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Mini Review

Detection of The Muscle Affected In Vertical Deviation Induced by A Single Muscle

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Abstract

Purpose: To detect the muscle affected in vertical deviation induced by a single muscle.

Material and methods: A table was formed combining the Parks-Bielschowsky and Bajandas tests.

Result: Detection of the muscle affected in vertical deviation induced by a single muscle is made possible by means of the table formed in accordance with the principles of the Parks-Bielschowsky and Bajandas tests.

Conclusion: If a single muscle is responsible for the deviation, it can be determined using these two tests. However, application of these tests may, on occasions though, cause some confusion. Through the table, it is quite easy for physicians to detect the affected muscle using the directions mentioned in the Table 1.

Keywords: Vertical deviation; Parks-Bielschowsky; Bajandas tests

Introduction

Table 1: Detection of the muscle affected in vertical deviation induced by a single muscle, by the table organized in accordance with the principles of Parks-Bielschowsky and Bajandas tests.

	Right Eye Hyper				Left Eye Hyper			
	Increase in Hyper in Right Gaze		Increase in Hyper in Left Gaze		Increase in Hyper in Right Gaze		Increase in Hyper in Left Gaze	
	Increase in Hyper by head tilt on right	Increase in Hyper by head tilt on left	Increase in Hyper by head tilt on right	Increase in Hyper by head tilt on left	Increase in Hyper by head tilt on right	Increase in Hyper by head tilt on left	Increase in Hyper by head tilt on right	Increase in Hyper by head tilt on left
Increase in Hyper in upgaze	Left Inferior Oblique			Left superior rectus	Right superior rectus			Right inferior oblique
Increase in Hyper in downgaze		Right inferior Rectus	Right superior oblique			Left superior oblique	Left inferior rectus	

Vertical deviations can come out with a result of a disfunction of a single or multiple muscle. The detection of muscle or muscles that are affected in vertical deviations may also give clues about the nerve functions that innervate these muscles. Vertical deviations result from sufficient functions of single or multiple muscles responsible for vertical movements, which are right superior rectus (SR), left SR, right inferior rectus (IR), left IR, left superior oblique (SO), right SO right inferior oblique (IO)and left IO. The medial and lateral recti, that don't have any vertical movement at all, don't have any role in vertical deviations. If hypertropia is thought to result from a disfunction of a single muscle that moves vertically, then this muscle can be detected by Parks-Bielschowsky test [1-6]. In each step by reducing half of the number of possible muscles, the muscle in question is detected in the last step.

Material and Methods

The first process that should be done in the first step of Parks-Bielschowsky test, is to detect which eye is in hypertropia. If there is right hypertropia in the patient, the weak muscle is either the depressor muscle of the right eye (right IR, right SO) or it is one of the elevators of the left eye (left SR, left IO). If there is left hypertropia, then the weak muscle is either the elevator of the right eye (right SR, right IO) or it is one of the depressors of the left eye (left IR, left SO). In the second step, the increase in hypertropia in the right or left gaze is evaluated. The superior and inferior recti have the most vertical movement in abduction. For this reason, the right hypertropia due to right IR paresis increases in right gaze, right hypertropia due to left SR paresis increases in left gaze. Similarly left hypertropia due to left IR paresis increases in left gaze, left hypertropia due to right SR paresis increases in right gaze. On the other hand, oblique muscles have the most vertical movements in adduction. For this reason, the right hypertropia due to left IO paresis increases in right gaze, where as it increases in left gaze when it is due to right SO paresis. Left hypertropia due to left SO paresis increases in right gaze, left hypertropia due to right IO paresis increases in left gaze.

In the third step, the state of increase in hypertropia in right or left head tilt is evaluated. Inferior rectus and superior oblique muscles make intorsion; superior rectus and inferior oblique muscles make extorsion in the eye. When head tilts on one side, eyes make corrective torsion mening intorsion in the eye on the same side, and extorsion in the other eye. When head tilts on right, right SR and right SO move together to make intorsion available in the right eye. At the same time their vertical movements are neutralized. If one of these muscles is the paretic muscle that is responsible for hypertropia, vertical movement will not be able to be neutralized, and so hypertropia will increase as the head tilt comes closer to the shoulder. Consequently, if there is possibility of any of two superior muscles, then the paretic muscle is the muscle on the same side of the hypertropia that increases by head tilt on shoulder. For example, when right SO or left SR are the suspicious muscles, if there is right hypertropia that increases by head tilt on right, then the paretic muscle is right SO; if there is hypertropia that increases by head tilt on left, then it is SR. If there is possibility of one of the two inferior muscles being the paretic muscle, then it is the muscle on the opposite side of the side that hypertropia increases by head tilt.

On the other hand, the Bajandas test, supporting the third step of the Parks-Bielschowsky test, evaluates the increase in hypertropia in upgaze and downgaze. After the second step of Parks-Bielschowsky test, there is possibility of the paretic muscle to be in one of these muscles groups which are right SR or left SO, right SO or left SR, right IR or left IO, right IO or left IR. When each muscle group is examined, it will be seen that one of these muscles is an elevator and the other one is a depressor. If hypertropia increases in upgaze, then the paretic muscle is the elevator; if hypertropia increases in downgaze then it is the depressor muscle that is affected.

Discussion

If a single muscle is responsible in vertical deviations, then it is found by the help of Parks-Bielschowsky and Bajandas tests. However, while explaining every process done within these tests which are based on fundamental functions of muscles, during clinical examinations application of these tests would sometimes lead to confusions. When these kinds of tests are taken into consideration, if there is suspicion of an affected single muscle, a convenient table which is formed by combining of Parks-Bielschowsky and Bajandas tests, will help to detect the paretic muscle. It is being very easy for the examiner to detect the affected muscle by applying the directions of this table. By the examination of this table, first the eye where hypertropia is determined, then its situation on right and left gaze is evaluated, and in the last step the paretic muscle is detected by evaluating hypertropia by head tilt tests and up-downgazes. Various tables formed related to Parks-Bielschowsky and Bajandas tests have been seen in literature, but this kind of table has not come accrosed, yet. In conclusion we are of the opinion that, by using this table that is organized in accordance with the principles of Parks-Bielschowsky and Bajandas tests, the detection of the muscle affected in vertical deviations induced by a suspected single muscle, will be done easily.

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