Evaluation of The Visual Function by Flash Visual Evoked Potentials in Patients with Congenital Cataract*

Konjenital Kataraktı Olan Hastalarda Görme Fonksiyonunun Flaş Görsel Uyarılmış Potansiyeller ile Değerlendirilmesi

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ABSTRACT

Purpose: To evaluate the visual function by flash Visual Evoked Potentials (fVEP) in patients with congenital cataract prior to surgery and to discuss the value of fVEP in predicting the visual potential.

Materials and methods: The medical records of patients with congenital cataract who had reliable preoperative fVEP recordings were reviewed. The fVEP was recorded prior to lensectomy and anterior vitrectomy. The N2 and P2 latencies and P2 amplitudes were evaluated. The preoperative and postoperative patients' characteristics including qualitative visual performance evaluation and accompanying ocular and systemic problems were recorded.

Results: Thirty-one eyes of 17 children were enrolled in the study. Three patients underwent unilateral surgery. The mean age of surgery was 6.76±5.69 months (2-24). Preoperative ophthalmological evaluation of the patients revealed no fixational ocular movement. The mean preoperative N2 latency was 92.46±19.91 ms, P2 latency was 123.72±25.69 ms and P2 amplitude was 7.49±4.98 µV. Seven patients had systemic diseases. Nine (52.9%) patients had nystagmus preoperatively. There was no significant difference of N2 and P2 latencies and P2 amplitudes among patients with and without systemic diseases ($p>0.05$ for all). All patients experienced fixational eye movements and voluntarily directed saccades postoperatively.

Conclusion: Preoperative fVEP recording, albeit prone to recording difficulties, may be a valuable test in the assessment of visual function but low amplitudes and delayed latencies seem not to predict worse visual outcome and should not affect surgical decision.

Key words: Cataract; congenital cataract; flash VEP; visual evoked potentials; visual function.

ÖZ

Amaç: Konjenital kataraktı olan hastalarda flaş Görsel Uyarılmış Potansiyeller (fGUP) ile cerrahi öncesinde görme fonksiyonunu değerlendirmek ve görme potansiyelini öngörmede fGUP'un değerini tartışmak.

Gereç ve yöntemler: Ameliyat öncesi güvenilir fGUP kayıtları olan konjenital katarakt hastalarının tıbbi kayıtları gözden geçirildi. fGUP lensektomi-ön vitrektomi öncesinde kaydedildi. N2 ve P2 latansları ile P2 amplitüdleri değerlendirildi. Niteliksel görme performansı değerlendirmesini içeren ameliyat öncesi ve sonrası hasta özellikleri ve eşlik eden oküler ve sistemik sorunlar kaydedildi.

Results: On yedi hastanın 31 gözü çalışmaya dahil edildi. Üç hastaya tek taraflı cerrahi yapıldı. Ortalama cerrahi yaşı 6,76±5,69 ay (2-24) idi. Hastaların ameliyat öncesi oftalmolojik değerlendirmesinde hiçbir fiksasyonel hareket izlenmedi. Ameliyat öncesi ortalama N2 latansı 92,46±19,91 ms, P2 latansı 123,72±25,69 ms ve P2 amplitüdü 7,49±4,98 µV idi. Yedi hastanın sistemik hastalığı vardı. Dokuz (%52.9) hastanın ameliyat öncesinde nistagmusu vardı. Sistemik hastalığı olan ve olmayan hastalar arasında N2 ve P2 latansları ve

The data was presented in Turkish National Ophthalmology Congress 4-8 October 2015 Istanbul/Turkey and in 53rd Symposium of International Society for Clinical Electrophysiology of Vision 24-27 June 2015, Ljubljana, Slovenia as poster and appeared as poster abstract in Doc Ophthalmol 2015; 130: 11-58, p.18.

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Geliş Tarihi - Received: 18.08.2016
Kabul Tarihi - Accepted: 20.10.2016
Glo-Kat 2017; 12: 180-182

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P2 amplitüdleri açısından anlamlı fark yoktu (p>0.05 for all). Tüm hastalarda ameliyat sonrasında fiksasyonel göz hareketi ve istemli sakkadlar mevcuttu.

Tartışma: Kayıt zorluklarına yatkın olmasına rağmen, ameliyat öncesi fGUP kaydı görme fonksiyonunun değerlendirilmesinde değerli bir test olabilir ancak düşük amplitüdler ve gecikmiş latanslar daha kötü bir görme sonucunu öngördürmüyor gözükmektedir ve cerrahi kararını etkilememelidir.

Anahtar kelimeler: Katarakt; konjenital katarakt; flaş GUP; görsel uyarılmış potansiyeller; görme fonksiyonu

INTRODUCTION

Congenital cataract is one of the most common reasons of the blindness in childhood. It requires prompt surgery and subsequent optical rehabilitation. It is almost always impossible to measure the visual acuity preoperatively due to young age at surgery even though objective chart based measurement is the mainstay of all studies inquiring the longterm success of congenital cataract surgery. In addition, accompanying systemic diseases and concomitant ocular problems may limit the final visual performance. As mentioned in the study of Hubel and Wiesel, visual deprivation may cause morphological changes in lateral geniculate body of the cats, untreated congenital cataract may also alter the activity of the unique fields of the visual pathways.[1]

Visual evoked potentials (VEP) are used to assess the integrity of the central vision throughout the visual pathways. Flash VEP (fVEP) uses brief light flashes and is preferable in patients with low cooperation, media opacities and poor fixation despite limited clinical utility due to variability.[2,3] VEP signals have been used in different clinical situations to evaluate the visual pathways.[4,5] In the present pilot study, preoperative fVEP recordings were analyzed in patients with congenital cataract. Its usefulness in the assessment of the visual performance, and in the prediction of the postoperative visual prognosis was evaluated in a subjective manner and preoperative fVEP parameters of children with congenital cataract were reported.

MATERIALS AND METHODS

The medical records of patients with uni-/bilateral congenital cataract who had preoperative reliable VEP recordings were reviewed. The study was conducted in full accordance with the Tenets of Helsinki and informed consent was obtained from all patients. The study was carried out upon approval of the Institutional Review Board. The flash VEP (RETIport21, Roland Consult, Brandenburg, Germany) was recorded according to ISCEV standards prior to lensectomy and anterior vitrectomy.[2] The N2 and P2 latencies and P2 amplitudes were all evaluated. The flash stimulus was given by a hand-held stroboscopic light. The presence of any systemic diseases, preoperative nystagmus, preoperative and postoperative fixational eye movements, voluntarily directed saccades and recognition of the mother's face responses were recorded.

Statistical analyses were done by using the IBM SPSS 22.0 package program. Continuous variables were presented as mean±standard deviation or median (min-max). Categorical variables were summarized as frequencies and percentages. Kolmogorov-Smirnov test was used to determine if the study data had a normal distribution, and nonparametric tests were used when a normal distribution was not confirmed. Mann Whitney U test was used for the two independent groups. Relations between continuous variables were determined by Spearman correlation coefficient. A *P* value less than 0,05 was considered as significant.

RESULTS

Thirty-one eyes of 17 children (7 boys, 10 girls) were enrolled in the study. Three patients underwent unilateral surgery. The mean age at surgery was 6.76±5.69 (2-24) months. Preoperative ophthalmological evaluation of the patients revealed no voluntarily fixational ocular movements, mother's face recognition and voluntarily directed saccaddes. One patient had microcornea. Of the 17 patients, nine patients (52.9%) had nystagmus preoperatively. Seven patients had systemic diseases including microcephaly (2 patients), seizures (2 patients), unidentified myopathy, thin corpus callosum and rhizomelic chondrodysplasia punctata. The mean preoperative N2 latency was 92.46±19.91 (70.5-120) ms , P2 latency was 123.72±25.69 (95-155) ms, and P2 amplitudes 7.49±4.98 (0.7-18.4) µV. There was no significant difference of N2 and P2 latencies and P2 amplitudes among patients with and without systemic diseases (p=0.161, p=0.230 and p=0.984, respectively). In addition, there was no significant relation with these parameters and age at surgery (p=0.769 for N2 latency, and p=0.243 for P2 latency and p=0.958 for P2 amplitude), the presence of preoperative nystagmus (p=0.837 for N2 latency, p=0.223 for P2 latency and p=0.260 for P2 amplitude) and laterality (p>0.05 for N2 latency, p=0.590 for P2 latency and p=0.729 for P2 amplitude) as well. All patients experienced fixational eye movements, recognition of their mothers' faces and voluntarily directed saccades postoperatively.

DISCUSSION

VEP signals are actually emerged from the baseline electroencephalographic activity of the visual cortex.[2] Flash VEP is best suited for patients with poor vision and low cooperation. Thus, in the present study fVEP recording was pre-

ferred to evaluate the visual performance of the patients with congenital cataract scheduled for surgery. fVEP was carried out as an auxiliary tool for evaluating preoperative visual function.

Visual electrophysiological tests may be used in the evaluation of various diseases and may give objective evidence of the visual dysfunction. Karaśkiewicz et al. showed that fVEP may be used in the monitorization of the intracranial hypertension of a patient with arachnoid cyst and found that alterations of the recordings may prompt an intervention.[4] Brecelj evaluated the role of pattern electroretinogram and pattern VEP in patients with optic neuritis, tumors affecting optic chiasm, achiasma and albinism and found that visual electrophysiology may be supportive to the clinical and radiological findings as well as beneficial particularly in atypical cases and suggested that they may be also used in the assessment of the acute and recovery phases of optic neuritis.[5] McGlone et al. investigated the visual outcomes in infants born to drug-misusing mothers by VEP recordings and found that these children have higher risk of having visual problems including nystagmus, strabismus and impaired vision due to exposure of the developing visual system.[6] Brecelj et al. studied the visual electrophysiological function in children with achiasmia and suggested that both flash and pattern stimulus is favorable for defining VEP characteristics and for differentiating this disorder from albinism.[7] In the present study, the variability of the P2 and N2 peak times among patients with congenital cataract was demonstrated. All patients underwent surgery and had postoperative accurate fixation. The major limitations of the study are the small number of patients and the subjective evaluation of the visual performance postoperatively. Thus, the results of the present study can not be extrapolated to all patients with congenital cataract. The postoperative flash VEP parameters were kept beyond the purpose of the study but may be compared with those of the preoperative period with the intention of the evaluation of the effect of surgery on the performance of the visual pathways in future studies. fVEP recordings are more prone to artifacts and are less accurate compared to those of pattern VEP but are less dependent to fixation and may be a good option in children. The variable results may limit its clinical significance and depend on many variables.[8] Age at surgery, laterality of the cataract and presence of nystagmus and systemic diseases were not found to be statistically related to fVEP parameters. However, in the present study recorded fVEP abnormalities are not only confined to the presence of congenital cataract and may be related to a wide variety of ophthalmological and neurological conditions as well.

The decision of surgery for congenital cataract may be challenging particularly in children who presented at older ages. fVEP is not among the routine preoperative evaluation tests in many pediatric ophthalmology clinics. To the best of our knowledge, this is the first pilot study which analyzes the preoperative visual performance in children with congenital cataract in respect with fVEP recordings.

In conclusion, fVEP may be a precious and auxillary test in the preoperative assessment of the patients with congenital cataract but should be carefully interpreted along with objective and subjective visual performance tests.

Acknowledgements

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Conflicts of Interest:

None

REFERENCES / KAYNAKLAR

1- Wiesel TN, Hubel DH. Effects of visual deprivation on morphology and physiology of cells in the cat's lateral geniculate body. J Neurophysiol 1963; 26: 978-93.

2- Odom JV, Bach M, Brigell M., et al. ISCEV standard for clinical visual evoked potentials (2009 update). Doc Ophthalmol 2010; 120: 111-9.

3- Young B, Eggenberger E, Kaufman D. Current electrophysiology in ophthalmology: a review. Curr Opin Ophthalmol 2012; 23: 497-505.

4- Karaśkiewicz J, Lubiński W, Penkala K. Visual evoked potentials in a diagnosis of a visual pathway dysfunction of a child with an arachnoid cyst. Doc Ophthalmol 2015; 130: 77-81.

5- Brecelj J. Visual electrophysiology in the clinical evaluation of optic neuritis, chiasmal tumours, achiasmia, and ocular albinism: an overview. Doc Ophthalmol 2014; 129: 71-84.

6- McGlone L, Hamilton R, McCulloch DL., et al. Visual outcome in infants born to drug-misusing mothers prescribed methadone in pregnancy. Br J Ophthalmol 2014; 98: 238-45.

7- Brecelj J, Sustar M, Pečarič-Meglič N., et al. VEP characteristics in children with achiasmia, in comparison to albino and healthy children. Doc Ophthalmol 2012; 124: 109-23.

8- Young B, Eggenberger E, Kaufman D. Current electrophysiology in ophthalmology: a review. Curr Opin Ophthalmol 2012; 23: 497-505.