**Introduction & Purpose**

Amblyopia— or “lazy eye” — is a widespread disorder, manifested as visual function impairments despite seemingly normal condition of the eye and visual pathways.

Traditionally, for amblyopia treatment, the complete occlusion of better eye (patch occlusion) is used to improve the worse eye into the vision process. Various schemes of occlusion procedures can be applied, but all of them are targeted on monococular vision improvement.

Nowadays, there is an alternative to the full occlusion: virtual occlusion (=dichoptic training).

The purpose: to compare the effectiveness of virtual occlusion (VO) and patch occlusion (PO) for amblyopia treatment in children.

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**Virtual occlusion & Patch occlusion**

Eye-occlusion (PO) - full occlusion, “turning off” the better eye from the visual process.

Virtual occlusion (VO) - adjustable occlusion, realized by means of 3D technique.

One of advantages of VO is good visibility of environment, meanwhile the game image is less contrast.

Virtual occlusion was provided by using polarized 3D technique: passive 3D-glasses and the 3D monitor LG Flextron 32LF820U.

For amblyopic eye: high contrast, 100% visibility.

For better eye: less contrast. We used gradual increase: 0% (not visible at all), 25%, 50%, 75%, 90% visibility.

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**Subjects & Procedure**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Test</th>
<th>VO</th>
<th>PO</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>10</td>
<td>10 sessions by 5 min</td>
<td>Virtual occlusion</td>
<td>Patch occlusion</td>
</tr>
<tr>
<td>II</td>
<td>29</td>
<td>10 sessions by 5 min</td>
<td>Virtual occlusion</td>
<td>Patch occlusion</td>
</tr>
</tbody>
</table>

Groups description:

- **Group I** (PO vs VO):
  - 15 patients
  - 15 dichoptic
  - 5 refractive
- **Group II** (VO vs PO):
  - 8 patients
  - 5 dichoptic
  - 6 refractive

During the experiment and during 6 months before, patients have no other treatment of amblyopia.

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**Results**

**Monocular visual acuity**

PO → VO training

We observed significant improvement of visual acuity after VO as well as after PO on the trained eyes in both groups.

Improvement by VO and PO were not statistically different.

To our surprise, on a non-trained eye we observed a significant improvement of visual acuity after VO in both groups.

**Conclusions**

- **The results obtained show the following advantages of virtual occlusion:**
  - improvement in monocular visual acuity of both eyes (trained and even non-trained);
  - improvement in binocular visual acuity more pronounced after VO then after PO.

Additionally, improvement in accommodation and binocular function seems to be more prominent after VO than after PO.
Direct comparison of eye patch and virtual occlusion during computer-aided treatment of amblyopia in children

Rychkova S., Gracheva M., Sandimirov R., Bolshakov A.

Some recent investigations evidenced that, in treating amblyopia, virtual occlusion (VO) could have significant advantages over traditional occlusion with eye patches (PO). However, the data available are mostly obtained in adults and still seem to be preliminary but not comprehensive. In order to compare the effectiveness of using PO and VO in children directly, we employed PO in some training sessions and VO (realized by means of 3D technique) in others. The same sets of visual stimuli and identical training procedures were used in the courses of treating amblyopia (10 sessions by 5 minutes) in two groups of children aged 7-14 years. The groups had 15/15 and 15/14 patients with disbinocular/refractive amblyopia and similar characteristics as concerned distributions of age and initial visual acuity. The first group underwent treatment with PO sessions then VO sessions (PO/VO), the second one – in inverse order (VO/PO). For the amblyopic eyes designed to treatment, the training procedures PO/VO and VO/PO produced increase in visual acuity 35%/20% and 38%/10%, respectively. In the case of VO, significant improvement in visual acuity was also registered in the paired eyes (by 25%/11% after first/second course), while in the case of PO, visual acuity in these eyes remained unchanged. In addition, employment of VO results in significant increase of binocular visual acuity (by 33%/12% after first/second course).

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Teaser:

Direct comparison of eye patch and virtual occlusion during computer-aided treatment of amblyopia in children

Significant advantages of virtual occlusion (realized by means of 3D technique) in treatment of refractive and disbinocular amblyopia in children were revealed: increase in visual acuity not only in amblyopic eye designed to treatment, but also in paired eye, and increase in binocular visual acuity.