

Original Research Article

Functional outcome of carcinoma tongue after primary surgical treatment

Palash Chandra Sarkar¹, M. Abu Hanif¹, K. M. Nurul Alam¹, Mohammad Rafiqul Islam²,
M. Shafiul Akram¹, S. M. Azizur Rahman¹, Raisa Enayet Badhan^{3*}

¹Department of Otolaryngology and Head-Neck Surgery, National Institute of ENT, Tejgaon, Dhaka, Bangladesh

²Shaheed Sayed Nazrul Islam Medical College, Kishorganj, Bangladesh

³Department of Microbiology and Immunology, Sheikh Hasina National Institute of Burn and Plastic Surgery, Dhaka, Bangladesh

Received: 22 June 2024

Revised: 05 July 2024

Accepted: 07 July 2024

*Correspondence:

Dr. Raisa Enayet Badhan,

E-mail: raisabadhan@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Majority of patients with oral malignancies appear in a late stage, with a low survival rate, despite advancements in imaging and therapy choices. Surgery is a well-known option among the various therapeutic techniques. In order to evaluate the functional outcome of carcinoma tongue among patients receiving primary surgery, the study was designed.

Methods: This cross-sectional observational study was conducted at the department of otolaryngology, national institute of ENT and central hospital (Pvt.) limited, Dhaka. All histopathologically diagnosed case of carcinoma tongue undergone primary surgical treatment were approached for including into the study. Informed written consent was taken from each subject. Total 30 patients were included. After surgical intervention, functional outcome was measured by the performance status scale (PSS) for head and neck cancer. Data analysis was done by SPSS 20.

Results: Total 30 patients of carcinoma tongue were included in this study. Base of tongue (66.6%) and oral tongue (33.3%) were present as advanced and early stage respectively. Hemiglossectomy (43.3%) was the most commonly used methods. Improvement was seen in 'eating in public' score and 'understandability of speech score at 4th month after surgery, which was not steady over subsequent follow-ups. Normalcy of diet score also showed improvement at 4 months follow-up but slowly declined afterwards. Overall, improvement in 'eating in public' understandability of speech' and normalcy of diet score were not statistically significant.

Conclusions: Improvement of functional status was not statistically significant following primary surgical intervention in carcinoma tongue.

Keywords: Oral malignancy, Carcinoma tongue, Pre malignant lesion, Glossectomy

INTRODUCTION

Carcinoma of tongue comprises 3% of all malignancies and 30% of oral malignancies of which division between anterior 2/3rd and posterior 1/3rd is 3:4.¹ Oropharyngeal squamous cell carcinoma (SCC) is said to represent 10-15% of all head and neck tumor. Frequency distribution of the primary site carcinoma in oropharynx is tonsil or

faucial pillar 45%, posterior tongue 40%, soft palate 15%, posterior pharyngeal wall 5%.²

Although lesion is either ulcerative or proliferative on an easily visible organ with exceptional mobility, it is a sad fact that many patients present in late stages, Hence, even though the disease is curable and has a high five years

survival rate, presenting in the late stages, reduces five years survival rate.³

The modalities of treatment vary according to the stage of disease. Anaplastic and poorly differentiated tumors make poor prognosis. In early stage both surgery and radiation play equal role in outcome. Treatment decision depends on availability of facility, patient's choice and the combined decision of multimodality tumor board. In advance stage adjuvant treatment like radiation therapy and chemo-radiation therapy is indicated based on histopathology reports bearing the risk factors determining the modality of adjuvant treatment. Only chemotherapy has very minimum use in head and neck cancer. This is only used as a palliative treatment in stage IV diseases.

Chemotherapy, as in most head and neck malignancies, plays a secondary role to radiation and surgery.⁴ However, in the stage III and stage IV tumors, where spread has occurred to the mucosa of floor of mouth, buccal mucosa it may be used in conjunction with radiation or prior to surgical excision, with an over view to reduce the post-operative recurrence.³

All tumors were staged according to the 2010 TNM classification of the American joint committee on cancer. Data collected included age, sex, history of premalignant lesions, etiologic factors, histopathology, location, TNM stage, treatment modality, reconstruction, and outcome. Likewise, histological features recorded comprised surgical margins, tumor thickness, perineural invasion, peritumoral inflammation, extra capsular spread in the cervical lymph nodes, and bone involvement, although these data were not available in all patients. Follow-up consisted of periodic clinical revisions and occasional imaging diagnosis tests such as CT, MRI and ultrasonography. Three different treatment modalities were applied: surgical resection alone, resection with reconstruction, surgery followed by radiotherapy and neoadjuvant chemotherapy/radiotherapy.⁵

