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COMPARISON OF ADEQUACY OF RESECTED SURGICAL MUCOSAL MARGINS IN ORAL CANCER USING NARROW BAND IMAGING AND DIRECT VISUALIZATION UNDER OT LIGHTS

Otolaryngology

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ABSTRACT

Background: The main goal of oncologic surgery is to excise the tumor with adequate margins . Narrow Band Imaging (NBI) is an endoscopic imaging enhancement technology that improves the contrast of mucosal surface texture and enhances visualization of mucosal and submucosal vasculature. **Aim:** To compare the adequacy of resected mucosal margins in oral cancer using Narrow Band Imaging (NBI) and direct visualisation under OT lights. **Material and Methods:** Biopsy proven cases of oral cancer posted for surgery were included in the study. Patients were divided into two groups wherein in group I mucosal margins for resection were marked at 1cm all around oral cancer under direct visualization and in another group using NBI. HPE was performed to observe the surgical margin , distance was measured from the margin and was compared in the two groups. **Result:** The overall mean surgical mucosal margins were significantly larger with NBI (0.65±0.18mm) as compared to direct visualization (0.53±0.17mm) . However , when specific surgical margins were observed , only mean posterior margins were significantly larger . In carcinoma tongue the overall mean margins obtained under NBI were larger but not statistically significant while in buccal mucosa it was statistically significant. **Conclusion:** Use of NBI for surgical mucosal resection in oral cancer lead to increased surgical margins and was statistically significant. Thus incorporating NBI into routine surgical practise for the oral cancer has the potential to improve surgical outcomes by facilitating wider resection margins.

KEYWORDS

Narrow Band Imaging (NBI), Direct Visualization, Histopathological examination, Surgical mucosal margins.

INTRODUCTION

Oral cancers is the most prevalent form of cancer in India with OSCC (Oral squamous cell carcinoma) accounting for more than 90 % .[1] The goal of cancer surgery is complete removal of tumor. Histopathological testing aids in the establishment of definitive assessment of the margins after surgery.[2] In oral cancer two varieties of surgical margin are taken into account, pathological and clinical. Clinical margins of 1 to 1.5 cm while pathological margins greater than 5mm are recommended.[3] Margins can also be classified as mucosal margins and deep margin on the basis of three dimensional tissues. The mucosa of the tumor is completely excised along the tumor length to guarantee its total eradication, forms the mucosal margins.[4] Surgeons consider achieving uninvolved margins at final histological evaluation to be gold standard. This is because local recurrence events is more likely to happen when dysplasia or carcinoma is present after carcinoma resection.[5] Surgical margins are important because they affect locoregional control after treatment.If surgical margins are greater than 3mm chances of locoregional failure are less.[6] NBI (Narrow Band Imaging) is an advanced endoscopic optical imaging technique which enhance the visualization of blood vessels in the mucosal along with submucosal layers.[7] Increased neovascularisation is seen in malignancy and these patterns are detected through NBI.[8] NBI helps to detect minute changes in microvasculature which is missed on conventional endoscopic examination .

Our study purpose was to analyse and compare the difference in the surgical mucosal margins in oral cancer patients excised using Narrow Band Imaging and direct visualisation under OT lights.

MATERIALS &METHODS

This was a cross sectional study conducted in tertiary hospital in Northern India from September 2022 to January 2024 after obtaining institutional ethical clearance. All histopathologically confirmed cases of oral cancer during this time period who were posted for surgery were included in the study. All patients with recurrent disease, with history of previous radiotherapy and chemotherapy were excluded.

Patients were divided into two equal groups and these were allocated with the help of randomization software (randomizer.org). During surgery the mucosal margins for resection were marked at 1cm from all around the oral cancer using surgical marker and pen.In first group it was done using direct visualisation under OT lights and in second group using Narrow Band Imaging(NBI).The resected margins in both groups were sent for HPE for reporting by a single experienced pathologist. In pathology slides were examined under microscope and ink was marked around the tumor margin and distance was measured from the section.Results obtained through direct visualisation under OT lights and Narrow Band Imaging were compared. The data collected was tabulated and statistically analysed by IBM SPSS software (version 29)

OBSERVATION AND RESULT

In our study of 40 patients, 80% patients were males and 20% were females. Patient's age ranges from 25 years to 65 years with majority of them 37.5% presenting in 41 to 50 age group. 70% patients had carcinoma of buccal mucosa followed by carcinoma tongue 22.5% .Majority of the patients presented with cancer of left side 57.5% . 45% patients presented in T2 stage followed by T3 stage 37.5%.

