

Original Research Article

Hearing loss in patients with head and neck cancer post chemoradiotherapy

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ABSTRACT

Background: The aim of the study was to study incidence of sensorineural hearing loss (SNHL) and conductive hearing loss (CHL) in patients receiving chemoradiation for head and neck malignancies and to ascertain the pattern of hearing loss in different frequencies.

Methods: The present study was conducted on 100 patients of histopathologically proven head and neck malignancy admitted in Department of Otorhinolaryngology and head and neck surgery, SMGS Hospital, GMC Jammu during a time period of July 2017 to June 2019. Inclusion criteria for our study were patients with primary site of malignancy at nasal cavity, nasopharynx, oral cavity, oropharynx, larynx, hypopharynx and salivary glands undergoing chemoradiotherapy. Hearing loss was calculated with reference to the pre-treatment hearing threshold. A decrease of >20 dB in single frequency or >10 dB in two or more consecutive frequency was considered significant.

Results: In the study, 65 patients (65%) developed sensorineural hearing loss and 22 patient (22%) developed conductive hearing loss during course of treatment. However, 7 patients (7%) developed a mixed type hearing loss during course of treatment.

Conclusions: Although chemo radiation affects all the frequencies significantly but SNHL is markedly seen in higher frequencies. Conductive hearing loss is also a common adverse event after radiotherapy to the upper head and neck area.

Keywords: Chemoradiation, Hearing loss, Cancer, SNHL, CHL

INTRODUCTION

Head and neck malignancies (including thyroid lesions) is the sixth most prevalent type of cancers across the globe, while it is the commonest malignancy in the Indian subcontinent.

The treatment modalities include surgery, chemotherapy and radiotherapy; singly or in combination. Among other factors, the choice of treatment depends on the size and location of tumour, disease stage, the patient's condition and above all, the aim of treatment (i.e., curative or palliative).¹

In locally advanced inoperable head and neck malignancies, addition of chemotherapy and radiotherapy has drastically improved the survival rate of patient in addition to preservation of organ. Irradiation of head and neck tumours is being increasingly used and usually involves the region of temporal bone in case of 1% tumours of cervical metastases.¹ Radiotherapy refers to treatment of cancers and occasional some non-cancerous tumours by means of ionising radiation, which destroys the cancerous cells but the normal cells also suffers a short term or sometimes long term damage. As the benefits outweigh the risk, radiotherapy has been used as a single modality of treatment for head and neck cancers now a days. These patients who receive radiotherapy in and around acoustic structures are extremely high risk of

developing hearing loss which is frequently overlooked. Cochlea hair cell death and acoustic nerve damage is implicated to be responsible for radiation induced sensory neural hearing loss which is an unpleasant unavoidable consequence of radiotherapy for head and neck cancers.

Similarly, effects of radiation on middle ear includes otitis media due to transient Eustachian tube dysfunction leading to conduction hearing loss. Eustachian tube (ET) dysfunction and otitis media (OM) are known side effects of RT among head and neck cancer patients, characterized by earache, chronic purulent secretion, tinnitus, hearing loss and a significant reduction in quality of life.²

The objective of present study is to study incidence of sensorineural hearing loss (SNHL) and conductive hearing loss (CHL) in patients receiving chemoradiation for head and neck malignancies and to ascertain the pattern of hearing loss in different frequencies.

METHODS

The present prospective study, after approval from institutional ethics committee, was conducted on 100 patients of histopathologically proven head and neck malignancy admitted in department of otolaryngology and head and neck surgery, SMGS hospital, GMC Jammu during a time period of July 2017 to June 2019.

Inclusion criteria for our study were patients with primary site of malignancy at nasal cavity, nasopharynx, oral cavity, oropharynx, larynx, hypopharynx and salivary glands undergoing external beam radiotherapy.

Exclusion criteria were patients on palliative radiotherapy, patients who underwent surgery for primary cancer, patients with pre-existing external, middle or inner ear pathology, patients suffering from hypertension and / or diabetes and patients at risk of developing noise induced hearing loss due to occupation.

All patients on admission were subjected to relevant clinical history, general physical examination including neck examination and indirect laryngoscopy. Indirect laryngoscopy findings were confirmed with flexible laryngoscopy. All patients were subjected to routine laboratory investigations, X-ray chest, ultrasound abdomen, CECT neck and Biopsy of the lesion. Malignancies were then staged as per TNM staging system.

