Nerve Monitoring System enabling better outcomes in Thyroid Surgery

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Intraoperative nerve monitoring

Use in Thyroid Surgery - why and what benefits?

- One of the two most concerning, although infrequent, complications of Thyroid Surgery is laryngeal recurrent nerve injury (1-2%).
- If at least one of the nerves is injured during surgery, it can cause temporary or permanent hoarseness, and in the most severe cases, total cord paralysis and airway obstruction.
- Nerve monitoring technology:
  - Reduces nerve damage, positively impacts voice outcomes, increases nerve preservation, and decreases cases of paresis. [1,2,3]
  - Provides real-time feedback on nerve function so you can adjust course, if necessary, during thyroid surgery and other procedures affecting head and neck nerves.
  - Reduces surgical time[4] and postoperative complications.[5]
  - Shows and records the results obtained before and after the dissection, allowing to predict the need for care and the outcomes of the surgery.

Fig.1 – Scheme of nerve monitoring devices

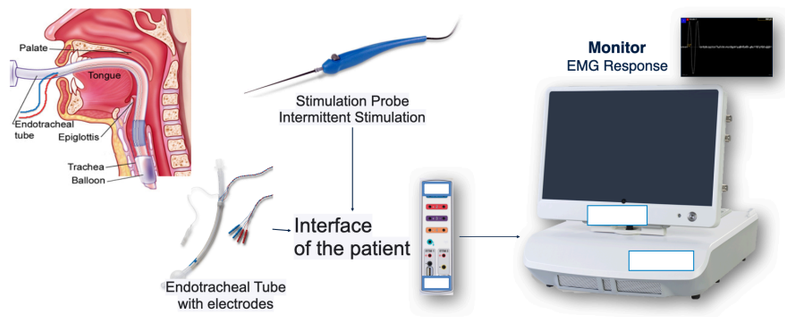
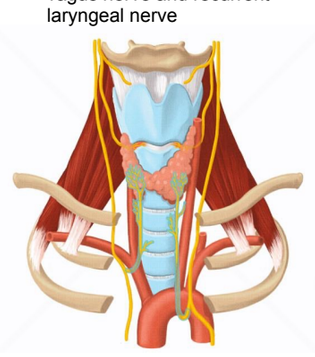


Fig.2 – Thyroid, trachea, vagus nerve and recurrent laryngeal nerve



How it works?

- Electrodes are placed on the muscles innervated by the nerve to be monitored.
- Through a stimulation probe, the system stimulates the nerve, propagating an action potential, which in turn causes muscle contraction.
- The system receives the electrical response from the muscles and converts it into an EMG signal displayed on the monitor with an audible confirmation.

