**Background**

Postoperative visual dysfunction (POVD) after craniotomy is a devastating complication. Intraoperative visual evoked potential (VEP) has been considered to monitor the functional integrity of visual pathway during neurosurgical procedures, in which the optic pathway is at a risk of injury. Recent advances in techniques including a new light-stimulating device consisting of high-luminosity light-emitting diodes (LEDs) and induction of electroretinography (ERG) to ascertain the arrival of the stimulus at the retina have provided better conditions for stable VEP recording under total intravenous anesthesia (TIVA) with propofol.

**Objectives**

In this study, we investigated feasibility and reliability of intraoperative VEP monitoring during craniotomy.

**Materials and Methods**

- Ninety patients undergoing elective craniotomy under general anesthesia from May 2009 to December 2013 were enrolled. (male 39, female 51: age: 59±18)
- Visual field and visual acuity were examined preoperatively and postoperatively for all patients.
- TIVA was maintained by propofol with 2.0-3.0 μg/ml using target controlled infusion, remifentanil with 0.05-0.3 μg/kg/min, fentanyl and rocuronium.
- In all patients, VEP and ERG monitoring were performed at bilateral eyes throughout the operation.
- ERG was recorded simultaneously with VEP to guarantee the delivery of adequate flash stimuli to the retina.
- LED flash stimulation for recording VEP was performed with LSF-101 II (Unique Medical Co, Japan). (Fig 1)

**Setting for intraoperative VEP monitoring**

- Luminosity: 10000-20000 Lx (supramaximal stimuli)
- Duration: 10-20 msec
- Frequency: 1.0-2.0 Hz
- Summation: 50-100 responses
- Filters: 10 Hz (low) and 500 Hz (high)
- Analysis time: 200 msec

**Types of surgeries performed (n=90)**

- Hardy: 53 cases
- Craniotumorectomy: 31 cases
- STA-MCA anastomosis: 2 cases
- Others: 4 cases

**Diagnosis**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pituitary tumors</td>
<td>43</td>
</tr>
<tr>
<td>Saddle nodule section meningioma</td>
<td>8</td>
</tr>
<tr>
<td>Rathke cyst</td>
<td>9</td>
</tr>
<tr>
<td>Others</td>
<td>30</td>
</tr>
</tbody>
</table>

**Results**

- VEP amplitudes were defined as the range of peak to peak amplitude between N75 and P100. (Fig 3)
- More than 50% decrease in VEP amplitudes compared to the control level was defined as significant VEP change.
- Assessment of intraoperative VEP monitoring
  1. Success rate of recording baseline VEP amplitude
  2. Accuracy of VEP monitoring during craniotomy when the association between intraoperative significant change of VEP amplitude and postoperative new visual dysfunction was evaluated.

**Discussion**

- In this study, 5 cases were failed to record control VEP. The causes of failed recording were the displacement of the stimulation pad for the one case, the interruption of the alternating current into the waveform for the another 2 cases and preoperative almost blind for the remaining 2 cases.
- The previous reports indicated that there was difficulty to perform reliable VEP monitoring for the patients with visual acuity less than 0.4. (references 1 and 2)
- VEP monitoring under general anesthesia might have difficulty to detect intraoperative small changes of visual fraction.
- For recording stable VEP waveform during craniotomy, it was necessary to apply flash stimulation pads containing high-luminance LED and combination of ERG for ascertaining delivery of adequate flash stimuli to the retina under TIVA with propofol.

**Conclusions**

Clinical use of intraoperative VEP monitoring might have feasibility and satisfying reliability to prevent postoperative visual dysfunction during craniotomy under general anesthesia.

**References**