https://doi.org/ 10.33472/AFJBS.6.Si3.2024.199-210

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Efficacy of Therabite Exercises on Pain and Trismus in Oral Cancer Patients

Aya Salah Eldin Fouad Rostom[1], Wafaa Hussein Borhan[2], Eid Rizk Elgammal[3], Mohamed Maher Elkeblawy[4], Rokaia Ali Zain EL-Abedeen Mohamed[5]

1-Assistant Lecturer of Physical Therapy, Department of Physical Therapy for General Surgery, Burn and Skin, Faculty of Physical Therapy, Suez University, Egypt.

2- Professor of Physical Therapy, Department of Physical Therapy for Surgery, Faculty of Physical Therapy, Cairo University, Egypt.

3- Assistant Professor of Onco-Surgery, Department of Oncology, Faculty of Medicine, Azhar University, Egypt.

4-Lecturer in National Center of Research, Egypt

5- Assistant Professor Physical Therapy, Department of Physical Therapy for Surgery, Faculty of Physical Therapy, Cairo University, Egypt.

Corresponding author Email: drayarostom@gmail.com

Article History

Volume 6,Issue Si3, 2024

Received:21 Mar 2024

Accepted : 08 May 202

doi: 10.33472/AFJBS.6.Si3.2024.199-210

Abstract

Background: Temporomandibular joint dysfunction (TMJD) indicated alterations in the muscle, temporomandibular joint (TMJ) and other tissues that lead to discomfort and jaw pain. One of the adverse consequences of oncologic treatment that is commonly experienced by individuals suffering from head and neck cancer (HNC) is trismus, which is characterized by a restricted 35 mm of mouth opening or less. Trismus has been reported to occur as often as 40% of the time. The range of prevalence is 5% to 46%. Mandibular function (chewing and eating) and quality of life (QoL) are negatively impacted by trismus. Speech, dental care, oral hygiene, nutrition, clearing the airways, and oncological follow-up can all be negatively impacted. **Study objective:** This investigation was conducted to look into the impact of Therabite (TB) exercises on trismus and temporomandibular joint dysfunction (TMJD) following oral oncologic treatment

Patients & Methods: Sixty patients diagnosed clinically by maxillofacial surgeon/ physician as trismus and temporomandibular joint dysfunction (TMJD), 2-3 months post chemo-radio therapy, they were selected from National Cancer Institute, Cairo, Egypt. The Cairo University Faculty of Physical Therapy's Ethical Committee confirmed the research (approval No. 012- 003625) conducted before initiating the study. Patients Suffered from trismus and pain based on Therabite scale, caliper and visual analogue scale (VAS) assessment. They were between fifty and seventy years old.

They were divided into two factions at random (A) and (B), equal in number. Group A (study group) received Therabite (TB) exercise and manual therapy three times every week for two weeks. In addition to basic medical care (BMC): (Analgesics, mouth wash daily, movement of neck, swallowing and early manipulation). While Group B (control group) received manual therapy and basic medical care (BMC): (Analgesics, mouth wash daily, movement of neck, swallowing and early manipulation) for 2 weeks. Maximum mouth opening (MMO) and pain were measured by Therabite scale, caliper and visual analogue scale (VAS) two times, one pre and one post treatment after 14 days in three head postures. **Results**: With mixed MANOVA, a significant interaction effect between treatment and time was discovered ($F = 101.08$, $p = 0.001$). There was a noteworthy primary outcome of the medical intervention ($F = 3.18$, $p = 0.02$). There was a noteworthy primary effect time ($F = 810.10$, $p = 0.001$). Comparing groups within: In both the research and control groups, the VAS considerably dropped following treatment as in contrast to earlier. ($p > 0.001$). The percentage of the VAS change in study and control groups were 58.73 and 49.56% correspondingly. In the study and control groups, there was a noteworthy rise in MMO following treatment when compared to pretreatment levels ($p > 0.001$). The percentage of change in MMO at NHP, FHP and RHP in study group was 26.66, 23.71 and 24.40 as well as the fact that in the control group was 14.07, 10.27 and 9.18% respectively. **Comparison between groups**: There was no appreciable difference between the groups before treatment ($p > 0.05$). Following treatment, the study group's MMO at NHP, FHP, and RHP significantly increased compared to the control group, and the VAS significantly decreased ($p > 0.01$). **Conclusion:** These results showed that Therabite (TB) exercises provide positive effects for treatment of trismus following oral oncologic treatment**.**
Key words: Trismus - Therabite exercises - Manual therapy – Head and neck cancer- Oral cancer - Temporomandibular joint dysfunction.

