



## Neck Dissection and Shoulder Dysfunction

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**Abbreviations:** MRND: Modified Radical Neck Dissection; SAN: Spinal Accessory Nerve; SCM: Sternocleidomastoid; SND: Selective Neck Dissection; IJV: Internal Jugular Vein; SPADI: Shoulder Pain and Disability Index; SDQ: Shoulder Disability Questionnaire; CSS: Constant's Shoulder Score; NDII: Neck Dissection Impairment Index; ASES: American Shoulder and Elbow Surgeons; DASH: Disabilities of the Arm, Shoulder and Hand; SST: Simple Shoulder Test.

### Introduction

Head and neck malignancies are the common malignancies in the Asian subcontinent [1]. This is because of extensive use of tobacco in various forms- chewing, topical application on gums and smoking. Oral cancers are the most common among head and neck cancers [2]. Treatment modalities for head and neck cancers include surgical resection, chemoradiation or a combination of both. Neck dissection is a part of standard surgical treatment in head and neck cancers for diagnosis and treatment of metastasis to cervical lymph nodes. The extent of neck dissection depends on the "N" staging of the neck based on TNM classification [3]. Neck dissection can either be therapeutic or elective. Therapeutic neck dissection is performed in a case of clinically palpable or radiologically detectable nodal metastasis. Elective neck dissection is performed in cases where there is no evidence of nodal metastasis (N0) but the likelihood of microscopic occult lymphatic metastasis is high.

In modified radical neck dissection (MRND) removal of nodal levels, I-V with preservation of spinal accessory nerve [SAN] (type I), SAN with internal jugular vein [IJV] (type II) or SAN with IJV with sternocleidomastoid [SCM] (type III) is done. In Selective neck dissection (SND) preservation of one or more levels of lymph node is done [4]. The most commonly performed selective neck dissection is supra-omohyoid neck

dissection for oral squamous cell carcinoma. Out of various complications of neck dissection, shoulder dysfunction is quite troublesome for the patient. Ewing and Martin first described "shoulder dysfunction following neck dissection" in 1952 [5]. It is mainly due to decreased trapezius function due to varying grades of injury to the SAN.

The SAN is the main nerve that innervates the trapezius muscle. In the normal shoulder, scapular rotation is achieved by the balance between the trapezius muscle and the serratus anterior muscle. Without the trapezius muscle to counteract it, the serratus anterior muscle pulls the scapula inferiorly and laterally, interfering with shoulder movement. Further, the failure of scapula fixation causes the deltoid to contract early during abduction; therefore, it is unable to achieve a full ROM [6]. The signs and symptoms of shoulder dysfunction are - atrophy of the trapezius muscle, loss of shoulder abduction, shoulder droop, pain in shoulder and neck and scapular dyskinesia [5,7,8].

In MRND, the SAN is skeletonized and isolated in its extracranial course starting from the jugular foramen till its entry into the anterior border of trapezius. This leads to traction injury and devascularization of the SAN although there is no gross injury to the nerve. Selective neck dissection involves dissection in the submuscular recess which corresponds to level IIB lymph node. It is a relatively narrow area and dissection in this region can lead to traction injury and devascularization of the SAN due to inadvertent stretching. Therefore, both the types of neck dissection are reported to be associated with shoulder dysfunction in the post-operative period.

Shoulder dysfunction can be detected early by clinical and electrophysiological test. A number of questionnaires and clinical tools like Shoulder Pain and disability index

(SPADI), shoulder disability questionnaire (SDQ), Constant's Shoulder score (CSS), the Neck Dissection Impairment Index (NDII), the modified American Shoulder and Elbow Surgeons (ASES) standardized form, Disabilities of the Arm, Shoulder and Hand questionnaire (DASH) and the Simple Shoulder Test (SST) have proven beneficial in multiple studies. Electrophysiological tests in the form of electroneurography (ENoG) and electromyography (EMG) are objective tests and help in predicting the recovery from shoulder dysfunction in the post-operative period [9].

Rehabilitation exercises including head, neck and shoulder mobilisation have proven to be beneficial in early recovery from shoulder dysfunction in previous studies. Simple exercises like active rotation of the head in both directions, flexion-extension of the head in a neutral position, lateral flexions of head, stretching of the platysma and muscles of the neck, gentle shoulder mobilisation exercises (pendulum exercise, passive forward flexion and external rotation and active assisted range of motion exercises) can be included in the rehabilitation regimen of such patients [10].

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