

RESEARCH ARTICLE

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To Compare the Effect of Swallowing and Non-Swallowing Exercises on Dysphagia in Post Operative Oral Cancer Individuals: A Comparative Study

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Abstract

Primary Objective: To find out the effect of Swallowing and Non-Swallowing Exercises on Dysphagia in Post-Operative Oral Cancer individuals. **Secondary Objective:** To compare the effect of Swallowing and Non-Swallowing Exercises on Dysphagia on Quality of Life in Post-Operative Oral Cancer individuals. **Methods:** The study was conducted in Krishna Hospital Karad where 66 participants with post-operative oral cancer were selected according to the inclusion criteria. Simple random sampling was used to allocate the subjects into Group A (n=33) (non-swallowing exercises) & Group B (n=33) (swallowing exercises). The subjects performed respective exercises for 5 weeks. Pre & post assessment was performed by the outcome measures. **Results:** Using paired t test both the Groups demonstrated significant results with all the outcome measures MWST with $p < 0.0001$, MDADI with $p < 0.0001$ and FACT H&N with $p < 0.0001$ respectively concluding extremely significant results. Unpaired t test analysis for MWST, MDADI & FACT H&N of group A showed extremely significant mean difference as compare to group B with $p < 0.0001$. **Conclusion:** This study concluded that both swallowing and non-swallowing exercises are beneficial for dysphagia in post-operative oral cancer individuals, but the Non-Swallowing Exercises were more effective.

Keywords: Oral cancer- dysphagia- swallowing and non-swallowing exercises

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Introduction

Cancer is a group of diseases which involves abnormal cell growth with the potential to invade or spread to other parts of the body [1]. Cancer is classified according to the type of tumour cell and the origin of the tumour cells. It is classified as:

- i. Carcinoma: It arises from the epithelial cells. E.g. Breast, prostate, lung, colon and pancreas.
- ii. Sarcoma: It arises from the connective tissues. E.g. bone, cartilage, fat, nerve, bone marrow.
- iii. Blastoma: It is formed from precursor cells or from the embryonic tissue cells [2].

Cancers are the most common cause of death in adults [3]. Oral cancer is commonly found on the lip, floor of the mouth, cheek lining, gingiva, palate or in the tongue. In India, one among three prevalent cancer is oral cancer [4]. The incidence of oral cancer is highest in India, south and Southeast Asian countries and in India around 90 -95% of the populations are diagnosed with the oral cancers is (squamous cell carcinoma) [5]. Severe alcoholism, use of tobacco like cigarettes, smokeless tobacco, betel nut chewing and human papilloma virus (HPV) and due to poor dental care and poor diet are the most common risk

factors for oral cancer [6,7].

Tumour resection is a surgery where the entire tumour and a healthy-looking margin of surrounding tissue is resected. There exist other treatment methods like chemotherapy, radiotherapy or surgical intervention for head and neck cancer. Various techniques developed for the purpose of tumour resection depending on the original size of the tumour, its location and other factors like, age, previous histories of surgeries etc [8]. Types of surgeries based on the location and size of the tumour are:

- i. Glossectomy (removal of the tongue),
- ii. Mandibulectomy (removal of the jaw bone)
- iii. Maxillectomy
- iv. Laryngectomy (removal of the voice box)
- v. Neck dissection
- vi. Reconstructive surgery [9].

One common symptom experienced post-operatively by subjects with advanced Head and Neck Cancer is dysphagia. Dysphagia is defined as an individual's inability to safely manage certain foods and fluids, requiring a modification of consistencies and use of specific strategies to manage swallowing [10].

Swallowing is defined as "a complex sensorimotor behaviour involving the coordinated contraction and

inhibition of the musculature located around the mouth, at tongue, larynx, pharynx and esophagus bilaterally". The swallowing process requires intricate coordination between central nervous system and various striated muscles of face innervated by the cranial nerves for effective deglutition. Normal swallowing consists of four phases:

- i. The oral preparatory phase in which food is ground and mixed with saliva to form a food bolus.
- ii. Oral phase where the bolus is then transported to the pharynx by the tongue.
- iii. The pharyngeal phase in which the swallowing reflex is triggered.
- iv. The oesophageal phase where the oesophageal muscles move the bolus into the stomach [11,12].

As concluded by various authors, subjects with head and neck cancer face a common problem of dysphagia where swallowing becomes problematic. Several swallowing interventions are applied for dysphagia that aims to strengthen the swallowing musculature. Rehabilitative techniques including swallowing manoeuvre, such as the effortful swallow, Tongue-Holding Swallow Exercise (Masako Maneuver), Mendelsohn Maneuver Kinesiology, Supraglottic Swallow, Super-supraglottic swallow and Postural modification [13,14].

Few authors have concluded that non-swallow exercises, such as Jaw opening exercises, Tongue rom exercise, Lip protrusion and retraction, Tongue Base Retraction Exercise, Tongue Resistance-Strengthening, Shaker exercises, Tongue strengthening exercises and the Shaker (head lift) exercise [11,12].

