

## Dissociated Vertical Deviation

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Dissociated Vertical Deviation (DVD) is one of the least understood forms of strabismus. It was first described by Stevens as double vertical strabismus, other common names given to this anomaly are, Alternating hyperphoria (Crone), Anaphoria / anatrophia (Stevens), Periodic vertical squint (Anderson), Strabismus sursoadductorius (Cords). The term "Dissociated Vertical Deviation" was given by Bielschowsky (1938).

This anomaly is intermittent and is characterised by an upward excursion, excyclotorsion, lateral movement. Uniqueness of DVD is that it violates Herring's law of ocular motility. No movement is seen in the fixing eye when the deviated eye returns for refixation. Traditionally, the upward excursion is labelled as Dissociated Vertical Deviation; the excyclotorsion is called as Dissociated Torsional Deviation and the lateral movement is termed as Dissociated Horizontal Deviation. All these three components are labeled as dissociated strabismus complex.

### *Clinical features of DVD*

DVD does not usually present with visual symptoms; however it may be a significant cosmetic blemish. The patients do not complain of diplopia as there is poor fusion and suppression of the deviating eye. However, occasionally diplopia and confusion has been reported. The characteristic excursion of the eye may be present as phoria (manifesting only under cover) or tropia (when it manifests spontaneously, in conditions of fatigue, daydreaming, inattentiveness or during poor health). On uncovering the eye, it slowly drifts back rather than show a rapid refixation movement as seen in any other hyperphoria or hypertropia. The condition is usually bilateral and asymmetric. The signs are more profound in an amblyopic, non-dominant or non-fixing eye. It is rarely seen in isolation and associated features include

esotropia, Intermittant Divergent Squint and latent nystagmus. It is best to examine a DVD using a translucent occluder so that the updrift behind the occluder is visible. A +4 dioptre lens may also serve the same purpose.

### **Problems with DVD**

Visual disturbances -diplopia, rare

Cosmetic (Manifest DVD)

Longstanding DVD ?SR contracture ?truehypertropia

Amblyopia in children

Interference with the measuring of associated vertical strabismus

### **Classification of DVD**

Comitant DVD is said to be present when the vertical deviation (with in  $\pm 7$  PD) measures same in abduction, primary position and adduction. DVD is called incomitant when there is difference in the magnitude of deviation in abduction, primary position and adduction. These differences may help in the management of the case.

### **Measuring DVD**

It is difficult to measure the DVD, as there is change in deviation depending upon the alertness and co-operation of the patient. The deviation may increase when the patient is inattentive, day dreaming, tired. On the other hand the deviation may be recorded less as the patient is attentive at the time of examination. In our experience Prism Bar Under Cover Test (PBUCT) is the best way of measurement of DVD. During this test the base down prism and a cover is placed in front of the dissociated eye, now as the cover is shifted in front of the fixing eye note the downward movement of the dissociated eye, keep increasing prisms till no movement is seen on

switching occlusion.

Hirschberg's test may also be used to provide a gross estimate. Depending upon the amount of deviation there has been attempt to classify DVD into mild (0-9 PD), moderate (10-19 PD) and severe (> 20 PD) forms Bielschowsky's phenomenon. This is known to be present in at least 50% of cases of DVD suggesting that DVD is a sensory anomaly. As the intensity of light shown to the fixing eye is decreased, the dissociated eye gradually comes down. This can be done with the help of neutral density filters and hence one can measure "depth of DVD".

### **Red glass test**

If a red glass is presented before either eye the red light is always perceived to be below the white light. The reason for this is, the eye under the red glass dissociates and moves upwards. This test may be used to differentiate DVD from hypertropia as in case of hypertropia the red light would be seen below or above the white light depending upon whether it is placed on the hyper or the hypo deviated eye.

### **DVD and inferior oblique overactions (IOOA)**

The two entities should be differentiated as both may cause elevation and add to the confusion and diagnosis. DVD is evident in primary position while IOOA is seen in adduction and elevation. However, unequal IOOA may give rise to vertical deviation even in primary position. The two can be differentiated as there would be an associated "V" phenomenon with IOOA, also the vertical deviation would increase in adduction and elevation. Presence of Superior oblique over action may point towards DVD rather than IOOA. The rapid refixation movement of

IOOA would be approx 200-400 degrees/sec, while the slow redressing movements of DVD would range from 2-200 degree/sec. Further clinical tests like the red filter test and Bielschowsky's phenomenon may help to differentiate the two.

A difficult situation can arise when there is DVD in presence of IOOA. In such cases the rapid refixation movement of the hypotropic eye can be measured with the help of prism bar cover test. Then the total upward deviation may be measured using the PBUCT. DVD is the difference between the two readings.

### **Non surgical management of DVD**

*Observation:* it is believed that the condition improves with the age

*Encourage fusion of bifixation:*

This step is meant to enhance the fusion. Proper refractive correction should be given, as the image blur may lead to break in fusion and worsening of DVD may take place. Conversely, a clear image encourages the fusion and may lead to better control of DVD. Associated amblyopia need to be addressed and treated. If strabismus is present, it may need surgical or prism correction as it may promote peripheral fusion.

*Switching fixation:*

Trying to switch fixation to the non dominant eye with the help of occlusion or mild refractive blur of the fixing eye may help in control of DVD as now the eye with the DVD will be used for fixation.

### **Surgical management**

*When to perform surgery?*

Surgery is often indicated when DVD is increasing in frequency and a phoric deviation is gradually converting to a manifest. This can deteriorate the peripheral fusion and there is an increased risk of amblyopia in children. Anomalous head posture, if present, helps to control the magnitude of DVD or gain peripheral fusion. If the head posture is to the opposite side then it indicates a poorer control or a larger magnitude of DVD. Surgery may thus be indicated to improve the head posture. A large and cosmetically unacceptable deviation is another indication for surgical intervention.

*Options in surgical management:*

The surgical modalities advocated are:

Recession with anterior positioning IO

Superior rectus-recession 7-10 mm with or without retroequatorial myopexy

Inferior rectus-resection 5 mm

*Check for inferior oblique over action:*

IOOA & mod. DVD (<5 pd in abduction)

Recommended treatment modality: Recession with anterior positioning IO

IOOA & Severe DVD (>5 pd in abduction)

Recommended treatment modality: Recession with anterior positioning IO + Superior rectus-recession 7-10 mm

DVD & no IOOA:

Superior rectus-recession 7-10 mm + Inferior rectus resection

DVD & SOOA:

Superior rectus-recession 7-10 mm + Posterior tenectomy of Superior oblique

Frequently the DVD is bilateral but asymmetrical so much so that the other eye is missed pre-operatively. As DVD is asymmetric, it is important to check both the eyes for DVD. Even if the DVD in the other eye does not appear to be clinically significant it is preferred to operate both the eyes for the DVD as the other eye starts to manifest the DVD post-operatively. One can do asymmetric surgery with greater amount of surgery in the manifesting eye.

**References:**

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