VISUAL ABILITY IN AMBLYOPIC CHILDREN COMPARED TO CHILDREN WITH NORMAL VISUAL ACUITY

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Vision rehabilitation in adults with low vision, even in children, is achieved with special devices, called low vision aids, LVA.

The aim of the study is to determine the degree of visual function in amblyopic children and daily activities that are best related to those of normally sighted peers with normal visual acuity.

The subjects were divided into two groups, matched 1:1 by age and gender: the first group consisted of 19 amblyopic children, and the second one consisted of 19 children with normal visual acuity. The questionnaire used to assess visual ability was Cardiff Visual Ability Questionnaire for Children (CVAQC), a reliable instrument for measuring visual ability in children with low vision. The study was conducted in the only rehabilitation center for amblyopic children in this region, so this is also a pioneer study.

The overall result of CVAQC in amblyopic children was 1.287 log vs.-2.956, representing statistically significantly poorer visual ability in comparison to peers without vision deficit (p<0.005). Amblyopic children function best in entertainment activities, especially in listening music (-2.31 log); as for sport, these children report swimming to be their favourite activity (-0.99 log). In the field of education they show best results in language acquisition (-0.79 log) and the worst in mathematics (3.13 log). The greatest problem is reading small print texts books (2.61 log).

Low vision children have poorer result of visual function in comparison to their peers with normal visual acuity. A precise deficit assessment in the most important spheres of life can be determined by using the questionnaires, so the rehabilitation can be rightly chosen. Acta Medica Medianae 2016;55(1): 33-37.

Key words: low vision/amblyopia, low vision aids, rehabilitation of vision, CVAQC

Introduction

Low vision is a vision deficit, meaning that best corrected visual activity in the better eye is less than 0.3 and higher or equal to 0.05 (according to Snellen test). In the true sense, a child with vision deficit untreatable with medication, surgery or optical correction has low vision. In childhood, low vision as a consequence of eye pathology (genetic or developmental anomalies) may have a cerebral origin in 27% (1) to even 45% (2) or 48% (3) children with low vision. It may be of retinal origin as well and also associated with other anomalies, as seen in 55% of children with low vision (4). Low vision imposes a problem concerning socialization, reduced education and children’s participation in daily activities. Although visual correction and visual deficit can be mathematically expressed, the real life of amblyopic children is not mathematics. In our modest clinical practice with low vision persons, patients have never been given measurements of quality of life influenced by low vision by the ophthalmologists. Namely, if a child has associated cerebral paralyses, best corrected visual acuity of 0.2 in the better eye, certainly has reading problem, too. On the opposite, a child in the absence of pathologic conditions, with the same visual acuity, has better reading results. With completed ophthalmic examination, it can be seen that both children have the same visual acuity, but different degree of functioning. That is why an examination by a defectologist is needed to complete the clinical picture of a child’s visual function 33. Questionnaire instruments targeted at measuring the degree of visual deficit based on subjective perception of difficulties during the child’s growth and development have been designed for amblyopic adults and children as well (5; 6).

Quality of life in children should be assessed by special instruments rather than questionnaires, since the quality of life questionnaires for adults do not meet the needs of children and adolescents
Material and methods

This research is a prospective observational clinical study. It enrolled amblyopic children aged between 6 to 18 years, with permanent residence in Montenegro. These children were the patients at the Ophthalmology Department, Children’s Hospital, Clinical Center of Montenegro, registered by the Association for the Blind, or referred to the Department by ophthalmologists. The Department is the only one of the kind within the public healthcare system in the region and is equipped with sufficient number of reading LVAs: telescopes (LVA of magnification power from 2x to 8x), electronic lenses of magnification power from 2x to 24x with different degree of contrast potential, and prisms ready fit 2-16 pD base in. Then, there are devices for long distance viewing: telescopes of magnification power of 1.9x and 4.2x and optical devices in the form of lenses.

