ISSN No:-2456-2165

Assessing Shoulder Dysfunction Following Neck Dissection for Treating Squamous Cell Carcinoma of the Oral Cavity

Dr. Harshjeet H. Desai, Dr. Anuj Dadhich, Dr, Seemit Shah, Dr. Harish Saluja, Dr. Srishti Salunke,
Dr. Kedar Kawsankar, Dr. Ajinkya Patil, Dr. Shruti Desai
Pravara Institute of Medical Sciences Loni, Ahmednagar, Maharashtra

Abstract:-

Aim: The objective of this study is to evaluate the impact of neck dissection on shoulder dysfunction, encompassing pain and disability, over a six-month follow-up period in individuals who have undergone surgery for squamous cell carcinoma of the oral cavity.

Objectives: This observational study was conducted to assess the evolution of the degree and extent of shoulder pain and shoulder disability during a six-month period following neck dissection.

Materials and methods: All patients who had undergone neck dissection as part of their treatment for squamous cell carcinoma of the oral cavity and had provided written consent to participate in the study were subjected to an evaluation of shoulder dysfunction using the SPADI index. The SPADI questionnaire was administered, and corresponding scores were assigned to each patient based on their responses.

Result: In summary, the manipulation of cranial nerve XI during neck dissection indeed leads to shoulder pain, decreased shoulder range of motion, reduced strength, and limitations in shoulder-related activities. Furthermore, the degree of manipulation of cranial nerve XI has a notable impact on these outcomes.

I. INTRODUCTION

Various treatment modalities exist for managing oral squamous cell carcinoma, including surgery, radiation therapy, chemotherapy, targeted therapy, and immunotherapy. However, surgery, often accompanied by neck dissection, is the primary treatment approach for oral squamous cell carcinoma. This is typically followed by postoperative chemotherapy and/or radiation therapy. The choice to perform a specific type of neck dissection varies significantly based on factors such as the location of the primary disease, nodal involvement, and pathological diagnosis. Neck dissection may be conducted either therapeutically when clinical evidence of neck metastasis is already present or electively for the management of an N0 neck.

For quite some time, it has been acknowledged that the temporary or permanent denervation of the trapezius muscle, stemming from spinal accessory nerve (cranial nerve XI) injury during a neck dissection, leads to disability in the shoulder. As the significance of this shoulder disability for patients became evident, surgeons devised alternative approaches to the traditional radical neck dissection. These include the modified radical neck dissection and selective neck dissections, which aim to preserve cranial nerve XI without compromising the oncologic outcomes.1,2Nevertheless, even with the preservation of cranial nerve XI through these less aggressive procedures, patients still report experiencing shoulder disability.3,4

The aim of this study was to evaluate the extent and severity of shoulder dysfunction, including both shoulder pain and disability, following neck dissection over a six-month duration. This assessment was carried out using the Shoulder Pain and Disability Index (SPADI) scoring criteria.

II. MATERIALS AND METHODS

This observational study was conducted within the Department of Oral and Maxillofacial Surgery at Rural Dental College and Hospital, Loni BK, Maharashtra, India. The study involved the evaluation of approximately 25 patients over a six-month follow-up period. Questionnaires were administered in accordance with the SPADI (Shoulder Pain and Disability Index) scoring criteria, and scores were assigned on a scale of 0-10 for each question related to shoulder pain and shoulder disability. These individual scores were then totaled to calculate the overall SPADI score.

A. SPADI (Shoulder Pain And Disability Index) score.5

The Shoulder Pain and Disability Index (SPADI) is a self-administered questionnaire comprising two dimensions: one focusing on pain and the other on functional activities. The pain dimension encompasses five questions that gauge the intensity of an individual's pain, while the functional activities section consists of eight questions aimed at assessing the level of difficulty encountered by an individual in performing various upper-extremity activities in daily life. Completing the SPADI typically takes patients between 5 to 10 minutes, and it stands as the sole dependable and valid region-specific measurement tool for evaluating shoulder-related issues.

B. Scoring instructions:

To respond to the questions, patients utilize a 10 cm visual analogue scale for each question. For the pain dimension, verbal anchors range from 'no pain at all' to 'worst pain imaginable,' while the functional activities dimension utilizes anchors from 'no difficulty' to 'so difficult

ISSN No:-2456-2165

it required help.' The scores from both dimensions are combined and averaged to obtain a total score.

