### Methods and Procedures

This study was a prospective, interventional, single arm, open-labeled study and was approved by the Institutional Review Board for Clinical Research, Tokai University.

Forty-two patients with esophageal cancer were enrolled; all the patients were scheduled to undergo an elective thoracoscopic esophagectomy in a prone position for esophageal cancer (5,6,7).

The aim of this study was to clarify whether such monitoring could be useful during thoracoscopic esophagectomy for esophageal cancer.

### Results

**Patient background** (n = 42)

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Sex</th>
<th>Vocal cord paralysis</th>
<th>RLNP</th>
<th>CD &gt; I</th>
<th>Amp(%)</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66</td>
<td>M</td>
<td>Right</td>
<td>1</td>
<td>0</td>
<td>50</td>
<td>Chest, thermal injury</td>
</tr>
<tr>
<td>2</td>
<td>69</td>
<td>F</td>
<td>Left</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Cut</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>M</td>
<td>Right</td>
<td>1</td>
<td>0</td>
<td>50</td>
<td>Chest, thermal injury</td>
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<tr>
<td>4</td>
<td>72</td>
<td>F</td>
<td>Right</td>
<td>1</td>
<td>0</td>
<td>50</td>
<td>Chest, thermal injury</td>
</tr>
<tr>
<td>5</td>
<td>66</td>
<td>M</td>
<td>Left</td>
<td>0</td>
<td>1</td>
<td>60</td>
<td>Neck, stretch</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
<td>M</td>
<td>Left</td>
<td>1</td>
<td>0</td>
<td>50</td>
<td>Chest, stretch</td>
</tr>
<tr>
<td>7</td>
<td>63</td>
<td>M</td>
<td>Right</td>
<td>1</td>
<td>0</td>
<td>60</td>
<td>Neck, stretch</td>
</tr>
</tbody>
</table>

**Continuous intraoperative nerve monitoring (CIONM)**

Continuous intraoperative nerve monitoring (CIONM) was performed by regular stimulation of the left RLN while patients were intubated with EMG needle electrodes and an APS electrode attached to the vagus nerve. The patient was then turned to the prone position for thoracoscopic esophagectomy.

Continuous intraoperative nerve monitoring (CIONM) of the left RLN was performed by regular stimulation of the left vagus nerve, and intravascular conduction was detected by the electromyography (EMG) of the left vocal cords. The alarm was set to activate when EMG amplitude reduced by 50% or latency prolonging by 10%.

### Discussion

Continuous intraoperative vagus nerve stimulation for monitoring the RLN function during thoracoscopic esophagectomy is one of the most important postoperative complications causing hoarseness, aspiration, pneumonia, or dysphagia (7,9). To the best of our knowledge, this is the first study of continuous nerve stimulation during thoracoscopic esophagectomy in a prone position for esophageal cancer (5,6,7,10).

This monitoring method seems to be useful for identifying harmful procedures intraoperatively and for establishing safer procedures while performing lymph node dissection in the vicinity of the RLN.

### Conclusion

Continuous intraoperative vagus nerve stimulation for monitoring the RLN function during thoracoscopic esophagectomy is one of the most important postoperative complications causing hoarseness, aspiration, pneumonia, or dysphagia (7,9). This monitoring method seems to be useful for identifying harmful procedures intraoperatively and for establishing safer procedures while performing lymph node dissection in the vicinity of the RLN.

**References**