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## Comparison between the effectiveness of heister jaw opener and head & neck exercise on jaw rom and effective pain reduction in patients with post-operative oral cancer

**Gayatri Mukesh Gujar, Dr. Drashti Niket Trivedi and Dr. Aakanksha Joshi**

### Abstract

**Background:** Oral cancer has become a global health concern worldwide. The sites included are oral cavity, pharynx, and larynx, as well as the nasal cavity and sinuses. Trismus is one of the most frequent complications in head-neck and face (further referred as HNF) cancer patients undergoing radiotherapy. Trismus in oral cancer is defined as a tonic contraction of the muscles of mastication resulting from any abnormal condition or disease with a mouth opening of  $\leq 35$  mm. Exercise intervention alone, in the role of eliminating trismus in oral cancer, has proven its effectiveness under head and neck as well as jaw exercise interventions. A study has demonstrated that a simple metal Vernier Caliper can provide reliable and valid assessment of intrinsical distance by patients and may be a valuable research tool in a setting. The Vernier caliper in a study has shown good to excellent parameters in all movements.

**Aim:** The purpose of the study was to compare the effectiveness of heister jaw opener and head & neck exercise on jaw ROM and Effective pain reduction in post-operative oral cancer.

**Methodology:** Vernier Caliper and Heister jaw opener were the equipments being used for the study. 40 subjects were randomly and equally divided into 2 groups. Group 1 was treated under Conventional Jaw exercise intervention coupled with additional head and neck exercise. Whereas, Group 2 treated under Conventional jaw exercise intervention coupled with heister jaw opening device. Post-operative oral pain was calculated with the NPRS scale. By comparing the MIO values using the Vernier caliper from the data obtained from both groups, the result was obtained. Study was conducted for a total of 5 days from the second post-operative day in patients with oral cancer.

**Outcome measures:** Vernier caliper and Pain Rating Scale – Numerical Pain Rating Scale (NPRS).

**Result:** Effective increase in jaw ROM has been seen in group B wherein the HJO device has been used (p-value= 0.02) against group A. There is seen less than significant difference in pain reduction on NPRS in analysis of each group (group A- p-value= 0.079) (group B- p-value= 0.091).

**Conclusion:** We conclude that the heister jaw opening device (group 2) gives better results with jaw ROM and each group method showed less than significant improvement in pain.

**Keywords:** Oral cancer, trismus, heister jaw opener, vernier caliper, jaw range of motion exercise, maximal intrinsical opening, numerical pain rating scale (NPRS)

### Introduction

Oral cancer has become a global health concern worldwide <sup>[1]</sup>.

It accounts for over 30% of all cancers in India, with a rate of 20 per 100,000 population. <sup>[1]</sup>

The sites included are oral cavity, pharynx, and larynx, as well as the nasal cavity and sinuses. Oropharyngeal cancer (OPC) is a rare cancer overall but common in the head and neck region <sup>[1]</sup>.

Surgery, radiotherapy and chemotherapy are therapeutic modalities used in the treatment of oral cancer.

This can damage tissues and structures that are critical for jaw range of motion, such as the temporal mandibular joint, muscles of mastication, and the mucosa of the oropharyngeal cavity <sup>[1]</sup>.

Types of oral cancers include the cancers of oral cavity- Incidence of oral cancer in India is 28 per 1,00,000 population. Commonest oral cancer in India is of buccal mucosa (more than 70%). In oral cavity, in West, it is common in tongue (50%), buccal mucosa (25%), floor (15%), gums and others (10%).

#### **Premalignant conditions of oral cavity**

- Leukoplakia
- Erythroplakia
- Oral submucous fibrosis (OSMF)

#### **Oral and upper aerodigestive cancers**

Include cancers of oral cavity, larynx & pharynx- Depending on anatomical location they present with different features other than common features- trismus, ear pain, hoarseness of voice, dysphagia, ankyloglossia <sup>[11]</sup>.

#### **Common sites**

**Cheek/ buccal mucosa -commonest:** Larynx

**Tongue:** Pharynx

**Floor of the mouth:** Lips

**Palate- soft and hard:** Tonsils

#### **Indications for surgery**

##### **Early tumour**

- Pain is controlled
- Mortality (5%)
- Tumour spreading to mandible bone/alveolus
- Fungation, haemorrhage due to erosion
- Recurrence of tumour after RT
- Multiple sites
- Soft tissue spread
- Locally advanced but amenable to surgical resection.

