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Original Article

Predicting Post-Operative Drainage in Head and Neck Surgery for Oral Cancer and Short vs Long Interval of Removal of Neck Drains

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ABSTRACT

Objectives: To compare duration of neck drain removal in patients with drainage monitoring performed at short intervals (every eight hours) versus long intervals (every twenty-four hours) who underwent supraomohyoid or extended supraomohyoid neck dissection with tumor resection for oral cancer.
Study Design: Comparative cross-sectional study.
Place and Duration of Study: Combined Military Hospital, Lahore Pakistan, from December 2023 to March 2024.
Methodology: Thirty-four patients who underwent surgery for oral cancer were included in the study and were divided into two "short interval monitoring" and "long interval monitoring" groups. Drainage rate, total drain output, duration of drain removal, and length of stay at hospital were documented. In addition, frequency of patients discharged after twenty-four hours of surgery was also documented.
Results: Median age was 52.00 (62.00 – 39.00) years. 25(73.53%) males and 9(26.47%) females. No significant difference was observed between the two groups in terms of mean total drain output (p=0.442). Median duration of drain removal (p<0.001) and median duration of hospital stay (p<0.001) were significantly less in short interval monitoring group as compared to long interval monitoring group. Frequency of patients who were discharged after 24-hours in short interval monitoring group was 11(64.71%) while in long interval monitoring group it was 4(23.53%), (p=0.016).
Conclusion: Monitoring drain output at shorter intervals significantly reduces the duration of drain removal and hospital stay.
Keywords: Drainage, Length of Stay, Oral Cancer, Squamous Cell Carcinoma.

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INTRODUCTION

"Oral squamous cell carcinoma (OSCC)" is a highly common form of oral cancer, with an estimated yearly incidence of over 350,000 new cases in a single calendar year.[1] In Pakistan, the incidence of this condition, when adjusted for age, has been documented to be one of the highest globally, estimated at approximately 27.03 per 100,000 individuals. China and Iraq follow suit, while Kuwait exhibits the lowest incidence, estimated at 0.51 per 100,000 individuals.[2] There exist multiple factors that exhibit a propensity to elevate the likelihood of developing OSCC. These factors encompass the utilization of tobacco in the forms of cigarettes, bidi, huqqa, and cigars, alcohol, and habitual chewing of areca nut, betel leaf, and slaked lime.[3] Furthermore, a noteworthy risk factor for the development of OSCC is genetic predisposition.[4]

The pathogenesis of OSCC involves a series of steps that occur gradually. Initially, specific carcinogenic mutations and genetic changes lead to dysplasia, which then develops into precancerous pathological lesions. This is followed by the onset of carcinoma-in-situ, and eventually the cancer, which may or may not spread to other parts of the body. [5] Clinically, this malignancy can manifest as non-healing ulcers on several places, such as the tongue (the most prevalent location), lips, gums, floor of mouth, hard palate, retromolar trigone and buccal mucosa.[6] The enlargement of lymph nodes, particularly those located in the neck, is a significant clinical manifestation of oral cancer and this enlargement is mostly attributed to the metastasis of the tumor.[7] In order to assess the spread of tumor and removal of involved lymph nodes, surgical intervention on the neck lymph nodes, a procedure often referred to as neck dissection, plays a central role.[8]

One of the factors that is associated with longer stay at the hospital after the surgery resulting in higher risk of nosocomial infections is longer duration of drain in-situ.[9] This makes it essential to adopt

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measures to reduce the duration for which neck drain is retained. One such method that has been hypothesized to have the ability to reduce duration of retention of neck drains is the drain monitoring interval.[10] In general, drain volume is monitored at twenty four hours interval which has the tendency to increase the duration of drain placement.[10] Alternatively, drain output monitoring at shorter interval may help in reducing the duration of drain being left in place.[10] However, in real life whether this practice can actually be of use is yet to be established. To answer this research question, present study was conducted with the aim of comparing duration of neck drain removal in patients with drainage monitoring performed at shorter intervals (every eight hours) versus performed at longer intervals (every twenty four hours).

