EXPERIENCE WITH STRABOLOGIC SURGERY ON PEDIATRIC PATIENTS WITH DIVERGENCE EXCESS EXOTROPIA

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SUMMARY

Aim: This retrospective clinical study evaluates the results of surgical treatment of patients diagnosed with intermittent exotropia of the divergence excess type. The study compares the results of surgery delayed due to the Covid-19 pandemic (patients underwent the surgery after the age of eight), versus a group of younger children.
Materials and methods: The objective angle of deviation and quality of binocular functions were examined. The follow-up period was six months after surgery. The patients were divided into two groups according to age: 4–7 years and 8–13 years.
Each group included 20 patients. The second group comprised patients whose surgery was postponed due to restrictions on elective surgery during the ongoing pandemic. The surgery took place at the University Hospital in Pilsen. Angle of deviation and binocular functions were examined before surgery, postoperatively, and three and six months after surgery. Data were collected retrospectively and statistically processed. The main values were plotted in charts.
Results: Accordance between the angle of deviation before surgery in both groups was statistically demonstrated. During the six-month follow-up period, the median angle of deviation was statistically without proof of disparity between the groups. Six months after surgery, an objective angle of deviation within the limit ±5 degrees was achieved in 65% of patients from the first group and in 75% from the second group. Binocular vision before surgery was statistically without proof of difference between both groups. However the statistical processing demonstrated a difference between the two groups six months after the surgery. Better binocular functions were achieved by the younger children in the first group.
Conclusion: The objective deviation angle was comparable in both study groups prior to surgery as well as six months after the surgery. The first group of younger patients attained a higher quality of binocular functions within the six-month follow-up period compared to children operated on after the age of eight. This claim was statistically verified.
Key words: divergence excess, intermittent exotropia, binocular vision, lateral rectus recession, medial rectus resection, Covid-19

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INTRODUCTION

The Covid-19 pandemic had a sudden and dramatic impact on the functioning of the healthcare system. With hindsight it is now possible to evaluate the later consequences of the restrictive measures that were applied within the framework of the pandemic. One of these was the blanket restriction of elective surgery, which had its consequence in a prolonging of the waiting time for surgical procedures. At our center this impact is clearly visible on pediatric patients indicated for strabologic procedures, since these operations are performed exclusively under general anesthesia, and in addition to the operating surgeon also require the presence of an anesthetist.

Based on the processing of the data from the healthcare software at our center, it ensued that the first wave of Covid measures introduced in 2020 led to the complete halting of strabismus operations at our center from March to the middle of May. Even despite the subsequent increase in the number of procedures following the end of the restrictions, during the course of 2020 there was a decrease in the total annual number of strabologic procedures on children by 15% in comparison with the average annual total of operations from the period of 2015–2019. During 2021 there

was a complete halting of operations in the period from the end of January to the end of April. In that year the number of strabologic procedures at our center decreased by 13% in comparison with the average annual total of operations from the period of 2015–2019. The decrease in the number of performed strabologic surgical procedures was manifested in a prolonging of the waiting period for an operation, and the result of this was that children were operated on at a higher age than had originally been planned. Children who required an early surgical procedure were prioritized.

Strabismus surgery is generally planned for a time when, in addition to the improvement of the position of the eye, it is also possible to expect a development of binocular functions postoperatively. We were interested in whether the deferral of a surgical procedure was manifested in the quality of the acquired binocular functions or the size of the postoperative deviation. For the purposes of this comparison, we chose patients with a diagnosis of divergence excess exotropia, since in this diagnosis the deterioration of visual functions or decompensation of the deviation is slower than in the case of esotropia [1]. As a result, these patients were not prioritized in the calendar, and the waiting time for the operation was most markedly prolonged precisely for these patients.

Divergence excess exotropia is one of the forms of intermittent exotropia. In the foreign literature, the term intermittent exotropia in the broader sense may be used to describe any type of inconstant exotropia. In the English-written literature, the term intermittent exotropia X(T) is often used to describe exodeviation, which is manifested in distance vision, while for near vision the deviation is smaller or absent – the terms divergence excess exotropia, periodic exotropia or exotropia of inattention are used with the same meaning [2]. In the Czech literature, the most widely used term is divergence excess exotropia.

Intermittent exotropia in the broader sense is divided according to a number of different classifications. One of these is the classification according to Burian, based on the clinical finding. According to this classification, exotropia is divided into basal exotropia, divergence excess exotropia and convergence insufficiency [3].