##### **Surgical approaches**

Mandibulectomy  
Neck lymph node block dissection  
Maxillectomy  
Flap reconstruction  
Glossectomy (tongue)  
Laryngectomy

Trismus is one of the most frequent complications in head-neck and face (further referred as HNF) cancer patients undergoing radiotherapy. Trismus in oral cancer is defined as a tonic contraction of the muscles of mastication resulting from any abnormal condition or disease with a mouth opening of  $\leq 35$  mm <sup>[1]</sup>.

The limitation of mouth opening may occur in the course of radiotherapy due to stiffening of the epidermal and dermal layers.

Studies found trismus occurred in 4%–50% of oral cancer patients at the time of diagnosis, in 44%–86% of patients

shortly after surgery and radiotherapy, and in 31%–65% of oral cancer patients six months after treatments <sup>[4]</sup>.

The common risk factors of trismus are large tumour size, high radiotherapy dosage, tumour location, etc. <sup>[1]</sup>.

The normal range of mouth opening range from 39mm to 70mm in males and 36mm to 56mm in females in Indian population. Gradual classification for trismus such as mouth opening  $>30$  mm indicate light trismus, between 15 and 30 mm indicates moderate trismus and mouth opening  $<15$ mm indicates severe trismus <sup>[1]</sup>.

As per a previous study, no significant difference was observed preoperatively or intraoperatively with the use of the device, hence postoperative analysis appears to be the mainstay of study <sup>[2]</sup>.

Greater effectiveness of jaw opening in trismus was proven with the use of rehabilitative jaw openers like the heister jaw opener device. It consists of two flat and narrow blades which rest on the occlusal surface of molar teeth, with an incetric pivot and plain short handle.

Preventive exercise is a necessary intervention for ensuring that patients with head and neck cancers maintain the ability to open their mouths.

Exercise intervention alone, in the role of eliminating trismus in oral cancer, has proven its effectiveness under head and neck as well as jaw exercise interventions.

This study has demonstrated that a simple metal Vernier Caliper can provide reliable and valid assessment of intrinsical distance by patients and may be a valuable research tool in a setting. It has the distinct advantage of being cheap, and easily provided for use by patients.

The Vernier caliper in a study has shown good to excellent parameters in all movements <sup>[3]</sup>.

#### **Materials and Methods**

##### **Methodology**

- **Study design:** Randomized Controlled Trial
- **Study type:** Experimental Study
- **Study population:** Post operative Oral cancer patients
- **Study setup:** Tertiary care hospital in Sangli district
- **Study duration:** 6 months
- **Study Sampling:** Purposive Sampling
- **Sample size:** 40

##### **Material**

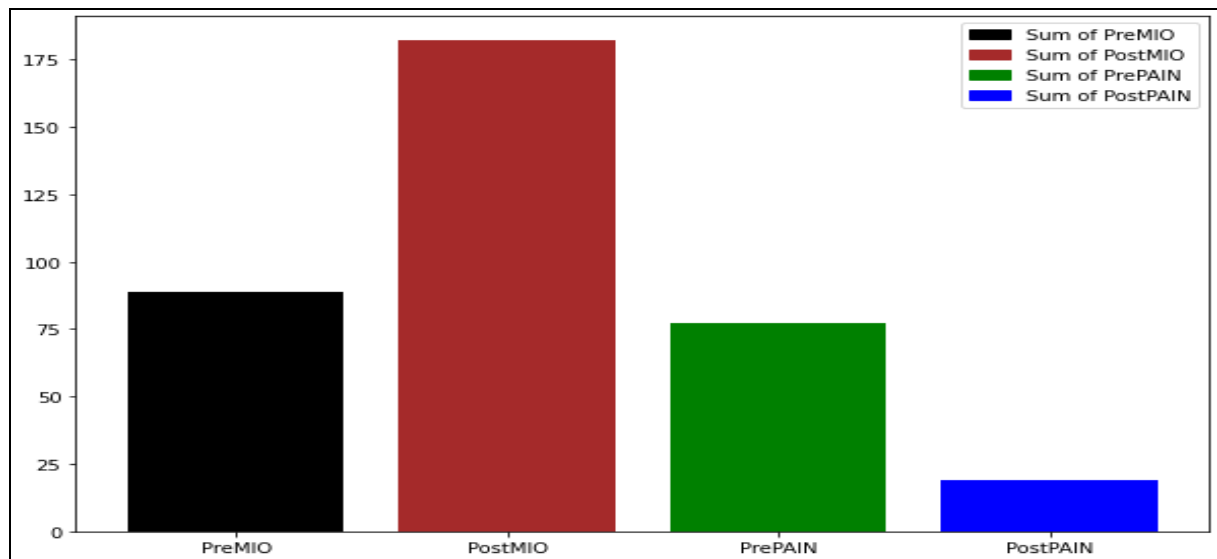
- Data collection form/assessment form
- Vernier Caliper
- Heister mouth opener
- Gloves

#### **Results and Discussion**

Statistical analysis was done using Paired and Unpaired t-test.