Introduction:

A variety of cancers that can develop in and around the oral cavity are referred to as "oral cancers." Squamous cell carcinomas account for more than 90% of these lesions, however even they can be classified into other groups according to the location, aetiology, and prognosis. Particularly, oral cancer, or squamous carcinomas in the mouth cavity, should be treated differently from oropharyngeal carcinomas. Oropharyngeal cancer exhibits distinct clinical and histological characteristics and is linked to human papillomavirus (HPV) infection. **[1].**

Among the main risk factors for mouth cancer are it is widely acknowledged that alcohol use, smoking, and tobacco use are the main causes of oral cancer. In addition, smokeless tobacco (SLT) has been classified as a carcinogenic agent by the World Health Organisation (WHO), despite disagreements over SLT's possible contribution to carcinogenesis. Several substances found in cigarette smoke have an impact on the oral cavity and gastrointestinal tract. Nicotine is one of them; its physiological impacts on the oral cavity, the brain, and other organs, are well known. While alcohol by itself is not linked to the development of cancer, it works in concert with tobacco to do so. Additionally, alcohol breaks down the lipid composition of the membrane of the epithelial cell of the oral mucosa, making it easier for carcinogens to penetrate. **[2].**

Following chemotherapy, patients with oral cancer may develop painful oral mucositis. The intensity of the pain increases during the course of treatment, peaks continue at the 3-month follow-up, having begun at the 2-week follow-up. Nearly three-quarters of patients (73%) chose neuropathic pain descriptors, indicating that

neuropathic pain is prevalent in oral cancer patients during treatment. Approximately 80% of patients report experiencing both intermittent and continuous pain episodes, with over half reporting continuous pain. Other studies showing that 30% of oral patients have neuropathic pain corroborate these findings. **[3].**

Trismus, or the abnormal incapacity to open the mouth, is a serious issue that is commonly observed in individuals suffering from cancer in the head and neck, especially when the tumours are situated in the oropharynx and mouth. Trismus is described as a tonic muscle contraction used for chewing as a result of any ailment that causes the mouth to open less than 35 mm. Reduced capacity to open the mouth can significantly impair speaking, maintaining good dental health, monitoring tumours, and being able to safely close an airway in addition to making it more difficult to chew and swallow. As a result, it may cause starvation, weight loss, and trouble receiving dental care, which may result in tooth decay. Pain is also linked to trismus, particularly during chewing. Individuals who struggle with chewing and swallowing typically have lower ratings for life quality. Thus, exercise for jaw range of motion (ROM) therapy is crucial for either treating or preventing trismus in patients with head and neck cancer undergoing surgery. **[4].**

Oral cancer requires a multidisciplinary approach involving plastic surgery, oncosurgery, oncotherapy, and physical therapy.
The surgical approach includes wide local excision of the tumor with a minimum safety margin of one-centimeter and selective neck dissection of cervical lymph nodes on affected side and reconstruction either by adjacent flap or free flap.