The study participants were children with voluntary and detailed informed consent concerning the type and method of investigation signed by their parents. The inclusion criteria were the best corrected visual acuity in the better eye less than 0.3 and greater or equal to 0.05 according to Snellen’s test; children oriented in space and time and to people as well. The questionnaire was in mother tongue, understandable both to parents and children. Those who had difficulties in understanding were excluded from the study. The study exclusion criteria were the children’s history of non-cooperation and severe mental retardation. The study was approved by the research ethics committee.

CVAQC score is shown as the total score and specific spheres of life score concerning education, short and long distance vision, getting around, social interactions, entertainment and sport. The control group comprised the same number of children, the total of 19 children with visual acuity of 1.0 according to Snellen’s test, with no vision problems or any other ophthalmic disease. The subjects were age and gender matched, one amblyopic child matched with a child without vision deficit. The parents of the children from the control group also signed a voluntarily consent for study participation.

Native and best corrected visual acuity was determined in all the children included in the study. Visual acuity was determined using Snellen’s optotype for older children, but in cases it was not possible to assess acuity in this way the Lea Symbols chart was used. Visual acuity is expressed as a decimal number and correction as spherical equivalent, the sum of the sphere and one half of the cylinder power. Each child had his/her ophthalmic and optometric chart. All the parents or guardians filled in a questionnaire about their child’s general health facts. Low-vision children were given LVA upon determining the type and the strength of the vision aid. All the children underwent the Cardiff Visual Ability Ques-
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Instruments for measuring functional abilities of low vision children have to be easily understood by the individuals, easy to interpret, with as few questions as possible focusing on the most important functioning areas. Also, interpretation of rehabilitation outcomes with LVA is very important in assessing real needs of people with low vision, especially children (17). The questionnaire CVAQC used in this study fulfills all the criteria of validated measuring instruments. Low vision children enrolled in the study showed weaker achievements in all the spheres of functioning in comparison to their normally sighted peers, as shown by some other authors as well. They achieve the best results in the fields of music and language acquisition.

The second aspect of this study indirectly relates to organizing a high-need special low vision care services for children. A respectable journal

### Results

The total of 38 children equally distributed into two groups, gender and age matched, were examined. The experimental group consisted of 19 low vision children and the control group included 19 children in the absence of visual deficit (mean age 13.2±4.1 years, age range from 9 to 18 years). All the children met the study inclusion criteria. They were tested using the CVAQC questionnaire and answered the questions on their own or with the assistance of the parents.

The 25-item Cardiff visual Ability Questionnaire for Children comprises seven categories — education, near vision, distance vision, getting around, social interaction, entertainment and sport. The results expressed as standard deviation and a logarithmic function of standard deviation are presented in Table 1.

The overall result of CVAQC in low-vision children was 1.287 log (SD 1.26) and in the control group it was -2.956 log (SD 0.983), what is statistically significantly worse visual function in comparison to peers without visual deficit (p<0.005).

Low vision children reported never watching a film at the cinema (only 3/19 went to the cinema) and never using public transport on their own but only with a companion.

The children from the experimental group showed the best results in the sphere of entertainment. All the children reported listening to music (score -2.31 log), playing computer games and using mobile phones (score 0.19 log to 1.14 log) as very easy. In the sphere of sport, swimming was found to be the favourite activity of amblyopic children (-0.99 log), but they avoid playing ball games or running (1.99 to 2.65 log).

In the sphere of education, language lessons are found to be the easiest (-0.79 log) and maths lessons the most difficult (3.13 log). The greatest problem is reading the small print in the textbooks (2.61 log), while drawing, colouring and painting is not so difficult (1.72 log). As for daily functioning and distance vision, amblyopic children reported reading the board in the classroom the most difficult (2.04 log), but watching television also poses a problem to them (2.26 log).

Low vision children demonstrated weaker social interaction in comparison to their peers with normal visual acuity. They like being with friends (0.84 log), but have problems in recognizing their faces while approaching them (1.65 log) or when they are at a playground (1.77 log). It is a distress for low vision children and they very often avoid making friends as not to feel embarrassed in recognizing and identifying faces.

