



Oral Sensory-motor Method to Facilitate Feeding Skills and Speech Clarity in Individuals with Post Mandibulectomy

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Purpose: This case study explores use of oral placement therapy for both feeding and speech issues in three individuals after mandibulectomy. As feeding issues and speech clarity are the major challenges of head and neck cancer, an appropriate intervention method is essential.

Method: Investigation examined effect of oral placement therapy, sensory motor exercises, to facilitate feeding skills and speech clarity after five months of intervention. Intervention occurred thrice a day with monthly twice face to face sessions. Pre and post therapy were evaluated with PCC, perceptual speech intelligibility rating scale and GUSS.

Result: Observable improvements were noticed in both feeding skills and speech clarity after intervention. PCC and GUSS scores showed a remarkable positive raise on post intervention.

Conclusion: This study highlights importance of OPT based sensory-motor exercises for feeding and speech in adult patients and also draws attention to this method apart from traditional methods to rehabilitate oral phase dysphagia and speech clarity issues by using a single goal.

Keywords: Feeding skills, Speech clarity, Mandibulectomy, Oral placement therapy, Sensory motor approach



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INTRODUCTION

Resection of mandible is often done for cancers of oral cavity as well as for benign lesions involving the mandible. This often leads to significant morbidity for both chewing and speech [1]. Patients with oral and oropharyngeal cancer are prone to speech difficulties and swallowing issues. Speech outcome is dependent on residual mobility of structures in the oral cavity and oropharynx. Limited oral functions can lead to malnutrition and interference in physical and social development.

Mandibulectomy is a procedure used to eradicate disease that involves the lower jaw or mandible. The extent of surgical resection of the mandible (mandibulectomy) is based on size, location and depth of mandibular invasion of cancers into the oral cavity as well as benign characteristic of the lesion involving the mandible. The sequelae of this type of surgery may range from very simple to extremely complex issues which include drooling, pooling of secretions, dysphagia, aspiration, change in vocal resonance, impairment of speech production, reduction in the sense of taste, dental problems,

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mucosal reactions to radiation, cosmetic alterations and psychological concerns [2]. In segmental mandibulectomy continuity of the mandible is disrupted by removing all or portion of the ramus, angle, body and parasymphysis of the mandible due to gross involvement of the tumor. Extent of resection and type of reconstruction are the major variables that would predict functional outcomes of surgery [3]. Significant communication impairment and swallowing difficulties are present in majority of patients with post-mandibulectomy due to limited movements of active articulators.

Oral Placement Therapy (OPT) is a proprioceptive-tactile teaching technique used for both children and adults with placement and movement deficits. This method is a modern extension of Phonetic Placement Therapy (PPT) as taught by Van Riper (1978) and follows the Feedback Model by Mysak (1971). Major goals of OPT include a) providing adequate nutrition, b) development of “normalized” oral motor functions for feeding, and c) development of “normalized” oral motor functions for speech. Traditional approaches are widely used for therapeutic intervention to improve speech clarity. Non-speech oromotor exercises are widely used to enhance sensory motor functions of oral peripheral mechanism (OPM) including individuals with head and neck cancer [4]. This is generally focused on the range of movement of lip, tongue and jaw. Apart from that, different maneuvers and strategies were considered for swallowing difficulties.

Research suggests that improvement in lingual strength through sensory-motor approach not only aids dysphagia rehabilitation, but it may also improve dysarthric speech indirectly [5]. There may not be one-to-one correspondence between oral sensory-motor skills for feeding and for speech, however there is an overlay of one system to another [6]. However, rehabilitation for speech and dysphagia is taken as different entities in majority of clinical settings. Limited discussions and studies give attention to slate an appropriate method or approach to intervene these two domains under an umbrella. Hence, here is presenting an OPT based intervention method to rehabilitate individuals with post mandibulectomy. Here comes the importance of addressing oral sensory motor issues in patients with head and neck cancer and their challenges in oral feeding and communication after radiation and surgical management. Since OPT is a holistic method to address oral sensory motor issues, the study focuses on a single goal to facilitate both feeding skills and speech clarity in post mandibulectomy.

AIM

The case study focuses on effectiveness of OPT based intervention method to facilitate both feeding skills and speech clarity following mandibulectomy.

METHODS

Ethics

Informed consent from the patients were taken to carry out the study and the study was approved by Review Authority for Research (RAR) of National Institute of Speech and Hearing.

