Section: Radiation Oncology

Original Research Article

IMPAIRMENT OF ORAL SENSATIONS AND SWALLOWING DIFFICULTIES IN PATIENTS OF HEAD AND NECK CANCER TREATED WITH THREE-DIMENSIONAL CONFORMAL RADIATION THERAPY (3D-CRT) & INTENSITY MODULATED RADIATION THERAPY (IMRT).

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ABSTRACT

Background: The aim is to evaluate the impairment of oral sensations in patients treated with Three-Dimensional Conformal Radiotherapy (3DCRT) and Intensity Modulated Radiation therapy (IMRT) in head and neck cancer.

Materials and Methods: This Longitudinal Observational study will be conducted in patients receiving IMRT and 3D-CRT from July 2022 to Dec 2023 in Department of Radiation Oncology at Gandhi Medical College (GMC), Bhopal (M.P) and Jawaharlal Nehru Cancer Hospital & Research Centre (JNCH & RC) Bhopal (M.P) from July 2022 to Dec 2023.

Results: Both 3DCRT and IMRT are effective in managing head and neck cancers, IMRT offers superior outcomes in reducing dysphagia during and shortly after treatment. Both modalities ultimately achieve high rates of complete recovery, underscoring the effectiveness of modern radiotherapy approaches in managing treatment-related side effects.

Conclusion: Our findings reveal that both treatment modalities have distinct impacts on dysesthesia and dysphagia, reflecting their differing mechanisms and target precision. The results indicates that, while pretreatment dysesthesia and dysphagia grades were similar between the two groups, significant differences emerged post-treatment.

Keywords: Dysesthesia, Radiotherapy, Intensity Modulated Radiation therapy, Three-Dimensional Conformal Radiotherapy.

INTRODUCTION

Cancer, with 9.3 million deaths, is among the four major NCDs that collectively killed about 33.3 million people in 2019, with a 28% increase compared to 2000. The other major NCDs include cardiovascular disease (17.9 million) chronic respiratory disease (4.1 million), and diabetes (2.0 million).[1]

According to GLOBOCAN estimates, HNSCC accounts for 8.9 lakh new cancer cases and results in 4.5 Lac deaths annually.[2]

Radiotherapy plays a pivotal role in the management, cure, and limitation of disease in local and locally advanced head and neck cancers. Three-dimensional conformal radiotherapy (3DCRT) and intensity-modulated radiotherapy (IMRT) are established radiotherapy techniques for head and neck cancers, although they are associated with some local and systemic toxicity and adverse reactions that may be reversible or irreversible.[3] Of these two modalities of radiotherapy, IMRT shown to be associated with reduced incidence of severe mucositis, dysphagia,

xerostomia, weight loss, and the requirements for nasogastric tube.

MATERIALS AND METHODS

This Longitudinal Observational study will be conducted in patients receiving IMRT and 3D-CRT from July 2022 to Dec 2023 in Department of Radiation Oncology at Gandhi Medical College (GMC), Bhopal (M.P) and Jawaharlal Nehru Cancer Hospital & Research Centre (JNCH & RC) Bhopal (M.P) from July 2022 to Dec 2023.

Sample Size: Calculation of Sample size was done using formula N = z^2 pq/d^2.

With a prevalence of 0.02 percent sample size comes approximately 48, and including 10% non-respondent patients, final sample size was 54 patients. Total 54 was then divided into two subgroups constituted of 27 patients for each for IMRT, and 3D-CRT.

Inclusion Criteria

- Histopathologically confirmed cases of Head and Neck Carcinoma at Stage I, II, III, IV-A and IV-B (Early, and locally advanced Head and Neck cancer)
- Patient receiving Adjuvant Radiotherapy 60 Gray over 30 fractions in the span of 6weeks by 3D-CRT or IMRT with Concurrent Cisplatin weekly.
- Patients who gave consent for the study
- KPS score ≥ 80
- Patients of age group 18yr to 60yr
- Patient not received any radiotherapy or chemotherapy previously.