Functional outcome also factors into the decision of treatment modality because alterations to the tongue base and adjacent pharynx may have a profound impact on speech and swallowing, particularly with advanced disease. Functional outcome measured from the PSS for head and neck cancer. The PSS scale ranges from 0 to 100. With 0 representing the poorest function and the hundred representing the best function in each of the subscales.⁶

The tongue is a muscular organ in the mouth of most vertebrates that manipulates food for mastication, and is used in the act of swallowing. The tongue's upper surface (dorsum) is covered with taste buds housed in numerous lingual papillae also serves as a natural means of cleaning the teeth.⁷ A major function of the tongue is the enabling of speech in humans and vocalization in the other animals.

The human tongue is divided into two parts, an oral part at the front and a pharyngeal part at the back. The left and right sides are also separated along most of its length by a vertical section of fibrous tissue that results in a groove on the tongue's surface.

Carcinoma of the tongue is one of the most commonly occurring neoplasms among all intra-oral malignant tumors, accounting for about 30% of all the oral malignancies.⁸ The cervical constant irritation by jagged or irregular teeth and tobacco usage has been considered a very common etiology by many practitioners. Patients with SCC of the tongue and floor of mouth, who have clinically N0 necks, have a risk for micro-metastases to lymph nodes, for such patients undergoing a surgical resection of primary tumors, it is advised to perform elective supra omohyoid neck dissection.⁷

SCC of the tongue with clinically negative neck may have up to 50% incidence rate of having an occult cervical node metastasis. Most surgeons perform elective neck dissection or neck irradiation in all No cases to provide the best chance of cure, while others prefer a wait-and-watch policy treating the neck only when a metastatic node is detected clinically.⁷ The various modalities for treatment of carcinoma of the tongue have been proposed in literature which includes surgical excision, radiation therapy, chemo-radiation therapy and only chemotherapy based on their stages. However surgical excision with elective supraomohyoid neck dissection is believed to have reported with low chances of recurrence post operatively.^{9,10}

Mean PSS scores by subscales eating in public, understandability of speech and normalcy of diet were 55 (range, 0-100), 73 (range, 25-100) and 49 (range, 0-100), respectively.¹¹ PSS scores were significantly higher in patients with primary closure of the surgical defect. No mandible surgery, and early T-stage lesions.⁶

Surgical intervention for primary carcinoma of tongue is a common practice in day-to-day practice, but still now it is under focused topics among the researcher. As there is limited work is available particularly emphasis on functional outcome of this group, the study was designed to assess the functional outcome of carcinoma tongue after primary surgical treatment among the patients admitted in national institute of ENT.

METHODS

Study design

It was a cross sectional observational study.

Place of study

The study conducted at the Department of Otolaryngology, national institute of ENT, Tejgaon, Dhaka.

Study period

Study conducted for one year from January 2019 to December 2019.

Study population

All histopathological diagnosed case of carcinoma tongue undergone primary surgical treatment and fulfilling the inclusion and exclusion criteria in the department of otolaryngology, national institute of ENT, Tejgaon, Dhaka-1215 during the study period.

Sampling method

Purposive sampling method was applied in this study.

Sample size

Sample size was 30.

Sample size calculation

The following formula was applied to calculate the sample size:

$$n = (z^2 \times pq) / (d^2)$$

n=required sample size

z=confidence limit=1.96

p=prevalence=3%=0.03

q=1-0.03=0.97

d=acceptable standard error=0.05

$$n = ((1.96)^2 \times 0.03 \times 0.97) / ((0.05)^2) = 44.017$$

According this formula the required sample was 44. Due to unavailability of the patients, total 30 sample size considered for the study.

Inclusion criteria

Patients histopathologically diagnosed with carcinoma of tongue (operable) and patients with age 18-70 years, both male and female, patient who willing to take part in the research were included in study.

Exclusion criteria

Patient not fit for general anesthesia, having systemic metastasis, patients who himself/herself withdraw his/her name and previous history of CT, RT were excluded from the study.

Written informed consent-taken from each patient.