Participants

Participant 1

A 46-year-old male reported with a complaint of limited speech clarity and feeding issues followed by segmental mandibulectomy due to left lower alveolus carcinoma. Histopathological reports showed differential squamous cell carcinoma in the left lower alveolus and submandibular gland. MRI reports of the neck revealed carcinoma of left submandibular gland, ill-defined STIR hyperintensity and heterogeneous enhancement involving the soft tissue of left submandibular region and left digastric muscles. The patient underwent a segmental mandibulectomy followed by 27 days of radiotherapy. Pectoralis Major Myocutaneous (PMMC) flap reconstruction surgery was also done after segmental mandibulectomy.

Oromotor examination

Oromotor examination reveals limited rate and range of movement of articulators. Jaw appeared to be unstable and reduced lip seal on the left side led to occasional drooling of saliva. Patient had no trismus but excessive salivation was observed. Missing premolar and molar teeth on the left side was also noticed. Tongue movement found to be restricted towards the right side and flattened anterior portion of the tongue led to inadequate tongue palatal contact. However, velopharyngeal function, laryngeal elevation, excursion and cough were found to be normal.

Feeding evaluation

It was observed that the patient had occasional involuntary cough for thin liquids and pocketing of semi solids and solids in the buccal vestibule. Spillage of food and slight delay in bolus propulsion due to reduced tongue pumping led to multiple swallowing of solid foods. Patient did not prefer to have solid foods at home after segmental mandibulectomy due to

chewing difficulty.

Participant 2

38 years old male reported with a major complaint of spillage of food and drooling of saliva through left corner of the lips and speech clarity issues followed by marginal mandibulectomy and wide neck dissection secondary to left lateral border carcinoma of mandible. Histopathological findings revealed moderately differentiated squamous cell carcinoma and MRI revealed mass in the left lateral mandible, posteriorly up to tertiary lymphoid structure (TLS). Hence the patient underwent marginal mandibulectomy and left modified neck dissection and defect reconstruction surgery with facial artery myomucosal (FAMM) flap.

Oromotor examination

As the patient was a known case of left marginal mandibulectomy; lip deviation and affected lip seal on left side were present when conducted OPME. Left lower teeth from incisors to molar were removed as the part of marginal mandibulectomy and restricted tongue movements toward right side were also seen. Hard and soft palate clinically observed to be normal and patient had no reports of trismus other than drooling and spillage of food through the left side of the mouth. Patient prefer to have semiliquid due to absence of teeth and limited tongue mobility. Patient reported of having xerostomia after chemotherapy and radiation.

Feeding evaluation

Feeding trials with semisolid and liquid revealed patient difficulty to clear out semisolids remaining inside the mouth after one to two swallows. Liquid drooled out from the left corner of the lips when it was not performed carefully by the patient. Immediate laryngeal excursion was observed but tendency for aspiration noted with residue in the mouth. Patient would not prefer to have solids due to reduced tongue pumping.

Participant 3

Third one was 63-year-old, known case of arch segmental mandibulectomy reported with a complaint of swallowing difficulty and patient was under Ryle's tube. Histopathological findings showed ulceroproliferative lesion in the floor of the mouth infiltrating arch of mandible and left side reaching up to gingivobuccal sulcus. CT showed lesion occupying entire floor of the mouth with bony erosion and bilateral level lb nodes. Wide excision and arch segmental mandibulectomy

was done followed by reconstruction with titanium plate. Left modified radical neck dissection type II and right selective neck dissection (I-IV) was also performed then, reconstruction done with PMMC flap.

Oromotor examination

OPME revealed restricted jaw mobility, limited lip seal and lower lip deviation towards right side. Left lower teeth from incisors to molar were removed during arch segmental mandibulectomy. Rate and range of movements of tongue were restricted. Hard and soft palate observed to be normal. Patient had difficulty with both dry swallow and saliva swallow hence, drooling of saliva was frequent. Head and neck movement were severely affected with edema in the neck was present.

Feeding evaluation

Semisolids and liquids found difficult to have orally by the patient as he had severe cough and due to edema in the neck swallow as observed to be effortful. Patient was not able to lay down in supine position which led to saliva aspiration. GUSS score was poor in this patient when compared to other two patients. Patient was under Ryle's tube after surgery.

Assessment procedure

Baseline assessment was done with a thorough oromotor examination, Gugging Swallowing Screen (GUSS) [7] for swallowing assessment, percentage of correct consonants (PCC) [8] calculation with a reading passage to find articulatory errors and perceptual speech intelligibility rating scale, developed at Ali Yavar Jung National Institute of Speech and Hearing Disabilities (AYJNISHD); Mumbai (2003) to assess speech intelligibility followed by a detailed case history. Perceptual speech intelligibility rating scale rated on a 7-point scale with 0 implies normal and 6 implies poor intelligibility.

