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Original Article

Neurological Complications Following Neck Dissection in Oral Squamous Cell Carcinoma (OSCC) Patients

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ABSTRACT

Background: Neck dissection is a well-established procedure for managing lymph node metastases in oral squamous cell carcinoma (OSCC) and other head and neck cancers. Despite its therapeutic value, the surgery can result in significant functional and aesthetic disturbances due to nerve injury. Limited data exist regarding postoperative neurological complications following neck dissection. **Objectives:** To evaluate functional and aesthetic outcomes in relation to neurological complications after neck dissection in OSCC patients. **Materials and Methods:** This observational study was conducted in the Department of Oral and Maxillofacial Surgery, Dhaka Dental College & Hospital, from July 2016 to June 2017. About 53 patients with histopathologically confirmed OSCC who underwent neck dissection with curative intent were included. Neurological outcomes were assessed monthly and documented for qualitative and quantitative analysis. Main outcome measures included aesthetic changes (incompetent lower lip, sagging of mouth corner) and functional limitations (shoulder syndrome, pain, limited arm extension, shoulder drooping, tongue deviation, ageusia, hypogeusia, auricular sensory alteration). **Results:** Of 53 patients, 32 (60%) developed neurological complications. The most frequent was marginal mandibular nerve injury (24.5%), followed by spinal accessory nerve injury (22.6%). Complication rates were highest in radical neck dissection (100%). Supraomohyoid neck dissection was the most common procedure (66%). The alveolar ridge mucosa was the predominant primary site (38%), followed by buccal mucosa (24%) and retromolar area (24%). **Conclusion:** Neurological complications are frequent after neck dissection, often leading to functional and aesthetic deficits. Routine postoperative assessment of sensorimotor nerve function is essential. Careful preoperative evaluation, meticulous surgical technique, and timely rehabilitation play a critical role in minimizing and managing these complications.

KEY WORDS: *Oral squamous cell carcinoma (OSCC), Neck dissection, Functional outcome, Aesthetic outcome, Nerve injury*

INTRODUCTION

Oral cancer is a malignant growth in any part of the oral cavity, including the lips, tongue, palate, salivary glands, cheeks, floor of the mouth, and gums [1]. In the United Kingdom and United States, oral cancer accounts for 1.6–5.5% of all cancers, whereas in India and South-East Asia it represents up to 40% of malignant tumors and contributes to 25% of new cancer cases [2]. According to the World Health Organization, oral cancer is the eleventh most common cancer worldwide [3]. Bangladesh has a high incidence, with approximately 200,000 new cancer cases annually, of which oral cancer represents 17% and ranks as the third leading cancer in the country [4].

The single most important prognostic factor in oral cancer is the presence of regional nodal metastasis, which reduces survival rates by 50% and increases the risk of distant metastasis [5]. Neck dissection is the standard surgical procedure for controlling cervical lymph node metastasis, performed either for clinically or radiologically evident nodes or prophylactically when the risk of occult metastasis is high [6].

Neck dissection is a major surgery under general anaesthesia, with the extent of tissue removal depending on disease spread. Three main types are described: radical, modified radical, and selective neck dissection [7]. The history of neck dissection dates back to Crile's en bloc dissection in 1906, with earlier concepts of cervical lymph node metastasis noted by Joseph von Chelius in 1847 [7]. Indications include selective dissection in pathological N0 patients,

significant operable neck disease, extensive recurrent disease, and clinical signs of gross extranodal spread [7,8].

Complications are frequent and include bleeding, pneumothorax, thoracic duct injury, nerve transection, chylous leak, wound infection, internal jugular vein occlusion, and shoulder dysfunction [9,10].Neural injuries are common, affecting the spinal accessory nerve (67%), hypoglossal nerve (1.08%), marginal mandibular nerve (1%), vagus nerve, sympathetic trunk, and brachial plexus [11,12]. Neurological complications can be diagnosed clinically, with findings such as shoulder pain, limited abduction, facial asymmetry, Horner's syndrome, tongue deviation, speech and swallowing difficulties [13]. Lingual nerve injury may cause loss of tongue sensation, mastication and speech problems, while chorda tympani injury may impair taste and nutrition [14]. Injury to the great auricular nerve results in pain, hypersensitivity, and abnormal sensations in the ear and neck, sometimes leading to neuroma formation [15,16].

Neck dissection, utilized for treatment of lymph node metastases in patients with oral squamous cell carcinoma, can result in clinically significant functional disturbance secondary to the corresponding nerve damage. Several types of neck dissection are performed in the treatment of OSCC. There are differences among various type of neck dissection in regards of their extent and importance. The study result may have implications for early detection of frequency and severity of neural damage, prevention, management and rehabilitation plan suffering from neurological complication following various type of neck dissections in Bangladesh.