Formal ethical clearance was taken from the ethical review committee of the national institute of ENT for conducting the study.

Data processing and analysis

All the data were checked and edited to remove inconsistency with maintaining proper ethical issues. Data was sorted in according to the study objectives and entered into the MS excel 2016. Following primary enrollment all data were transformed into statistical package for social science (SPSS) 20 for Windows 7 program version. Distribution of age, sex, occupation, risk factors of tongue cancer, presentation of the cancer and others were expressed by frequency distribution. All continuous variables were calculated and expressed as mean±SD. Comparison of PSS scores for patients with early (I and II) and advanced (III) stage of carcinoma were estimated by chi-square test. Statistical significance was assumed if $p < 0.05$.

RESULTS

Total 30 patients of carcinoma tongue were included in this study. Mean age of the subjects was 47.43 ± 15.59 years and median age was 45 years. Patients' age ranged from 16 years to 70 years. Majority of the patients (46.7%) were aged between 31 to 50 years (Figure 1).

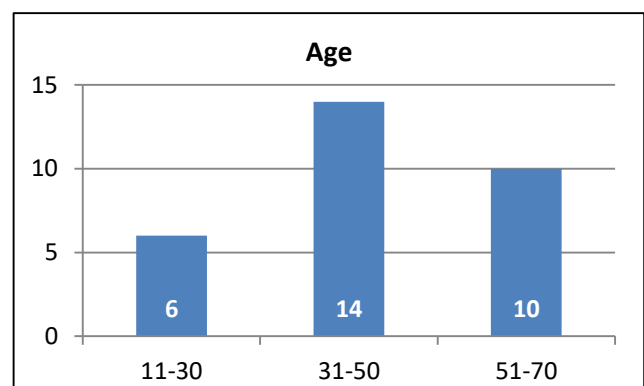


Figure 1: Distribution of subjects according age, (n=30).

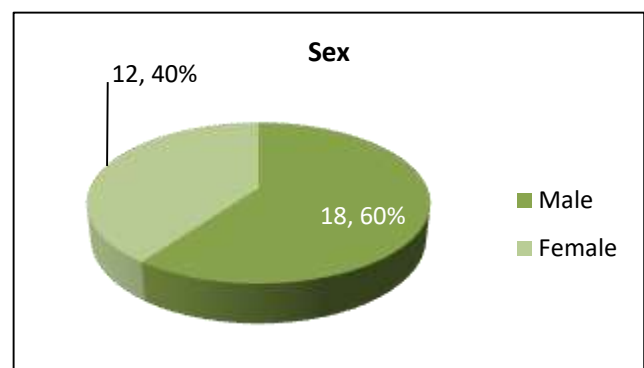


Figure 2: Distribution of subjects according sex, (n=30).

Out of 30 subject majority (60%) were male and 40% were female (Figure 2).

Most of the subjects were housewives (33.3%), followed in decreasing order by farmer (26.7%), others (23.3%), business (13.3%) and government service (3.3%). Others included day-laborer, rickshaw-puller, road side vendor and hawker.

Majority of the patients (63.3%) had smoking habit. Betel-nut and betel-leaf were chewed by respectively 26.7% and 36.7% patients with or without tobacco. Fifty percent patients had poor oral hygiene. None of the patients had any pre-malignant lesions (Table 1).

Table 1: Distribution of patients according to risk factors for tongue cancer, (n=30).

Variables	N	Percentage (%)
Smoker	19	63.3
Betel-nut chewer	8	26.7
Betel-leaf chewer	11	36.7
Oro-dental hygiene		
Good	6	20
Average	9	30
Poor	15	50
Pre-malignant lesion	0	0

Carcinoma of the tongue may present as ulcer or swelling. The most prevalent lesion was the right sided tongue ulcer (46.7%) followed in decreasing order by left sided tongue swelling (23.3%), right sided tongue swelling (16.7%) and left sided tongue ulcer (13.3%). Majority of lesions were in oral part of tongue (73.3%). Neck swelling was present in 23.3% subjects. Majority of neck swelling was right sided (20.0%) (Table 2).

Table 2: Distribution of subjects according to characteristics of the cancer, (n=30).

