Gordana Stankovic-Babic[1],
Nevenka Despotovic[2]

[1]Ophthalmology Clinic,
 Clinical Center Nis
[2]Dispensary
 of Sporting Medicine Nis[2]

ARE REFRACTIVE ERRORS RELATED TO DEFORMITIES OF THE SPINAL COLUMN?

SUMMARY

Deformities of the spinal column and refractive errors deserve a special attention and follow-up in the period of adolescence. The aim of the paper was to analyze the presence of refractive errors in children with deformities of the spinal column.

Thirty children (22 F: 8 M) aged between 5 and 16 years were referred to ophthalmological examination with clinically diagnosed deformities of the spinal column, such as scoliosis, kyphosis, kyphoscoliosis and scoliotic posture. Children were evaluated according to refraction, visual function, ortoptic values and all of them exercised corrective gymnastics.

Scoliotic posture and scoliosis were prevalent and three times more frequent in girls (n= 16, 12 F: 4 M), followed by kyphoscoliosis (n= 8, 4F:4M) and kyphosis (n=6, 2F:4M). The results of ophthalmological examinations: emmetropia was found in 60 %, myopia in 33.3 %, and hypermetropia in 6.6 % cases.

Preventive measures against deformities of the spinal column and refractive errors (particularly myopia) are necessary for an adequate therapeutic treatment. The significance of systematic health examinations is to be emphasized as they are the best way of early detection and diagnosing a refractive error, any disease or body deformities. Also, a full cooperation of parents, children, teachers, and all the subjects involved in the treatment is required.

Key words: refractive error, deformities of the spinal column

INTRODUCTION

Anomalies of refraction can be classified into two types – *simple refractive errors*, made up of the chance combinations of essentially normal elements of the eye refractive system and *pathological refractive errors* determined by abnormal developmental or acquired variations in its optical components.

About 98% of all refractions range between + 4 and – 4 D. Hypermetropia of +2 to +3 D is a usual refractive state in infants. In the first six or seven years of life, no change or a slight increase of hypermetropia occurs. In adolescence, hypermetropia tends to lessen or gives way to myopia.

In a great majority of cases, myopia first appears between the ages of 5 and the onset of puberty, and may progress during the growth until adolescence has passed when the eye stabilizes. On the other hand, degenerative myopia increases more rapidly during adolescence between ages 12 and 20. The incidence of simple variant myopia is high, while high (above 6D) and degenerative myopia are relatively rare. It has been estimated that myopia of

Corresponding author. Gordana Stankovic-Babic • Phone: 018/591- 098 • E-mail: gordanasb@nadlanu.com

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over – 6 D accounts for 27 % to 32 % of the myopic population, and over – 8 D, from 6 to 18 %.

From the medical point of view, degenerative myopia is the most important of all refractive errors for it is relatively common, leading frequently to visual disability and not infrequently to eventual blindness; its economic and sociological implications are therefore considerable (1).

The spinal column in the frontal plane does not normally show any deviation onto one or the other side. Scoliotic posture represents a lateral deviation of the spinal column, completely correctible in the lying posture. Scoliosis represents a painless distortion of the spinal column in the frontal plane, while kyphosis represents an excessive increase of the spinal column curve in the sagittal plane. Recommended by the Scoliosis Research Society, the term kyphoscoliosis marks a lateral distortion joined with a deformity in the sagittal direction with convexity to backwards (2). Some varieties of spinal deformities seem to be inherited as multifactorial autosomal dominants. In early childhood, about 60% are boys. However, in the adolescence, girls account for 90% (3). Using a Cobb angle of 10° as the cut-off point to define idiopathic scoliosis, the point prevalence in a study of Leeds was 0.5% between 6 and 14-year-old subjects, with a maximum of 1.2% between the age 12 and 14 (4) .

Scoliosis is the commonest among spinal column deformities, and usually starts as a poor posturing of the body. Adolescent idiopathic scoliosis (AIS) is the most common form of scoliosis (90 %), four to six times more frequent in girls (5) and a leading orthopedic problem in children (6).

Conservative interventions to treat curves detected through screening include spinal orthoses (braces) and exercise therapy, but they may not significantly improve back pain or the quality of life for adolescents diagnosed with idiopathic scoliosis. The potential harms of screening and treating adolescents for idiopathic scoliosis include unnecessary follow-up visits and evaluations due to false positive test results and psychological adverse effects, especially related to brace wear. Although routine screening of adolescents for idiopathic scoliosis is not recommended, clinicians should be prepared to evaluate idiopathic scoliosis when discovered incidentally or when the adolescent or parent expresses concern about scoliosis (7).