METHODOLOGY

This cross-sectional observational study was conducted in the Department of Oral & Maxillofacial Surgery, Dhaka Dental College & Hospital, from July 2016 to June 2017. For this study 53 patients with clinically and histopathologically confirmed OSCC who underwent neck dissection with curative intent were included.

Inclusion criteria: Patients of all ages and both sexes with OSCC undergoing any type of neck dissection. Exclusion criteria: Patients with prior surgery, radiotherapy, chemotherapy, systemic diseases, or pre-existing neurological disorders of the head and neck.

Procedure: Neurological complications were assessed monthly and analyzed in relation to age, sex, primary lesion site, and type of neck dissection. Complications evaluated included marginal mandibular nerve injury, spinal accessory nerve paralysis, hypoglossal nerve paresis, lingual nerve dysfunction, and greater auricular nerve abnormalities. Diagnosis was based on clinical criteria: shoulder pain, limited abduction, and drooping for spinal accessory nerve paralysis [13]; facial asymmetry for marginal mandibular nerve injury [12]; tongue deviation and speech/swallowing difficulty for hypoglossal nerve injury [12,36]; taste disturbance for lingual nerve injury [33–35]; and auricular sensory changes for greater auricular nerve injury [15,16]. Standardized tests such as salt/sweet taste evaluation and pin-cotton sensory testing were applied.

Ethical approval: Ethical approval was obtained from the Dhaka Dental College Ethical Committee. Written informed consent was taken from all participants. Data were collected using a structured sheet and analyzed with SPSS v20. Descriptive statistics were used to present demographic characteristics and complication frequencies.

RESULTS

In the current study with 53 Oral Squamous Cell Carcinoma (OSCC) patients, we found that Maximum (32%) of them were in between the age of 50-59 years with the mean age 51.1 years and majorities (57%) were female.

Table1: Distribution of the respondents according to Socio-demographic distributions

Variable (Age Group)	Frequency	Percent
30–39 years	6	11%
40–49 years	13	25%
50–59 years	17	32%
60–69 years	14	27%
70 years & above	3	5%
Total	53	100%
Gender		
Female	30	57%
Male	23	43%
Total	53	100%
Primary site		
Alveolar mucosa	20	38%
Buccal mucosa	13	24%
Retromolar area	13	24%
Tongue	3	6%
Floor of the mouth	4	8%
Total	53	100%
Type of neck dissection		
SOND (Supra-omohyoid neck dissection)	35	66.03%
MRND (Modified radical neck dissection)	15	28.30%
RND (Radical neck dissection)	3	5.67%
Total	53	100.00%

Regarding site, maximum (38%) affected in alveolar mucosa followed by buccal mucosa and retromolar area equally (24%). Majorities (66%) were treated by supra-omohyoid neck dissection (SOND) followed MRND (28%) and RND (6%). Among 53 respondents Majorities (60%) were experienced at least one nerve injury among which maximum (53.1%) had single nerve injury followed by multiple nerve injury (46.9%). In case of single nerve injury, Maximum (24.5%) suffered with MMN, SAN (22.6%) and GAN (20.8%) and less commonly with Hypoglossal (11.3%) and lingual (7.5%). On the other hand, Multiple nerve injury occurred in RND (100%) and SND (54.3%). Regarding complications, All (100%) were suffered from shoulder dysfunction due to Spinal accessory nerve (SAN) injury in case of RND(3/3), majorities (66.7%) suffered from speech difficulty, tongue deviation and swallowing problems due to Hypoglossal nerve injury, most (66.7%) of them suffered from facial asymmetry due to Marginal Mandibular nerve injury, majorities (66.7%) were suffered from Hypogeusia and few (33.3%) in ageusia due to lingual nerve injury and also suffered from loss of sensation (66.7%) due to Great Auricular nerve injury who were underwent Radical Neck Dissection (RND) rather than SOND and MRND

Figure 1: Distribution of shoulder dysfunction of study patients who underwent various type of neck dissection

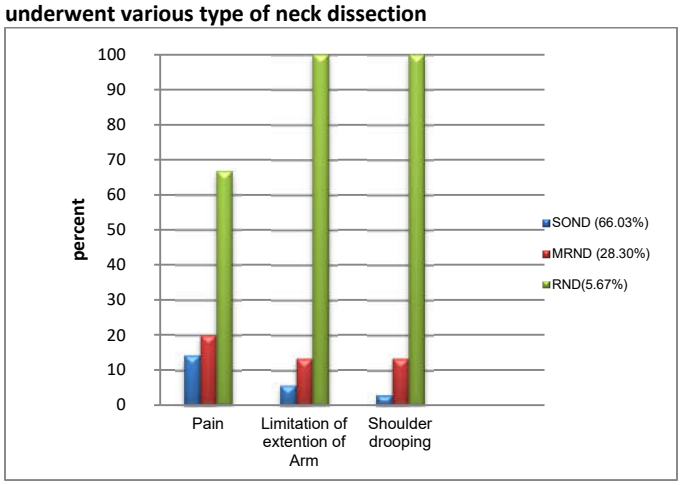

Table 2: Distribution of neurological complications by type of neck dissection.