Variables	N	Percentage (%)
Type of lesion		
Tongue ulcer		
Right	14	46.7
Left	4	13.3
Tongue swelling		
Right	5	16.7
Left	7	23.3
Part of tongue involved		
Oral	22	73.3
Pharyngeal	8	26.7
Neck swelling		
Right	6	20.0
Left	1	3.3

All of the subjects underwent TNM staging before surgical treatment. The most prevalent stages were T3N1 (n=5) and T2N0 (n=5). Majority of the patients were from stage T2 (n=13) (Table 3).

Table 3: Distribution of subjects according to TNM staging, (n=30).

Stage distribution of patients					
Stage	N0	N1	N2	N3	Total
T1	2	0	0	0	2
T2	5	4	4	0	13
T3	2	5	0	0	7
T4	1	4	3	0	8
Total	10	13	7	0	30

Subjects who with T1 and T2 cancer without nodal involvement and with nearby nodal involvement were categorized as stage I and II respectively. Subjects having higher than T2 size with or without nodal involvement were categorized as stage III. No subjects had distant metastasis in this study (Stage IV).

Surgical treatment of the primary lesion involves glossectomy with or without neck resection. In this study, the most common glossectomy was wide excision of the lesion (43.3%), followed in decreasing order by partial glossectomy (23.3%), subtotal excision (23.3%), hemi-glossectomy (6.7%) and total excision (3.3%).

Modified radical neck dissection was carried out in 16 cases. Majority MRND was of type III of right side of neck (33.3%). The most prevalent surgery with neck dissection was sub-total glossectomy with right sided type III MRND (20%). SND type I was done in 13.3% cases in right side and type II was done in 10% cases in left side. Left sided SND with wide excision was the most common (10%) (Table 4).

Table 4: Distribution of subjects according to neck dissection.

Dissection of neck	N	Percentage (%)
MRND		
Type II (right) + partial glossectomy	1	3.3
Type II (right) + wide excision	1	3.3
Type III (right) + wide excision	4	13.3
Type III (right) + sub-total glossectomy	6	20.0
Type III (left) + hemi-glossectomy	2	6.7
Type III (left) + wide excision	2	6.7
SND		
Level I (right) + partial glossectomy	1	3.3
Level I (right) + hemi-glossectomy	1	3.3
Level I (right) + wide excision	1	3.3
Level I (right) + total glossectomy	1	3.3
Level I (left) + wide excision	3	10.0
Level I (left) + subtotal glossectomy	1	3.3

ALT flap was the most prevalent flap used (16.7%). Only 3 patients were needed to be sent for radiotherapy after surgery (Table 5).

Table 5: Distribution of patients according to reconstruction and radiotherapy.

Variables	N	Percentage (%)
Reconstruction		
Radial artery forearm flap	1	3.3
Antro-lateral thigh (ALT) flap	5	16.7
Pectoralis major (PM) flap	1	3.3
Facial artery myomucosal flap	1	3.3
Sent for radiotherapy	3	10.0

All the subjects were followed up after surgery using PSS for carcinoma of tongue. PSS includes: Eating in public (Eating), understandability of speech (Speech) and normalcy of diet (Diet). All the patients could be followed up for 6 months. Subsequently 12 patients were lost from follow-up after 6 months, another 8 patients (total 20) were lost from follow-up after 8 months, and another 7 patients (total 27) were lost from follow-up after 10 months.

Patients' average score on 'understandability of speech', 'eating in public' and 'normalcy of diet' scores improved

over 4 months and remained relatively steady afterwards up to 6 months (Table 6).

Table 6: PSS over 6 months follow-up after surgical management of carcinoma of tongue, (n=30).

PSS	Follow-up month		
	2 nd	4 th	6 th
Eating	58.50±15.92	71.66±17.03	69.16±20.43
Speech	66.67±18.95	82.5±17.55	80.83±20.43
Diet	41.00±7.58	49.00±9.94	48.66±8.99

Patients showed improvement in 'eating in public' score and 'understandability of speech' score at 4th month after surgery, then declined slightly and remained steady over subsequent follow-ups. Normalcy of diet score also showed improvement at 4th follow-up month but slowly declined afterwards. (Table 7).

Comparison of PSS scores for patients with early (I and II) and advanced (III) stages of carcinomas shows that PSS score was lower for advanced stages across all categories (Eating, speech and diet) at all times (all follow-up months) except at 4th month follow-up for 'eating' category. Besides, both early and advanced stages showed improvement in PSS score over 4 month and remained steady afterwards up to 6 months except 'eating' category for advanced stages which declined slightly after improving over 4 months (Table 8).

