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## RESEARCH ARTICLE

# EFFECT OF EXERCISES ON SWALLOWING AND NECK DYSFUNCTION POST RADIOTHERAPY/CHEMOTHERAPY IN HEAD AND NECK CANCER PATIENTS

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### ABSTRACT

**Background:** Head and neck patients experience treatment-related complications that may interfere with health related quality of life. Cancers of head and neck include malignant tumors of the buccal cavity, larynx, pharynx, thyroid, salivary glands, and nose/nasal passages. Swallowing and neck disability, impaired neck movements, and, eating, or swallowing contribute to decrements in functional status of an individual.

**Materials and Methods:** The purpose of this study was to study the effect of swallowing and neck exercises on 40 outpatients after a course of radiotherapy (RT) /chemo-radiotherapy (CXRT) for cancers of Head and Neck. Data was collected in follow up cases from 0 week to 3 week, 3 week to 6 week post RT/CXRT patients using GUSS (Gugging Swallowing Screen), NDI (Neck Disability Index). In this for swallowing home exercise of tongue are taught to the patients and for neck disability isometrics of neck and neck range of motion exercises are taught to patients.

**Results and Conclusion:** The mean age of the patients was  $58 \pm 14$  years, in which 35 (85%) were males. The mean NDI score decreased significantly over the next 6 weeks while mean GUSS scores increased significantly over the same time period suggesting improvement in both neck and swallowing dysfunction with our intervention. Significant effect of exercises was seen with NDI scale, wilks Lambda = .578,  $F(2, 38) = 13.89$ ,  $p < 0.0001$ . Similarly, significant effect of exercises was seen with GUSS scale, wilks Lambda = .212,  $F(2, 38) = 70.83$ ,  $p < 0.0001$ . To conclude, the physical therapy plays an essential role in restoring function of the neck and swallowing in patients treated with chemo radiotherapy.

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## INTRODUCTION

Head and neck cancers usually begin in the squamous cells that line the moist, mucosal surfaces inside the head and neck. Head and neck cancer patients experience treatment-related complications that may interfere with health related quality of life.<sup>1</sup> Cancers of head and neck include malignant tumors of the buccal cavity, larynx, pharynx, thyroid, salivary glands, and nose/nasal passages<sup>2</sup>. In India, Head and Neck cancer accounts for approximately 30% of all cancers and is important disease in terms of incidence and mortality.<sup>3</sup> Based on the GLOBOCAN 2008 estimates, about 12.7 million cancer cases and 7.6 million cancer deaths are estimated to have occurred in 2008; of these, 56% of the cases and 64% of the deaths occurred in the economically developing world<sup>4</sup>.

Shoulder and neck disability, impaired neck function, and difficulty with breathing, eating, or speaking contribute to

decrements in health related quality of life (HRQOL). Fatigue and depression lead to physical inactivity in Head and Neck Cancer patients. All these factors together, impair their functioning capacity and quality of life.<sup>5</sup>

A Comprehensive Review of Head and Neck Cancer Rehabilitation with physical therapy perspective has been done. The role of physiotherapy in the cancer rehabilitation is less understood and particularly in the head and neck cancer (HNC) patients. This results in various residual deformities and dysfunctions for the patients with HNC. The fact that cancer patients are facing several months of chemotherapy and/or radiotherapy and usually major surgery, as well as the direct effect of immobility due to pain, means that muscle wasting, joint stiffness, as well as de-conditioning and fatigue are inevitable. Management of cancer appropriately focuses on prevention, early diagnosis, and cure, but following effective treatment, most cancer patients experience some physical

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impairment that results in a physical disability or a handicap. As the prognosis for most types of cancers improves, it becomes more important to ensure that all cancer patients regain maximum function in the broadest sense to ensure return to all former roles. Multidisciplinary rehabilitation, therefore, is an integral part of the total management of the cancer patient. The exact functional deficits need to be identified for each patient and proper rehabilitation interventions should started promptly or at the same time as other treatments.<sup>6</sup>

*Aim of this study is to describe effects of exercise on*

- Swallowing impairment
- Impaired neck functions
- Objective of the study
- To assess effect of swallowing exercises on swallowing dysfunction using GUSS.
- To assess effect of neck exercises on neck dysfunction using NDI.