C. Pain scale:

The patient was inquired about the intensity of pain and was requested to circle the number that best reflects their experience on a scale where: 0 = No difficulty 10 = So difficult it requires help.

D. Disability scale:

The patient was inquired about the level of difficulty and was instructed to circle the number that best characterizes their experience on a scale where: 0 = No difficulty 10 = So difficult it requires help.

E. Interpretation of scores:

The total pain score is calculated as: Total Pain Score: / 50 x 100 = %

(Note: If a person does not answer all questions, divide by the total possible score, e.g., if 1 question is missed, divide by 50)

The total disability score is calculated as: Total Disability Score: / 80 x 100 = %

(Note: If a person does not answer all questions, divide by the total possible score, e.g., if 1 question is missed, divide by 80)

The total SPADI score is calculated as: Total SPADI Score: / 130 x 100 = %

(Note: If a person does not answer all questions, divide by the total possible score, e.g., if 1 question is missed, divide by 130)

The means of the two subscales are averaged to produce a total score, ranging from 0 (best) to 100 (worst).

III. RESULT

The data was recorded and entered into a Microsoft Excel spreadsheet. For statistical analysis, descriptive statistics such as mean and standard deviation were employed. A comparison of the means for post-operative SPADI values, measured from 1 week to 6 months, was conducted using the Student's Paired 't' test at significance levels of 5% ($p < 0.05$) and 1% ($p < 0.01$).

The statistical analysis was carried out using SYSTAT version 12, which is a licensed software produced by Crane's Software in Bangalore.

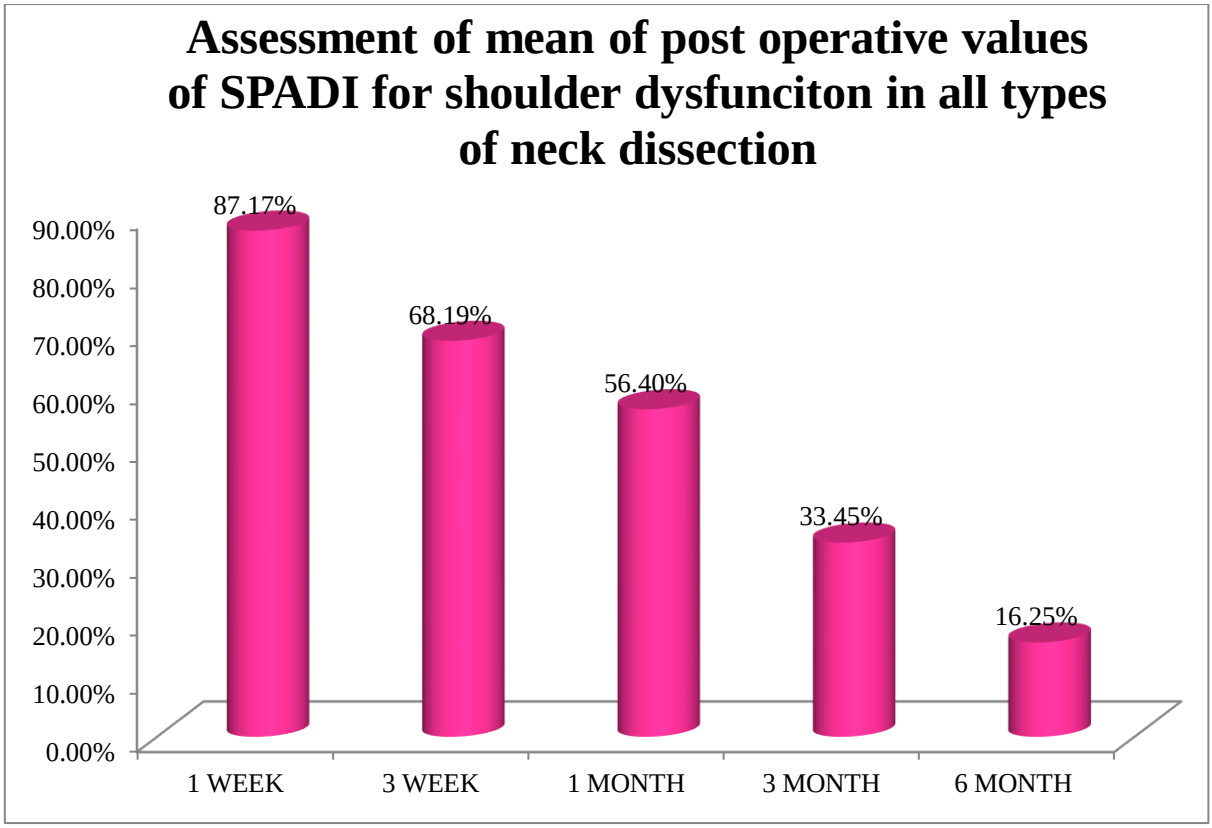
In this study, 16 out of 25 patients (64%) underwent Selective Neck Dissection (SND), while the remaining 9 patients (36%) underwent Modified Radical Neck Dissection (MRND) for the treatment of oral squamous cell carcinoma. There were no cases of Radical Neck Dissection (RND) or Extended Radical Neck Dissection (ERND). It's important to note that in all cases, the spinal accessory nerve was preserved.