Exclusion Criteria

- Histopathologically confirmed cases of Head and Neck Carcinoma at Stage IV-C (Metastatic Head and Neck Cancer).
- Head, and Neck cancer patients receiving palliative Radiotherapy, or on altered fractionation or receiving radiotherapy by other modalities except 3D-CRT and IMRT.
- Chronically ill patients
- Patients who do not give consent for the study
- KPS score < 80
- Patients below 18yr age and above 60yr age
- Patients having any other comorbidities
- Patient received any radiotherapy or chemotherapy previously.
- Data compilation: - Data collected with the help of pretested proforma was compiled using Microsoft Excel 2007, and Master chart was prepared for the collected data.

RESULTS

The study included patients with a mean age of 45.1 years, with a standard deviation of 9.39 years. The median age was 45 years, with an interquartile range (IQR) of 14.5 years. The ages of the patients ranged from a minimum of 28 years to a maximum of 60 years.

The age distribution of the patients in the study shows that the largest group, representing 22.2% of the total, was aged 41 to 45 years. The next most common age groups were 51 to 55 years and 56 to 60 years, each comprising 16.7% of the patients. The 36 to 40 years age group made up 14.8%, while 46 to 50 years accounted for 13.0%. Smaller groups included those aged 31 to 35 years (9.3%) and under 30 years (7.4%).

The gender distribution of the patients in the study shows a significant majority of males, who constitute 83.3% of the total. Females represent a much smaller portion, making up only 16.6% of the patients

The majority of patients, 90.7%, were Hindus, while 9.3% were Muslims.

The majority of patients in the study, 83.3%, reside in rural areas, while the remaining 16.7% come from urban areas.

The addiction status of patients reveals that the majority, 66.7%, are addicted to tobacco. A significant portion, 20.4%, use both tobacco and bidi. Smaller groups include those addicted to bidi (5.6%), cigarette (1.9%), and gutka (1.9%). Only 3.7% of the patients reported having no addiction.

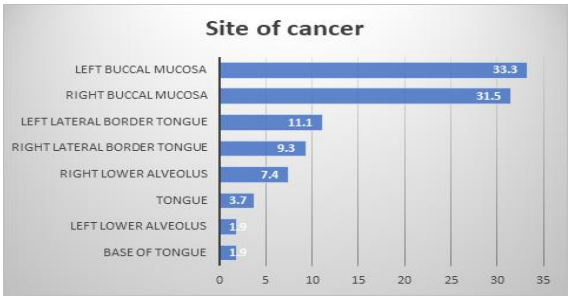

Figure 1: Distribution of patients based on Site of cancer

The site of cancer in patients shows that the most common locations are the left buccal mucosa (33.3%) and right buccal mucosa (31.5%). Other notable sites include the left lateral border of the tongue (11.1%) and right lateral border of the tongue (9.3%). Less frequent sites include the right lower alveolus (7.4%), tongue (3.7%), and both the base of the tongue and left lower alveolus, each accounting for 1.9% of the cases.

Table 1: Descriptive statistics of age of patients

Mean	45.1
Standard deviation	9.39
Median	45
IQR	14.5
Minimum	28
Maximum	60

Table 2: Distribution of patients based on TNM staging

TNM	Counts	% of Total
T1N0M0	2	3.7 %
T1N1M0	1	1.9 %
T1N2aM0	1	1.9 %
T1N2bM0	1	1.9 %
T2N0M0	13	24.1 %
T2N1M0	5	9.3 %
T2N2bM0	2	3.7 %
T2N3aM0	1	1.9 %
T2N0M0	3	5.6 %
T3N0M0	11	20.4 %
T3N1M0	5	9.3 %
T3N2aM0	1	1.9 %
T3N2bM0	1	1.9 %
T3N3bM0	1	1.9 %
T3N0M0	1	1.9 %
T4aN0M0	5	9.3 %

The distribution of patients according to TNM staging shows that the most common stage is T2N0M0, which accounts for 24.1% of the patients. This is followed by T3N0M0, representing 20.4%. Other notable stages include T2N1M0, T4aN0M0 and T3N1M0, each comprising 9.3% of the patients. Each of the following stages, T1N0M0, T2N2bM0, T2NOM0, and T2NOMO, account for 3.7% of the cases, while several other stages account for 1.9% each.

