Percutaneous Threshold of Facial Nerve Stimulation Predicts Facial Canal Dehiscence

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INTRODUCTION

- Iatrogenic injury to the facial nerve is a devastating complication of otologic surgery. Facial canal dehiscence increases the risk of facial nerve injury.
- Natural dehiscences of the facial nerve are common, and otologic disease requiring surgical intervention increases dehiscence rates and their extent.

In this retrospective review, we propose that preoperative facial nerve stimulation thresholds may predict dehiscence of the facial nerve canal.

METHODS

- Retrospective review of otologic procedures at our institution performed from January 2015 to February 2017.
- Intraoperatively, neurophysiologists placed percutaneous electrodes: four on the operated side and one in the orbicularis oris on the contralateral side as a control (Figure 1).

A monopolar Praas probe was used to stimulate the facial nerve transectaneously at the stylomastoid foramen with stimulus parameters as follows: cathodal, constant current, 200 µsec pulse, 3.1 Hz, intensity 0.1—30 mA.

The following parameters were measured preoperatively:
1) Threshold to compound muscle action potential (CMAP), which was defined as the lowest intensity (mA) at which a response was recorded from that muscle.
2) Average threshold to CMAP in all muscles tested (mA).
3) Threshold to Maximum Amplitude of CMAP (mA).
4) Maximum Amplitude of the CMAP (µV).

RESULTS

Dehiscence Visualized intraoperatively in 24 patients (34.3%).

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Pathologies</th>
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<tbody>
<tr>
<td>70 patients included</td>
<td>Chronic otitis media 20</td>
</tr>
<tr>
<td>Mean age (range)</td>
<td>Conductive hearing loss 9</td>
</tr>
<tr>
<td>49.1 (20 – 71)</td>
<td>Sensorineural hearing loss 6</td>
</tr>
<tr>
<td>Female</td>
<td>Chronic tympanic membrane perforation 4</td>
</tr>
<tr>
<td>33 (47.1%)</td>
<td>Otosclerosis 3</td>
</tr>
<tr>
<td>Male</td>
<td>Canal cholesteatoma 2</td>
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<tr>
<td>37 (52.8%)</td>
<td>Other* 2</td>
</tr>
</tbody>
</table>

HRTC skin thickness (mm) (avg ± SD) | 7.5 ± 6.6 (P=0.09)

Dehiscence | No Dehiscence
---|---
Mean | 5.1 ± 2.4 | 9.1 ± 5.5
Median (range) | 4.85 (2-9) | 9.25 (2-40)

For dehiscent nerves, only 4 values were greater than 7 mA, for nondehiscent nerves, only 4 values were less than 5 mA. If the cutoff for likely or possible dehiscence is set at 7 mA, then the specificity is 81.8%, the sensitivity is 75.5%, the positive predictive value is 68.3% and the negative predictive value is 90%.

DISCUSSION

To improve our ability to predict fallopian canal dehiscences preoperatively, we have developed a novel method utilizing percutaneous stimulation of the facial nerve at the stylomastoid foramen.

Lowest and average threshold to CMAP were significantly different between the dehisced and non dehisced groups.

Using a preoperative percutaneous facial nerve stimulation threshold of around 7 mA will accurately predict facial nerve canal dehiscence.

Preoperative percutaneous facial nerve stimulation is a simple and cost effective method to accurately predict facial nerve canal dehiscence.

Figure 1. Electrodes placed in foramina, orbicularis oculi, orbicularis oris and the mentalis on the operated side. Contralateral electrode not shown.

CT scan (A) and intraoperative view (B) of a large dehiscence of the tympanic segment of the facial nerve of a patient in our series.