In the case of basal exotropia, the deviation of the axis of the eye in distance and near vision is identical, or smaller than 10 prismatic diopters. In the case of divergence excess exotropia, the deviation is larger in distance than near vision, by at least 10 prisms. In convergence insufficiency the difference in the deviation of the eye is greater than 10 prismatic diopters, with the deviation larger in near than distance vision [2,4–6].

This classification has been supplemented further. The classification according to Kushner divides divergence excess exotropia into true divergence excess and pseudo-divergence excess. In order to differentiate between these two conditions a patch test is used, after which the degree of deviation in distance and near vision is measured again [2,7–9]. Occlusion eliminates the tone of fusional vergence. Converging lenses (+3 D) can also be used to differentiate between the two conditions, in which the influence of accommodation to the measured deviation is eliminated [8,9].

In the case of pseudo-divergence excess it is possible to observe a decrease in the difference of the measured deviation in distance and near vision [4]. In true divergence excess there is no change of the deviation by means of the fusion or accommodation mechanism, and as a result the measured deviation remains larger in distance than in near vision, by at least 10 prismatic diopters [2,4,7].

The etiology of intermittent exotropia has not been entirely clarified; progressive decompensation of exophoria is assumed. There is also no consensus with regard to the development of intermittent exotropia, in which different authors state a different representation of patients with deterioration of binocular functions and stable patients for whom a surgical solution was not indicated [2].

A deviation may be present only occasionally and may be fluctuating during the course of the day. It is generally more evident in the afternoon, and also depends on patient fatigue and any relevant stress reaction [9]. Patients do not generally have pronounced subjective complaints. Manifest deviation is typically expressed in a gaze to a greater distance, upon lack of concentration, illness, fatigue or glare [1,2,9].

Therapy of divergence excess exotropia is both surgical and conservative [6,9].

Conservative therapy consists in the monitoring (watchful waiting) of the patient, orthoptic exercises, prescription of correction in the case of presence of a refractive error, or anti-correction [11].

In patients with divergence excess exotropia, a high accommodation convergence to accommodation (AC/A) ratio may, though need not necessarily, be present. The basis of the difference of the divergence in distance and near vision may also be a reduction of positive fusional vergence [7,8]. The AC/A ratio is frequently within the norm [7,10].

The influence of orthoptic exercises before the surgical procedure has been widely discussed, and may bring an improvement of binocular functions before the operation in the case of smaller deviations. Occlusion therapy can also be used [6,11].

Divergence excess exotropia is not generally associated with amblyopia, and in most cases no dioptric error is present [2,7,9]. However, if it is present it requires a prescription for correction. In the case of hypermetropia, full cycloplegic refraction is not recommended; myopia and astigmatism should be fully corrected [9,11].

Some authors recommend anti-correction (negative addition) of -1.0 to -2.0 spherical diopters [11]. Anti-correction leads to stimulation of accommodation, with subsequent stimulation of synkinetic vergence (or excessive vergence in the case of a raised AC/A ratio). Stimulated vergence induced by anti-correction then leads to a reduction of divergent deviation [7]. Anti-correction is not recommended for myopia due to the risk of asthenopic complaints [11].

With reference to the intermittent nature of strabismus, it is also difficult to arrive at a clear-cut definition of the indication criteria for a surgical procedure. Decisive factors are the age of the child at the time of origin of strabismus, the size of the deviation and if applicable its increase, the frequency as described by the parents and the time of duration of the observed divergent deviation during the child's waking hours, as well as any applicable deterioration of binocular functions

[1,2,9,11] and an insufficient effect of conservative therapy.

Surgery is not indicated at a low patient age, though it is necessary to perform surgery within the period when it is possible to expect an improvement of binocular functions postoperatively [4,11]. In the case of a late surgical procedure, the development of binocular functions is then limited. In general, a surgical procedure is planned between the patient ages of 4 and 7 years [12].

A number of surgical procedures can be used for the surgical solution of divergence excess exotropia. There is no consensus regarding the recommendation of an optimal surgical procedure for divergence excess exotropia.