AIMS

The aim of the paper was to analyze the presence of refractive errors in children with deformities of the spinal column.

MATERIAL AND METHODS

During one month, in cooperation with the Dispensary of Sporting Medicine, 30 children (22 F: 8 M) aged between 5 and 16 years were sent to an ophthalmological examination with clinically diagnosed deformities of the spinal column, such as scoliosis, kyphosis, kyphoscoliosis and scoliotic posture. Children were evaluated according to refraction, visual function, ortoptic values.

RESULTS

In 86.6% of cases, children were sent to corrective gymnastics in the Dispensary of Sporting Medicine after a systematic health examination. Thirty children (22 F: 8 M) aged between 5 and 16 years were examined. The most numerous category of the children ranged from 13 to 16 years (n= 14, 4 M: 10 F). (Table 1).

Table 1. Growth and sex of children with the spinal column deformities

Growth	Male	Female
5 to 8 years	4	6
9 to 12 years	0	6
13 to 16 years	4	10
Sum	8	22

Scoliotic posture and scoliosis prevailed, and were three times more frequent in girls (n= 16, 12 F: 4 M), followed by kyphoscoliosis (n= 8, 4F:4M) and kyphosis (n= 6, 2F:4M) (Table 2).

Table 2. Types of deformities of the spinal column in relation to sex of the children

Deformities of the spinal column	Male	Female
Scoliosis and scoliotic posture	4	12
Kyphosis	4	2
Kyphoscoliosis	4	4
Sum	12	18

The results of ophthalmological examination: emmetropia was found in 60 %, myopia in 33.3% and hypermetropia in 6.6 % of cases (Table 3).

Tab.3 Refractive status of children with deformities of the spinal column

Deformities of the spinal column	Refractive status		
	Emmetropia	Myopia	Hyper-metropia
Scoliosis and scoliotic posture	10	4	2
Kyphosis	4	2	0
Kypho-scoliosis	4	4	0
Sum (%)	18 (60%)	10 (33.3 %)	2 (6.6%)

In respect to degree of myopia, the examined children had corrected a low degree myopia of –0,50 up to –2,0 D and hypermetropia of + 0,75 up to +1,25 D. Only one boy who had kyphosis operated had myopia of – 6,0 D reciprocally. All patients examined in our Ophthalmology Clinic were thoroughly ophthalmologically examined with slit-lamp biomicroscopy and with direct ophthalmoscopy. The findings of the anterior segment of the eye were normal in all patients, except in one girl with mydriasis of the left eye remaining after spreading the pupils, due to the partial paralysis in m.sph.pupilae as the consequence of having suffered varicella. The ophthalmoscopic findings were normal except for the findings of conus myopicus in 30 % of myopic children. Motility was normal; however, 22,2 % of the cases showed exophoria.

DISCUSSION

Without regard to whether the refractive errors develop by themselves, especially myopia, or together with the deformities of the spinal column or a poor posturing of the body, their common characteristic is a tendency to advance through the period of growth. Preventive measures against deformities of the spinal column and refractive errors (particularly myopia) are necessary for an adequate therapeutic treatment.

Posture is not static. It can dynamically and continuously cause variations in a standing position, which have consequences in all evaluations performed on scoliotic subjects (8). Screening adolescents for idiopathic scoliosis is usually done by visual inspection of the spine and if idiopathic scoliosis is suspected, radiography can be used to confirm the diagnosis and to quantify the degree of curvature (7). Radiographs offer the most reliable way to quantify the curve, but carry the risk of exposure to ionizing radiation. The Orthoscan (Orthoscan Technologies, Inc.) is a non-radiographic topographic method for measuring spinal curves but it is not yet ready to replace the radiograph in the evaluation of a scoliosis curve (6). Also, Negrini A, Negrini S (2006) proposed a 3D clinical classification of spine morphology projected on the horizontal plane (3-DEMO). In this plane, the trend of the curves in anterio-posterior and latero-lateral projections can be simultaneously viewed and only the information relating to the vertical axis is lost. The new 3-DEMO morphological classification has a high repeatability and systematic error is very low. If in the future alternative methods are developed for the appliance in everyday clinical practice, the repeatability of each single method needs to be assessed (8).

The fact that an adequate upbringing of a child and an adequate physical development are essential to the prevention of deformities was emphasized in 1741 by N. Andry who created the term orthopedics referring to the branch of medicine dealing with deformities and impairments of locomotor apparatus (9).