In our study the overall mean values of surgical margins were compared between two groups.Statistically significant difference was obtained in measurements of margins when comparison was made between direct visualization and NBI. When specific mucosal margins were compared only posterior margins was significantly larger (Table 1).

In our comparison of mean values in both groups in Carcinoma tongue , Narrow band imaging showed a higher mean posterior margin (0.82 ± 0.05 cm) compared to direct visualization (0.45 ± 0.35 cm) Overall improvement was observed in measurements obtained through NBI but it was not statistically significant (Table 2).

In our study comparison of mean values of surgical margin in rest of sites of oral cancer was : Overall there was significant improvement obtained through NBI in measurement of resection margins in comparison to direct visualization ($p<0.05$)The mean values for inferior, lateral, medial, anterior, posterior, superior were higher for Narrow Band Imaging as compared to direct visualization (Table 3).

Table 1: Comparison Of Mean Values Between 2 Groups.

Surgical mucosal margins (cm)	Groups		P value
	Direct visualisation	Narrow band imaging	
Superior	0.52±0.22	0.67±0.17	0.069
Inferior	0.66±0.19	0.66±0.20	0.947
Lateral	0.40±0.18	0.47±0.25	0.719
Medial	0.34±0.23	0.7±0.1	0.072

Anterior	0.68±0.20	0.66±0.19	0.725
Posterior	0.59±0.22	0.74±0.19	0.016
Overall	0.53±0.17	0.65±0.18	0.044

The NBI measurements are larger than the direct visualization measurements for these mucosal margins. For the posterior orientation, the NBI measurements was significantly higher than the direct visualization measurements ($p<0.05$). Overall significant improvement was obtained in measurement of margins when comparison was made between direct visualization and NBI.

Table 2: Comparison Of Mean Values In Both Groups In Carcinoma Tongue

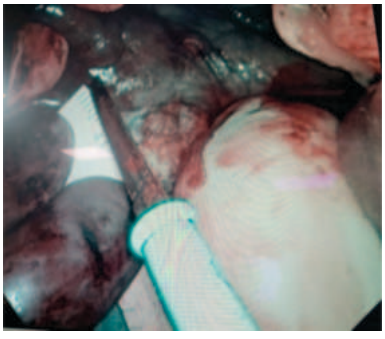
Surgical margins	Direct visualisation	Narrow band imaging	P value
Superior	0.50±0.28	0.50±0.26	1.000
Inferior	0.70±0.20	0.540±0.19	0.308
Medial	0.20±0.0	0.5	-
Anterior	0.76±0.15	0.60±0.18	0.259
Posterior	0.45±0.35	0.82±0.05	0.372
Overall	0.522±0.19	0.592±0.13	0.26

Wider margins were obtained under NBI but it was not statistically significant.

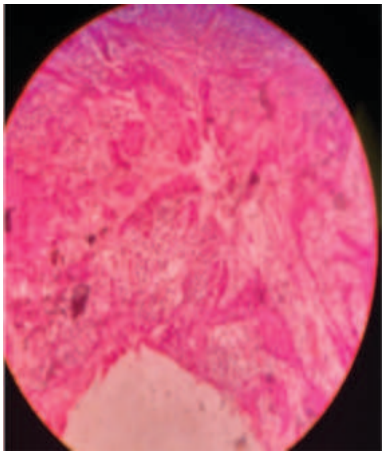
Table No 3 : Comparison Of Mean Values In Both Groups In Rest Of Subsites Of Oral Cancer

Surgical margins	Direct visualisation	Narrow band imaging	P value
Superior	0.52±0.22	0.73±0.08	0.01
Inferior	0.65±0.21	0.76±0.15	0.256
Lateral	0.40±0.18	0.45±0.35	0.820
Medial	0.37±0.25	0.70±0.10	0.091
Anterior	0.65±0.21	0.68±0.19	0.728
Posterior	0.61±0.21	0.72±0.20	0.201
Overall	0.53±0.21	0.67±0.17	0.035