In the literature, a bilateral procedure with retro-positioning of the m. rectus externus (BLR – Bilateral Lateral Rectus Recession) is recommended for large deviations, or an operation on two muscles of one eye, involving resection of the m. rectus internus and retro-positioning of the m. rectus externus (RR – Unilateral Recess-Resect) [2,4,6,9]. The suitability of each alternative is the subject of discussion, with some authors advocating BLR and others RR [2]. For smaller deviations it is possible to operate on one muscle only [2,4]. This procedure constitutes a lower risk of overcorrection to consecutive esotropia, and also spares the other oculomotor muscles for any further applicable operation.

Upon a surgical solution, slight overcorrection of the deviation is recommended [4], which usually subsides within 4 weeks of the operation. Temporary diplopia may be associated with this state. If diplopia persists for a longer time, it can be resolved with the prescription of prismatic correction [5]. For patients with a high AC/A ratio it is possible to use hypermetropic or bifocal correction [5,8,9].

The necessity to repeat surgery for divergence excess exotropia is frequent, and increases with the time that has elapsed since the primary procedure [2]. The course of growth of the central regions of the facial skeleton leads to an inclination of the anteroposterior axis of the orbit into a divergent position [13], which may culminate in an increase of the objective deviation.

After the surgical procedure it is appropriate to support binocular functions with orthoptic exercises [6,14]. It is suitable to include exercise of the motility of the muscles on a motility trainer, exercise of convergence synkinesis and training of fusion width with prisms in space [15].

MATERIALS AND METHODS

A retrospective study compared the results of surgical treatment of divergence excess exotropia in 40 pediatric patients. The patients were divided into two groups according to age: 4–7 years and 8–13 years, each group containing 20 patients. The first group comprises patients operated on within the usual age range. The second group of older children comprises patients who were operated on during the time of the Covid pandemic, i.e., between the years of 2020–2022. These patients were indicated for surgery for divergence excess exotropia, but were operated on with a delay due to the deferral of surgical procedures.

All the surgical procedures were performed at the Department of Ophthalmology, University Hospital in Pilsen. The follow-up period was set at six months after the surgical procedure.

We included only patients indicated for surgery for a diagnosis of divergence excess exotropia in the study. We excluded patients with incomplete documentation within the observed parameters and the follow-up period of 6 months after surgery. Patients with a diagnosis other than isolated divergence excess exotropia, patients with ARK, and patients with pseudo-divergence excess were also excluded. In addition, we excluded patients with neurological disorders or patients who had undergone a strabologic procedure in the past. Finally, we excluded patients older than 13 years of age.

We took into account the age of each patient on the day of the operation. We determined binocular functions preoperatively, postoperatively, and three and six months after surgery. We also observed the incidence of postoperative diplopia and the size of the deviation before and after the operation.

During the ophthalmological examination, distance and near visual acuity was determined, a cover-uncover test was performed, as well as an alternating cover test, a prismatic test in which deviation of the axis of the eye in distance and near vision was measured, and motility of the eyes was evaluated. A Worth test and Bagolini striated glasses test for distance and near vision were performed. Correspondence of the retinas was also examined with the aid of a Hering-Bielschowky after-image test [15], and a thirty-minute patch test was conducted [16].

The state of binocular functions was examined on a synoptophore. The angle of deviation was determined both objectively and subjectively. Capacity of superimposition, fusion I (peripheral), fusion II (macular), fusion III (foveal) and stereopsis were determined in the examination by the synoptophore in order to assess the quality of binocular functions. The examinations were conducted on the instrument Synoptophore, type 2001 (manufacturer Haag-Streit UK, Harlow, Essex, UK).

Cycloplegic refraction was determined, and an examination of the anterior and posterior segment of the eye was performed.

For the patients with diagnosed divergence excess exotropia, conservative therapy was commenced first of all: the parents were instructed with regard to the performance of convergence synkinesis and orthoptic exercises within a home environment. The patients attended an orthoptic training center once per week for active orthoptic exercises if this was possible on the part of the patient.

The majority of the patients had no dioptric error, though if a dioptric error was determined it was corrected with glasses. Hypermetropia up to +2 D of cycloplegic refraction was not corrected.

A surgical procedure was generally planned between the ages of 4 and 7, and patients were monitored until the time of the operation. With regard to the Covid pandemic, the surgical procedure was deferred for a proportion of the patients.

A surgical procedure was indicated according to the size of the measured deviation in distance vision with the aid of an alternating cover test with prisms. In the case of smaller

deviations, a procedure was indicated on one muscle of one eye, for larger deviations a procedure on two oculomotor muscles (monolateral operation on two muscles or bilateral surgical procedure on two oculomotor muscles. In the case of non-alternating strabismus, the surgical procedure was performed on the diverging eye.

