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Influence of different targets on near point of Convergence

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Objectives: Objectives of the study were to investigate effect of different targets on near point of convergence in adult emmetropes and to compare the values of break and recovery points with different targets.

Method: Near point of convergence was measured in 50 patients by using penlight, finger tip, accommodative target N5, pencil tip, RAF rule line target. Persons who had best corrected visual acuity less than 6/12, who were not co-operative or having any kind of deviation were not included in this study.

Results: Break and recovery points of near point of convergence with pencil tip, finger tip and accommodative target were close to each other.

Conclusion: Penlight and RAF rule gave remote values than other targets. Penlight gave more remote values than RAF rule line.

Key Words: Near point of convergence, vergence, convergence, pen light, finger tip, RAF rule, accommodative target, and pencil tip

Introduction:

Near point of convergence is overlap of line of sight of two eyes when utmost convergence is exerted at the same time ability to view images singly is maintained.[1] It is widely used in regular baseline eye examination by the eye care practitioners and usually performed in vision screening. NPC measurement has also significant value in the diagnosis of convergence insufficiency.[2]

Convergence insufficiency is explained as the condition of exophoria which is pronounced at near, receded near point of convergence and convergence fusional reserves are worse along with existence of asthenopia. The most common binocular abnormality is the convergence insufficiency. The prevalence of convergence insufficiency is estimated to be 1% to 33% everywhere.[3] Pencil push-up tests are helpful in the reducing the symptoms of convergence insufficiency that cause difficulty in near work.[4]

Conventionally 8 and 10cm were assumed to be standard value for NPC break point according to conventional optometric text books and this point of view is broadly used by many optometrists until now. However, near point of convergence measurements are generally less than 6 and 10cm for break and recovery points as revealed by latest researches in children.[5]

Near point of convergence and binocular single vision has important relationship with each other. The ability of the visual system to offer sufficient power to converge the eyes can be evaluated by performing some clinical tests such as near point of convergence measurement. A remote value is found in symptomatic persons for convergence insufficiency and 8-10cm of NPC is found in asymptomatic or normal persons.[6]

While assessing near point of convergence, the relation of accommodation with vergence becomes prominent. All types of convergence (tonic, fusional, accommodative, proximal) are involved in assessment of near point of convergence. Examiner can evaluate near point of convergence by patient's response of doubling or himself by keenly observing divergence of eye, which is especially suitable for non cooperative patients. Typically two types of targets are used for assessment of this value. First is accommodative and second is non accommodative. A non accommodative target gives remote value as compared to accommodative one.[8] RAF rule is 50cm long with square drum and plastic rod, which contains four targets on each side. Target (line with dot) is directed to the patient until break point is achieved.[5]

Study Design, Material and Methods:

It was comparative cross-sectional study, conducted in College of Ophthalmology and Allied Vision Sciences (COAVS), from August 2014 to December 2014. Fifty patients were included in study by using non probability convenient sampling method. Dependent variable was Near point of convergence while independent variables were gender and target type. Individuals between 10 to 50 years of age with best corrected visual acuity $\geqslant$ 6/9, having no asthenopic symptoms were included in study. Patients who were mentally retarded, uncooperative and strabismic were excluded. Distance visual acuity was assessed by using Snellen visual acuity chart and near point of convergence was measured by using five different targets i.e. Pen torch, Accommodative target, Pencil tip, Finger tip, RAF rule. Influence of these targets was assessed by filling a self-structured proforma. Data was recorded and entered in statistical package for social science (SPSS version20.0). The results were analyzed and tabulated by using same software.

Results:

Name of target	Break points			Recovery point		
	Mean value	Std. Deviation	P values	Mean value	Std. Deviation	P values
RAF rule	9.88	3.671	0.01	12.54	4.274	0.01
Pen light	11.28	4.354	0.00	13.94	4.656	0.00
Finger tip	7.74	3.520	0.03	10.32	3.733	0.03
Pencil tip	7.80	3.569	0.02	10.32	3.577	0.02
Accommodative target	7.96	3.554	0.04	10.08	3.754	0.04

Explanation:

Penlight and RAF rule gave higher mean values of break and recovery points than other targets. But out of these two targets penlight gave higher values than RAF rule.