Table 7: PSS over 10 months follow-up after surgical management of carcinoma of tongue, (n=10).

PSS	Follow-up month				
	2 nd	4 th	6 th	8 th	10 th
Eating	58.00±22.38	80.00±15.81	77.50±24.86	72.5±24.86	72.50±24.86
Speech	67.50±20.58	85.00±17.48	82.5±20.58	72.5±24.86	75.00±23.57
Diet	42.00±7.88	54.00±9.66	52.00±7.88	51.00±12.86	45.00±8.49

Table 8: Comparison of PSS scores for patients with early (I and II) and advanced (III) stage of carcinoma.

PSS	Stage	Follow-up month					
		2 nd month	P	4 th month	P	6 th month	P
Eating	I-II	63.33±12.90	0.17	71.66±15.99	0.96	71.66±12.90	0.59
	III	53.66±17.57		71.66±18.58		66.67±26.16	
Speech	I-II	71.66±18.58	0.21	88.33±15.99	0.08	85.00±18.41	0.32
	III	61.66±18.58		76.66±17.59		76.66±22.09	
Diet	I-II	43.33±7.23	0.11	50.66±7.98	0.30	50.00±8.45	0.56
	III	38.66±7.43		47.33±11.62		47.33±9.61	

DISCUSSION

Various modalities of treatment are available for carcinoma of tongue including: conventional surgery, laser surgery, radiotherapy, chemotherapy, photodynamic therapy and cryotherapy.^{2,8} This study focused on conventional surgery for tongue cancer and its outcome in the form of functional assessment after surgery.

Total 30 patients of carcinoma tongue were included in this study. Mean age was 47.43±15.59 years ranging from 16 to 70 years. Majority patients were aged between 31 to 50 years (46.7%). In Bangladesh oral carcinoma is most commonly found in patients aged between 45 to 54 years and tongue is one of the most prevalent sites.¹²

Male were more prevalent than female (60% vs. 40%) in this study. Carcinoma of the tongue has been regarded as

a disease that affects men more than women (1). But, a recent shift towards women was also noted in the United Kingdom.¹³ The cancer registry of Bangladesh reports a similar proportion of male and female affected by oral cancer.¹²

Tobacco is considered to be the single most important modifiable risk factor for cancer.¹² The prevalence of smoking in Bangladesh is 50.1% among men aged more than 30 years. It was 3.1% among women aged more than 30 years. In addition, 22.4% of men aged >30 years and 39% of women 30 years and older currently use smokeless tobacco in chewable form such as jarda and sadapata with betel leaf and betel nut, etc. Altogether, 62% of men and 41% of women (52% sex combined) aged more than 30 years were found to either smoke or chew tobacco at the time of the survey.¹²

The present study found that 63.3% subjects smoked, 26.7% subjects betel-nut and 36.7% subjects chewed betel-leaf with or without tobacco.

Oro-dental hygiene was found poor in 50% subjects and average in 30% subjects. Poor oral hygiene has been linked to oral cancer as a risk factor. One study reported that 85% of oral patients have poor oral hygiene. Poor oral hygiene related risk factor is around 60% for men and 35% were women.¹²

Carcinoma of the tongue usually presents clinically as an ulcer, an exophytic mass, or as a deep infiltration with varying degrees of induration.⁵ The present study found carcinoma tongue presenting as ulcer in 60% cases (46.7% right sided and 13.3% left sided) and as swelling 40% cases (23.3% left sided and 16.7% right sided). Oral (anterior) part of the tongue was involved in 73.3% subjects and pharyngeal (posterior) part was involved in 26.7% subjects. This is consistent with the findings that two-thirds of carcinomas of the tongue occur on the lateral borders and ventral surface of the anterior two-thirds of the tongue, while only a quarter occur on the posterior third.⁴ Neck swelling constituting cervical lymphadenopathy was found in 23.3% subjects. Tongue cancer lesions are often painless and their silent nature may result in presentation with asymptomatic cervical nodal enlargement.⁵

In this study the most prevalent stages were T3N1 (5 among 30) and T2N0 (5 among 30). Majority of the patients were from stage T2 (13 among 30). Gourin and Johnson in a comparable study entitled “surgical treatment of SCC of base of tongue” also enlisted majority patients from stage T2 (31 among 87) and T3N1 (14 among 87).¹³ Their study found 9 N3 cases whereas this study found none. Spiro and strong also found similar distribution of stages of tongue cancer in their study.¹⁴