## MATERIALS AND METHODOLOGY

The study was experimental in nature. Forty patients with head and neck cancer were recruited in the study. Informed consent was obtained from each patient before enrolment. The study included Post Radiotherapy/ Chemo-radiotherapy. The Forty individuals who participated in the study were recruited from out-patients from the Radiotherapy department at Christian Medical College and Hospital, Ludhiana who met the study criteria and had even medical unit numbers. The duration of study was 6 months.

### Inclusion criteria

- Not below 19 years of age; Should be 1 month post radiotherapy / chemo-radiotherapy;
- Should be disease free

### Exclusion Criteria

- Without chemotherapy/radiotherapy;
- Impaired shoulder and neck function due to prior disease or surgery;
- Any metastatic tumour;
- On Nasogastric Tubing;
- With neck dissection.

NDI<sup>7</sup> and GUSS Scale<sup>8</sup> were used to assess the neck and swallowing dysfunction. Home exercise program including swallowing exercise<sup>9</sup>, breathing, isometrics of neck and neck range of motion exercises were taught to the patient. Patients were assessed at 0 week, 3 week and 6 week.<sup>10</sup>

### Statistical Analysis

Descriptive statistics were performed to determine the mean and standard deviation for demographic data. Paired t-test was used to assess the effect of swallowing exercises on swallowing

dysfunction using GUSS and to assess effect of neck exercises on neck dysfunction using NDI from 0 week to 3 weeks, 0 to 6 weeks and 3 weeks to 6 weeks. Repeated measured ANOVA was performed on baseline, 3-weeks and 6-week data. All data were analyzed using IBM SPSS version 21.0 (IBM, Armonk, NY, USA). All analyses were two-tailed, and a difference was considered to be statistically significant if the p value was less than or equal to 0.05.

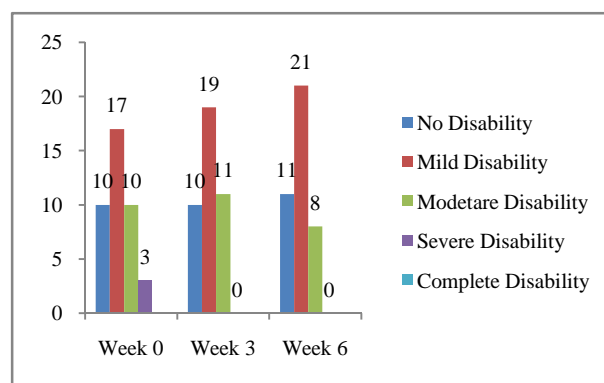
## RESULTS

A total of 40 patients were included in the study of which 35 (85%) were males. The mean age was 58 ± 14 (21-80) years and the median age was 60 years. Of the 40 patients, 15(37.5%) received radiotherapy and 25 (62.5%) received chemo-radiotherapy. Table 1 describes the baseline characteristics of our patient cohort. Using the NDI scale, at 0 week 17(42.5%) patients had mild disability, followed by moderate and no disability {10 {25%}} each.

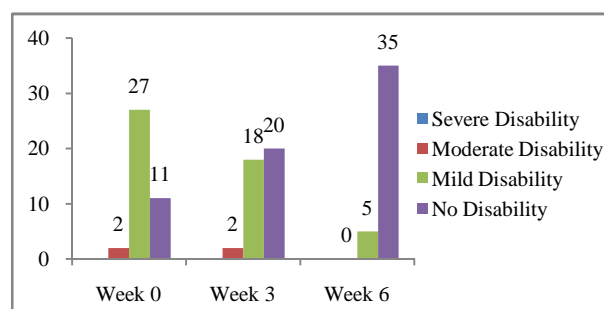
**Table 1** Baseline characteristics of patients