Table 3: Distribution of patients based on stage of cancer

Technique	3DCRT	IMRT	Total	χ^2 p value
STAGE I	2 (7.4 %)	0 (0.0 %)	2 (3.7 %)	8.96
STAGE II	5 (18.5 %)	11 (40.7 %)	16 (29.6 %)	0.05
STAGE III	14 (51.9 %)	9 (33.3 %)	23 (42.6 %)	
STAGE IVA	6 (22.2 %)	4 (14.8 %)	10 (18.5 %)	
STAGE IVB	0 (0.0 %)	3 (11.1 %)	3 (5.6 %)	
Total	27 (100.0 %)	27 (100.0 %)	54 (100.0 %)	

The distribution of patients based on the stage of cancer indicates that the most common stage is Stage III, comprising 42.6% of the patients. Stage II follows with 29.6%, while Stage IVA accounts for 18.5%. The least common stages are Stage IVB, representing 5.6%, and Stage I, with 3.7% of the patients.

Table 4: Distribution of patients based on histopathology

HPR	Counts	% of Total
IKSCC	8	14.8 %
ISCC	3	5.6 %
IWDKSCC	1	1.9 %
MDKSCC	2	3.7 %
MDSCC	9	16.7 %
SCC	15	27.8 %
WDKSCC	7	13.0 %
WDSCC	9	16.7 %

The most common histopathological type is SCC, accounting for 27.8% of cases. This is followed by MDSCC and WDSCC, each comprising 16.7%. The IKSCC and WDKSCC types are represented by 14.8% and 13.0% of the patients, respectively. The less common histopathological types include ISCC (5.6%) and MDKSCC (3.7%), with IWDKSCC being the least frequent at 1.9%.

Table 5: Distribution of Patients Across Age Categories by Treatment Type (3DCRT vs IMRT)

Age category in years	3DCRT	IMRT	Total
<30	1 (3.7 %)	3 (11.1 %)	4 (7.4 %)
31 TO 35	3 (11.1 %)	2 (7.4 %)	5 (9.3 %)
36 TO 40	2 (7.4 %)	6 (22.2 %)	8 (14.8 %)
41 TO 45	6 (22.2 %)	6 (22.2 %)	12 (22.2 %)
46 TO 50	4 (14.8 %)	3 (11.1 %)	7 (13.0 %)
51 TO 55	8 (29.6 %)	1 (3.7 %)	9 (16.7 %)
56 TO 60	3 (11.1 %)	6 (22.2 %)	9 (16.7 %)
Total	27 (100.0 %)	27 (100.0 %)	54 (100.0 %)

The distribution of patients across different age categories reveals that for those receiving 3DCRT, the most common age group is 51 to 55 years (29.6%), followed by 41 to 45 years (22.2%). For IMRT, the age distribution is more evenly spread, with the most common groups being 36 to 40 years,

56 to 60 years, and 41 to 45 years, each representing 22.2%. The total distribution shows a higher concentration of patients in the 41 to 45 years category (22.2%), with less frequent representation in other age groups.

Table 6: Distribution of patients by gender among those who received 3DCRT & IMRT

Technique	Female	Male	Total
3DCRT	4 (14.8 %)	23 (85.2 %)	27 (100.0 %)
IMRT	5 (18.5 %)	22 (81.5 %)	27 (100.0 %)
Total	9 (16.7 %)	45 (83.3 %)	54 (100.0 %)

The distribution of patients by gender for 3DCRT and IMRT treatments shows that 85.2% of those receiving 3DCRT are male, while 14.8% are female. For IMRT, 81.5% of patients are male and 18.5% are female. Overall, the total gender distribution is 83.3% male and 16.7% female.

Table 7: Distribution of patients by place of residence for 3DCRT and IMRT treatment group

Technique	Rural	Urban	Total	χ^2 p value
3DCRT	24 (88.9 %)	3 (11.1 %)	27 (100.0 %)	1.20
IMRT	21 (77.8 %)	6 (22.2 %)	27 (100.0 %)	0.273
Total	45 (83.3 %)	9 (16.7 %)	54 (100.0 %)	

The distribution of patients based on place of residence shows that among those receiving 3DCRT, 88.9% live in rural areas compared to 11.1% in urban areas. For IMRT, 77.8% of patients are from rural areas and 22.2% from urban areas.