**Intragroup Analysis:** for MIO and PAIN readings for Pretest 1<sup>st</sup> and PostTest 5<sup>th</sup>.

**Group A**

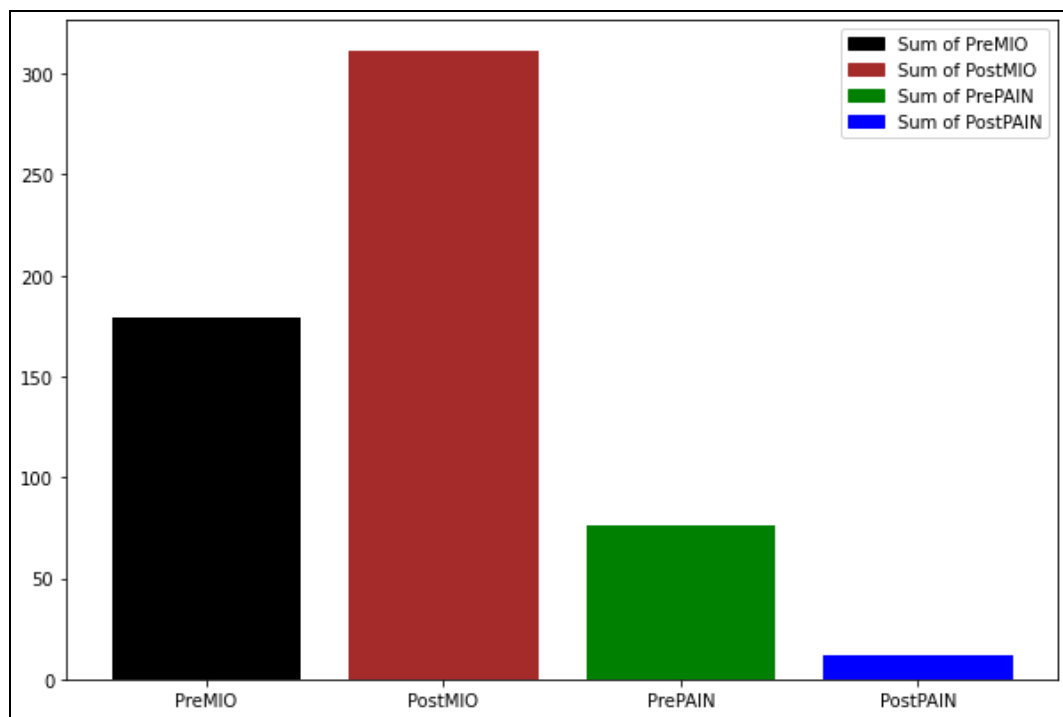


**Graph 1:** Intragroup Analysis of MIO and NPRS in Group A

**Table 1:** Group A MIO & PAIN, sum of pre & post readings

Variable	Tests	Sum of readings	Mean	t-value	p-value
MIO	Pre1	89	4.94	4.007	0.026
	Post5	182	10.11		
PAIN	Pre1	77	4.27	7.366	0.079
	Post5	19	1.05		