A refractive error not associated with amblyopia, myopia and hypermetropia remains correctable regardless of the age at detection. Early detection and treatment of a refractive error can improve visual acuity (10). Myopia is rare before school age; it gradually increases during school life and reaches its highest level of prevalence during the years of most intense studying at university (11). In the past two decades, the prevalence of myopia among young adolescents increased from 5–10% to 10–25% in industrialized societies in Europe and North America, and by over 25% to 60–80% in East Asia (12). There is strong evidence for environment-induced change in the prevalence of myopia, associated with increased education and urbanization (13). Also, computers have become the primary medium through which we receive information and we use computers either at work, in school or at home. Computer Vision Syndrome (CSV) is a complex of eye- and vision-related problems associated with computer use. The primary symptoms are eyestrain, blurred vision, dry and irritated eyes, tired eyes, and headaches. Neck- and backaches can also be related to the way that we use our eyes when working at computer. These musculo-skeletal symptoms result from assuming a less than optimal position for extended periods of time, which causes tonic stress in the musculature. For visually intensive tasks, the body locates the eyes at a position where they can comfortably and efficiently perform the job; this is often accomplished by creating an awkward posture that results in musculoskeletal problems (14).

Results of our study showed that in 86,6% of cases children were sent to corrective gymnastics in the Dispensary of Sporting Medicine after a systematic health examination. The most numerous category of the children ranged from 13 to 16 years. Scoliotic posture and scoliosis prevailed and were three times more frequent in girls. The results of the ophthalmological examination: emmetropia was found in 60 %, myopia in 33.3 %, and hypermetropia in 6.6 % cases. In relation to the degree of myopia, the examined children had corrected a low degree myopia and hypermetropia. Only one boy who had kyphosis operated had myopia of – 6,0 D reciprocally.

Although the observation period is short and the size of the observed sample is small, we believe that both problems – deformities of the spinal

column and refractive errors deserve a special attention and follow-up in the period of adolescence. A general hygienic dietetic regime which includes appropriate nutrition, physical activity, children staying in fresh air, suitable regime of work, both at school and home, together with fulfilling the hygienic standards as well as periodic control of children at systematic health examinations in the responsible health institutions is required.

CONCLUSION

Irrespective of whether the refractive errors develop by themselves, especially myopia, or to-

gether with the deformities of the spinal column, their common characteristic is a tendency to progress through the period of growth.

Preventive measures against deformities of the spinal column and refractive errors are necessary for an adequate therapeutic treatment.

The significance of systematic examinations is to be emphasized, as it is the best way of early revealing and diagnosing refractive errors, any disease or body deformities. In addition, a full cooperation of parents, children, teachers, and all the subjects involved in the treatment is needed.

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POVEZANOST REFRAKCIONE ANOMALIJE SA DEFORMITETIMA KIČMENOG STUBA

Gordana Stanković-Babić[1], Nevenka Despotovic[2]

[1]Klinika za oftalmologiju, Klinički centar Niš
[2]Sportski dispanzer Niš

SAŽETAK

Cilj rada bio je da ispita deformitete kičmenog stuba i refrakcione anomalije. Posebnu pažnju zaslužuje praćenje deformiteta kičmenog stuba refrakcione anomalije u periodu adolescencije. Cilj rada bio je analiza refrakcionih anomalija kod dece sa deformitetom kičme.

Tridesetoro dece (22 Ž : 8 M) uzrasta 5 - 16 godina bilo je poslato na oftalmološki pregled sa klinički dijagnostikovanim deformitetom kičmenog stuba kao skolioza, kifoskolioza i skoliotično držanje. Deca su sagledavana u odnosu na refrakciju, vidne funkcije , ortoptički nalaz , a sva su vežbala korektivnu gimnastiku.

Skoliotično držanje i skolioza bili su dominanti i 3 puta češći kod devojčica (n= 16, 12 Ž: 4 M), slede kifoskolioza (n=8, 4Ž:4M) i kifoza (n=6, 2 Ž : 4 M). Rezultati oftalmoloških ispitivanja su: emetropija je nađena u 60 %, miopija u 33.3% i hipermetropija u 6.6% slučajeva .

Za adekvatan terapijski tretman neophodne su preventivne mere protiv deformiteta kičmenog stuba i refrakcionih anomalija (posebno miopije). Naglašava se važnost sistematskih pregleda kao najbolji put za rano otkrivanje i dijagnostikovanje neke bolesti ili telesnog deformiteta, kao i puna saradnja roditelja, dece, nadležnih nastavnika i svih lica uključenih u tretman koji je potreban.

Ključne reči : refrakcione anomalije , deformiteti kičmenog stuba