Therabite (TB) Jaw Motion Rehabilitation System, wooden tongue blades, rubber stoppers, dynamic bite openers, and other exercise techniques and tools have all been suggested as ways to improve mouth opening in trismus patients. When using the Therabite (TB) device instead of manual stretching or exercising with wooden tongue blades, mouth opening was increased significantly. A mechanical device operated by the patient, the Therabite (TB) What makes up the Jaw Motion Rehabilitation System is two mouthpieces that are placed in between the lower and upper jaw's teeth. The mouthpieces open with a squeeze of the handles, facilitating mouth opening **[5].**

Pauli et al. contend that the most crucial aspects of treating trismus are a regimented exercise programme and routine follow-up. Studies have demonstrated that employing a stretching tool like Therabite (TB) yields better outcomes than manual jaw stretching. Exercise programme adherence has a major impact on the results of therapeutic interventions for trismus as well. Postoperative physical therapy is important to minimize mandibular hypomobility. Melchers and colleagues discovered that Therabite (TB) adherence was influenced by self-discipline, having a clear goal, the perceived effect, and an internal drive to exercise. **[4].**

Patients and Methods:

Patients:

Sixty patients from both genders with temporomandibular joint dysfunction (TMJD) and trismus following chemo-radiotherapy as oncologic treatment in oral cavity cancer those who took part in the research, they were between the ages of 50 to 70 years. Trismus and pain were based on tape, caliper and VAS assessment. They were arbitrarily divided into two equal groups (A) and (B). Group A (study group) received Therabite (TB) exercises and manual therapy 20 min per session in addition to basic medical care (BMC): (Analgesics, mouth wash daily, movement of neck, swallowing and early manipulation) for 2 weeks. Group B (control group), on the other hand, got manual therapy in addition to basic medical care (BMC): (Analgesics, mouth wash

daily, movement of neck, swallowing and early manipulation) for 2 weeks. Maximum mouth opening (MMO) and pain (outcome variables) were measured by Therabite scale, caliper and VAS.

The inclusion criteria were as follow:

Both genders participated in the study. Age ranged between 50-70 years. All patients have chronic oral cancer stage 3&4. All patients participated in this study had Maximum Interincisal Opening (MIO) <35mm, but not <12mm. All patients were post chemo-radio therapy by 2 to 3 months. All Patients will be pre operative oral cancer. All patients had trismus and temporomandibular joint dysfunction (TMJD) following chemo-radio therapy. The therapeutic intervention for all patients started within 2-3 months post chemo-radio therapy. All patients were generally healthy and did not take medications permanently. All subjects were conscious and cooperative. The informed consent form will be signed by each patient who is recruited for the study.

The exclusion criteria were as follow:

Mandible or Maxilla bone fracture, weakness of the bone of the jaw, infection of the jaw, osteomyelitis of the jaw, any illness has an impact on the study's findings, open wound in the affected area, history of facial trauma, regular drug therapy, history of myofascial pain syndrome, mental illness, diabetes, epilepsy or any psychological disorder, internal mandibular fixation, ill health in general, a recent temporal bone fracture, or a mouth splint that restricts movement and <12 mm mouth opening (cannot use Therabite). All patients who participated in this study wrote approval consent before beginning any treatment and were aware by all steps were done.

Materials:

- Vernier Caliper gauge: It was used to measure maximal linear mouth opening, which is described as the maximum separation between the mandibular central incisor and the maxillary central incisor's incisal edges.
- Therabite ROM Scale: which calculates the millimetre (mm) maximum mouth opening (MMO).
- Visual Analogue Scale (VAS): was employed to evaluate and calculate the pain level of the patients.
- Therabite (TB) stretching device.

