



# Intraoperative spinal accessory nerve monitoring in neck dissections

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## Abstract

**Background** The identification and preservation of the spinal accessory nerve (SAN) is essential in neck surgeries due to possible complications. We report the technique to intraoperative neuromonitoring (IONM) of SAN in functional neck dissections.

**Method** SAN was monitored by needle electrodes placed on the trapezius muscle. Preoperative and postoperative nerve mapping was performed.

**Conclusion** IONM for spinal accessory nerve in patients undergoing neck dissection is a useful technique that can be valuable for neck surgeries where spinal nerve injury is at risk.

**Keywords** Neck dissection · Spinal accessory nerve · Intraoperative neuromonitoring

## Introduction

Intraoperative neuromonitoring (IONM) has become a common tool in surgical procedures in which there is a potential risk of nerve injury. Despite the need for a high level of anatomical knowledge and surgical experience, identification of nerves can sometimes be difficult and cause nerve injury. The main objective of the IONM is to confirm the location of the nerve structures intraoperatively to prevent morbidity.

In head and neck surgery, IONM is widely used to monitor the laryngeal branches of the vagus nerve. IONM has shown high surgical safety by improving the rate of nerve injury to the laryngeal branches in thyroid or parathyroid surgery [1]. Other cranial nerves such as the facial nerve or the hypoglossal nerve are monitored in otologic and parotid surgery, and in oral cavity surgery, respectively [2, 2].

Cervical lymph node dissection is a common surgery in the management of patients with head and neck cancers. In this type of surgery, there are certain nerves that could be affected such as the marginal mandibular branch of the facial nerve, the vagus nerve and its branches, the spinal accessory nerve, and the hypoglossal nerve [4]. Some patients with

node-negative head and neck cancer require prophylactical treatment because of a high risk of occult metastases. Therefore in such cases, selective neck dissection (SND) or functional neck dissection (FND) is performed. The identification and preservation of the spinal accessory nerve (SAN) is essential in these neck surgeries due to possible complications such as loss of active shoulder abduction, shoulder girdle and weakness of the trapezius [5].

We describe the technique of neuromonitoring the SAN in patients undergoing functional neck dissections.

## Description of the technique

IONM for SAN was performed in five patients (Table 1). SAN was monitored by needle electrodes placed on the trapezius muscle. For electrode placement, the trapezius muscle is pinched, and the electrodes are inserted perpendicularly and deep into the trapezius muscle as shown in the Fig. 1. The needles electrodes used were 0.45 × 25 mm with an angle of 30° (Spes Medical, Genova, Italy).

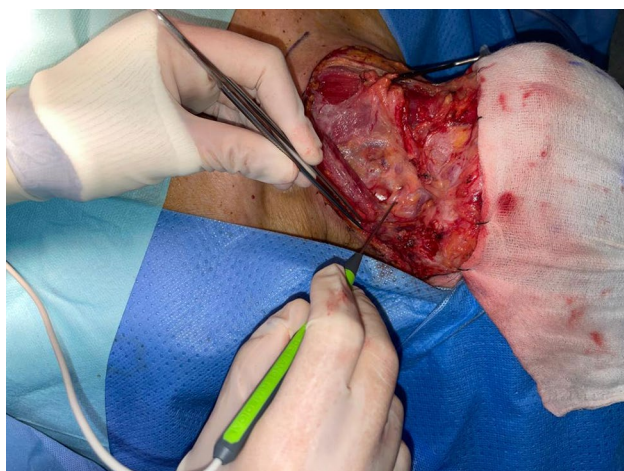
Patients were placed in supine decubitus with cephalic hyperextension. A functional neck dissection was performed according to the technique described by Osvaldo Suarez [6]. IONM was performed using a monopolar probe at a power of 1 mV (Fig. 2). The amplitude of the recording signal, as well as its latency before and after neck dissection, were collected (Fig. 3). To locate the SAN, the Erb's point, the transverse process of the atlas and the internal jugular vein were used as reference

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**Table 1** IONM of the SPAN records

	Right functional neck dissection				Left functional neck dissection			
	Preoperative amplitude (mV)	Postoperative amplitude (mV)	Preoperative latency (mS)	Postoperative latency (mS)	Preoperative amplitude (mV)	Postoperative amplitude (mV)	Preoperative latency (mS)	Postoperative latency (mS)
Case 1	3.995	0.103	5.2	9.4	1.296	1.210	9.7	5.0
Case 2	1.948	3.571	4.0	4.1	8.662	0.110	3.8	3.3
Case 3	9.046	1.884	3.4	3.6	20.471	13.340	4.5	4.0
Case 4	21.007	0.173	3.7	2.1	1.775	4.837	3.4	3.9
Case 5	3.080	1.860	4.1	3.6	0.160	0.480	3.7	4.8

**Fig. 1** Surface electrode placement technique on left trapezius muscle**Fig. 2** IONM of the SAN with a monopolar probe prior to dissection of the left area IIb

landmarks. Once located two nerve stimulations were performed. The first one was executed when the nerve was localized prior to dissection of area IIb and the second one when neck dissection of this area was completed (Fig. 4). We used the Avalanche<sup>®</sup> SI neuromonitor (Dr. Langer Medical GmbH, Waldkirch, Deutschland) for nerve stimulation.

