



ASSESSMENT OF SPINAL ACCESSORY NERVE NEUROPATHY USING EMG AND NERVE CONDUCTION TEST FOLLOWING NECK DISSECTION

Dental Science

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ABSTRACT

The primary prognostic factor related with head and neck malignancy is the presence of the lymph node metastases in the neck, and the neck dissection is the best treatment for such metastases.¹ However, this procedure may cause extreme morbidity and different complications like seroma, chylous fistula, carotid sinus disorder, shoulder dysfunction and so forth. One of the most well-known complexity stemming for the neck dissection is shoulder dysfunction caused by the manipulation of the spinal accessory nerve which causes atrophy of the trapezius muscle primarily in procedures involving the posterior triangle neck dissection. The aim of this study was to assess spinal accessory nerve function after selective neck dissection (SND) and modified radical neck dissection (mRND) by assessing the nerve with electromyographic (EMG) examinations and nerve conduction test.

KEYWORDS

Modified Radical Neck Dissection (mrnd), Electromyography, Selective Neck Dissection (snd), Shoulder Dysfunction.

INTRODUCTION:

Surgical management of head and neck malignancy may include the removal of lymph nodes from the neck, referred to as a neck dissection. mRND involves preservation of one or more of the following structure: the spinal accessory nerve, sternocleidomastoid muscle and internal jugular vein and SND involves preservation of all the non lymphatic structures. Although the aim of the former is to safeguard the spinal accessory nerve, the nerve may still be injured during the procedure. This injury may happen during retraction of the nerve and the sternocleidomastoid muscle, when the surgeon endeavors to dissect the upper jugular and cervical spinal lymph nodes located in the proximity of the spinal accessory nerve. Penance of the spinal accessory nerve during RND is viewed as a critical factor in depicting post-operative shoulder function. In 1961, Nahum et al. characterized a shoulder disorder occurring after RDN, containing a shoulder droop, winged scapula, inability to shrug, and a dull, non-localizing agony, which was noted in all patients and was exacerbated by movement, especially on abduction.² According to their studies, active abduction of the shoulder was constrained; however, the full passive range of motion was maintained in most patients. Spinal accessory nerve dysfunction experienced as shoulder syndrome can be demonstrated by utilizing clinical and electrophysiological devices.

Electromyography (EMG) has indicated that the trapezius muscle is the primary muscle liable for shoulder elevation and, by means of its upper bundle; it participates in the arm elevation movement.³ Nonetheless, this movement also includes the participation of the deltoid, supra-spinal and infra-spinal muscles. Hence, arm elevation paresis secondary to spinal nerve mononeuropathy might be missed by clinicians, on the grounds that the movement may be remunerated by the action of the other muscles liable for arm elevation.⁴ Studies which evaluate superficial muscles have utilized surface electromyography (EMG) to collect data, examining its clinical application, since it is a non-invasive method, safe and simple, which does not cause discomfort and empowers one to measure muscle electrical activity.⁵

Sobol et al. tried spinal accessory nerve function indirectly by performing needle EMG of the trapezius muscle in patients with neck dissection, using the trapezius muscle of the unaffected side as a control.⁶

Thus, the aim of the present study is to introduce the clinical and electrophysiological data from 20 patients who underwent neck dissection surgery to treat head and neck cancer.

MATERIALS AND METHODS:

This is prospective study involving 20 patients who underwent unilateral SND and mRND due to head and neck cancer or neck

metastasis. Group I patients (10) underwent SND and Group II patients (10) underwent mRND.

All the patients in both the groups were evaluated for shoulder pain, shoulder dysfunction, nerve conduction test and needle EMG immediate postoperatively.

RESULTS:

In the study out of 20 patients, 10 (50%) patients were male and 10 (50%) patients were female with ages varying between 26 to 55 years with mean value of 34.60 in Group I and 36.40 in Group II.