Demographics	N = 40
Mean ± SD age in years	58 ± 14 (21-80)
Median age in years	60
Gender, n%	
Male	35 (85%)
Females	5(15%)
Treatment	
Radiotherapy	15 (37.5%)
Chemo-radiotherapy	25 (62.5%)

Figure 1 shows the progress of patients at 0 week, 3 weeks and 6 weeks for NDI patients. Using the GUSS scale, 27 (67.5%) of the patients had mild eating and speaking disability, followed by no disability {11 (27.5%)} and moderate disability {2 (5%)}.<sup>10</sup>



**Figure 1** NDI scale at 0 week, 3 weeks and 6 weeks



**Figure 2** GUSS scale at 0 week, 3 weeks and 6 weeks

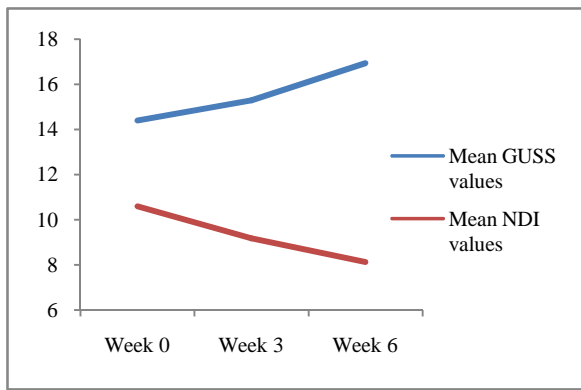


Figure 3 Mean GUSS and NDI values

Table 2 Descriptive statistics of patient reported outcome

Patient-Reported Outcomes	Mean ± SD
<b>GUSS</b>	
0 WEEK	14.4 ± 2.11
3 WEEK	15.28 ± 2.34
6 Week	16.93 ± 1.72
<b>NDI</b>	
0WEEK	10.6 ± 8.35
3 WEEK	9.18 ± 7.03
6 WEEK	8.13 ± 7.08

Twenty seven (67.5%) patients were reported mild disability at 0 week. At the end of week 6, 5(12.5%) patients had mild disability and 35 (87.5%) patients had no disability with the GUSS scale (fig. 2). Figure 3 shows the improvement in the head and neck cancer patients at week 6 with the lower mean NDI values and higher mean GUSS values. Table 2 explains the patient outcomes. With the GUSS scale, there was significant improvement in head and neck cancer patients from 0 to 3 weeks ( $p = 0.001$ ), from 0 week to 6 weeks ( $p < 0.0001$ ) and from 3 weeks to 6 weeks ( $p < 0.0001$ ). Similarly for NDI scale, there was significant improvement in head and neck cancer patients from 0 week to 6 weeks ( $p = .002$ ) and from 3 weeks to 6 weeks ( $p < 0.0001$ ). There was no significant improvement seen from 0 to 3 weeks for NDI scale ( $p = 0.056$ ). Due to the mean of the two treatment time intervals ( 0 week to 3 weeks, 3 weeks to 6 weeks and 0 week to 6 weeks) and the direction of the t-value, there was no statistical significant improvement seen after the exercises from mean  $10.60 \pm 8.35$  to mean  $9.18 \pm 7.03$  ( $p = 0.056$ ) from 0 week to 3 weeks. Statistical significant improvement was seen for the rest of the time intervals (Table 3).

Table 3 Paired t-TEST for NDI and GUSS

NDI		
	Mean change ± SD	P value
0 WEEK to 3 WEEK	-1.43 ± 4.57	0.056
0 WEEK to 6 WEEK	-2.46 ± 4.69	0.002
3 WEEK to 6 WEEK	-1.05 ± 1.38	<.0001
GUSS		
	Mean change ± SD	P value
0 WEEK to 3 WEEK	0.88 ± 1.62	0.001
0 WEEK to 6 WEEK	2.53 ± 1.50	<0.0001
3 WEEK to 6 WEEK	1.65 ± 1.21	<0.0001

The mean NDI score decreased significantly over the next 6 weeks while mean GUSS scores increased significantly over the same time period suggesting improvement in both neck and swallowing dysfunction with our intervention.