**Group B:**

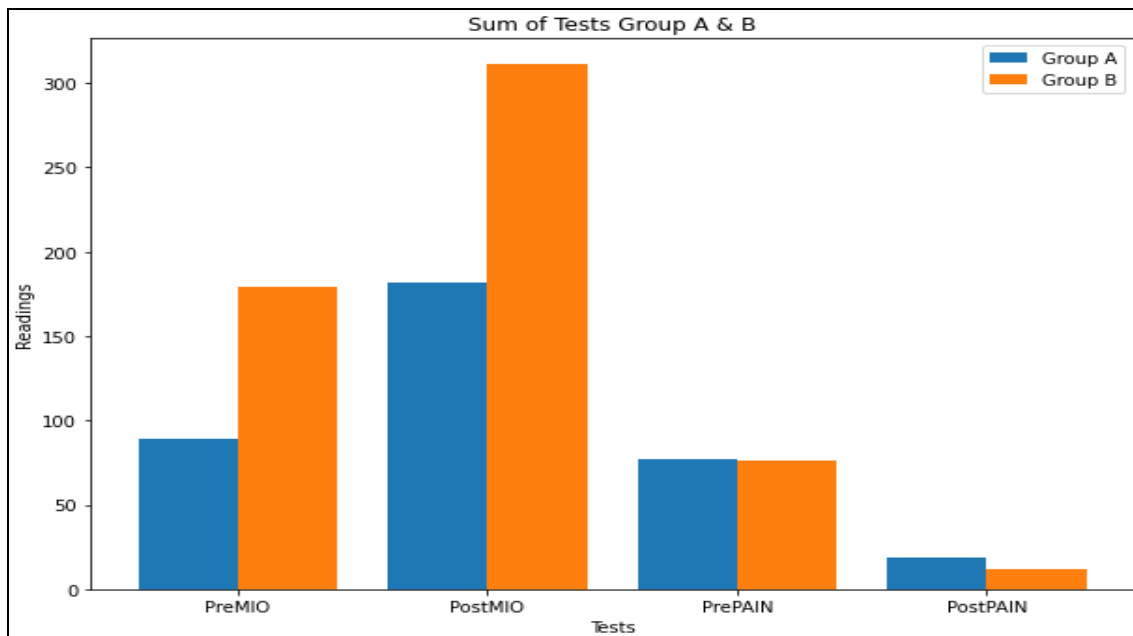


**Graph 2:** Intragroup Analysis of MIO and NPRS in Group B

**Table 2:** Group B MIO & PAIN, sum of pre & post readings

Variable	Tests	Sum of readings	Mean	t-value	p-value
MIO	Pre1	179	9.94	3.334	0.019
	Post5	311	17.27		
PAIN	Pre1	76	4.22	9.945	0.091
	Post5	12	0.66		

**Intergroup Analysis**



**Graph 3:** Intergroup analysis of A and B comparing pre & post MIO & pre & post PAIN readings

We will compare the differences from both the groups. Firstly normalizing the differences to bring the different values under same scale. Then finding the p-value, considering 0.05 as statistically significant value, less than that we accept alternate hypothesis. If more than significant value we accept null hypothesis and reject alternate hypothesis.

**For MOI**

We observe that there is no major difference and t-value 2.09, p-value we get as 0.0207, which means there is major improvement in movement from the two Group methods. As the p-value is less than 0.05 significant, we accept alternate hypothesis. As there is significant difference between the two groups for MIO. From the mean difference between Pre-test 1 and Post-test 5 readings, Group B [u==7.33] has more mean difference than Group A [u==5.16] i.e Group B method has better and faster improvement than Group A method.

**For Pain**

Similarly for PAIN we observe that there is very less difference- lesser than MOI and p-value we get as 0.97153, which means there is not major reduction in PAIN from the two Group methods. And so we accept null hypothesis.

**Table 3:** Intergroup comparison of MIO & PAIN

Variable	Group	Mean	t-value	Df	p-value
MIO	Group A	5.16	2.09	10.5	0.0207
	Group B	7.33			
Pain	Group A	3.5	1.15	4.77	0.9715
	Group B	3.2			

**Results from analysis**

The final analysis proves that both the groups were clinically significant in case of both jaw ROM and Pain. Although in case of pain, analysis proves that there is clinical pain reduction in the jaw but not as significant, statistically. Paired t-test was used to analyse the effect of group A with additional jaw, neck and shoulder ROM exercises, giving significant improvements in jaw ROM (MIO), but when

compared to group B, it has shown better results in ROM than group A.

With unpaired t-test, intergroup analysis showed less than significant pain reduction (p-value=0.97) when treated post-operatively. This shows statistical non-significance in pain. Based on the results of the test analysis at 5% (0.05) significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value less than the 5% significance level (i.e.  $0.02 < 0.05$  in group A MIO) ( $0.019 < 0.05$  in group B MIO) in the study and therefore it justifies the improvements in ROM in each group.

The mean values in MIO readings in group A show an increase from pre-test 1 (u==4.94) to post-test 5(u==10.11). This indicates that there is significant analytical improvement post treatment with conventional couples with additional group of exercises in group A. Mean values in group A, pain readings have shown a decrease from pre-test 1 (u==4.27) to post-test 5(u==1.05), which indicates that there is significant reduction in pain symptom post treatment with exercises alone.

Similarly, in group B, mean values show increase from u==9.94 pre-test 1 to post-test u==17.27, indicating increase in jaw ROM but more significant when compared against group A in MIO. For pain, the mean has decreased from u==4.22 to u==0.66, proving statistical decrease.

**Conclusions**

Result of the study indicates that there is significant difference in the ROM of patients with oral cancer within each group. Although, in Group B, where the heister jaw opening device was used showed better improvement in jaw ROM when compared against group A, as clinically and statistically analysed.

In case of pain in intra group analysis, each group has shown significant reduction in pain on the NPRS. Whereas, in case of inter group analysis, there is marginally more significant effective pain reduction with exercises, than the group with the device, in patients with post-operative oral cancer.

**Appendix**

Ethical clearance letter

Consent form

**Acknowledgments**

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