Table 1: Assessment of mean and SD of Post-operative SPADI of shoulder dysfunction in total cases of neck dissection for the treatment of oral squamous cell carcinoma:

	1 WEEK	3 WEEK	1 MONTH	3 MONTH	6 MONTH	Student's Paired 't' test and significance
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Total cases (n=25)	87.17%±0.09%	68.19%±0.11%	56.40%±0.13%	33.45%±0.11%	16.25%±0.09%	Value of t = 39.41, p=0.0001, significant

By applying Student's Paired 't' test there is a significant difference in the mean of post-operative values of SPADI in total cases of neck dissection from 1 week to 6 month (p=0.0001).

ISSN No:-2456-2165



Graph 1: Assessment of mean of post-operative values of SPADI for shoulder dysfunction in total cases of neck dissection for the treatment of oral squamous cell carcinoma (OSCC).

IV. STATISTICAL ANALYSIS

Statistical analysis was conducted using descriptive statistics, including mean and standard deviation (SD). The comparison of mean values for post-operative SPADI scores, assessed from 1 week to 6 months, was carried out using the Student's Paired 't' test at significance levels of 5% ($p < 0.05$) and 1% ($p < 0.01$).

The data analysis was performed with the licensed SYSTAT version 12 software, developed by Crane's Software in Bangalore.

V. DISCUSSION

Shoulder-related morbidity has been a well-documented concern following neck dissection. However, there is still significant ambiguity regarding the actual scope of impairments, activity limitations, and participation restrictions, especially after nerve-sparing neck dissections. The occurrence of shoulder dysfunction varies depending on the type of surgical procedure conducted, with the most aggressive form being the Radical neck dissection.6, During a Radical neck dissection, which involves the excision of the accessory nerve, sternocleidomastoid muscle, internal jugular vein, as well as lymph nodes, injury to the accessory nerve and the subsequent denervation of the trapezius muscle diminishes the ability to elevate the shoulder girdle. This condition, known as scapular dyskinesis, often leads to patients experiencing shoulder pain.6, function loss7, reduced active range of motion and reduced health related quality of life8.Neck dissection is a crucial component of the surgical approach for managing oral squamous cell carcinoma. Current evidence suggests that shoulder impairment can persist in a significant proportion of individuals, ranging from 31% to 60%, even in cases of functional or modified neck dissection. Additionally, approximately 29% to 39% of individuals may experience shoulder impairment following selective neck dissection, even when efforts have been made to preserve the accessory nerve.7-10.

Similar studies have been done before in the literature by many scientists, and similar results have been obtained to a variable extent. Koybasioglu A et al11 did a similar study and observed a similar kind of results that even after sparing the spinal accessory nerve some shoulder dysfunction was seen. Van Wilgen et al's12 study's conclusion revealed that despite the intended purpose of reducing shoulder morbidity with this type of neck dissection, approximately 28% of the patients still encountered shoulder pain after undergoing supraomohyoid neck dissection. It's worth noting that the level of disability related to these shoulder complaints was relatively minor. Watkins J P et al13discovered that selective neck dissection can have an adverse impact on shoulder function, even when the spinal accessory nerve is preserved. Furthermore, they found that adjuvant therapy does not further worsen shoulder function.Van Wilgen C P et al14 found that patients who underwent MRND had 33.3% experienced shoulder pain, 66.7% Posterolateral neck dissection (PLND) patients had experienced shoulder pain and 20% patients who underwent SOHND had experienced shoulder dysfunction.