Table 8: Distribution of patients by stage of cancer among those who received 3DCRT & IMRT

Technique	Stage I	Stage II	Stage III	Stage IVA	Stage IVB	Total	χ^2 p value
3DCRT	2 (7.4 %)	5 (18.5 %)	14 (51.9 %)	6 (22.2 %)	0 (0.0 %)	27 (100.0 %)	8.96
IMRT	0 (0.0 %)	11 (40.7 %)	9 (33.3 %)	4 (14.8 %)	3 (11.1 %)	27 (100.0 %)	0.05
Total	2 (3.7 %)	16 (29.6 %)	23 (42.6 %)	10 (18.5 %)	3 (5.6 %)	54 (100.0 %)	

The distribution of patients across cancer stages for 3DCRT and IMRT treatments shows a notable difference between the two techniques. For 3DCRT, the majority of patients are in Stage III (51.9%), followed by Stage IVA (22.2%), with no patients in Stage IVB. In contrast, for IMRT, Stage II is the most common (40.7%), followed by Stage III (33.3%) and Stage IVB (11.1%). Overall, Stage III is the most common stage across both treatments (42.6%), with Stage II and IVA being less frequent. The chi-square value is 8.96 with a p-value of 0.05, suggesting a significant difference in the stage distribution between the two treatment groups.

Table 9: Distribution of patients by various histopathology among those who received 3DCRT & IMRT

Technique	IKSCC	ISCC	IWDKSCC	MDKSCC	MDSCC	SCC	WDKSCC	WDSCC	Total	χ^2 p value
3DCRT	3 (11.1 %)	3 (11.1 %)	0 (0.0 %)	1 (3.7 %)	2 (7.4 %)	13 (48.1 %)	0 (0.0 %)	5 (18.5 %)	27 (100.0 %)	22.5 0.002
IMRT	5 (18.5 %)	0 (0.0 %)	1 (3.7 %)	1 (3.7 %)	7 (25.9 %)	2 (7.4 %)	7 (25.9 %)	4 (14.8 %)	27 (100.0 %)	
Total	8 (14.8 %)	3 (5.6 %)	1 (1.9 %)	2 (3.7 %)	9 (16.7 %)	15 (27.8 %)	7 (13.0 %)	9 (16.7 %)	54 (100.0 %)	

The distribution of patients across various histopathological types for 3DCRT and IMRT shows distinct patterns. For 3DCRT, SCC is the most common type (48.1%), followed by WDSCC (18.5%) and IKSCC and ISCC (each 11.1%). No cases of IWDKSCC or WDKSCC were reported in this group. For IMRT, IKSCC (18.5%) and WDSCC (14.8%) are most common, with notable representation from MDSCC and WDKSCC (both 25.9%). The total distribution indicates that SCC (27.8%) is the most frequent histopathological type across both treatments, followed by WDSCC and IKSCC (each 16.7%). The chi-square value is 22.5 with a p-value of 0.002, indicating a significant difference in histopathology distribution between the two treatment groups.

Table 10: Comparison of pretreatment Dysesthesia grades Between 3DCRT and IMRT Groups

Technique	Grade 1	Grade 2	Total	χ^2 p value
3DCRT	23 (85.2 %)	4 (14.8 %)	27 (100.0 %)	0
IMRT	23 (85.2 %)	4 (14.8 %)	27 (100.0 %)	1.00
Total	46 (85.2 %)	8 (14.8 %)	54 (100.0 %)	

The comparison of pretreatment dysesthesia grades between 3DCRT and IMRT groups shows that both treatment groups have the same distribution: 85.2% of patients are classified as Grade 1 and 14.8% as Grade 2. This distribution is consistent across both treatments. The chi-square value is 0 with a p-value of 1.00, indicating no significant difference in the pretreatment dysesthesia grades between the two treatment groups