A baseline otologic and otoneurologic examination was done before starting the chemo radiotherapy, at the end of treatment, and on follow up at 1st and 3rd month after treatment completion. A pure tone audiogram (PTA) was also done before starting the chemo radiotherapy, at the end of treatment, and on follow up at 1st and 3rd month after treatment completion. Hearing loss was calculated with reference to the pre-treatment hearing threshold. A

decrease of >20 dB in single frequency or >10 dB in two or more consecutive frequency was considered significant. (ASHA guideline)

All patients received a total dose of 60-70 Gy of external beam radiotherapy for 7 weeks. Concomitant chemotherapy using cisplatin (30 mg/m² weekly) with paclitaxel (50-80 mg/m² weekly) and 5-fluoro uracil (10 mg/kg weekly) was given. Statistical analysis was done using software SPSS 17.0 (p<0.05 = significant).

RESULTS

The study population included total of 100 out of which 79 include men and 21 include women and population age ranged from 30 to 70 years (Figure 1).

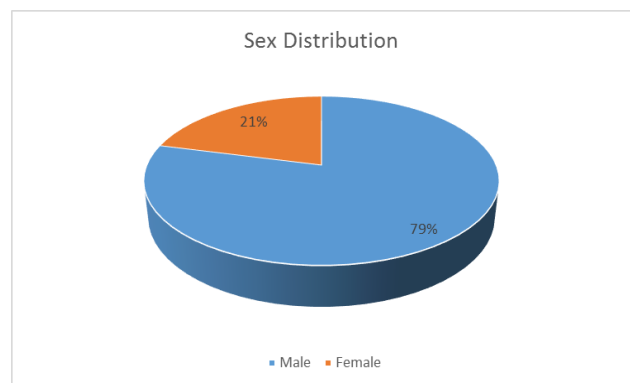


Figure 1: Sex distribution.

In our study, mean age of presentation was 64.2 years, with majority of patients in the age group of 61-70 years. (Figure 2).

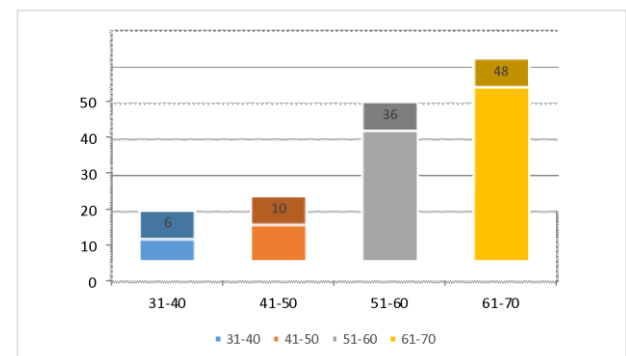


Figure 2: Age-wise distribution of patients.

In our study, most common site involved was larynx (72%), followed by hypopharynx in 15%, tonsillar fossa was involved in 6% and Base of tongue was involved in 3%, while in 4% patients no primary site could be traced and were treated as occult primaries (Table 1).

In our study, 43% of patients complained of hearing impairment, 21% complained of aural fullness, while 22% patients complained of both hearing impairment and

aural fullness. 14% patients complained of hearing impairment with tinnitus (Table 2).

Table 1: Site wise distribution of malignancies (n=100).

Site	Number of patients	Percentage (%)
Base of tongue	3	3
Tonsillar fossa	6	6
Larynx	72	72
Hypopharynx	15	15
Occult primaries	4	4

Table 2: Patient presentation (n=100).

Symptoms	Number of patients	Percentage (%)
Hearing impairment	43	43
Aural fullness	21	21
Hearing impairment and tinnitus	14	14
Hearing impairment and aural fullness	22	22

Table 3: Number of patients with SNHL observed at different follow up periods of time at different frequencies.

SNHL (In kHz)	Completion			First month			3 rd month	
	2	4	8	2	4	8	2	4
Number of patients	7	14	25	15	23	27	11	24
Percentage (%)	7	14	25	15	23	27	11	24

Table 4: Hearing threshold (dB) observed on different follow up periods at different frequencies.

Variables	Hearing threshold at 500 Hz	Hearing threshold at 1000 Hz	Hearing threshold at 2000 Hz	Hearing threshold at 4000 Hz	Hearing threshold at 8000 Hz
Pre-treatment	15.3±5	15.5±6	14.6±5	17.1±6	17.9±5
Completion	26±5	24±5	27.3±5	24.8±5	23.3±6
1 month	26.1±5	27.9±5	29.7±5	27.6±5	29.7±5
3 months	29±6	29.6±6	33.3±6	37±6	38.8±5

Table 5: Number of patients with CHL observed at different follow up periods of time at different frequencies.

Type of tympanogram	Completion	1 month	3 rd month
A	5	14	16
B	11	6	3
C	6	2	3

DISCUSSION

Even though hearing loss after chemoradiotherapy of upper head and neck cancer is well known between clinicians, it is not well documented. The reason might be

In the study, 65 patients (65%) developed sensorineural hearing loss and 22 patient (22%) developed conductive hearing loss during course of treatment. However, 7 patients (7%) developed a mixed type hearing loss during course of treatment.