Procedures:

Group A (Study group):

- Every patient in group A (study group) was fully aware of the protocol of treatment and was informed by the benefits of Therabite (TB) stretching device and manual therapy to gain their collaboration and inspiration during treatment.
- Directions were provided to the patient to be in sitting position during Therabite (TB) stretching device application and lie in supine lying and sitting during the manual therapy.
- Patients received manual therapy in the form of stretching, exercises for range of motion, both passive and active and resistance training of mouth muscles. The duration of each exercise was 6 seconds and 10 repetitions were completed. All were devoted for two weeks, 20 minutes, three times a week, would show results **[6].**
- The Therabite (TB) The Jaw Motion Rehabilitation System is a mechanical device that is operated by the patient and consists of two mouthpieces that are placed in between the lower and upper jaw teeth. The mouthpieces open with a squeeze of the handles, aiding in mouth opening. Therabite (TB) was applied to mobilise the jaw. Therabite (TB) treatment's impact has already been assessed in

patients whose head and neck cancer has limited their maximum mouth opening. During the stretching process, a C-shaped hand aid helps the patient or the helper maintain a constant opening. The device is constructed with a mandibular mouthpiece That, upon being squeezed, descends in an anatomically accurate manner.

- Basic Medical Care (BMC): (Analgesics, movement of neck, swallowing, early mobilization and mouth wash daily for two weeks was described to patients.

Group B (Control group):

- Every patient in group B (control group) was fully informed about the treatment protocol to gain their cooperation and motivation during the treatment.
- Patients received manual therapy in the form of stretching, exercises for range of motion, both passive and active and resistance training of mouth muscles. The duration of each exercise was 6 seconds and 10 repetitions were completed. All were devoted 20 minutes, three times every week, for two weeks.
- Patients received basic medical care (BMC): (Analgesics, movement of neck, swallowing, early mobilization and mouth wash daily) for two weeks.

Analytical Statistics:

To contrast the ages, weights, and heights among the groups, an unpaired t test was used. To compare the allocation of sexes among the groups, a chi-squared test was employed. To compare the VAS and MMO amongst groups, an unpaired t test was used. The VAS and MMO were compared between the pre- and post-treatment periods for each group states using a paired t test. The significance threshold for each statistical test was established at $p < 0.05$. Every statistical test was performed using the statistical package for social sciences (SPSS) version 25 for Windows. (IBM SPSS, Chicago, IL, USA).

Results:

Patient demographic information:

Table 1 displayed the study and control subjects' characteristics. Age and chemotherapy cycle between-group differences were not statistically significant ($p > 0.05$).

Table 1. Comparing the characteristics of the study and control groups' subjects:

	Study group	Control group			
	Mean ± SD	**Mean ± SD**	**MD**	**t- value**	**p-value**
Age (years)	55.66 ± 2.73	56.77 ± 3.41	-1.11	-1.37	0.17
Weight (kg)	75.20 ± 10.56	77.03 ± 9.37	-1.83	-0.71	0.48
Height (cm)	163.13 ± 6.39	165.27 ± 5.40	-2.14	-1.39	0.16
Sex, n (%)					
Females	17 (57%)	16 (53%)		($\chi^2 = 0.07$)	0.79
Males	13 (43%)	14 (47%)			

χ^2, Chi squared value; p value, probability value; SD, standard deviation; MD, mean difference

Effects of treatment on VAS and MMO:

Using mixed MANOVA, it was discovered that there was a noteworthy exchange effect between treatment and time ($F = 101.08$, $p = 0.001$). Treatment had a substantial principal result ($F = 3.18$, $p = 0.02$). A noteworthy principal result time was observed ($F = 810.10$, $p = 0.001$).

Comparing groups within:

In both the research and control groups, the VAS considerably dropped following treatment as in contrast to earlier ($p > 0.001$). The percent of change in VAS in study and control groups were 58.73 and 49.56% respectively (Table 2).

There was a statistically significant increase in both the study and control groups in MMO after treatment as compared to pretreatment ($p > 0.001$). According to Table 3, the study's MMO change percentages at neutral head posture (NHP), forward head posture (FHP), and retracted head posture (RHP) were 26.66, 23.71, and 24.40, respectively, while the control group's MMO change percentages were 14.07, 10.27, and 9.18%.