METHODOLOGY

This comparative cross sectional study was conducted at "Oral & Maxillofacial surgery department of CMH, Lahore Medical College & Institute of Denstistry from December 2023 to March 2024" after taking the approval from ethical review board of institution (ERB #: 02/ERC/CMH/LMC) and informed consent from patients through a written consent proforma. Sample size was calculated using WHO sample size calculator taking 5% level of significance, 99% power, anticipated frequency of patients discharged after twenty four hours of surgery in short interval monitoring group as 86% and anticipated frequency of patients discharged after twenty four hours of surgery in long interval monitoring group as 20.9%.[10] The estimated sample size came out to be 34 (17 in each group). Appropriate sample size was calculated using following formula:

$$n = \frac{\left\{z_{1-\alpha/2}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right\}^2}{(P_1-P_2)^2}$$

Inclusion Criteria: Patients were over the age of 18 years, both males and females, without any other significant morbidity, who underwent supraomohyoid or extended supraomohyoid neck dissection for oral cancer were included in the study.

Exclusion Criteria: Patients who were unfit for surgery by the anesthesia department during pre-anesthesia evaluation, history of hypercoagulability disease, had evidence/history of previous thromboembolic disorder, pregnant women, history of bleeding disorder or had any other significant morbidity like diabetes, hypertension or ischemic heart disease were excluded from the study. Patients with co-morbidities were excluded as they may have impacted the outcome.

Patients were selected by using non-probability consecutive sampling technique. A written informed consent proforma was signed by all the patients. Baseline characteristics of the patients including age, gender, history of smoking, history of tobacco chewing and laterality of neck lymph nodes were documented. In accordance with the established practice at CMH Lahore, all patients underwent preoperative assessments, which included basic laboratory tests such as full blood count, renal/hepatic function tests, thyroid function tests, screening for hepatitis B, C and HIV and coagulation profile. Additionally, an electrocardiogram (ECG) and a chest X-ray were performed. Weight, height and blood pressure were monitored. Subsequently, patients were provided with a comprehensive explanation of the surgical process and the objective of the study. Based on the order of presentation, patients were allocated one of the two groups alternatively while keeping the patients blinded to the group being assigned to them. First patient who was registered for surgery was placed in "short interval monitoring group", second patient was placed in "long interval monitoring group" and so on. The procedures were conducted while the patient was under general anesthesia, which was administered and managed by a consultant anesthesiologist who had a minimum of 14 years of expertise. All the procedures were conducted by a single surgical team led by a highly experienced senior surgeon with over a decade of expertise and were conducted in the same manner to avoid any effect on the outcome. The surgeries involved the use of "modified Crile's incision" followed by dissection using cautery. Following the surgical procedure, a closed suction drain was positioned at the surgical site, and the neck wound was closed using the conventional "two-layer suturing" approach. Patient was then shifted to the surgical ICU where drain output monitoring was performed and all the patients were provided with similar post-operative care package as per hospital protocol to avoid any effect on the outcomes. In the "short interval monitoring group", drain output and rate (ml/hour) was assessed and documented after every eight hours and the drain bottle was then emptied, in the "long interval monitoring group" conventional 24 – hourly monitoring practice was adopted in which drain output and rate was measured after every 24-hours

and drain bottle was then emptied. Once a drainage rate of ≤ 1ml per hour was achieved at a monitoring point, decision to remove the neck drain was made. At this point, total drain output was calculated, drain was removed, duration of drain removal was documented and the patient was discharged. At this point, duration of hospital stay was documented. Additionally, frequency of patients in which neck drain was removed and were discharged at completion of twenty four hours of surgery was also documented.

"Data analysis was performed using Statistical package for Social Sciences (SPSS) version 20. Normality of data was checked using Shapiro-Wilk test which showed that drain output and drainage rate were normally distributed and were thus represented using mean ± standard deviation (SD) while age, duration of drain removal and duration of hospital stay were not distributed normally so these were represented as median interquartile range (IQR). Qualitative data was represented by using percentage and frequency. Comparison of frequency of being discharged from hospital after 24-hours of surgery between groups was performed using Chi-square test. For comparing total drain output, Student t-test was used. For comparing duration of drain removal and duration of hospital stay, Mann-Whittney U-test was used. A $p \leq 0.05$ was taken as significant".

RESULTS

In this study, 34 patients (17 in each group) were included. Median age was 52.00 (62.00 – 39.00) years. There were 25(73.53%) males and 9(26.47%) were females. 28(82.35%) of patients were smokers while 6(17.65%) were non-smokers. 10(29.41%) patients had history of tobacco chewing. 16(47.06%) patients had unilateral neck lymph node dissection while 18(52.94%) had procedure bilaterally. Comparison of baseline characteristics between groups is summarized below in table I:

In short interval monitoring group (n=17), maximum duration of neck drain in place was 32 hours with mean drain output and drainage rate at 8, 16, 24 and 32 hours of 36.70±6.28ml & 4.58±0.78 ml/hour, 12.35±3.35ml & 1.54±0.41 ml/hour, 7.00±1.62 ml & 0.87±0.20ml/hour and 3.83±1.32 ml & 0.47±0.16 ml/hour, respectively. In long interval monitoring group, maximum duration of drain in place was 48 hours with mean drain output and drainage rate at 24 and 48 hours of 58.29±24.39ml & 2.42±1.01ml/hour and 5.84±0.98 ml & 0.24±0.04ml/hour, respectively. This is described below in table-II.

