods of visual inattention (Video 10-4, Fig 10-8). Some patients have an associated head tilt, for reasons that are unclear.



VIDEO 10-4 Bilateral DVD in a person with esotropia.

Courtesy of Susana Gamio, MD.



DVD is usually the most prominent component of the *dissociated strabismus complex* (DSC), but sometimes the principal dissociated movement is one of abduction (*dissociated horizontal deviation, DHD*) (Video 10-5), and occasionally it is almost entirely a torsional movement (*dissociated torsional deviation, DTD*) (Video 10-6). DVD is usually bilateral



Figure 10-8 Dissociated vertical deviation, left eye. **A**, Straight eyes during binocular viewing conditions. **B**, Large left hyperdeviation immediately after the eye is covered and then uncovered. **C**, The left eye comes back down to primary position without a corresponding right hypotropia.

but is frequently asymmetric. It may occur spontaneously (manifest DVD) or only when 1 eye is occluded (latent DVD).



VIDEO 10-5 DHD in right eye and DVD in left eye.

Courtesy of Inas Makar, MD.



VIDEO 10-6 Bilateral torsional DVD.

Courtesy of Inas Makar, MD.



CLINICAL PEARL

Even in the absence of true inferior oblique overaction, an eye with latent DVD may overelevate in adduction, because it is occluded by the nose. Because DVD can mimic OEAd, distinguishing it from simple overaction of the inferior oblique muscles is important, as the surgical approaches to these 2 conditions may differ. In addition, the 2 conditions may coexist.

Measurement of vertical deviations in the presence of DVD cannot be performed with standard prism and alternate cover testing, because no single prism neutralizes the vertical refixation movement in both directions of the cover test. One approach is to measure the deviations when the left eye is fixating and when the right eye is fixating separately: a prism is placed in front of the nonfixating eye while it is behind an occluder. The occluder is then switched to the initially fixating eye. The prism power is adjusted until the deviating eye shows no vertical movement to refixate. These steps are then repeated for the other eye. The measurement taken when a given eye is fixating reflects the combined effect of the DVD in the fellow eye and any coexisting true hypertropia.

Management

Treatment of DVD is indicated if the deviation is noticeable (generally more than 6Δ – 8Δ) and occurs frequently during the day. When DVD is unilateral or highly asymmetric, encouraging fixation by the eye with greater DVD by optically blurring the fellow eye is sometimes sufficient.

Surgery on vertical muscles can make DVD less noticeable but rarely eliminates it. For constant DVD of 1 eye in a child who never alternates fixation, vertical muscle surgery on the affected eye can mask the deviation. However, in a child with bilateral DVD and alternating fixation, any vertical eye muscle surgery that would mask the DVD in 1 eye would worsen the appearance of the DVD in the fellow eye. Treatment in this situation therefore involves bilateral procedures that limit the vertical excursions of each eye. These usually consist of large (6–10 mm) recessions of the superior rectus muscles, or anterior transposition of the inferior oblique muscles (especially if inferior oblique overaction is present). If there is residual DVD, inferior rectus muscle resection or plication can be performed.