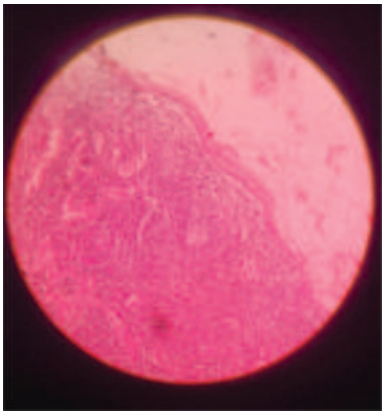
The mean values for inferior, lateral, medial, anterior, posterior were higher for Narrow Band Imaging as compared to direct visualization. Our study showed significant difference in delineation of superior margin using NBI. Overall there was significant improvement obtained through NBI in measurement of resection margins in comparison to direct visualization ($p<0.05$)



CA Right Buccal Mucosa : Resection Being Carried Using NBI



Margin Obtained Under NBI



Margins Obtained Under Direct Visualization

DISCUSSION

Although oral cavity cancer incidence varies greatly around the globe, it is agreed that the oral cavity cancer ranks between 6th to 9th in terms of cancer incidence. In some regions like South Eastern Asia, it might signify the most popular location.[8] A patient's early diagnosis of malignant or possibly malignant oral mucosal lesions can improve the prognosis significantly. [9]

It may not be possible for, white light examination of lesion to detect all neo-angiogenic patterns that are indicative of pre-malignant and malignant transformation. Since the presence of a residual tumor may increase the risk of local recurrences, the primary objective in oncology continues to be the full excision of the cancer.[9]

The NBI video endoscopic system permits the passage of two distinct bands visible spectrum bands, which corresponds with the hemoglobin absorption peak. Filtered wavelengths amplifies anomalies in the microvascular system .[5] When green light (525 to 555 nm) penetrates deeper into the mucosa it increases clarity and gives surface vessels a brownish/black appearance. In contrast, blue light (400 to 430 nm) highlights the capillaries in superficial oral cancer.[10] Its use in biological endoscopy has been proven and can be used in defining superficial tumor extent and helping delineate resection margins.[5]The superiority of NBI over conventional visual inspection can be attributed to its capability to improve the visualization of mucosal vasculature patterns and surface irregularities, which are often associated with neoplastic lesions. By highlighting these features, NBI aids in better delineating the extent of the tumor and ensuring more precise resection margins.[10]

In our study we compared overall margins obtained through direct visualization and Narrow Band Imaging (NBI).Our study showed that margins obtained were larger when resected with Narrow Band Imaging (NBI) as compared to direct visualization and this was statistically significant..According to Hinni et al NBI wavelength effectively enhances the mucosal and submucosal vasculature, enabling accurate delineation of superficial boundaries.[11]Resection margins were first drawn at 1.5 cm in a study by Tirelli et al andthen with NBI before resection were performed. By using NBI, they were able to get 11±3mm resection enlargement which resulted in negative margins for cancer and / or dysplasia on histological analysis.[12] This is currently only published study that discusses the intra-operative use of NBI to more accurately define the superficial margin in cases of early glottic cancer.

Surgical margins were also compared in the two groups as per subsite of oral cancer . In margins of Carcinoma tongue the mean measurements obtained with Narrow Band Imaging (NBI) were higher than direct visualization though it was not statistically significant. The possible reason can be that well defined structure of the tongue enabling the margins of the tongue to be easily palpated clinically whether it is direct visualization or NBI. When there was 0.5 cm separation between the tumor cell and surgical margins in a study by Wejjers et al on clinical importance of epithelial dysplasia in surgical margins of tongue and floor of mouth squamous cell carcinoma the probability of obtaining a tumor free margin was probably higher.[13]In our study we compared overall margins under direct visualization from NBI in rest of the oral cancers which included carcinoma of the buccal mucosa and alveolus..Overall NBI helped in better delineation of

resected surgical mucosal margins than direct visualization in rest of the subsites of oral cancer . In our study posterior margins obtained were significantly larger with NBI . It is important as visibility of posterior margins is poor or difficulty to palpate posteriorly . A possible reason can be NBI enhances visualization of the mucosal surface microvasculature which is a characteristic of malignant lesions.[4]

CONCLUSION

In our study surgical mucosal margins were significantly larger with resection under NBI as compared to direct visualization especially posterior margin. In Carcinoma Tongue the overall mean of margins obtained through NBI was larger than direct visualization but was not statistically significant. Use of NBI in oral cancer resection leads to increased surgical mucosal margins and may thus in turn reduce the recurrence rates at the primary site.

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