Swallow exercises are used during the swallow with the aim to increase the success of the swallow itself by training the involved muscles [15]. Non-swallow exercises aim to improve the range of motion and strength of the swallowing and neck musculature (i.e., the tongue or suprahyoid musculature) [16]. But there is scarcity in the literature regarding comparison of swallowing and non-swallowing exercises in post-operative oral cancer subjects with dysphagia, hence this study is ben undertaken.

Materials and Methods

This comparative study was conducted using simple random sampling with a sample size of 66 who were recruited on the basis of inclusion criteria and were divided into 2 groups. Group A with Non-swallowing exercises (n=33) and Group B Swallowing exercises (n=33). Inclusion criteria - Age group between 18 – 70 years, both males and females, Individuals undergone with post-operative oral cancer surgery. Exclusion criteria - Individuals with any history of recent fracture nasal bone fracture, maxillary or mandible, Neurological or neuromuscular disease metabolic, myopathies or myasthenia gravis, Individuals not willing to participate.

Outcome measures used in the current study were:

1. Modified Water Swallowing Test [17].
2. M.D Anderson Dysphasia Inventory (MDADI) [18].
3. Functional Assessment For Cancer Therapy – Head

And Neck Questionnaire (FACT- H&N) [19].

Procedure

Ethical approval was obtained from the institutional ethical committee of Krishna Vishwa Vidyapeeth after which the subjects were selected as per the inclusion criteria. The purpose and procedure of study were explained to the subjects and written consent was taken. Demographic data was recorded and procedure was explained prior to the assessment. On Day one of the therapy the prior to pre-assessment, post-operative counseling was performed about the intervention. Group A received Non swallowing exercises: Jaw opening exercises, Tongue Range of Motion exercises, Lip protrusion and Retraction, Tongue Base Retraction Exercise, Tongue Resistance-Strengthening and Shaker exercises and Group B received Swallowing exercises: Tongue-Holding Swallow Exercise Masako Maneuver, Mendelsohn Maneuver Kinesiology, Supraglottic Swallow, Super-supraglottic swallow, Postural modification. Exercises were started for each group after completion of 1st week after the surgery through 5th week. Each exercise was repeated for 10 times during each session in both the groups. The frequency of exercise was 3 sessions per day for 5 weeks. Post assessment was done after the completion of protocol at 5th week by using the outcome measure. The data was collected of each outcome measure and was subjected to statistical analysis.

Statistical Analysis

Data analysis was done using IBM SPSS statistical software (SPSS version 25; IBM, ARMONK, NY, USA). Independent sample t test was used to compare outcome parameters before and after intervention. The level of significance (p value) was set up at $p \leq 0.05$.

Results

Table 1 represents, a total of 66 subjects were taken for the study. Out of 66 subjects 54 were males and 12 were females. 66 subjects were divided into four age ranges; from 30-40; 41-50, 1-60 and 61-70 and which comprised of 02 subjects, 13 subjects, 22 subjects, and the 29 subjects, respectively. Also, the table represents; the type of surgery like composite reconstruction (23 subjects), buccal excision (10 subjects) and 33 subjects are undergoing to combined mandibulectomy and neck dissection operation

Interpretation: Table 2 shows a comparison of mean values and standard deviation of MWST scoring for the dysphagia in oral cancer individuals. In the present study Group A and Group B demonstrated 1.21 ± 0.40 as pre-intervention MWST scoring. Whereas post interventional score of Group was 2.03 ± 0.39 and that of Group B was 1.36 ± 0.54 . The table demonstrated that there exist significant difference between pre and post value of Group A with p value of < 0.0001 and Group B with p value of < 0.0001 . whereas, the between group difference existed only during post-intervention analysis with p value of < 0.0001 .

Table 1. Base Line Characteristic of Participants

Demographic/ characteristic	n (%)
Gender	
Male	54 (81%)
Female	12 (18%)
Age	
30-40	2 (3%)
41-50	13 (19%)
51-60	22 (33%)
61-70	29 (43%)
Type of surgery	
Composit Reconstruction	23 (34%)
Wide Buccal Excision	10 (15%)
Combined Mandibulectomy and Neck Dissection Operation (COMMANDO)	33 (50%)

Table 2. Within the Group Comparison of Modified Water Swallowing Test between Group A and Group B

MWST	Group A	Group B	P-value
	Mean±SD	Mean±SD	
PRE	1.21±0.40	1.21±0.40	>0.9999
POST	2.03±0.39	1.36±0.54	<0.0001
P-value	<0.0001	<0.0001	

Interpretation: Table 3 shows a comparison of means value and standard deviation of MDADI scoring for the dysphagia in oral cancer individuals. In the present study Group A and Group B demonstrated a score of 33.90±4.44 as MDADI as pre interventional. Post interventional score of the same outcome measure of Group A was 50.18±5.57 and that of Group B was 40.4±4.65. The Pre and post value was compared by applying the student unpaired t-test. The post-intervention assessment showed that all had an effect on improving dysphagia in early post-operative oral cancer individuals. But statistical analysis showed that non swallowing exercises were more effective than swallowing exercises on dysphagia in early post-operative oral cancer individuals with p value <0.0001.