Shoulder pain and disability were evaluated postoperatively using the Spanish version of the SPADI questionnaire (shoulder pain and disability index) questionnaire [7]. The score in all cases was 0%. Fast-acting neuromuscular blockade was used for anesthetic induction with rocuronium bromide, Esmerón<sup>®</sup> (Merck Sharp & Dohme, Kenilworth, New Jersey, USA). This is important so that the registration is not distorted by muscle relaxation.

### Indications, limitations and how to avoid complications

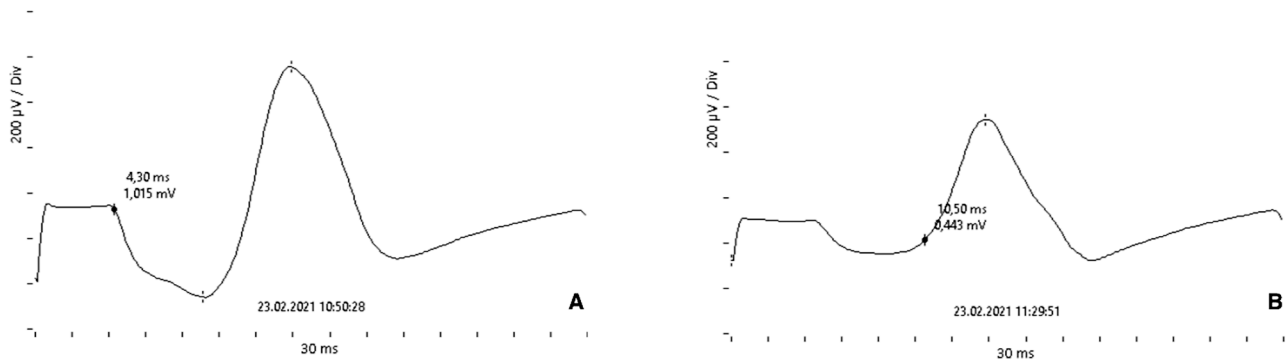
This technique can be performed on any patient undergoing neck dissection or cervical surgery to avoid SAN injury. IONM of the SAN is a method to support the security of these surgeries but in any case, eliminates the surgeon's need for anatomical knowledge to avoid surgical errors. Thus, the localization of the SAN nerve by the surgeon is mandatory to perform safe surgeries.

In most cases, the amplitude of the post-dissection recording was decreased. It could be attributed to the sternocleidomastoid muscle traction during the procedure. The responses to the postoperative shoulder mobility questionnaire were not altered. We are expanding the study to evaluate the postoperative parameters.

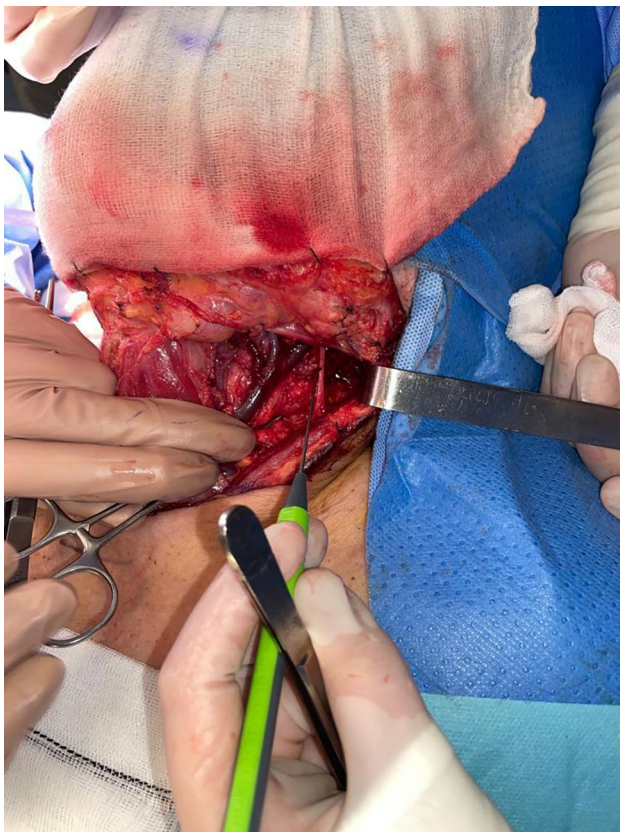
No complications related to the use of this technique were observed. Although we use it for FND, we believe that it can be used for comprehensive and selective neck dissection.

### Perioperative considerations and information for the patient

No special perioperative considerations are necessary to perform the technique.



**Fig. 3** IONM of the SAN records. **A** SAN record before dissection. **B** SAN record after dissection



**Fig. 4** IONM of the SAN after left functional neck dissection

## Conclusion

IONM for spinal accessory nerve in patients undergoing neck dissection is a useful technique that can be extrapolated to different neck surgeries where spinal nerve injury is at risk.

## Declarations

**Conflict of interest** No conflicts of interest to declare. The patients included in this short series signed an informed consent prior to the procedure.

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