Various modality of glossectomy with or without neck dissection was needed for the subjects. The most commonly employed surgery of the tongue was wide

excision of the lesion which was done in 43.3% subjects. This was followed in decreasing order by partial glossectomy (23.3%), subtotal excision (23.3%), hemi-glossectomy (6.7) and total excision (3.3). Modified radical neck dissection was carried out in 16 cases and sub-total glossectomy with right sided type III MRND (20%) was the most common surgery. Other studies have enlisted different modalities of treatment.^{13,14} The most common surgery reported by Spiro and Strong was partial glossectomy for oral part of tongue and ‘commando’ (resection of the tumor in conjunction with a radical neck dissection and excision of a portion of the lower) for carcinoma base of the tongue.¹⁵ Gourin and Johnson reported transhyoid pharyngotomy to be the most common surgery in their series.¹³

Al-Qahtani et al treated stage III and IV cancer of tongue with surgery and used radial artery forearm flap for reconstruction in all of their patients.¹⁵ Reiger et al has also done surgical reconstruction using radial artery forearm flap in the management of cancer of base of the tongue.¹⁶ In comparison this study used ALT flap in 16.7% subjects beside other flaps. Radial artery forearm flap was used in 3.3% cases. The differences in choice of flap could be explained by the fact that in this study both oral and pharyngeal part of tongue involvement were treated, but in Al-Qahtani et al and Reiger et al the cancers did not consist oral part of the tongue.^{15,16}

Several studies have assessed functional outcome of patients after management of carcinoma tongue with various modalities of treatment using PSS for head and neck cancer developed by List et al.^{11,17,18} But all of these studies either assessed function at one point of time long after surgery (12) or compared radiotherapy with surgery in the management of tongue cancer.^{11,17} Present study is unique in that subjects were followed-up bi-monthly for 12 months after surgery to assess improvement in function after surgery over a period of time.

Subjects showed improvement in all categories of PSS after surgery which reached a peak at 4 months and either remained steady (eating and speech) or slightly declined afterwards (diet). Ten subjects could be followed up for 10 months. Their average eating, speech and diet scores at 10 months are respectively 72.50 ± 24.86 , 75.00 ± 23.57 and 45.00 ± 8.49 . This can be compared to the assessment done by Friedlander et al.¹⁷ They assessed the patients of carcinoma tongue who survived at least 5 years after primary surgical management of tongue cancer. They reported a mean eating, speech and diet score of 79.8 ± 28.3 , 80.8 ± 14.7 and 73.1 ± 29 . Hence, in comparison to their study this study showed less improvement in diet (normalcy of diet) 10 months after surgery. A further follow-up after 4 years could make the comparison more valid but this was out of scope of the present study.

Similar to Friedlander et al this study also found that functional status of stage I and II cancer higher than that of stage III cancer.¹⁷

Harrison et al reported that primary radiotherapy is superior in terms of PSS score in comparison to primary surgery for carcinoma of tongue.¹⁹ They included a small number patients in their study.¹⁵ But the present study along with Friedlander's indicate that most patients who received surgery as a primary treatment showed good improvement in functional status years after surgery.