Interpretation: Table 4 shows a comparison of means value and standard deviation of FACT H&N scoring for the quality of life in oral cancer individuals. Pre-intervention score of Group A demonstrated 68.87±7.85 and Group B was 101.75±11.34. The significant with group analysis was seen in both the group after pre-post analysis with p value of <0.0001 individually for both the groups. Whereas; only between group analysis demonstrated significant result only with post-intervention values compared to pre-intervention.

Discussion

Although addressing dysphagia in oral cancer patients is crucial, there is scarcity in the literature concluding whether swallowing or non-swallowing activities are effective within the first week following surgery.

Swallowing function is commonly affected due to

Table 3. Within the Group Comparison of Md Anderson Dysphagia Inventory between Group A and Group B

MDADI	Group A	Group B	P-value
	Mean±SD	Mean±SD	
PRE	33.90±4.44	33.90±4.44	>0.9999
POST	50.18±5.57	40.4±4.65	<0.0001
P-value	<0.0001	<0.0001	

Table 4. Within the Group Comparison of Fact H and N between Group A and Group B

FACTH&N	Group A	Group B	P-value
	Mean±SD	Mean±SD	
PRE	68.87±7.85	68.83±7.42	0.7762
POST	101.75±11.34	81.39±8.34	<0.0001
P-value	<0.0001	<0.0001	

various causes in people with oral cancer. The current study was undertaken in order to compare the effect of swallowing and non-swallowing exercises on dysphagia in post-operative oral cancer individuals.

Current study demonstrated the males were more susceptible to oral cancers 81% compared to their counterpart group. The findings correlated to those reported by Hsiang et.al who concluded that males were most affected with 96% compared to females. The reason given by the authors were due to consumption of excessive tobacco and alcohol [20].

A study by P.K.Sahu et.al stated that the prevalence of oral cancer was more common in age group of 60-70 years. The current study also showed the same results. The reason may be due to chronic tobacco chewer or alcoholic leads to development of cancerous tissue [21].

The current study demonstrated that both swallowing and non-swallowing exercises resulted in effective treatment for the subjects, thus improving the modified water swallowing test. According to Zhuoshan Huang, demonstrated that the swallowing training strategy incorporated both direct and indirect treatments, and concluded that all patients showed notable improvements in swallowing following ten days of postoperative training. The reason quoted by the authors was, early identification and management of dysphagia improved the treatment outcome [22].

According to a study conducted by Dr. Renu Pattanshetty, Krystle Mascarenhas, and Kennoshea Dias showed the improvement of MDADI after Shaker's exercise. The authors concluded that; the MDADI value indicates statistically significant factors that contribute to an improvement in the quality of life for those who have post-operative dysphagia due to oral cancer. The current study also showed the similar results. The authors concluded that the improvement in MDADI is due to early physical therapy intervention in the form of Shaker's exercises in Head and Neck Cancer patients has proved beneficial in terms of swallowing efficiency [23].

The current study demonstrated that the FACT H&N Scale, was seen to be improved in both the groups post-

intervention. Previous studies have also shown the similar results for FACT H&N score with p value <0.0001 [23]. Hence, the literature has demonstrated; FACT H&N values are very important in enhancing daily activities and providing a higher standard of living. The findings corroborate according to I Rudberg et.al assertion that it has shown to strengthen the suprahyoid muscles of the neck during swallowing enhancing the upward and forward movement of the hyoid bone and larynx resulting in the opening of the oesophageal sphincter. Author thus stated, this may be one of the reasons for the swallowing efficiency with Shaker's exercise in the present study.

In conclusion, from the present study we recommend that non-swallowing exercises were better and efficient compared to swallowing exercises through the assessment via Modified water swallowing test, MD Anderson Dysphagia Inventory scale and FACT H & N scale. The current study demonstrated improvement in dysphagia in early post-operative oral cancer individuals in both the groups. However, Group A showed more effective than Group B in as swallowing considered as a task is itself difficulty in such subjects.

Author Contribution Statement

Dr. Dhairysheel Patil conducted literature review for this manuscript, developed an introduction section of manuscript, conducted the discussion of the study, findings, collected data and analysed the data. Dr. Trupti Yadav provided a description of the background information, collected data and analysed the data and participated in prescription of the manuscript, all the authors read and approved the final manuscript.

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Ethical Committee

The study was approved by institutional Research ethical committee of Krishna Vishwa Vidyapeeth Deemed to Be University, Karad, Maharashtra. With opinion number 112/2022-2023, of August, 2022.

Statement conflict of Interest

The authors claimed that there are no conflicts of interest concerning the content of the present study.

Abbreviations

MWST – Modified Water Swallowing Test.

MDADI – MD Anderson Dysphagia Inventory scale.

FACT H&N – Functional Assessment of Cancer Therapy- Head and Neck.

COMMANDO – Combined Mandibulectomy and

Neck Dissection Operation.

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