Orthoptics

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1. Introduction

The world orthoptics has his origin in Greek words orthos (straight) and optikos (ocular). Orthoptics is method which should lead to renewing of simple binocular vision (SBV). SBV has two components – motor and sensorial. Renewing of both eyes cooperation is possible only in case of earlier SBV existence. During the orthoptics training we can use many different instruments, which helps to renew of SBV and to improve eye motility and position. In case of congenital and acquired eye disorder orthoptics training helps to rehabilitate of SBV. Training must be leaded by the orthoptics specialist.

2. Procedures of orthoptics training

The base of diagnosis and indications of orthoptics training is precise examination of patient's visual function (visual acuity, cover test, test of eye motility etc.). In case of positive diagnosis ophthalmologist/orthoptist suggests procedures of treatment, which depends on degree of SBV development and age of child. Really important is child's motivation to training, which makes treatment much easier and effective. Training should be performed with optimal spectacle correction. Procedures of orthoptics training are these:

Un-suppressing of eye and training of superposition

Training of fusion

Training of stereopsis

Training of eye motility

Training of convergence

Training of relationship between accommodation and convergence

3. Troposcope/Synoptophore

Troposcope or synoptophore is basic and the most used instrument for diagnosis and treatment of disorders of SBV. Troposcope is based on principles of Wheaston's mirror stereoscope and Worth's amblyoscope. The name synoptophore is used for this instrument usually in Great Britain. Modern types of synoptofore are based on mechanical and electrical principles. Synoptophore has many programs for removing of eye suppression. The basic principal of this instrument is called haploscopy. It means that every eye has its own perception of image, which could be changed by moving the arms of instrument.

Figure 1: Synoptophore

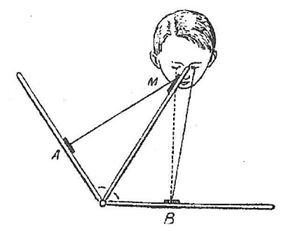

Figure 4: Mirror stereoscope

Figure 5: Brewster-Holmes stereoscope training

Figure 6: Brewter-Holmes stereoscope

Figure 7: Vergence stereoscope

4. Cheiroscope

This instrument is the second most used for orthoptics. With this instrument we try to overcome and to train superposition. Cheiroscope allows dissociation thanks to special mirror.In case, that child draws picture by memory, fixation is alternating. The drawn picture is bigger or smaller than pattern. Typical is shift of picture in direction of deviation.

Figure 2: Cheiroscope

Figure 3: Hunt on cheiroscope

5. Stereoscopes

Mirror stereoscope

This instrument is usually used for breaking suppression, training of superposition and fusion.Mirror dissociation brings real sensation of space (not instrumental). Patient watches with one eye pattern and drawing part of board with other eye.

Brewster – Holmes stereoscope

This instrument allows training of fusion, its width and stereo vision.Distance of picture is invariable. We usually use pictures for fusion or stereo vision.

Vergence stereoscope

This instrument is used in the same way like Brewster-Holmes stereoscope (fusion, fusion width and stereopsis). The difference is in possibility of changing distance between pictures.

6. Remy's separator

This mechanical instrument is used for relaxation of accommodation and convergence and for training their relationship. Partial dissociation in real space is reached with 30 cm long lath, which is placed to nose root.

Figure 8: Remy's separator

7. Remy's diplocope

This instrument is based on dissociation of real space. It is used for training of relationship between accommodation and convergence. Instrument is composed of metal lath with nose-rest, removable fixation stick, movable curtain with 4 apertures with 7 mm diameter (adjustable according to pupilar distance) and carriers for patterns. Curtain and fixation stick is movable. Distance between curtain and eyes is 250 mm. Apertures are placed in shape of "chair" (two vertically and two horizontally). Patterns are usually made of 3 letters, e.g. DOG, DAY etc. Patient can see them through the two apertures in the middle of curtain (horizontally). Every eye can see only two letters. This principal image is called diplogram.

Parallel position of eye – patient see with one eye DO, with second eye OG – together DOG

With esotropia patient see – OGDO

With exotropia patient see – DOOG

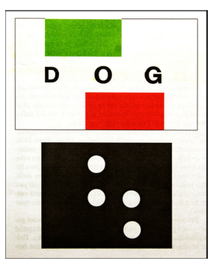

Figure 9: Pattern

Figure 10: Remy's diploscope

8. Diploptics training

Diploptics training was for the first time described by Avetisov in 1978. It is used for training of fusion. Instrument use real space dissociation with red filter. At first we initiate diplopia and after that we use red filter. Pictures could be than see still doubled or could be fused. We provide the treatment in dark room with one source of light, which could be placed from 1 to 6 meters. Patient should fix this point, examiner use red filter. Patient should notice his diplopia and should hold it despite weakening of light intensity and despite of presence of red filter. Due to this effect patient is trying to connect pictures with motor fusion. Children learn this way how to control position of both eyes. We can also use prisms with power matching to deviation. During the training we weaken power of prisms.