Discussion:

The distance at which convergence is maximally exerted is near point of convergence. Normal values range from 6-10cm. There is much confusion about use of target for measurements of near point of convergence. And much more important to measure it accurately as it gives us the strength of binocular single vision. It is also important to find out convergence insufficiency. As it is closely related to, horizontal phorias, especially exophoria. Near point of convergence is not affected by age of patient but alteration may be due to the attention of the patient.

One study's result is that break point with penlight and RAF rule give more remote values than other targets but

RAF rule gives more far values than penlight. In our study penlight gives more receded values than RAF rule.

According to a study conducted by Siderov, the break point with pencil tip and finger to gave receded values but the target was placed along with RAF rule[9] which is much close to this study because pencil tip and finger tip give less remote values than other targets. But according to Adler, details on the targets like pencil tip, accommodative target and finger tip do not affect near point of convergence.[10]

Objectively and subjectively measured values are not affected by the attention of the patient.[5] In previous studies by Siderov and Scheiman patients had worn their spectacle correction which may had affected the results.[2-9] But in this study all the participants were emmetropic with 6/6 vision on Snellen chart, having no ocular pathology.

It was thought that targets requiring accommodative effort give better values of near point of convergence.[11] But instead finger tip and pencil tip give better values which may be due to the fact that these two are stereoscopic used in space.

In previous studies RAF rule gave far values than penlight[5] but in this study penlight gives remote values that may be due to the position where RAF rule was placed. This can also be due to the fact that RAF rule line can be seen by physiological diplopia. In this study, RAF rule line was copied to a ruler and ballpoint tip was used instead of pencil tip so this can also affect the values of near point of convergence with these targets.

Conclusion:

Penlight gives remote values than other targets.

References:

1. Elliot BD. Clinical procedures in primary eye care. United Kingdom Elsevier; 2014.
2. Scheiman M, Gallaway M, Frantz KA, Peters RJ, Hatch S, Cuff M, et al. Nearpoint of convergence: test procedure, target selection, and normative data. Optometry and vision science : official publication of the American Academy of Optometry. 2003;80(3):214-25.
3. Maples WC, Hoenes R. Near point of convergence norms measured in elementary school children. Optometry and vision science : official publication of the American Academy of Optometry. 2007;84(3):224-8.
4. Garber N. Creating stereograms for near point of convergence exercises. Journal of ophthalmic nursing & technology. 1999;18(4):164-9; quiz 70-1.
5. Adler PM, Cregg M, Viollier AJ, Margaret Woodhouse J. Influence of target type and RAF rule on the measurement of near point of convergence. Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians. 2007;27(1):22-30.
6. Hamed MM, David AG, Marzieh E. The relationship between binocular vision symptoms and near point of convergence. Indian journal of ophthalmology. 2013;61(7):325-8.
7. Sorkin R. Nearpoint of convergence: test procedure, target selection, and normative data. Optometry and vision science : official publication of the American Academy of Optometry. 2003;80(8):555.
8. Maino DM, Taub MB, Bartuccio M. Visual Diagnosis and Care of the Patient with Special Needs. Philadelphia: Lippincott Williams and Wilkins; 2012.
9. Siderov J, Chiu SC, Waugh SJ. Differences in the nearpoint of convergence with target type. Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians. 2001;21(5):356-60.
10. Adler P. Efficacy of treatment for convergence insufficiency using vision therapy. Ophthalmic & physiological optics : the journal of the British College of Ophthalmic Opticians. 2002;22(6):565-71.
11. Ciuffreda KJ, Gutner R. A review of anterior segment photography. American journal of optometry and physiological optics. 1974;51(7):465-9.