After the surgical procedure, the patients underwent active orthoptic training. This was commenced immediately after the surgical procedure during hospitalization, and was continued in outpatient care. The patients attended orthoptic training once per week over the long term.

The statistical analysis of data was performed with the use of the software SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). The graphs were processed in the software STATISTICA (Data Analysis Software System), version 12 (StatSoft, Inc., Tulsa, OK, USA).

For the measured parameters, basic statistical data were calculated such as mean, standard deviation, dispersion, median, interquartile range, minimum, maximum. For categorical variables, their absolute and relative frequency was examined. Selected parameters were graphically processed into the form of box plots, mean plots and histograms.

For the comparison of distributions of the examined parameters between the tested groups, non-parametric tests were used (Wilcoxon two-sample test and Median test). Equivalence was tested with the aid of a TOST (two one sided test). The differences in frequency were tested with the aid of a Chi-square test. The development of the examined parameters over time was tested with the aid of a Wilcoxon paired test and a parametric repeated ANOVA.

Statistical significance was set at the boundary of alpha = 5%.

The graphic processing of the results was performed with the use of standardized graphs.

RESULTS

The median age of the patients from the early operated group was 6.0 years, in the group of older children 10.2 years.

In the early operated group, the median objective deviation before surgery was measured on a synoptophore at -11.0 degrees, according to a prismatic test the median deviation in distance vision was 25 prismatic dioptres base-in. In the second group of children, the median measured deviation was -10.0 according to the synoptophore, respectively 23.6 prismatic diopters of base-in nasally in the prismatic test for distance vision.

The data on the objective measured deviation in patients from both groups were statistically processed. A non-parametric ANOVA test (Wilcoxon test) was performed, which did not demonstrate any difference between the groups ($p = 0.672$). The hypothesis of accordance was also tested, in which TOST (two one sided tests) succeeded within the set tolerance limit of ±3 degrees in demonstrating accordance of the measured deviation between the tested groups ($p = 0.012$). It is possible to state that accordance in the objective angle of strabismus before surgery was successfully demonstrated within the selected tolerance limit in both groups.

A surgical procedure on one muscle was indicated for 50% of the children of younger age. A monolateral procedure on two muscles was then indicated for 40% of the children, and a bilateral procedure for 10% of the children.

In the second group of children aged over 8 years, an operation on one muscle was performed on 55% of the children. A monolateral procedure on two oculomotor muscles was performed on 40% of the children, and a bilateral procedure on 5% of the children.

After the surgical procedure the median objective deviation according to the synoptophore was 0 degrees in the first group of patients, while one patient stated diplopia (5%). In the second group the median objective deviation after surgery was 0 degrees, and 4 children stated diplopia (20%). Diplopia subsided within 2–3 weeks of the operation. It was not necessary to prescribe prismatic correction for any of these observed patients.

For the statistical analysis, the data was processed on the objective deviation measured after surgery according to the synoptophore. It was not possible to demonstrate a difference of the examined parameters between the tested groups with the aid of a Wilcoxon two-sample test ($p = 0.643$).

At the examination three months after the surgical procedures, the median of objective deviation in the early operated children was -3.0 degrees according to the synoptophore, and after six months -4.0 degrees. In the case of the delayed procedures, the median of objective deviation after three months was -2.0 degrees, and six months after surgery -3.5 degrees. At the follow-up examinations three and six months after the procedure, none of the children stated diplopia.

For the statistical evaluation, data was processed on the objective deviation measured according to the synoptophore. With the aid of a Wilcoxon two-sample test we did not succeed in demonstrating any difference in the examined parameter between the tested groups ($p = 0.627$ for the evaluation of the finding 3 months after surgery and $p = 0.808$ for the evaluation of the finding six months after surgery). The hypothesis of different change in the objective deviation measured preoperatively and the objective deviation measured six months after surgery was also tested. In the first group of younger patients, the median change was equal to 7.5, in the second group of older children the median of change was equal to 7.0. With the aid of a Wilcoxon test we did not succeed in demonstrating a different value of change in the objective deviation over time between the groups ($p = 0.968$), neither did we succeed in demonstrating a different dispersion value ($p = 0.998$) between the tested groups with the aid of an F test.