After oromotor evaluation of the patients, speech was recorded using the standard reading passage in native language and transcription and calculation done separately by three speech language pathologist who have clinical experience of more than six years in this field. Perceptual speech intelligibility was also rated by the same raters and labelled them as R1, R2, and R3. GUSS was done followed by a subjective clinical swallowing examination with semisolid, liquid and solid foods.

After proper counselling regarding assessment and its results to the patients and his by-standers, he was recommended for intervention and further follow up. The first ses-

Table 1. OPT intervention method; pre-feeding exercises given by Lori L and Overland MS., 2013 to facilitate oral sensory motor skills

Areas focused	Oromotor skills	Pre-feeding exercises
Cheeks	Cheek strengthening and stability	Facial massage Cheek stretch Cheek resistance
Lips	Lip closure and stability	Lip rounding Upward chin pressure
Tongue	Tongue exercises for lateral movement of the tongue and to narrow down anterior portion of the tongue	Lateral tongue massage Bilateral tongue hugs

sion of therapy was began one week following the baseline assessment. A thirty-minute session consisted of OPT based pre-feeding exercises, given by Lori L and Overland MS, 2013, to facilitate oral sensory motor skills of the patients and counselling done about home training activities. The pre-feeding sensory motor exercises are described in Table 1. After the first session of therapy patients were recommended to do the exercises at home thrice a day and also asked to maintain a daily log of exercises being done at home. Each exercise for cheeks, lips and tongue were repeated ten times while doing it. Therapy duration of 5 months included twice a month face to face session in which first, third and fifth sessions of patient responses were closely monitored to observe oral functions. Assessment procedures done to draw the baseline were repeated after ten sessions of therapy. Third patient underwent head and neck exercises along with above recommended intervention as patient had restricted head and neck movements with edema.

Percentage of agreement of the three speech language pathologists (inter-rater reliability) for speech intelligibility were calculated along with agreement factor before and after the therapeutic intervention. Pre and post therapy were also evaluated using PCC and GUSS; after that severity of the problem were established.

RESULTS

Participant 1

Perceptual speech intelligibility rating scale and PCC were calculated after considering average of three raters who have clinical experience in this field of more than 6 years. The PCC score rated on pre therapy assessment of first participant was 74% with a severity of mild to moderate level, but on post therapy assessment it was 89.5% with a severity of mild level.

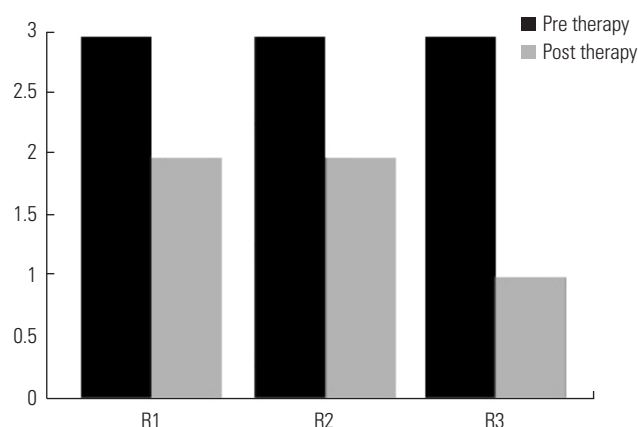


Figure 1. Depicted perceptual speech intelligibility rating of first participant done by three raters R1, R2, and R3 in pre and post therapy using AYJNHH perceptual speech intelligibility rating scale, 2003.

Considering the intelligibility rating of the client by three raters; R1, R2, and R3 with agreement factor was 2 out of 3 before therapy which was 66.7%. The same raters were rated post therapy recording, the agreement factor was as same as before therapy, i.e., 66.7%. The speech intelligibility rating before and after therapy is depicted in Figure 1, a positive improvement in speech intelligibility after therapy is clearly evident.

In pre therapy assessment, the patient had difficulty with solid foods and mostly prefers to intake liquids and semisolids and the GUSS results revealed moderate dysphagia and moderate risk of aspiration with a score of 11 out of 20. In post therapy assessment GUSS revealed slight dysphagia and slight aspiration with a score of 18 out of 20. Now client can have food with liquids, semi solids and solid consistencies with improved oral preparatory and oral stage of swallowing. Multiple swallows for solids were reduced to one to two swallows per bolus and aspiration for liquids was restricted to fast swallows.