Mean total drain output in short interval monitoring group (n=17) was 57.41±9.30ml while in long interval monitoring group (n=17) it was 62.76±26.75ml, (p=0.442). Median duration of drain removal in short interval monitoring group (n=17) was 24.00 (32.00 – 24.00) hours while in long interval monitoring group (n=17) it was 48.00 (48.00 – 24.00) hours, (p<0.001). Median duration of hospital stay in short interval monitoring group (n=17) was 24.00 (35.00 – 24.00) hours while in long interval monitoring group (n=17) it was 49.00 (51.00 – 24.00) hours, (p<0.001). Frequency of patients who were discharged after 24-hours of surgery in short interval monitoring group (n = 17) was 11(64.71%) while in long interval monitoring group (n=17) it was 4(23.53%), (p=0.016). Comparison of these outcomes between groups is given below in table-III.

Table-I: Comparison of baseline characteristics between groups (n=34)

Characteristic	Short interval monitoring group (n=17)	Long interval monitoring group (n=17)	*p*-value
Mean age in Years	52.00(62.00–39.00)	52.00(61.00–39.00)	0.892
Gender			
Male	13(76.47%)	12(70.59%)	0.697
Female	4(23.53%)	5(29.41%)	
Smoking			
Yes	14(82.35%)	14(82.35%)	1.000
No	3(17.65%)	3(17.65%)	
Tobacco chewing			
Yes	5(29.41%)	5(29.41%)	1.000
No	12(70.59%)	12(70.59%)	
Laterality of neck dissection			
Unilateral	9(52.94%)	9(52.94%)	1.000
Bilateral	8(47.06%)	8(47.06%)	

Table-II: Drain output and drainage rate based on monitoring interval (n=34)

Short Interval Monitoring group (n=17)				
Timing	**8hours**	**16hours**	**24hours**	**32hours**
Drain Output	36.70±6.28ml	12.35±3.35ml	7.00±1.62ml	3.83±1.32 ml
Drainage Rate	4.58±0.78 ml/hour	1.54±0.41 ml/hour	0.87±0.20 ml/hour	0.47±0.16 ml/hour

Long Interval Monitoring group (n=17)		
Timing	**24hours**	**48hours**
Drain Output	58.29±24.39ml	5.84±0.98 ml
Drainage Rate	2.42±1.01ml/hour	0.24±0.04ml/hour

Table-III: Comparison of outcomes between groups (n=34)

Outcome	Short interval monitoring group (n=17)	Long interval monitoring group (n=17)	*p*-value
Mean total drain output	57.41±9.30ml	62.76±26.75ml	0.442
Duration of drain removal	24.00(32.00–24.00) hours	48.00(48.00–24.00) hours	<0.001
Duration of hospital stay	24.00(35.00–24.00) hours	49.00(51.00–24.00) hours	<0.001
Discharge from hospital after 24-hours of surgery	11(64.71%)	4(23.53%)	0.016

DISCUSSION

Malignancies affecting the head and neck are the seventh most prevalent kind of cancer worldwide, with a primary morphology of oral cancers being "squamous cell carcinoma (SCC)".[11,12] Surgical dissection of neck lymph nodes is crucial in identifying, staging, and managing patients with oral cancer in its early stages.[13] Present study focused on a highly important aspect of this surgical procedure which is monitoring of the neck drain output at different intervals and its impact on the duration of retention of the neck drain in-situ and their length of stay at hospital. Average age of the patients suffering from oral cancer who were included in present study were aged approximately over fifty years which is consistent with the fact that oral malignancy is much common in older population in general.[14] In contrast, it has also been reported in recent times that the incidence of oral cancer is increasing in the younger population.[15] In present study, patients who had oral SCC exhibited male predominance with a gender ratio of 3:1. This male predominance has been exhibited in multiple studies and may be due to easier access and higher consumption rate of tobacco products in males.[16,17] A high proportion of patients in present study was comprised of smokers and had the habit of tobacco chewing. Both of these agents have been reported in a literature to be strongly associated with the pathophysiology of oral SCC.[18,19]