ISSN No:-2456-2165

The study's findings indicate that even when the spinal accessory nerve (CN XI) is preserved, some degree of shoulder pain and disability persists. Notably, there was a significant disparity in shoulder pain and disability between the Modified Radical Neck Dissection (MRND) and Selective Neck Dissection (SND) groups during the initial post-operative period. In the MRND group, shoulder pain and disability were more pronounced, but over time, there was a reduction in their severity as nerve function recovery took place.

VI. CONCLUSION AND SUMMARY

In summary, the manipulation of cranial nerve XI during neck dissection does lead to shoulder pain, reduced shoulder range of motion and strength, and limitations in shoulder-related activities. The extent of cranial nerve XI manipulation does have an impact on the outcomes, with radical neck dissection causing the most significant impairment and activity limitations, followed by modified radical neck dissection, and selective neck dissection having the least impact. Recovery of shoulder function is observed in cases of nerve-sparing modified radical neck dissection and selective neck dissection over time. This recovery is also influenced by factors such as diet, post-operative physiotherapy, physical health, and mental health.

However, further research is still necessary, not only to determine the actual prevalence of impairments, activity limitations, and participation restrictions, but also to develop and evaluate methods for predicting individuals at risk of long-term shoulder-related morbidity and implementing interventions to prevent its occurrence.

REFERENCES

[1.] Pinsolle V, et al. Spinal Accessory nerve and lymphatic neck dissection.revue de stomatologie et de chirurgie maxilla-faciale 1997; 98:138-42.
[2.] Kuntz AL and Weymuller EAJ. Impact of neck dissectionon quality of life. Laryngoscope 1999; 109:1334-8.
[3.] Saunders JR J, Hirata RM, Jaques DA. Considering the spinal accessory nerve in head and neck surgery. Am J Surg 1985; 150:491-94.
[4.] Chaplin JM, Morton RP. A prospective, longitudinal study of pain in head and neck cancer patients. Head Neck 1999; 21:531-37.
[5.] Roach KE, Budiman-Mak E, Songsiridej N, Lertratanakul Y. Development of a shoulder pain and disability index. Arthritis Care Res. 1991 Dec;4(4):143-9.
[6.] Ewing MR, Martin H. Disability following radical neck dissection; an assessment based on the postoperative evaluation of 100 patients. Cancer 1952; 5:873–883.
[7.] Gane E et al; Prevalence, Incidence and Risk factors for shoulder and neck dysfunction after neck dissection: a systematic review, European Journal of Surgical Oncology (2016).
[8.] Bocca E, Pignataro O, Sasaki CT. Functional neck dissection. A description of operative technique. Arch Otolaryngol 1980; 106:524–527.
[9.] Skolnik EM, Tenta LT, Wineinger DM, Tardy ME Jr. Preservation of XI cranial nerve in neck dissections. Laryngoscope 1967; 77:1304–1314.
[10.] Short SO, et al. shoulder pain and function after neck dissection with or without preservation of the spinal accessory nerve.Am J Surg 1984; 148:478-82.
[11.] Koybasiog˘lu A, Bora Tokc¸aer A, Inal E, Uslu S, Koc¸ak T, Ural A. Accessory nerve function in lateral selective neck dissection with undissected level IIb. ORL J OtorhinolaryngolRelat Spec 2006;68:88–92.
[12.] Van Wilgen CP, Dijkstra PU, Nauta JM, Vermey A, Roodenburg JL. Shoulder pain and disability in daily life, following supraomohyoid neck dissection: a pilot study. J Craniomaxillofac Surg 2003;31:183–186.
[13.] Watkins JP, Williams GB, Mascioli AA, Wan JY, Samant S. Shoulder function in patients undergoing selective neck dissection with or without radiation and chemotherapy. Head Neck 2011; 33:615–619.
[14.] Van Wilgen CP, Dijkstra PU, van der Laan BF, Plukker JT, Roodenburg JL. Shoulder complaints after nerve sparing neck dissections. Int J Oral Maxillofac Surg 2004; 33:253–257.