Participant 2

Pre therapy score of PCC on second participant was 62% with a severity of moderately severe level showed a better score of 83% with mild to moderate severity on post therapy evaluation. Future, speech intelligibility rating done by the raters with an agreement factor was 2 out of 3 before and after therapy was 66.7% which is depicted in the Figure 2.

Baseline GUSS score was 7 out of 20 indicated severe dysphagia with high risk of aspiration in the patient. Better lip seal and reduced spillage of food were remarkable difference observed on post therapy with a GUSS score of 13 represented the severity of moderate dysphagia with aspiration risk. At the

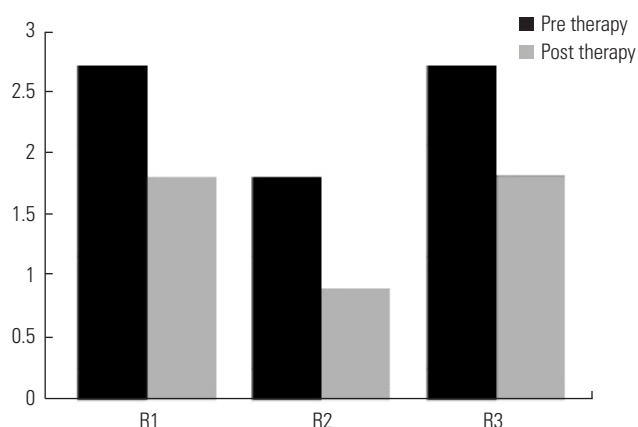


Figure 2. Depicted perceptual speech intelligibility rating of second participant done by three speech language pathologists R1, R2, and R3 in pre and post therapy using AYJNIHH perceptual speech intelligibility rating scale, 2003.

same time improved feeding skills were informed by the patient and patient started to prefer soft solids with minimum residue in the mouth. Patient was able to control drooling and most of the time patient swallowed saliva successfully.

Participant 3

Third participant baseline pre therapy score on PCC was 75% with a severity of mild to moderate level and articulation problems were more similar to the second patient as both of these patients had affected lip movements. After OPT based intervention along with head and neck exercise represented a positive improvement in the score on PCC of 90% with a severity of mild level. The rater's agreement of 3 out of 3 before and after therapy was 100% which is shown in the Figure 3.

When conducted GUSS, baseline score was 3 for the third patient and he was not in a position to have food orally. Swallow initiation and saliva swallow in supine position were also affected in the patient. Two weeks of head and neck exercise reduced edema and restricted head and neck movements, and the pharyngeal swallow became started to perform by the patient with saliva. The GUSS score was 13 after 5 months of OPT based intervention. Pre and post therapy scores of PCC and subjective clinical swallowing examination using GUSS of three participants are given in the Table 2.

As speech is a tactile-proprioceptive act, clients with motor and/or sensory impairments get benefit from tactile and proprioceptive technique. Post therapy OPME of these patients showed increased rate and range of movement of articulators. Lip closure was achieved with absence of drooling of saliva on first patient and at the same time second and third patient

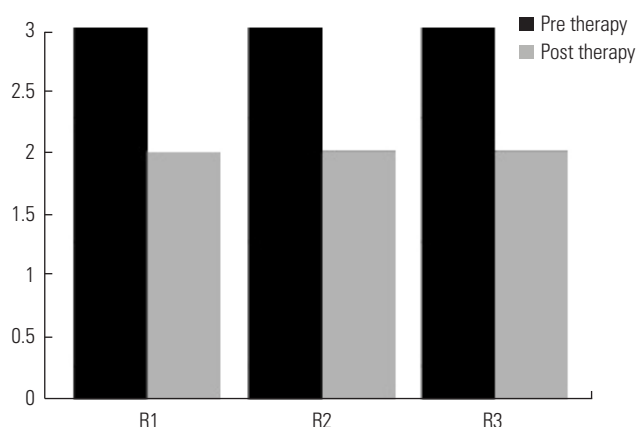


Figure 3. Depicted perceptual speech intelligibility rating of third participant done by three speech language pathologists R1, R2, and R3 in pre and post therapy using AYJNIHH perceptual speech intelligibility rating scale, 2003.