It is therefore possible to state that no statistical difference was demonstrated between the groups in the objectively measured deviations of strabismus within the observed period.

The median objective deviation in the first group was -4.1 degrees, and in the second group -4.3 degrees. Six months after surgery, 65% of patients from the first group and 75% of patients from the second group came within an interval of the objective angle of strabismus of ±5 degrees.

The development of the objective deviation over time is summarized in Graph 1.

We also observed the state and development of binocular functions upon examination on a synoptophore. Before surgery for divergence excess exotropia in the first group, i.e., the group of younger children, 70% of the patients did not manifest binocular functions even on the level of superimposition upon examination on the synoptophore. Superimposition only was present before surgery in 30% of patients, none of the children stated fusion and similarly stereopsis was not present in any of the children.

In the second group of older children, upon examination 55% of children did not even manifest superimposition, while superimposition only was present in 35% of the patients and peripheral fusion (I) was present in 10% of children. Higher binocular functions were not present preoperatively.

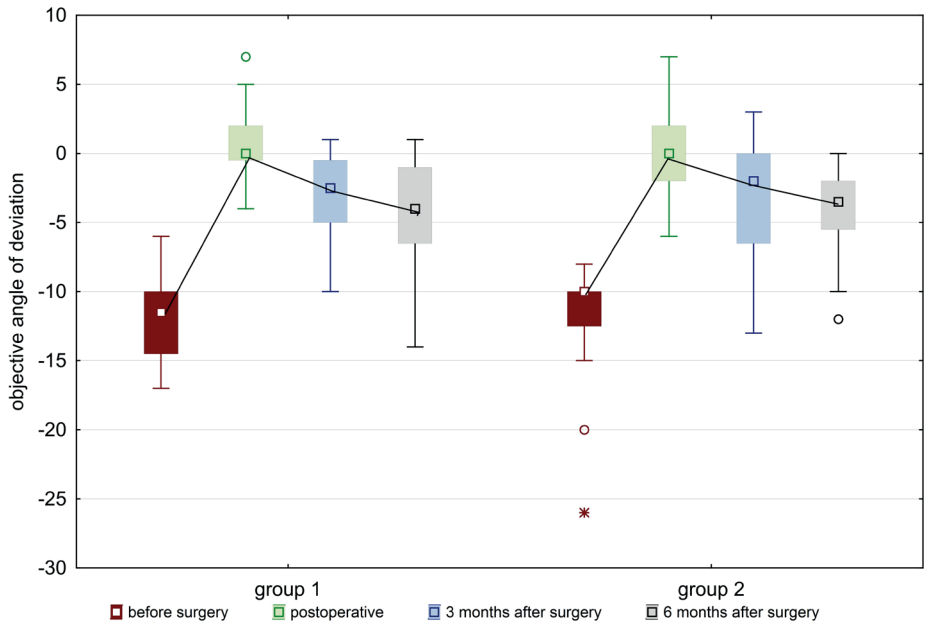
In the postoperative period, the highest attained binocular functions for the given patient were always taken into consideration for the statistical data processing and graphic illustration.

Upon examination after the surgical procedure, in the first group 10% of patients did not manifest binocular functions even on the level of superimposition. The best attained binocular functions after the surgical procedure was stated as superimposition by 25% of patients, with 10% stating peripheral fusion, 35% macular fusion (II), and the highest binocular function in this examination was foveal fusion (III), which was stated by 20% of patients. Upon examination three months after surgery, all the children were capable of joining images for superimposition, the highest attained binocular function was stereopsis in 5% of patients, and fusion III, which was present in 25% of patients. In the resulting evaluation six months after surgery, all the children had binocular functions on the level of at least superimposition or higher. The best attained binocular function was stated as superimposition in 5% of children, fusion I in 10%, fusion II in 15%, fusion III in 35%, and another 35% of patients attained stereopsis.