Comparing groups:

There wasn't any appreciable distinction between the two groups before treatment ($p > 0.05$). Following treatment, the study group's MMO at neutral head posture (NHP), forward head posture (FHP), and retracted head posture (RHP) was notably greater than that of the control group ($p > 0.01$), according to a comparison of the two groups (Table 2-3).

Table 2: Mean VAS for study and control groups before and after treatment

VAS	Study group	Control group		
	Mean ± SD	**Mean ± SD**	**MD**	**p value**
Pre treatment	6.47 ± 2.19	6.80 ± 1.92	-0.33	0.53
Post treatment	2.67 ± 1.06	3.43 ± 1.38	-0.76	0.01
MD	3.8	3.37		
% of change	58.73	49.56		
	p = 0.001	***p = 0.001***		

Standard deviation (SD), mean difference (MD), and probability value (p-value)

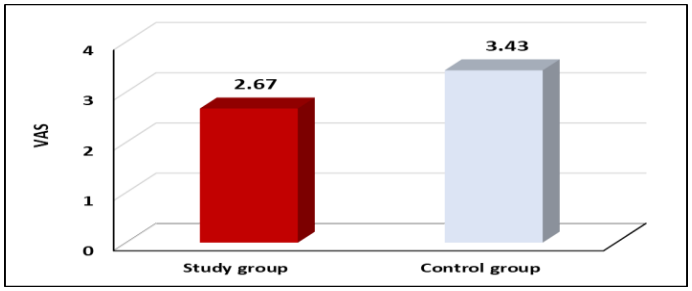

Figure (1). Before and after medical intervention mean values of VAS of study and control group.

Table 3. Mean MMO at NHP, FHP and RHP study and control groups both before and after treatment:

MMO (mm)	Study group	Control group		
	Mean ± SD	**Mean ± SD**	**MD**	**p value**
Neutral head posture				
Pre treatment	23.63 ± 4.89	23.17 ± 5.57	0.46	0.73
Post treatment	29.93 ± 5.26	26.43 ± 5.53	3.5	0.01
MD	-6.3	-3.26		
% of change	26.66	14.07		
	p = 0.001	***p = 0.001***		
Forward head posture				

Pre treatment	25.43 ± 5.16	24.63 ± 5.79	0.8	0.57
Post treatment	31.46 ± 4.86	27.16 ± 5.47	4.3	0.002
MD	-6.03	-2.53		
% of change	23.71	10.27		
	p = 0.001	***p = 0.001***		
Retracted head posture				
Pre treatment	22.83 ± 5.83	21.13 ± 5.67	1.7	0.25
Post treatment	28.40 ± 6.06	23.07 ± 5.69	5.3	0.001
MD	-5.57	-1.94		
% of change	24.40	9.18		
	p = 0.001	***p = 0.001***		

Standard deviation (SD), mean difference (MD), and probability value (p-value)