Table 11: Comparison of posttreatment Dysesthesia grades between 3DCRT and IMRT groups at treatment completion

Technique	Grade 1	Grade 2	Grade 3	Total	χ^2 p value
3DCRT	0 (0.0 %)	16 (59.3 %)	11 (40.7 %)	27 (100.0 %)	6.83
IMRT	8 (29.6 %)	16 (59.3 %)	3 (11.1 %)	27 (100.0 %)	0.033
Total	1 (1.9 %)	39 (72.2 %)	14 (25.9 %)	54 (100.0 %)	

In the 3DCRT group, 59.3% of patients are classified as Grade 2, and 40.7% as Grade 3, with no patients in Grade 1. For the IMRT group, 59.3% of patients are also in Grade 2, but 29.6% are in Grade 1 and 11.1% in Grade 3. Overall, across both treatment groups, 72.2% of patients are in Grade 2, 25.9% in Grade 3, and 1.9% in Grade 1. The chi-square value is 6.83 with a p-value of 0.033, indicating a significant difference in posttreatment dysesthesia grades between the two treatment groups. The IMRT group shows better results, as a higher proportion of patients (29.6%) are in Grade 1, indicating less severe dysesthesia compared to the 3DCRT group, which has no patients in Grade 1 and a higher proportion in Grade 3 (40.7%).

Table 12: Comparison of posttreatment Dysesthesia grades between 3DCRT and IMRT groups at 3 months

Technique	Grade 1	Grade 2	Total	χ^2 p value
3DCRT	19 (70.4 %)	8 (29.6 %)	27 (100.0 %)	9.39
IMRT	27 (100.0 %)	0 (0.0 %)	27 (100.0 %)	0.002
Total	46 (85.2 %)	8 (14.8 %)	54 (100.0 %)	

In the 3DCRT group, 70.4% of patients are classified as Grade 1, while 29.6% are in Grade 2. For the IMRT group, all patients (100%) are in Grade 1, with no patients in Grade 2. Overall, across both treatment groups, 85.2% of patients are in Grade 1 and 14.8% are in Grade 2. The chi-square value is 9.39 with a p-value of 0.002, indicating a significant difference in posttreatment dysesthesia grades between the two treatment groups. The IMRT group shows better results, as all patients experienced less severe dysesthesia (Grade 1) compared to the 3DCRT group, which had a notable proportion of patients in Grade 2 (29.6%).

Table 13: Comparison of posttreatment Dysesthesia grades between 3DCRT and IMRT groups at 6 months

Technique	Grade 0	Grade 1	Total	χ^2 p value
3DCRT	25 (92.6 %)	2 (7.4 %)	27 (100.0 %)	2.08
IMRT	27 (100.0 %)	0 (0.0 %)	27 (100.0 %)	0.150
Total	52 (96.3 %)	2 (3.7 %)	54 (100.0 %)	

The comparison of posttreatment dysesthesia grades between 3DCRT and IMRT groups at 6 months shows that in the 3DCRT group, 92.6% of patients are classified as Grade 0, indicating no dysesthesia, while 7.4% are in Grade 1. In the IMRT group, all patients (100%) are in Grade 0. Overall, across both treatment groups, 96.3% of patients are in Grade 0, and 3.7% are in Grade 1. The chi-square value is 2.08 with a p-value of 0.150, indicating no significant difference in posttreatment dysesthesia grades between the two treatment groups at 6 months. However, the IMRT group shows slightly better results, as all patients experienced no dysesthesia (Grade 0) compared to the 3DCRT group, where a small proportion of patients (7.4%) still had mild dysesthesia (Grade 1).