In present study, it was found that highest drainage rate observed was 4.5ml per hour which occurred during the first eight hours after the surgery. This finding was observed only due to monitoring the drain output at short intervals. This finding has also been observed in a study conducted by Amir *et al.*, who also conducted a study with almost similar objective as present study.[10] In general, drain output monitoring is performed every twenty four hours in the surgical procedures of the neck.[20,21] However, shorter interval monitoring performed eight hourly may be more beneficial as compared to conventional monitoring performed twenty four hourly as evident from results of the present study. Upon a detailed scrutiny of previous research (PubMed, Medline, Cochrane library and Google scholar) comparing the impact of short versus long interval monitoring of drain output after neck surgery on duration of drain removal and length of stay at hospital, only two studies relevant to the objective of present study were found. In present study, criteria for neck drain removal was set at a drain output rate of one milliliter per hour or less which was in accordance with multiple studies and which is the standard practice in most centers.[10,20] In present study, it was found that monitoring at short intervals not only reduced drain removal time significantly but also the length of stay at hospital. This finding was congruent with the findings of studies conducted by Amir *et al.*, and Kasbekar *et al.*, both of which favored short interval monitoring of drain output in neck surgeries.[10,22] In terms of frequency of patients who were discharged by the end of twenty four hours of surgery, higher percentage of patients were those who were monitored at short intervals for drain output as compared to those who were monitored at longer intervals, which was also congruent with studies conducted by Amir *et al.*, and Kasbekar *et al*.[10,22]

Based on these findings, it is strongly recommended that in patients who have neck dissection and tumor resection surgery for oral cancer, drain output monitoring should be performed eight hourly rather than twenty four hourly to reduce the time of drain removal and length of stay at hospital. However, small interval monitoring did reveal one major issue which was increased workload and paperwork to be done by the healthcare staff. Limitations of present study included lack of long term follow up and limited sample size. However, given the high treatment cost of cancer surgeries and management and a misbelief of cancer being a death sentence, many patients do not seek medical attention which may justify the smaller sample size.

CONCLUSION

In conclusion, monitoring the drain output at shorter time intervals can significantly reduce the duration of drain removal and length of stay at the hospital after the head and neck surgery for oral cancer that involves tumor resection and neck dissection. In addition, short interval monitoring can assist in discharging the patients earlier postoperatively as compared to monitoring performed at longer intervals.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MAI & AAC: Data acquisition, data analysis, critical review, approval of the final version to be published.