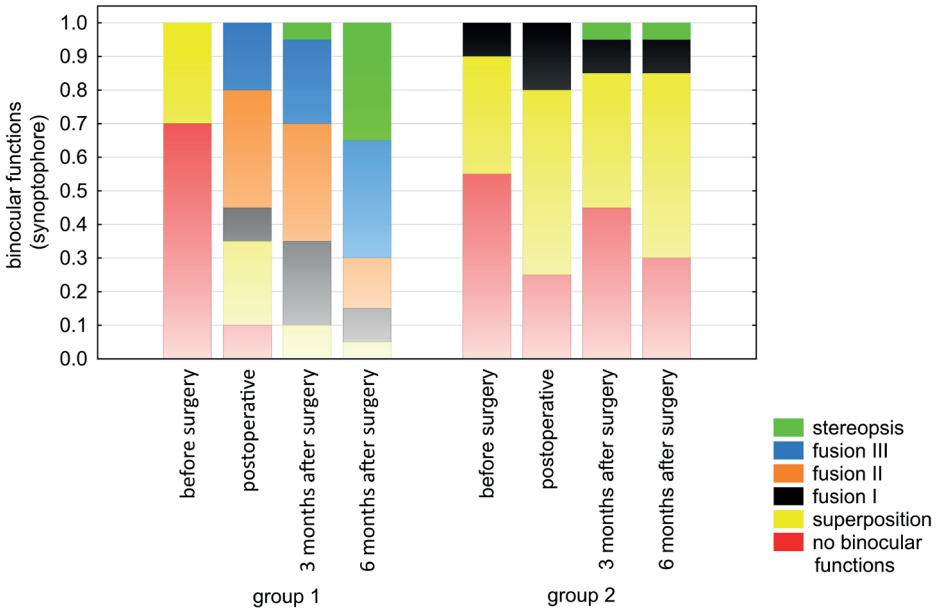
In the second group, in the postoperative period 25% of patients did not even attain superimposition, and six months after surgery 30% of patients came within this category. The best binocular function after the surgical procedure was fist-degree fusion, which was manifested by 20% of patients at the first preoperative follow-up examination. Three months after surgery 5% of patients attained stereopsis, the other patients were capable of joining images maximally for first-degree fusion or with a worse result. At the final examination six months after surgery, 30% of the patients from the second group of older children did not even manifest superimposition, the best binocular function was superimposition in 55% of children, in 10% of patients first-degree fusion, and 5% manifested stereopsis.

The results of the statistical data processing of the best attained level of binocular functions preoperatively and in the six-month period after surgery are summarized in Graph 2.

For the statistical processing, a median test was used for a comparison of the baseline data on binocular functions. For these purposes a numerical value of binocular vision was attributed: -1 without presence of superimposition, 0 presence of superimposition, 1 presence of first-degree fusion, 2 presence of fusion II, 3 presence of fusion III and 4 presence of stereopsis. The median test did not demonstrate a statistical difference between the groups in the preoperative period ($p = 0.333$). Upon the evaluation of the data from the examination six months after surgery, however, a statistical difference was demonstrated, in which the first group of early operated children manifested higher values ($p = <0.001$).



Graph 1. Median value of objective angle of deviation before the operation, postoperatively, three months and six months after the operation. Comparison of two groups of patients operated at the age of 4–7 and 8–13 years
Description of symbols: o *median* □ *25%–75% range,* ↕ *non-outliner range,* ∗ *outliners, extremes*



Graph 2. Development of the binocular functions: the best achieved binocular function of the patients preoperatively, after the surgery, three and six months following the surgery. Comparison of both groups of patients

Based on the above results of the statistical tests, we succeeded in demonstrating the assertion that the patients in the first group attained higher binocular functions six months after the surgical procedure than the patients in the second group, in which the state of binocular functions in both groups had been comparable preoperatively.

DISCUSSION

In our cohort of patients, the data of patients indicated for surgery for divergence excess exotropia are retrospectively evaluated. Patients treated conservatively are not included in our cohort.

The observed patients were divided into two groups according to age, and not according to the size of the objective deviation before the surgical procedure. A statistical TOST test with a tolerance limit of ±3 demonstrated accordance in the objective angle before surgery in both groups of children.

The recommendations for indication and the timing of the operation for divergence excess exotropia in children are not strict, and depend on the clinical finding. Divergence excess exotropia surgery should be performed at a time when it is still possible to expect good training of binocular functions. At the same time, however, it is not indicated for children at a low age due to the continuing growth of the central facial skeleton and the higher risk of loss of binocular functions upon consecutive esotropia [9]. At our center surgical procedures of exodeviations are generally planned between the patient age of 4 and 7 years, and the indications are based on the clinical finding.