Table 14: Comparison of pretreatment Dysphagia grades between 3DCRT and IMRT groups

TECHNIQUE	GRADE 1	GRADE 2	Total	χ^2 p value
3DCRT	22 (81.5 %)	5 (18.5 %)	27 (100.0 %)	0.133
IMRT	23 (85.2 %)	4 (14.8 %)	27 (100.0 %)	0.715
Total	45 (83.3 %)	9 (16.7 %)	54 (100.0 %)	

In the 3DCRT group, 81.5% of patients are classified as Grade 1, and 18.5% as Grade 2. For the IMRT group, 85.2% of patients are in Grade 1, and 14.8% are in Grade 2. Overall, across both treatment groups, 83.3% of patients are in Grade 1, and 16.7% are in Grade 2. The chi-square value is 0.133 with a p-value of 0.715, indicating no significant difference in pretreatment dysphagia grades between the two treatment groups. Both groups have a similar distribution of dysphagia grades prior to treatment.

Table 15: Comparison of posttreatment Dysphagia grades between 3DCRT and IMRT groups at treatment completion

Technique	Grade 1	Grade 2	Grade 3	Total	χ^2 p value
3DCRT	0 (0.0 %)	16 (59.3 %)	11 (40.7 %)	27 (100.0 %)	8.83
IMRT	1 (3.7 %)	24 (88.9 %)	2 (7.4 %)	27 (100.0 %)	0.012
Total	1 (1.9 %)	40 (74.1 %)	13 (24.1 %)	54 (100.0 %)	

In the 3DCRT group, 59.3% of patients are classified as Grade 2, and 40.7% as Grade 3, with no patients in Grade 1. For the IMRT group, 88.9% of patients are in Grade 2, 7.4% in Grade 3, and 3.7% in Grade 1.

Overall, across both treatment groups, 74.1% of patients are in Grade 2, 24.1% in Grade 3, and 1.9% in Grade 1. The chi-square value is 8.83 with a p-value of 0.012, indicating a significant difference in posttreatment dysphagia grades between the two treatment groups. The IMRT group shows better results, as a higher proportion of patients (3.7%) are in Grade 1 and a lower proportion (7.4%) in Grade 3, indicating less severe dysphagia compared to the 3DCRT group, which has a substantial proportion of patients in Grade 3 (40.7%).

Table 16: Comparison of posttreatment Dysphagia grades between 3DCRT and IMRT groups at 3 months

Technique	Grade 0	Grade 1	Grade 2	Grade 3	Total	χ^2 p value
3DCRT	0 (0.0 %)	16 (59.3 %)	10 (37.0 %)	1 (3.7 %)	27 (100.0 %)	11.8
IMRT	5 (18.5 %)	20 (74.1 %)	2 (7.4 %)	0 (0.0 %)	27 (100.0 %)	0.008
Total	5 (9.3 %)	36 (66.7 %)	12 (22.2 %)	1 (1.9 %)	54 (100.0 %)	

The comparison of posttreatment dysphagia grades between 3DCRT and IMRT groups at 3 months reveals notable differences. In the 3DCRT group, 59.3% of patients are classified as Grade 1, 37.0% as Grade 2, and 3.7% as Grade 3, with no patients in Grade 0. For the IMRT group, 18.5% of patients are in Grade 0, 74.1% in Grade 1, and 7.4% in Grade 2, with no patients in Grade 3. Overall, across both treatment groups, 9.3% of patients are in Grade 0, 66.7% in Grade 1, 22.2% in Grade 2, and 1.9% in Grade 3. The chi-square value is 11.8 with a p-value of 0.008, indicating a significant difference in posttreatment dysphagia grades between the two treatment groups. The IMRT group shows better outcomes, with a higher proportion of patients experiencing no dysphagia (Grade 0) and a lower proportion experiencing severe dysphagia (Grade 3), compared to the 3DCRT group

Table 17: Comparison of posttreatment Dysphagia grades between 3DCRT and IMRT groups at 6 months

Technique	Grade 0	Grade 1	Total	χ^2 p value
3DCRT	26 (96.3 %)	1 (3.7 %)	27 (100.0 %)	1.02
IMRT	27 (100.0 %)	0 (0.0 %)	27 (100.0 %)	0.313
Total	53 (98.1 %)	1 (1.9 %)	54 (100.0 %)	

The comparison of posttreatment dysphagia grades between 3DCRT and IMRT groups at 6 months indicates no significant difference between the two treatment modalities. In the 3DCRT group, 96.3% of patients are classified as Grade 0, indicating no dysphagia, and 3.7% as Grade 1. For the IMRT group, 100% of patients are in Grade 0, with no patients in Grade 1. Overall, across both treatment groups, 98.1% of patients are in Grade 0, and 1.9% in Grade 1. The chi-square value is 1.02 with a p-value of 0.313, suggesting no significant difference in posttreatment dysphagia grades between the 3DCRT and IMRT groups. Both groups show excellent outcomes, with nearly all patients experiencing no dysphagia at 6 months posttreatment.