At 2 kHz, SNHL was observed in 7% of patients which at the completion of treatment rose to 15% and 11% respectively at 1 and 3 months follow up period. Similarly, at 4 kHz, the SNHL which was 14% at the completion of treatment showed linear increase to 23 and 24% at 1 and 3 months follow up period respectively. At 8 kHz, SNHL which was seen in 25% of patients at the completion of treatment saw an initial surge at first month follow up period (15%) dropped to 11% at third month follow up (Table 3).

In our study, average hearing loss at 500 Hz was 13.7 dB, at 1kHz was 14.1 dB, at 2kHz was 18.7 dB, at 4kHz was 19.9 dB and at 8 kHz was 20.9 dB (Table 4).

At completion of treatment, conductive hearing loss was observed in 22% patients which dropped down to 9% after 1 month of radiotherapy and further down to 3% after 3 months of radiotherapy treatment which was evidenced by Type B or Type C tympanogram and otoscopic findings (Table 5).

that follow-up visits have primarily focused on relapse detection and not side effects of the treatment.

However, in parallel with better cancer survival, there has been an increased interest in morbidity and late side effects. Chemoradiation is associated with varying types

and degree of hearing loss. We conducted this study to evaluate audiological effects of chemoradiation.

In our study of 100 patients, 79% were males, while females were 21% with majority in 61-70 years age group. Site wise distribution of lesions showed that maximum number of patients (72%) had laryngeal carcinoma, which was followed by hypopharyngeal carcinoma in 15%, oropharyngeal carcinoma in 9% patients and occult primary in 4% patients. Similar observations were made by Bhagat et al.² and Pandey et al. with the predominance of laryngeal cancer and oral cavity and oropharynx cancer in their respective studies.

In our study, maximum number of patients (43%) complained of hearing impairment, 21% complained of aural fullness, while 22% patients complained of both hearing impairment and aural fullness. 14% patients complained of hearing impairment with tinnitus. Chen et al.⁴ in their study found hearing alteration as complaint in 33% patients.

In our study, most of patients (65%) developed sensorineural hearing loss, followed by conductive hearing loss in 22% of patients during course of treatment. Few patients (7%) among both these groups developed a mixed type hearing loss during course of treatment. Chen et al, reported SNHL in 43% of patients.⁴ Goel et al, observed SNHL in 43.3% and mixed hearing loss in 16% of patients at 6 months follow up.⁵ Higher prevalence in our study could be attributed to old conventional method of radiotherapy (cobalt-60) at our centre that is associated with significant unwanted radiation exposure of the inner ear.

We observed that at 2 kHz SNHL was present in 7% of patients which at the completion of treatment rose to 15% and 11% respectively at 1 and 3 months follow up period. Similarly, at 4 kHz, the SNHL which was 14% at the completion of treatment showed linear increase to 23 and 24% at 1 and 3 months follow up period respectively. At 8 kHz, SNHL which was seen in 25% of patients at the completion of treatment saw an initial surge at first month follow up period (15%) dropped to 11% at third month follow up. However, Jain A et al, in their study observed that at the end of 4 months, 72.5% patients had SNHL at 4 kHz and 82.5% of patients had SNHL at 8 kHz frequencies respectively.⁶

The average hearing loss in our study was maximum at 8 kHz (20.9 dB) followed by 4 kHz (19.9 dB). Goel et al, in a prospective study observed that the average hearing loss ranged between 5 and 15 dB and the frequency range commonly affected was 4000-8000 Hz.⁵

In our study, at completion of treatment, conductive hearing loss was observed in 17% patients. Conductive hearing loss could be due to otitis media with effusion and ET dysfunction as a result of injury to the ET tube ciliated epithelium, tubal swelling, and fibrosis that

blocks the lumen. OME usually occurs within a few weeks and causes transient hearing loss. The number of patients dropped down to 8% after 1-month post radiotherapy and further down to 6% after 3 months post radiotherapy treatment as evidenced by Type B or Type C tympanogram and otoscopic findings. Bhandare et al, reported OME in 11.5% of patients in their series.³ Jain A et al, in the present study of 100 patients, conductive hearing loss was present in 40 patients (17.5%) at the end of 4 months of follow up.⁶

CONCLUSION

Concerns for quality of life of patients undergoing cancer treatment is growing and determination of hearing loss should form part of it. Among the patients with head and neck cancer, much has been said about quality of life, but only a few studies have dealt with hearing loss and limitations and difficulties encountered because of it. Although chemo radiation affects all the frequencies significantly but SNHL is markedly seen in higher frequencies. OME is seemingly a common adverse event after radiotherapy to the upper head and neck area leading to conductive hearing loss. Further investigations are needed to characterize the sensorineural hearing loss into cochlear and retro-cochlear varieties.

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Conflict of interest: None declared

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

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