Patients with divergence excess exotropia are monitored, if a dioptric error is present then it is corrected; in the case of smaller deviations we also select anti-correction. Orthoptic therapy is indicated for the sustaining and development of binocular functions. Upon an increase of the angle of strabismus, poor condition or deterioration of binocular functions and more frequent manifestation during the day, we indicate a surgical procedure.

With regard to surgical procedures, for smaller deviations we indicate surgery only on one muscle. We consider this procedure to be advantageous thanks to its sparing of the other oculomotor muscles for any further prospective surgical procedure, as well as due to the shorter operation time. A limitation of the procedure is above all the size of the manifest deviation [17].

In the case of larger deviations or upon non-alternating strabismus, a surgical procedure on two muscles was indicated. For a minority of patients a bilateral procedure was primarily indicated.

In patients with divergence excess exotropia, the need for indication of subsequent strabologic surgery increases over time. This is caused primarily by the divergent inclination of the anteroposterior axis of the orbit during the course of growth. We therefore assume a potential increase of the objective measured deviation over time.

The results of the objective postoperative deviation six months after the surgical procedure were comparable in both groups of children. The median deviation was 0 degrees in both groups after surgery, within the six-months follow-up period the mean deviation in distance vision was -4 degrees in the first group and -3.5 degrees in the second group. The objective deviation fluctuated within an interval of ±5 degrees in 65% of the younger patients and 75% from the group of older children.

A comparison of the results with other authors is difficult, since the follow-up observation period of the patients after the surgical procedure differs greatly in the individual studies, as does the performed surgical procedure and the definition of a successful result [6]. More often, an operation is considered successful if the resulting deviation is less than 10 prisma-

tic diopters, thus 5 degrees. In our study we do not mutually compare the results of individual surgical procedures.

In the cohort there is a larger representation of patients in whom a surgical procedure on only one muscle was selected. This technique is prioritized at our center in the case of smaller deviations and alternating strabismus. A unilateral procedure for smaller deviations in pediatric patients has been published with good results [17,18].

Postoperative diplopia was observed more frequently in the group of children operated on at a higher age (20% vs. 5% in the early operated patients). In all the patients from the observed cohort, diplopia subsided without the need to prescribe prismatic correction. Prismatic correction is generally prescribed at our center for compensation of disruptive postoperative diplopia in school-aged children, but it was not used on the patients in our cohort.

We consider it important to follow the operation with orthoptic exercises. A motility trainer is used (primarily in the postoperative period), as well as a convergence trainer, cheiroscope, and training of fusion width with monitoring using Bagolini striated glasses [15]. Superimposition training can also be used with the aid of a Remy separator as a supplementary exercise.

The possibility of development of binocular functions is dependent on the age of the patient. In our cohort of children operated on within the age range of 4–7 years, we observed a high success rate in attaining binocular vision, in which all the children attained superimposition and 35% of patients attained stereopsis. In the older children, who underwent surgery after the 8th year of life, after six months 70% of children were able to join images after superimposition, though only 5% of the observed sample of patients attained stereopsis.

No statistical difference was demonstrated between the groups on the level of binocular vision before surgery, but the statistical processing of the data from the examination six months after surgery demonstrated a difference between the groups, in which a higher level of binocular vision was manifested by the patients from the first group.

CONCLUSION

In a retrospective study we compared the results of surgical treatment of divergence excess exotropia in children operated on before and including 7 years of age, and children operated on after 8 years of age.

It ensues from the data processing that an accordance was statistically demonstrated in the preoperative objectively determined angle of strabismus. Upon evaluation six months after the surgical procedure, no difference was statistically demonstrated in the median objective measured deviation in the postoperative period between the two groups of patients. It can therefore be stated that the motoric result of surgical therapy is comparable in both groups of patients.

At the final examination six months after surgery, the objective deviation was within the range of ±5 degrees in 65% of the patients from the first group and 75% of the children from the second group of older children. The median resulting objective deviation was -4 in the first group and -3.5 in the second group.

Upon a comparison of the determined data on the binocular functions of patients, a difference was statistically demonstrated between the groups, in which the younger patients from the first group manifested a higher level of attained binocular functions. No statistical difference was demonstrated in the preoperative data on the binocular functions of the patients from both groups.

Both groups of patients profited from the surgical solution of divergence excess exotropia in terms of the cosmetic result and gain of lower-order binocular functions. Six months after the surgical procedure, all the children from the first group and 70% of the children operated on after reaching eight years of age attained the level of superimposition.

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