A one-way repeated measures ANOVA was conducted to compare the effects of exercises on head and neck cancer patients using NDI and GUSS scale at 0 week, 3 weeks and 6 weeks of the treatment. Significant effect of exercises was seen with NDI scale, wilks Lambda = .578,  $F(2, 38) = 13.89$ ,  $p < 0.0001$ . Similarly, significant effect of exercises was seen with GUSS scale, wilks Lambda = .212,  $F(2, 38) = 70.83$ ,  $p < 0.0001$  (Table 4).

Table 4 Repeated Measure analysis of variance (ANOVA)

	Wilk's Lambda value	F-value	p-value
<b>NDI</b>	.578	13.89	<.0001
<b>GUSS</b>	.212	70.83	<.0001

## DISCUSSION

The purpose of this experimental study was to explore the effect of exercises on swallowing and neck dysfunction in 40 outpatients after a course of radiotherapy/chemo-RT for cancers of Head and Neck. Data was collected in follow up cases from 0 Week, 3 week and 6 week post RT/CXRT patients. Patients completed measures that assessed functional status; Gugging Swallowing Screen (GUSS) and Neck Disability Index (NDI). The Result indicated overall increased levels of physical and functional status.

In the current study more men (85%) were included. The mean age in our study was relatively old around 58 years in comparison with others valid studies where the mean age of the patients ranged from 21-80 years. The result indicated over all increased levels of swallowing and neck functional status in head and neck specific concerns. The normality of the total score of NDI and the completeness of item responses were similar in other studies. In the case of HNC, only a few clinical trials have been performed, and the need for empirical research on the relative safety and efficacy of exercise in this population is long overdue. Similar studies are being carried out by various authors on studying the effect of rehabilitation in Head and Neck Cancer patients. A clinical trial in 2015 is done to evaluate the potential benefit of an individualized resistance exercise-training program during radiotherapy for patients with locally advanced head and neck cancer Undergoing Organ-Preserving Definitive Therapy. Lean body mass and Upper and lower body strength will be analyzed at baseline, 3, 5, and 7-weeks (representing the last week of cancer treatment and end of on-site RET), 11-weeks (first clinic follow-up) and 14-weeks (second clinic follow-up and end of home-based RET program) for patients on both arms of the study.<sup>1</sup> Another research is being conducted in 2013 which is first RCT to examine the effect of exercise on functional capacity in patients with HNC undergoing CRT.<sup>1</sup> Furthermore, a 2013 publication also examined a randomized controlled trial (RCT) including 48 HNC patients undergoing concomitant CRT. The 24 HNC patients randomized to the intervention group followed a six-week supervised walking and active exercise training program, while the 24 control patients only received advice to remain as physically active as possible over the course of treatment. The preliminary findings support the safety and efficacy of supervised exercise to improve functional capacity and quality of life (mental component score) among HNC patients undergoing CRT<sup>13</sup>. In addition a 2012 research hypothesized that patients who are randomized to the 12-week lifestyle

intervention at treatment start will experience improved symptom management throughout treatment compared to controls (delayed intervention) as evaluated by: a) decreased loss of lean body mass, improved physical functioning and fitness outcomes, improved Kanofsky Performance scores and decreased levels of serum inflammatory markers. b) Improved patient sense of wellbeing and feelings of control and therefore overall reported QoL.<sup>5</sup>

The absence of exercise intervention would be detrimental to patient care and the ability of the patient/family to cope with the effects of the disease or its treatment on their functional capacity and quality of life. Following any treatment for HNC, physical therapy may play an essential role in preventing various complications and helping patients to mitigate impairments, and restoring function of the swallowing and neck.

Hence, based on the positive findings of our study, future research directions include improving health related quality of life by determining the optimal type and intensity of exercise for HNC patients.

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