Table 2. Pre and post intervention scores of PCC and GUSS on three participants P1, P2 & P3

Participants	PCC score		GUSS score	
	Pre (%)	Post (%)	Pre	Post
P1	74	89.5	11/20	18/20
P2	62	83	7/20	13/20
P3	75	90	3/20	13/20

drooling was limited after scheduled intervention. Protrusion with narrowing of anterior portion of the tongue and lateral movements of the tongue were achieved, but slight difficulty to lateralize extremes were observed in all the three patients. Retroflex, palatal, alveolar, liquids, glides and all the pressure consonants were affected initially in these three patients nevertheless, post therapy results exhibited speech sound errors limited to glides and retroflex.

DISCUSSION

Microsurgical reconstruction techniques have improved in quality of mandibular reconstruction; but still its effects on speech and feeding skills in post mandibulectomy are less predictable. Type and extent of surgery are also a variable to predict functional outcome of speech and feeding skills [3]. Radiotherapy is another variable that may have a supplementary impact on both of these skills. Hence majority of patients with post mandibulectomy are expected to have restricted movement of articulators which make a significant effect on communication and feeding. Commonly, the rehabilitation process for patients with head and neck cancer is a prolonged

process [9]. Even then, majority of them would not receive effective discharge from their problems particularly, for speech and feeding [10].

Generally feeding skills and speech clarity are considered to be intervened with different approaches and chooses separate goals for each one. Incorporate both skills under a goal, oral sensory motor exercises are highlighted in this study. The first patient had instability of jaw, poor lip seal and restricted movement of tongue lead to limited speech intelligibility and feeding difficulties. Left side of the mouth was more affected than the right on the three participants associated with left side mandibulectomy. Patients reported improved oral sensation and limited occasional drooling after six sessions of therapy and the first patient drooling ceased after therapy. Limited movement of tongue recommended multiple swallows of bolus which increased meal time of the first patient before undergoing the therapy but the other two patients restricted tongue movements compromised their swallowing function. Tongue pumping has a significant role for bolus propulsion from anterior to posterior part of the mouth. Improved rate and range of tongue movements in post therapy, may enhance tongue pumping; which reduced the number of swallows per bolus. Anterior pooling of saliva and effortful swallow were common signs of other two patients however, tongue mobility enhances the patients swallowing ability. Normal pharyngeal and laryngeal function (laryngeal elevation, excursion and cough) can clearly state multiple swallows were not due to pharyngeal phase difficulty on these three patients. Protrusion with narrowing of anterior portion of the tongue and lateral movements of the tongue in addition to improved lip seal after 10 sessions of therapy enhanced speech intelligibility of the patients. Occasional jaw jerks are still present for the first patient which can be corrected through prosthetic management. But economic crises limit the patient to endure further prosthetic management after segmental mandibulectomy and attend therapy to improve speech clarity to meet job requirements of the patient.

Second patient had poor lip seal and minimal space on the left corner of the mouth which hindrance the patient to make proper lip seal and at the same time absence of teeth on left side also aggravated the problem. OPT recommended lip and cheek prefeeding exercises minimized the patient lip deviation and lip closure difficulty. Third patient was on Ryle's tube during the baseline assessment and patient hardly prefer to have food orally. After 6 sessions patient reported absence of aspiration signs while lied down in supine position and

started to have orally twice a day without aspiration signs on 9th session onward. Articulation of labial, labiodental and lingual sounds were showed positive improvement by all three patients after attending therapy.

Feeding skills give musculature exercises to the tongue, which develop the tongue's ability to generalize certain positions that later produce intelligible speech sounds [11]. Both articulation and feeding required intact orofacial structure and oral motor functions and there is a relationship between these two developmental processes as they share common developmental periods and anatomical structures [12]. Hence facilitating sensory motor skills of OPM which direct towards better outcome of both speech as well as feeding skills. Traditional speech facilitation techniques have not been effective in patients with movement or placement disorder [13]. Working on isolated muscle skills will facilitate standard movements for speech but may not be beneficial for feeding skills. OPT used for the patient has been related to the functions of feeding skills which subsequently facilitate the rate and range of movements of the articulators rather than Non-Speech Oral Motor Exercises (NSOME). NSOME are widely used clinically in adult patients with stroke, neurological issues and after head and neck surgical procedures to improve articulation [14]. Recent discussions are emerging about agreement and controversies related to NSOME [15].

More number of participants incorporating to the current study might light up further precision in it. In addition, use of video fluoroscopic analysis can give visual representation of difference in tongue pumping and oropharyngeal phases of swallowing. However, this study portrait a non-instrumental clinical evaluation which directs to the use of OPT as an intervention method for post mandibulectomy could solve OPM related issues within a short period of time rather than getting adjust with limited recovery. It is expected that positive results of the study would be an instigate for further research in this area.

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