SHOULDER ABDUCTION TEST (SAT)

The SAT was performed in both the Group I and in Group II & was compared between the groups. In Group I shoulder abduction test was normal in 8 patients (can raise their arm up to 180° without pain or effort) while slight impairment (Up to 180° but with pain or effort) seen in 2 patients. In Group II shoulder abduction test was normal in 4 patients while slight impairment seen in 2 patients, moderately impairment (Up to more than 150° but less than 180°) in 2 patients, and severe disability observed in 2 patients (less than 150°).

Table 1: Shoulder abduction test

	Group I Mean±SD	Group II Mean±SD	t-value	p-value
SAT	4.80±0.42	3.40±1.95	2.21	P=0.040S

SHOULDER PAIN:

Patients were evaluated on the basis of Visual Analog Scale (VAS). In Group I, patient reported no post-operative shoulder pain were 8(80%) patients, while 2 (20%) patient had moderate pain.

In Group II patients shows no post operative pain were 2(20%) patients, while 2 (20%) patients had moderate pain, 2 (20%) patients had moderately severe pain, and 4(40%) patients had severe pain.

Table 2: Shoulder pain after neck dissection

	Group I Mean±SD	Group II Mean±SD	t-value	p-value
Pain	1.80±1.22	2.94±0.89	2.79	P=0.031 S

NERVE CONDUCTION TEST (NCT)

Comparison of the latency and amplitude values found during the assessment with nerve conduction test on the operated and non operated site in both the Group I and Group II.

OS: Operated Site, NOS: Non-operated Site

Table 3: Nerve Conduction Test

	GroupI Mean±SD	GroupII Mean±SD	t-value	p-value
NCTOSLatency	2.89±0.76	2.78±0.95	0.296	P=0.771NS
NCTOSAmplitude	7.71±1.40	8.67±1.53	1.46	P=0.160NS
NCTNOSLatency	2.53±0.60	2.85±0.84	0.995	P=0.333NS
NCTNOSAmplitude	12.47±0.98	11.53±2.30	1.18	P=0.255NS

Reduced values of amplitude and latency on the operated site signified damage to the spinal accessory nerve especially in Group II patients.

NEEDLE ELECTROMYOGRAPHY

The motor response of the SAN and the needle EMG findings for the trapezius muscle were assessed in order to clarify the presence of SAN neuropathy.

Needle electromyography test in Group I showed no nerve denervation in 8 patients, but partial denervation observed in 2 patients. In Group II, no nerve denervation was observed in 4 patients, while partial nerve denervation observed in 2 patients, and complete nerve denervation was observed in 4 patients.

Table 4: Needle EMG study

	GroupI No(%)	GroupII No(%)
CompleteDenervation	0	2(20.0%)
Normal	8(80.0%)	4(40.0%)
PartialDenervation	2(20.0%)	4(40.0%)

DISCUSSION:

The spinal accessory nerve is typically portrayed as a simple motor nerve supplying innervations to the sternocleidomastoid and upper trapezius muscles. After loss of nerve function, paralysis of both muscles occurs, and the loss of sternocleidomastoid activity is by and large of auxiliary significance concerning trapezius denervation, which causes the complex clinical image of shoulder syndrome.

Cappiello et al. concluded that the mRND increased shoulder morbidity when contrasted with SND.⁷ Another investigation drove by Tsuji et al. additionally affirms the complete or incomplete denervation of the trapezius muscle caused by the axonal injury to the XI cranial nerve, regardless of whether it is preserved, because of the traction caused to the accessory nerve during neck dissection.⁸ In our study, all the patients had a reduction in post-op electrical activity, with a critical difference in the Group II. Albeit selective neck dissections have been related with less shoulder pain and dysfunction compared with radical and modified radical neck dissection procedures, a variable degree of shoulder dysfunction is still reported in 29% to 39% of patients.⁹

CONCLUSION:

In postoperative findings, most of the patients in Group II had a disability of the upper bundle of the trapezius muscle, with pain, spinal accessory nerve dys function.

Our study, thus, recommend the advantage of utilizing EMG and NCT in the trapezium to affirm that spinal accessory dysfunction chances are more in mRND when contrasted with SND.

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