Facial asymmetry due to marginal mandibular nerve injury	SOND (n=35) No. (%)	MRND (n=15) No. (%)	RND (n=3) No. (%)	P value
Yes	7(20.0)	4(26.7)	2(66.7)	0.192^{ns}
No	28(80.0)	11(73.3)	1(33.3)	
Shoulder dysfunction due to SAN injury				
Yes	4 (11.4)	5 (33.3)	3 (100)	0.001*
No	31(88.6)	10 (66.7)	0(0.0)	
Complication due to hypoglossal nerve injury				
Speech difficulty				
Yes	2(5.7)	1(6.7)	2(66.7)	0.002*
No	33(94.3)	14(93.3)	1(33.3)	
Deviation of the tongue				
Yes	0(0.0)	0(0.0)	2(66.7)	<0.001*
No	35(100.0)	15(100.0)	1(33.3)	
Difficulty in swallowing				
Yes	0(0.0)	1(6.7)	2(66.7)	<0.001*
No	35(100.0)	14(93.3)	1(33.3)	
Complication due to lingual nerve injury				
Hypogeusia				
Yes	2(5.7)	1(6.7)	2(66.7)	0.002*
No	33(94.3)	14(93.3)	1(33.3)	
Ageusia				
Yes	0(0.0)	0(0.0)	1(33.3)	<0.001*
No	35(100.0)	15(100.0)	2(66.7)	
Complication due to Great auricular nerve injury				
Pain				
Yes	2(5.7)	3(20.0)	0(0.0)	0.241^{ns}
No	33(94.3)	12(80.0)	3(100.0)	
Abnormal sensation				
Yes	1(2.9)	2(13.3)	0(0.0)	0.309^{ns}
No	34(97.1)	13(86.7)	3(100.0)	
Loss of sensation				
Yes	0(0.0)	1(6.7)	2(66.7)	<0.001*
No	35(100.0)	14(93.3)	1(33.3)	

Chi-square test, ns= not significant, *significant

Figure 2: Frequency of neurological complication of various type of neck dissection

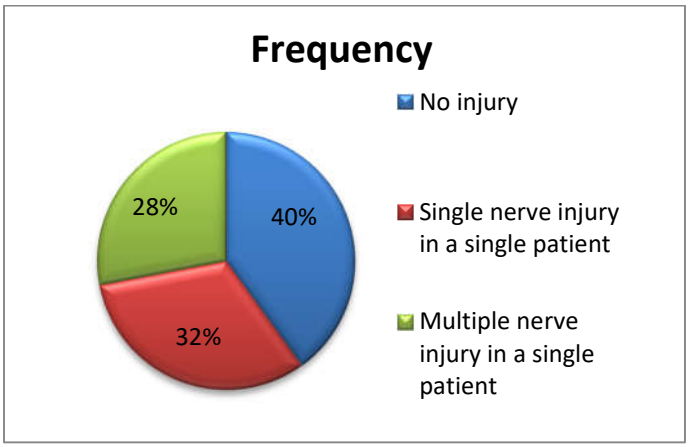

Figure 2. showed that out of 53 patients 40% patients had no nerve injury. 32% patients had single nerve injury and 28% had multiple nerve injury.

Table 3: Frequency of single and multiple nerve injuries by type of neck dissection.

Type of neck dissection	Name of the injured nerve (single)						Total
	Marginal mandibular nerve (MMN)	Spinal accessory nerve (SAN)	Hypoglossal nerve (HN)	Lingual nerve (LN)	Great auricular nerve (GAN)	Multiple nerve injury in a single patient	
SOND (n=35)	3(8.6%)	3(8.6%)	2(5.7%)	3(8.6%)	2(5.7%)	6(17.1%)	19(54.3%)
MRND (n=15)	3(20.0%)	2(13.3%)	0(0.0%)	0(0.0%)	0(0.0%)	6(40.0%)	11(73.33%)
RND (n=3)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	3(100.0%)	3 (100.0%)
P value	0.412^{ns}	0.737^{ns}	0.585^{ns}	0.441^{ns}	0.585^{ns}	0.005*	0.122^{ns}