### Discussion

In daily activities with low vision children it is of extreme importance to pay full attention to quality of life to areas of functioning that require good vision. Two aspects should be distinguished: the first one is functional visual (how well the person functions in vision-related activities), and the second one is visual function (describes how well the visual system functions) (16). Both aspects impact and crucially limit the quality of life of people with low vision.

#### Table 1: CVAQC in children with low vision compared to the controls

|                      | education | near vision | distance vision | getting around | social interaction | Entertainment | sport |
|----------------------|-----------|-------------|-----------------|----------------|--------------------|---------------|-------|
| control group (SD)   | -3.14     | -3.48       | -2.29           | -3.53          | -2.51              | -2.23         | -3.03 |
| low vision children (log) | 1.7       | 1.05        | 3.46            | 1.77           | 1.39               | 0.37          | -0.62 |

Legend: SD – standard deviation; log-logarithm
has recently published the result of a large sample size survey (total of 10033), suggesting that the greatest needs in general population are for eye care services, annual eye examination services, cataract surgery services and low vision services (18). The problem concerning special low vision services has been an on-going one recently, since there is a need for special education and training in all countries, regardless their economic development. Pioneer studies on this topic embraced experiences of three most developed societies and their low vision centers – Canada, Wales and England (19), but in the last few years a critical mass of publications has been achieved, suggesting the need for low vision services. The concept of low vision services has changed a lot over the last 50 years due to technological innovations and increasing number of low-vision people (20).

So, the significance of our study is in showing first results of a modern department for low-vision children, the first of the kind in the region.

Conclusion

Low children achieve weaker results in daily functioning in comparison to their peers with normal visual acuity. The lowest results are in the sphere of education, reading and mathematical tasks are the most difficult, but language lessons are the easiest. In the sphere of entertainment and sport they show best results in music and swimming, but the worst in ball games at the playgrounds. We believe that establishing rehabilitation centers for persons with low vision is a constant need aimed at improving lives of many patients, as proved by our experience.

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VIDNA FUNKCIONALNOST SLABOVIDE DECE U ODNOSU NA VRŠNJAKE SA NORMALnim VIDOM

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Rehabilitacija vida slabovidih osoba, pa i dece, vrši se uz pomoć specijalnih pomagala, tzv. LVA ili low vision aid. Cil ove studije bio je da se utvrdi stepen vidne funkcionalnosti slabovide dece, odnosno u kojoj sferi svakodnevnog funkcionalisanja imaju najpribližnije rezultate u odnosu na svoje vršnjake.

Ispitanci su bili podeljeni u dve grupe koje su međusobno bile ukrštene prema polu i uzrastu metodom 1 na 1: prvu grupu je činilo 19 slabovide dece, a drugu 19 dece sa normalnim vidom. Za procenu vidne funkcionalnosti slabovide dece korišćen je referentni instrument merenja Kardifski upitnik za procenu vida kod dece (eng. Cardiff Visual Ability Questionnaire for Children (CVAQC)). Studija je sprovedena u jedinom centru za rehabilitaciju slabovide dece u ovom regionu, te je ovaj rad i pionirski poduhvat.

Ukupan rezultat CVAQC slabovide dece iznosio je 1.287 log nasuprot -2.956 log, što je statistički značajno lošija vidna funkcionalnost u odnosu na vršnjake bez vidnog deficita (p<0,005). Slabovida deca najbolje funkcioniru u sferi zabave, posebno slušanja muzike (-2,31 log), u sferi sporta slabovida se izjašnjavaju da najradije plivaju (-0,99 log). U oblasti edukacije, najljakese savladavaju jezike (-0,79 log), a matematiku najteže (3,13 log). Najviše problema imaju sa čitanjem sitnog teksta u knjigama (2,61 log).

Slabovida djeca imaju slabiji rezultat vidne funkcionalnosti u odnosu na svoje vršnjake koji nemaju problema sa vidom. Korišćenjem upitnika se tačno može precizno kvantifikovati deficit u najvažnijim sferama života slabovidog deteta i usmeriti rehabilitacija u pravom smeru. Acta Medica Mediana 2016;55(1): 33-37.

Ključne reči: slabovidost, low vision aids, rehabilitacija vida, CVAQC