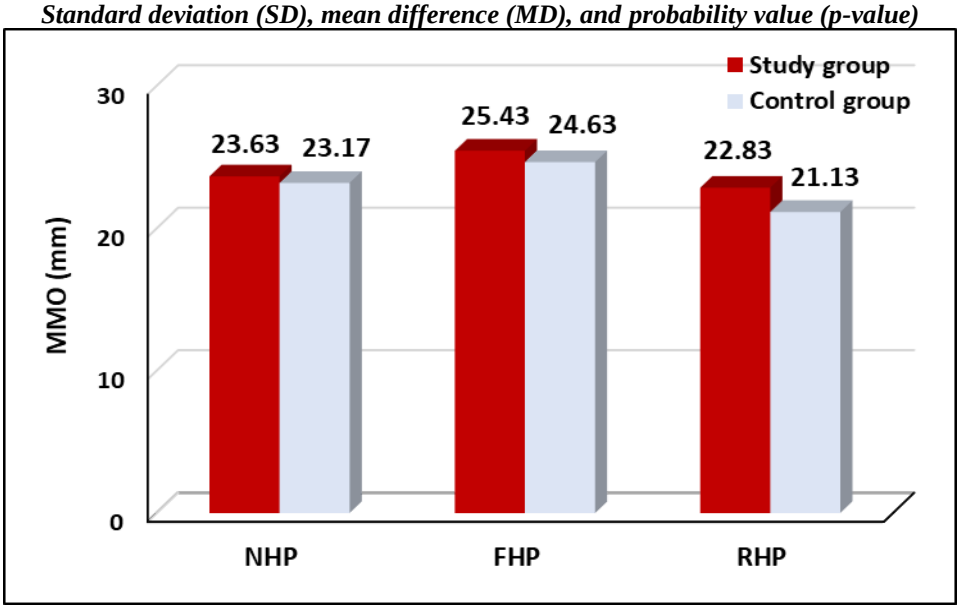

Figure (2). **Pretreatment mean values of MMO in NHP, FHP and RHP of study and control groups.**

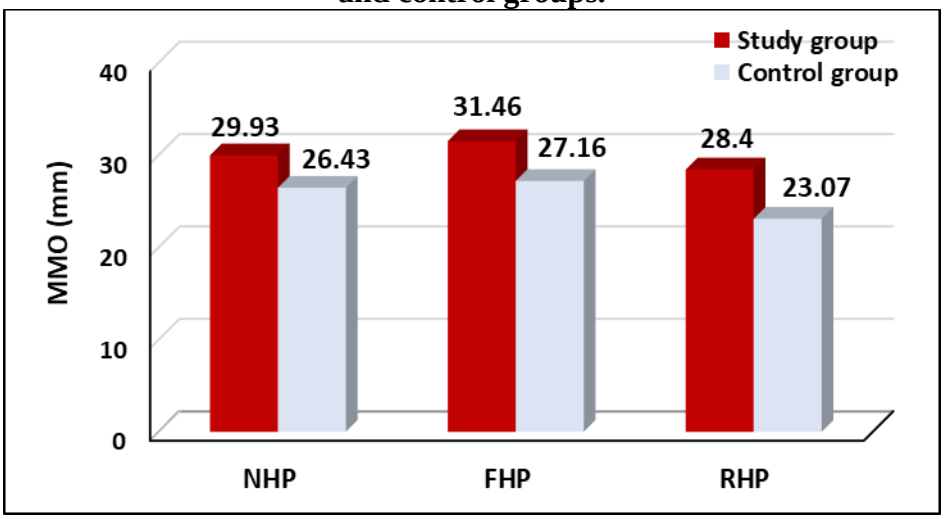

Figure (3). Post treatment mean values of MMO at NHP, FHP and RHP of study and control groups.

Discussion:

This study's objective was to investigate how patients undergoing oral oncologic treatment would respond to treatment for trismus caused by head and neck cancer while utilising the stretching exercise device Therabite (TB). In this investigation, sixty patients were divided into two equal groups at random based on their numbers; group A (study group) received Therabite (TB) stretching device, manual therapy and basic medical care (BMC): (Analgesics, mouth wash daily, movement of neck, swallowing and early manipulation) for 2 weeks. Group B (control group) received manual therapy and basic medical care (BMC): (Analgesics, mouth wash daily, movement of neck, swallowing and early manipulation). The purpose of the hand-operated, adjustable Therabite (TB) Jaw Motion Rehabilitation System is to help users increase their jaw's strength and range of motion. When using the jaw mobilizer, the mouthpiece is positioned between the upper and lower teeth and the jaw mobilizer is held in the hand. The user can provide resistance to closing or opening force (stretching) by applying pressure to the lever. Stretching and repeated passive motion are used by the Therabite (TB). A patient progress log, bite pads, range-of-motion scales, a hand aid, and a Therabite (TB) