Visually Evoked Potential Detection of Amblyopia in the Clinic
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ABSTRACT

Preverbal children with amblyopia risk factors can be challenging to manage, as they may have a fixation preference but may or may not have amblyopia. We developed a user and patient friendly test using visually evoked potentials to aid in management of such children.

INTRODUCTION

Preverbal children with amblyopia risk factors can be challenging to manage, as they may have a fixation preference but may or may not have amblyopia. We developed a user and patient friendly test using visually evoked potentials (VEPs) to aid in management of such children.

SUBJECTS

Age: 3-12 years old
30 normal subjects
• 20/20 vision or better and less than 2 lines of interocular difference (IOD)
43 amblyopic subjects:
• amblyopic in 1 eye or more than 1 IOD
• 18 have mild amblyopia (2 IOD or less)
• 25 have moderate/severe amblyopia (3 or more of IOD)

METHODS

• Tested using the Diopsys NOVA-TR system
• Checkerboard reversal pattern VEP at 2 Hz
• 5 spatial frequencies at 10 seconds each (20 reversals)

DATA ANALYSIS

The following illustrations represent one subject that was tested across 5 spatial frequencies. The fellow (OD, HOTV 20/25) eye appears on the top row, while the amblyopic (OS, HOTV 128x128) eye appears on the bottom row. Each graph show both amplitude and latency for each spatial frequency with the final graph being a combination of all 5 spatial frequencies.

RESULTS

A person is considered to be amblyopic if:
• There is a 9% difference in latency in at least 2 spatial frequencies
• There is a 25% diminution in VEP amplitude in at least 2 spatial frequencies

When using the established criteria...
• 93.9% of normal subjects are correctly identified
• 81.4% of amblyopic subjects are correctly identified
• 13/18 (72%) of the subjects with mild amblyopia are correctly identified
• 22/25 (88%) of the subjects with moderate to severe amblyopia are correctly identified

CONCLUSION

A pattern reversal VEP at 5 spatial frequencies can be used to correctly identify children with amblyopia, without misclassifying many normal children. This is important since fixation preference testing can be unreliable in detecting amblyopia in preverbal children. This commercially available software test can be used to reduce age of patient testing. Automation of the test protocol is under development.

The development of a clinically useful evoked potential test will help pediatric ophthalmologists manage amblyopia in preverbal children.

ACKNOWLEDGEMENTS

Thank you to Hrishikesh and Diana Tamboli.
• F.F.D. (New York)
• Dr. Donahue is a Co-Chairman of Ophthalmology at Vanderbilt University Medical Center
• Diopsys Inc: provided the instrument used for testing and covered travel expenses.

CONFLICTS

Dr. Donahue is a consultant for Diopsys Inc., and has also served as a consultant to several other related software companies.

Table 1: Rate of Latency and Number of Spatial Frequencies on Sensitivity and Specificity to Amblyopia Detection in Normal Subjects

<table>
<thead>
<tr>
<th>Spatial Frequency</th>
<th>Sensitivity</th>
<th>Specificity</th>
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<tbody>
<tr>
<td>2 spat. freq.</td>
<td>93.94%</td>
<td>93.94%</td>
</tr>
<tr>
<td>3 spat. freq.</td>
<td>93.94%</td>
<td>93.94%</td>
</tr>
<tr>
<td>4 spat. freq.</td>
<td>93.94%</td>
<td>93.94%</td>
</tr>
<tr>
<td>5 spat. freq.</td>
<td>93.94%</td>
<td>93.94%</td>
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