DISCUSSION

Patients with no prior exposure to radiotherapy were selected to ensure that the observed effects were attributable IMRT and 3D-CRT rather than previous treatments. While both techniques aim to effectively target and destroy malignant cells, they differ significantly in their approach to radiation delivery and, consequently, in their impact on surrounding healthy tissues.

This study delves into the comparative analysis of two critical side effects of these treatments: dysesthesia and dysphagia. Dysesthesia, characterized by abnormal sensory perceptions such as tingling, burning, or numbness, and dysphagia, marked by difficulty in swallowing, are significant concerns for patients undergoing radiation therapy. The severity and duration of these symptoms can greatly influence the patient's overall quality of life, nutritional status, and functional ability.

Demographic variable- Age

Our study's age distribution reveals a mean age of 45.1 ± 9.39 years for patients with head and neck cancer, with a median of 45 years. The largest age group in our study was 41 to 45 years (22.2%), followed by the 51 to 55 years and 56 to 60 years age groups (16.7% each). observed a mean age of 53.03 years, which is significantly higher than our study's mean age of 45.1 years Michaelraj et al.[4]

Gender

In our study, the gender distribution shows a notable male predominance, with males constituting 83.3% of the total patient population and females making up only 16.6%. This finding aligns with broader trends reported in the literature.

Rich Chauhan et al. reported a much higher male-to-female ratio of 8.43:1, with males making up 89.4% of their cohort and females only 10.6%.[5] This indicates a strong male predominance, which is consistent with established patterns in head and neck cancer, where males are significantly more affected than females.

Bashir A et al (2020) also observed male predominance for head and neck cancers, about 83.8% patients were males whereas only 16.2% cases were females.[6]

The pronounced male predominance in head and neck cancers is often attributed to higher rates of tobacco use, alcohol consumption, and exposure to other risk factors among males. Our study's gender

distribution supports this, as men are more likely to engage in these high-risk behaviors.

Site of cancer

Our study reveals a significant prevalence of cancers located in the buccal mucosa, with 33.3% on the left and 31.5% on the right. This high incidence aligns with the findings of Müller von der Grün J (2018), which also identified the oral cavity as a predominant site for head and neck cancers.[7]

In our study, while the buccal mucosa was a major site, the overall distribution of cancer sites differed, with the left and right lateral borders of the tongue being less prevalent (11.1% and 9.3%, respectively). This suggests regional variations in cancer site distribution, which could be influenced by local risk factors or demographic characteristics.

Overall, the high incidence of buccal mucosa cancers in our study underscores the importance of considering regional differences when analyzing cancer site distribution. These variations suggest that tailored screening and preventive measures are necessary to address the specific cancer burden in different populations.

Stage of cancer & histopathology

Our study reveals that Stage III is the most common stage of cancer among the patients, representing 42.6%, followed by Stage II at 29.6%. In contrast, Stage IVA and Stage IVB constitute 18.5% and 5.6%, respectively, with Stage I being the least common at 3.7%. These findings suggest that a significant proportion of patients present with locally advanced stages of head and neck cancer.

The high incidence of Stage III cancers in our study is consistent with the general trend observed in the literature, where locally advanced stages are predominant. For instance, Bashir A et al. (2020) reported that 57.2% of patients were diagnosed with Stage IV cancers, while Baxi SS et al. (2018) found over 80% of cases were Stage IV.[6,8] This similarity highlights a common challenge in managing head and neck cancers, which frequently present at advanced stages, complicating treatment and potentially impacting prognosis.