CONCLUSION

Tongue cancer is the most common malignancy diagnosed within the oral cavity, which accounts up to 40% of oral SCCs. Despite the development of multimodal treatment options, the prognosis remains relatively poor. Paucity of the literature in our country context was the inciting factors to conduct the study. In this study, middle aged male was suffering more from primary carcinoma of tongue. More frequent risk factors were smoking, betel nut and betel leaf chewing. Majority cases were detected at stage T2 which was managed by wide excision glossectomy, partial glossectomy, subtotal glossectomy, hemi-glossectomy and total glossectomy. Functional improvement was seen in initial follow up but in comparison to subsequent visit the overall prognosis was not statistically significant. However, this result should be used with caution as this study is limited due to small sample size.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Jayant K, Balakrishnan V, Sanghvi LD, Jussawalla DJ. Qualifications of the role of smoking and chewing tobacco in oral. Pharyngeal Oesophageal Cancers. 1977;35(2):232-5.
- Bradley PJ, Management of Squamous Cell Carcinoma of Oropharynx. Curr Opin Otolaryngol Head Neck Surg. 2000;8(2):80-6.
- Nason RW, Anderson BJ, Gujrathi DS, Abdoh AA, Cooke RC. A retrospective study of treatment outcomes in posterior and anterior tongue. Am J Surg. 1996;172(6):665-70.
- McGurk M, Goodger NM. Head and neck cancer and its treatment: historical review. Brit J Oral Maxillofacial Surg. 2000;38(3):209-20.
- Martin-Granizo R, Rodriguez-Camp F, Naval L, Gonzalez FJD. Squamous cell carcinoma of the oral cavity in patients younger than 40 years. Otolaryngol Head Neck Surg. 1997;117(3pt1):268-5.
- Malone JP, Stephenes JA, Grecula JC, Rhoades CA, Ghaheer BA, Schuller DE. Disease control, survival, and functional; outcome after multimodal treatment for advanced-stage tongue base cancer. Head Neck. 2004;26(7):561-72.
- Lim YC, Kim JW, KohYW, Kim K, Kim HJ, Kim KM, et al. Pervascular-submandibular lymph node metastasis in squamous cell carcinoma of the tongue and floor of mouth. Eur J Surg Oncol. 2004;30(6):692-8.
- Ramirez-Amador V, Esquivel-Pedraza L, Ochoa-Carrillo FJ, Cuapio-Ortiz A, Frias-Mendivil M, Meneses-Garcia A, et al. Cancer of the Mobile Tongue in Mexico: A Retrospective Study of 170 Patients. Fur J Cancer B Oral Oncol. 1995;31B(1):37-40.
- Ogus HD, Bennett MH, Path FRC. Carcinoma of the dorsum of the tongue: a rarity or misdiagnosis. Br J Oral Surg. 1978;16(2):115-24.
- Moor JW, Wills S, Holzle F, Ong TK, Mitchell DA, Mc Lennan KA, et al. Biopsy examination of squamous cell carcinoma of the tongue: Source of significant prognostic information? Br J Oral Surg. 2010;48(8):594-7.
- Marcy A, Ritter-Sterr C, Shirley B, Lansky M. A performance status scale for Head and Neck Cancer Patients. Cancer. 2006;66(3):28-30.
- Sultana N, Malik M. The Overview of Oral Cancer and Risk Factors in Bangladesh. Int J Dent Sci Res. 2014;2(5A):8-10.
- Gourin CG, Johnson JT. Surgical treatment of squamous cell carcinoma of the base of tongue. Head Neck. 2001;23(8):653-60.
- Spiro RH, Strong EW. Surgical treatment of cancer of the tongue. Surg Clin North Am. 1974;54(4):759-65.
- Al-Qahtani K, Rieger J, Harris JR, Mlynarek A, Williams D, Islam T, et al. Treatment of base of tongue cancer, stage III and stage IV with primary surgery: survival and functional outcomes. Eur Arch Oto-Rhino-Laryngol. 2014;272(8):2027-33.
- Rieger JM, Zalmanowitz JG, Li SY, Sytsanko A, Harris J, Williams D, et al. Functional Outcomes After Surgical Reconstruction of the Base of Tongue Using the Radial Forearm Free Flap in Patients with Oropharyngeal Carcinoma. Wiley Intersci. 2007;(11):10024-32.
- Friedlander P, Caruana S, Singh B, Shaha A, Kraus D, Harrison L, et al. Functional status after primary surgical therapy for squamous cell carcinoma of the base of the tongue. Head Neck. 2002;24(2):111-4.
- List JA, Ritter-Sterr MS, Lansky SB. A performance status scale for head and neck cancer patients. Cancer. 1990;66(2):564-9.
- Harrison LB, Zelefsky MJ, Armstrong JG, Carper E, Gaynor JJ, Sessions ROYB. Performance Status After Treatment for Squamous Cell Cancer of the Base Tongue-A Comparison of Primary Radiation Therapy Versus Primary Surgery. Int J Radiat Oncol Biol Phys. 1994;30(4):953-7.

Cite this article as: Sarkar PC, Hanif MA, Alam KM, Islam MR, Akram MS, Rahman SMA, et al. Functional outcome of carcinoma tongue after primary surgical treatment. Int J Otorhinolaryngol Head Neck Surg 2024;10:381-7.