9. Reading with image divider

With this method is possible to fix fusion and train SBV. It is based on partial dissociation of image in real space. In principle we insert slit with various width in front of reading text. Person with normal SBV has no problem with reading. Eyes built the visual sense together. If there is some defect in SBV, some part of text could disappear. Part of image divider of instrument is also head-rest. If the slit is near to text, reading is harder.

10. Training of convergence

Second complementary exercise to classic orthoptics is training of convergence. The biggest advantage of this exercise is possibility to do home training. Parent holds some small object in hand and child is trying to fixate this object at 1 meter distance. Parent moves with object closer to child, until it is seen doubled. Important thing is children's head immobilization, because moving is allowed only for eyes. We try to find symmetrical convergence. In orthoptics outpatient office is used special device called convergence trainer (convergence-meter).

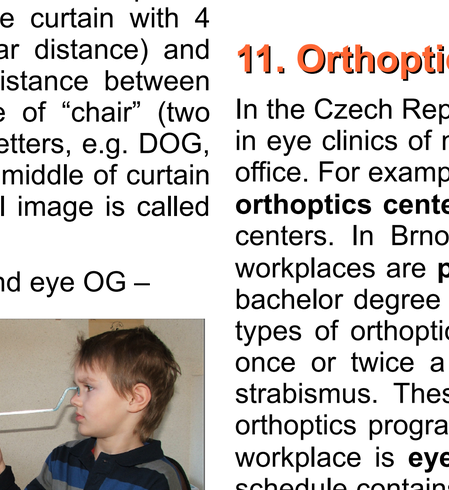

Figure 11: Image devider with text

Figure 12: Convergence-meter

11. Orthoptics in Czech Republic

In the Czech Republic (CZE) we have few types of orthoptics workplaces. First types are **outpatient offices** in eye clinics of many hospitals in CZE. Every bigger hospital has own eye clinic with orthoptics outpatient office. For example town hospital in Pardubice (CZE) has outpatient orthoptics office. Faculty hospitals have **orthoptics centers** or more outpatient offices. For example Prague has 3 faculty hospitals with orthoptics centers. In Brno there is one faculty hospital with lot of outpatient offices. Other types of orthoptics workplaces are **private orthoptics centers** usually leaded by medicine doctor or orthoptist with master or bachelor degree of orthoptics education, sometimes with diploma from post-graduation course. These two types of orthoptics workplaces are arranged as outpatient offices. Parents come here with their children once or twice a week. Other types of orthoptics workplace are for pre-school or school children with strabismus. These orthoptics places are really efficient for eye-therapy, because children have special orthoptics program. Children need not to do so many exercises at home. Last, special, type of orthoptics workplace is **eye-sanatorium in Dvur Kralove nad Labem**. Children stay here for 6 weeks. Their day schedule contains school lessons, playing games and entertainment with schoolmates. Three times per day children must undergo orthoptics training. This sanatorium works almost during whole year. This type of orthoptics training is most effective because of its intensity. Sometimes the problem is that children must stay here alone without their parents. But parents can visit their children.

12. Study of orthoptics in CZE

Study of orthoptics in CZE passed through o lot of changes during last 10 years. Before 2005 was legal in CZE to gain orthoptics diploma via distance studies at Institute for after-graduation education of health care staff. Today new **orthoptics licence** is connected only with a **bachelor or master degree** in orthoptics. Studying of orthoptics in CZE is today possible only in Olomouc (**Palackeho University, Faculty of Science**), but next year will be possible to study orthoptics also in Brno (**Masaryk University, Medical Faculty**).

Figure 13: Palackeho university

Figure 14: Masaryk university

13. Conclusion

Orthoptics training is very important discipline of ophthalmology. Now we have a lot of knowledge about the eye evolution and a lot of opportunities to diagnose vision disorders (exactly and sooner) and save or improve children's binocular vision and get better quality of their lives. Orthoptics training must be leaded with orthoptist with qualification and can be performed in outpatient offices, in hospitals or in home. Patients are usually school or pre-school children. This is the reason why orthoptist must be also emphatic, not only specialist. Success of orthoptics training depends also on motivation and good cooperation between the orthoptist and children. Orthoptics treatment in CZE has high position in word orthoptics. Every orthoptist in CZE must be member of Orthoptist association. Education of our specialist in orthoptics is still developing and we try to improve it as much as is possible.

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