Overall, the advanced stages of cancer at diagnosis and the high prevalence of SCC observed in our study reflect broader patterns seen in similar research. These findings emphasize the need for improved early detection and preventive measures to address the high incidence of advanced stage cancers and to tailor treatment strategies for the most common histopathological types.

Distribution across IMRT group & 3DCRT group

The age distribution of patients receiving 3DCRT and IMRT reflects distinct treatment patterns and possible age-related treatment preferences or constraints. For 3DCRT, the predominant age group is 51 to 55 years (29.6%), suggesting that this older cohort may be more commonly treated with 3DCRT due to its potential benefits or limitations in older patients. On the other hand, IMRT is more evenly distributed across various age groups, indicating its broader applicability or flexibility in managing different patient profiles. This variation might be influenced by the specific characteristics of each treatment modality and how they align with the age-related health conditions or preferences of patients.

The cancer stage distribution reveals a noteworthy difference between treatment modalities. 3DCRT is predominantly used for Stage III cancers (51.9%), while IMRT is more frequently used for Stage II cancers (40.7%). This might reflect differences in treatment indications or preferences, with 3DCRT potentially being reserved for more advanced stages or specific cases where its characteristics are beneficial. The significant variation in stage distribution (chi-square value of 8.96, p-value of 0.05) suggests that treatment choice may be influenced by the stage of the cancer, possibly due to differences in efficacy or suitability of the treatments for various stages.

Comparison of dysesthesia across IMRT group and 3DCRT group

In our study, the comparison of pretreatment dysesthesia grades between the 3DCRT and IMRT groups reveals no significant differences, with both groups showing similar distributions: 85.2% of patients in Grade 1 and 14.8% in Grade 2. The chi-square value of 0 with a p-value of 1.00 indicates that pretreatment dysesthesia severity is comparable across both treatment modalities, suggesting that the choice of treatment is not influenced by pre-existing dysesthesia severity.

Significant differences become evident in posttreatment dysesthesia grades at the end of treatment. In the 3DCRT group, 59.3% of patients are in Grade 2, and 40.7% in Grade 3, with no patients in Grade 1. In contrast, the IMRT group shows a more favorable outcome, with 29.6% of patients in Grade 1, 59.3% in Grade 2, and 11.1% in Grade 3. The chi-square value of 6.83 with a p-value of 0.033 indicates a significant difference, highlighting that IMRT is associated with a higher proportion of patients experiencing less severe dysesthesia (Grade 1) compared to the 3DCRT group.

Comparison of dysphagia among IMRT group and 3DCRT group

The comparison of pretreatment dysphagia grades between 3DCRT and IMRT groups shows minimal differences. Both treatment groups exhibit similar distributions, with the majority of patients categorized as Grade 1 (83.3% overall). The chi-square value of 0.133 with a p-value of 0.715 indicates no significant difference in pretreatment dysphagia grades. In contrast, the posttreatment dysphagia grades reveal significant differences between the two groups. At the end of treatment, the 3DCRT group shows a higher proportion of patients in Grade 2 (59.3%) and Grade 3 (40.7%), with no patients in Grade 1. The IMRT group, however, has a higher proportion of patients in Grade 1 (3.7%) and a lower proportion in Grade 3 (7.4%), with the majority in Grade 2 (88.9%). The chi-square value of 8.83 with a p-value of 0.012 indicates a significant difference.

Overall, these results suggest that while both 3DCRT and IMRT are effective in managing head and neck cancers, IMRT offers superior outcomes in reducing dysphagia during and shortly after treatment. Both modalities ultimately achieve high rates of complete recovery, underscoring the effectiveness of modern radiotherapy approaches in managing treatment-related side effects.

CONCLUSION

Our findings reveal that both treatment modalities have distinct impacts on dysesthesia and dysphagia, reflecting their differing mechanisms and target precision. The results indicates that, while pretreatment dysesthesia and dysphagia grades were similar between the two groups, significant differences emerged post-treatment.

Overall while IMRT shows better outcomes in the short to medium term, both IMRT and 3DCRT are effective in reducing dysphagia and dysesthesia over time. Future research should focus on optimizing treatment protocols and exploring personalized approaches to further enhance patient quality of life.

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