AA & RBZ: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MAP & AS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Zhang SZ, Xie L, Shang ZJ. Burden of oral cancer on the 10 most populous countries from 1990 to 2019: Estimates from the global burden of disease study 2019. Int J Environ Res Public Health 2022; 19(2): 875. https://doi.org/10.3390/ijerph19020875
2. Ren ZH, Hu CY, He HR, Li YJ, Lyu J. Global and regional burdens of oral cancer from 1990 to 2017: Results from the global burden of disease study. Cancer Commun 2020; 40(2-3):81-92. https://doi.org/10.1002/cac2.12009
3. Thankappan S, Nedumpillil S, Thomas V. Clinicopathologic features and risk factors associated with oral squamous cell carcinoma (OSCC): A comprehensive descriptive study analyzing the burden of OSCC in a tertiary-level hospital in North Kerala, India. Indian J Cancer 2023; 60(4): 534-541. https://doi.org/10.4103/ijc.IJC_203_21
4. Chamoli A, Gosavi AS, Shirwadkar UP, Wangdale KV, Behera SK, Kurrey NK, et al. Overview of oral cavity squamous cell carcinoma: Risk factors, mechanisms, and diagnostics. Oral Oncol 2021; 121: 105451. https://doi.org/10.1016/j.oraloncology.2021.105451
5. Georgaki M, Theofilou VI, Pettas E, Stoufi E, Younis RH, Kolokotronis A, et al. Understanding the complex pathogenesis of oral cancer: A comprehensive review. Oral Surg Oral Med Oral Pathol Oral Radiol 2021; 132(5): 566-579. https://doi.org/10.1016/j.oooo.2021.04.004
6. Stepan KO, Mazul AL, Larson J, Shah P, Jackson RS, Pipkorn P, et al. Changing epidemiology of oral cavity cancer in the United States. Otolaryngol Head Neck Surg 2023; 168(4): 761-768. https://doi.org/10.1177/01945998221098011
7. Masuoka S, Hiyama T, Kuno H, Sekiya K, Sakashita S, Kobayashi T. Imaging approach for cervical lymph node metastases from unknown primary tumor. Radiographics 2023; 43(3): e220071. https://doi.org/10.1148/rg.220071
8. Hosokawa S, Mochizuki D, Takahashi G, Okamura J, Imai A, Ishikawa R, et al. Relevance of level IIb neck dissection in patients with head and neck squamous cell carcinomas. World J Surg 2019; 43(12): 3059-3064. https://doi.org/10.1007/s00268-019-05147-z
9. Pennington Z, Lubelski D, Molina C, Westbroek EM, Ahmed AK, Sciubba DM. Prolonged post-surgical drain retention increases risk for deep wound infection after spine surgery. World Neurosurg 2019; 130: e846-e853. https://doi.org/10.1016/j.wneu.2019.07.013
10. Amir I, Morar P, Belloso A. Postoperative drainage in head and neck surgery. Ann R Coll Surg Engl 2010; 92(8): 651-654. https://doi.org/10.1308/003588410X12699663904754
11. Johnson DE, Burtness B, Leemans CR, Lui VWY, Bauman JE, Grandis JR. Head and neck squamous cell carcinoma. Nat Rev Dis Primers 2020; 6(1): 92. https://doi.org/10.1038/s41572-020-00224-3
12. Mody MD, Rocco JW, Yom SS, Haddad RI, Saba NF. Head and neck cancer. Lancet 2021; 398(10318): 2289-2299. https://doi.org/10.1016/S0140-6736(21)01550-6
13. López F, Fernández-Vañes L, García-Cabo P, Grilli G, Álvarez-Marcos C, Llorente JL, et al. Selective neck dissection in the treatment of head and neck squamous cell carcinoma patients with a clinically positive neck. Oral Oncol 2020; 102: 104565. https://doi.org/10.1016/j.oraloncology.2020.104565
14. Mohideen K, Krithika C, Jeddy N, Balakrishnan T, Bharathi R, Sankari SL. A meta-analysis of oral squamous cell carcinoma in young adults with a comparison to the older group patients (2014-2019). Contemp Clin Dent 2021; 12(3): 213-221. https://doi.org/10.4103/ccd.ccd_466_20
15. Alshami ML, Al-Maliky MA, Alsagban AA, Alshaeli AJ. Epidemiology and incidence of oral squamous cell carcinoma in the Iraqi population over 5 years (2014-2018). Health Sci Rep 2023; 6(4): e1205. https://doi.org/10.1002/hsr2.1205
16. Anwar N, Pervez S, Chundriger Q, Awan S, Moatter T, Ali TS. Oral cancer: Clinicopathological features and associated risk factors in a high risk population presenting to a major tertiary care center in Pakistan. PLoS One 2020; 15(8): e0236359 https://doi.org/10.1371/journal.pone.0236359
17. Guo F, Chang M, Scholl M, McKinnon B, Berenson AB. Trends in oropharyngeal cancer incidence among adult men and women in the United States from 2001 to 2018. Front Oncol 2022; 12: 926555. https://doi.org/10.3389/fonc.2022.926555
18. Jiang X, Wu J, Wang J, Huang R. Tobacco and oral squamous cell carcinoma: A review of carcinogenic pathways. Tob Induc Dis 2019; 17: 29. https://doi.org/10.18332/tid/105844
19. Gupta AK, Kanaan M, Siddiqi K, Sinha DN, Mehrotra R. Oral cancer risk assessment for different types of smokeless tobacco products sold worldwide: a review of reviews and meta-analyses. Cancer Prev Res 2022; 15(11): 733-746. https://doi.org/10.1158/1940-6207.CAPR-21-0567
20. Flam JO, Smith RV. What is the optimal time for removing drains in uncomplicated head and neck surgery? Laryngoscope 2018; 128(3): 545-546. https://doi.org/10.1002/lary.26863
21. Harris T, Doolarkhan Z, Fagan JJ. Timing of removal of neck drains following head and neck surgery. Ear Nose Throat J 2011; 90(4): 186-189. https://doi.org/10.1177/014556131109000410
22. Kasbekar AV, Davies F, Upile N, Ho MW, Roland NJ. The management of vacuum neck drains in head and neck surgery and the comparison of two different practice protocols for drain removal. Ann R Coll Surg Engl 2016; 98(1): 53-55. https://doi.org/10.1308/rcsann.2015.0055