DISCUSSION

This cross-sectional study was conducted in the Department of Oral & Maxillofacial Surgery, Dhaka Dental College & Hospital from July 2016 to June 2017, including 53 postoperative OSCC patients who fulfilled the inclusion criteria. The aim was to evaluate neurological complications following various types of neck dissections. The majority of patients belonged to the 50–59-year age group (32%), followed by 60–69 years (27%). The mean age was 51.1±11.5 years (range 30–74). These findings are consistent with regional studies reporting OSCC in middle age groups [17,18], and correspond with Shaheed et al. [19], Sadat et al. [20], and Adhikari [21]. Local studies have highlighted an alarming trend of younger patients being affected, attributed to early tobacco consumption [22].

Gender distribution showed 57% female and 43% male, similar to Sultana et al. [18], but differing from Sitan [17] and Adhikari [21]. Cultural practices such as betel quid chewing among women may explain this predominance. The alveolar mucosa was the most common primary site (38%), followed by buccal mucosa (24%) and retromolar area (24%). Tongue (6%) and floor of mouth (8%) were less frequent. This distribution aligns with Sitan [17] and Sadat et al. [20], but differs from Richard et al. [23]. reflecting variations in tobacco

placement habits. The result showed that different parameters, patients with shoulder dysfunction in case of SOND faced least pain, limitation of extension of arm, shoulder dropping. In case of RND, patient suffered with highest level of pain, limitation of extension of arm, and shoulder dropping. MRND is relatively moderate to both SOND and RND. Majority of the neural complications belonged to the RND 3 of 3 (100%) then followed by MRND 11 among 15 patients (73.3%) and the lowest complications rate in SOND 19 among 35 patients (54.3%). No significant difference of injured single nerve among different neck dissection except multiple nerve injury in a single patient which significantly higher in RND neck dissection group. Indications for neck dissection depend on staging [24]. In this study, 66% underwent SOND, 28% MRND, and 6% RND, consistent with Dedivitis et al. [24]. Neurological complications were frequent. Marginal mandibular nerve dysfunction occurred in 24.5% of (13/53) cases, comparable to Milenovic et al. [25], Dedivitis et al. [24], and Govindaraj et al. [26] Moller & Sorensen [27] reported similar prevalence. Injury to this nerve produces cosmetic deformity and facial asymmetry [28]. Spinal accessory nerve injury was noted in 22.6% of (12/53) patients, with shoulder dysfunction significantly higher in RND cases (100%). This corresponds with Wilgen et al. [11], Pinsolle [29], Cheng [30], and Leipzig [31]. Govindaraj [26] reported higher prevalence (58%). Hypoglossal nerve injury was found in 11% of (6/53) patients, mainly in RND cases. This compares with Milenovic et al. [25] and Dedivitis et al. [24], but differs from Prim [12] and Lauchlan [32]. Injury results in tongue deviation and speech difficulty. Lingual nerve injury occurred in 7.5% of (4/53) patients, higher in RND cases. This is similar to Turco et al. [33], Milton et al. [34], and Ichimura [35], though Milenovic [25] reported higher prevalence. Greater auricular nerve injury was observed in 20.7% of (11/53) patients, consistent with Brown et al. [16], Patel [15], and Milenovic [25]. Symptoms included pain, abnormal sensations, and sensory loss. Overall, neurological complications were present in 60% of (32/53) patients, with multiple nerve injuries significantly higher in RND cases. This compares with Govindaraj [26] and Dedivitis et al. [24], though frequencies vary across studies.

CONCLUSIONS & RECOMMENDATION

Neck dissection is an operation frequently performed in the patient of OSCC to treat or prevent the neck metastasis. From this study it has been seen that there is a variation of neurological complications rates respective to the nerve. Neurological complications also varies with type of neck dissection was performed. Several nerves may be damaged in a single type of neck dissection and higher extensive surgery causing higher prevalence of neural complications.

A careful preoperative assessment, meticulous surgical technique, high quality postoperative care and appropriate rehabilitation are the cornerstones of preventing and managing neurological as well as overall complications. All the possible integrity of the nerves should be maintained by proper anatomical knowledge and use a nerve monitor with stimulator to identify the nerves unless it compromises tumor resection.

LIMITATION OF THE STUDY:

- The study was conducted among the patients of Dhaka Dental College Hospital within twelve months period, Single hospital-based study.
- The study subjects were 53.
- Neurological examinations were performed clinically only, No Nerve monitor with stimulator used during Operation .
- The operations were performed by several surgeons of different skills and assisted by trainees.

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CONFLICT OF INTEREST: The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT: The data presented in this study are available on reasonable request from the corresponding author

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