Fig.3 – Nerve monitor scheme

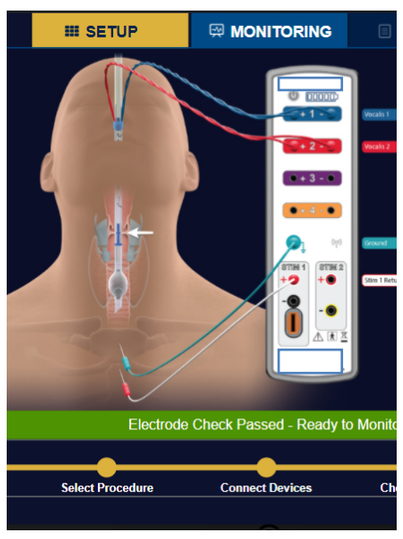


Fig.4 – Endotracheal tube and electrodes

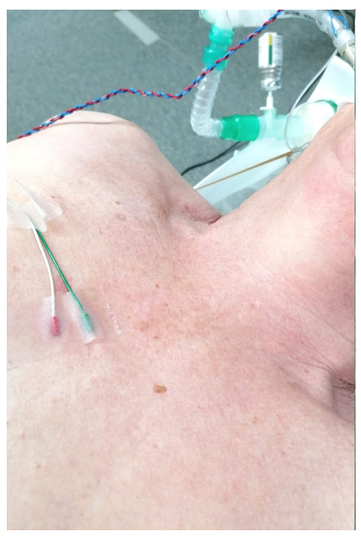


Fig.5 – WiFi interface where the electrodes are connected

Fig.6 – Connecting the probe to the interface

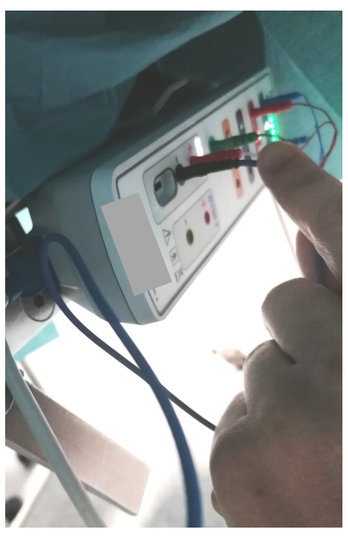


Fig.7 – Neurostimulation probe detecting recurrent laryngeal nerve

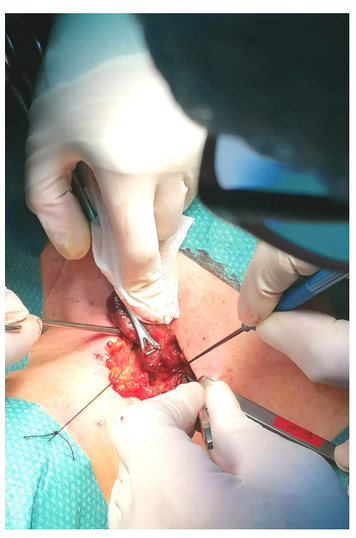


Fig.8 – Monitor showing recurrent laryngeal nerve response

Fig.9 -Total thyroidectomy

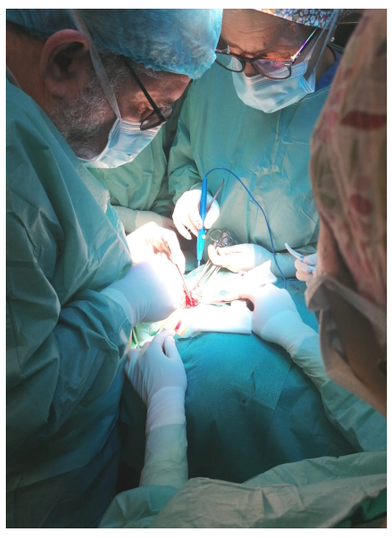


Fig.10 – Thyroid (1), tumor (2) and part of resected right recurrent nerve (3)

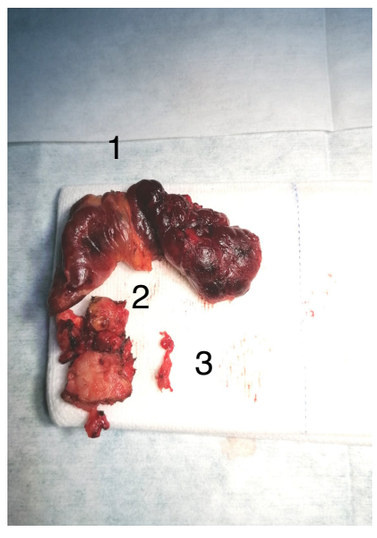


Fig.11– Right thyroid location with sectioned recurrent nerve (4)

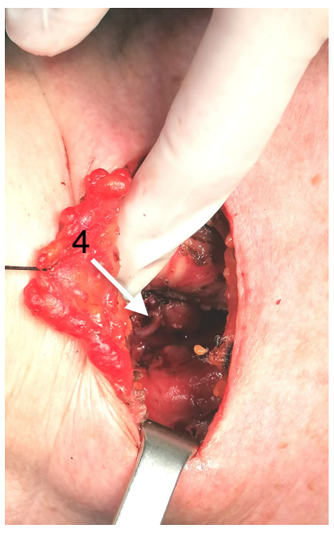


Fig.12 – Left thyroid location with preserved recurrent nerve (5)

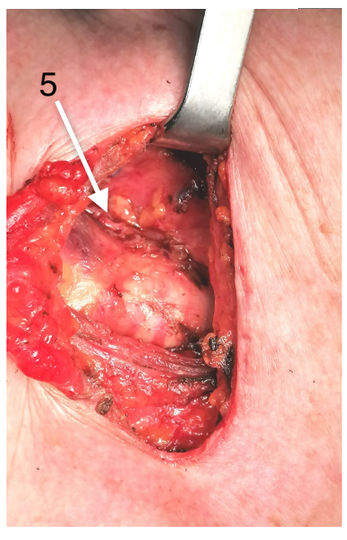


Fig.13 – Surgical wound closed with biological glue

Fig.14 – Immediate postoperative period

Authorized patient and staff photos

Clinical case

Clinical Case courtesy of Koch, Pedro MD
Soares, Virginia MD
and Alves, Daniela MD
from Endocrine Surgery Unit

- 74-year-old woman with obesity
- Hoarseness with 6 weeks of evolution
- Right vocal cord paralysis diagnosed by Otorhinolaryngology consultation
- Neck and thoracic CT scan:

A **nodule** is observed in apparent dependence of the **lower pole of the right lobe of the thyroid** that extends inferiorly to the right tracheoesophageal groove, with a major axis in the axial plane of 25x19 mm. It is located in the topography of the right recurrent laryngeal nerve and may be responsible for right vocal cord paralysis.

- Referred for endocrine surgery
- Indication for Total Thyroidectomy
- Procedure with high surgical risk for urgent tracheostomy during its performance

Surgical intervention

Identification of a tumor mass in the right lobe with involvement of the right recurrent laryngeal nerve (Fig.7), anterior invasion of the trachea and close proximity to the cervical vessels. Dissection, with no possibility of preservation of the right recurrent laryngeal nerve and then performed tracheal shaving (Fig.10 and 11). Identical procedure, with preservation of the left recurrent laryngeal nerve (Fig.12). Verification of the integrity of the left recurrent laryngeal nerve and the left vagus nerve, before and after the dissection, through neurostimulation.

Postoperative

- **Urgent tracheostomy was not necessary due to the effectiveness of the nerve monitoring system**
- **Discharged on the 1st day, with no complications.**
- **Right laryngeal nerve palsy**
- **No dyspnea, no paresthesias, no stridor but slight dysphonia**

Conclusions

Intraoperative Nerve Monitoring:

- Increases efficiency and surgical precision.
- Reduces the risk of intraoperative nerve damage.
- Reduces the time needed to identify nerves.
- It helps surgeons identify the site of nerve damage, helping to make surgical decisions.

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5. Wilson L, Lin E, Lalwani A. Cost-effectiveness of intraoperative facial nerve monitoring in middle ear or mastoid surgery. The Laryngoscope 2003;113(10):1736-1745.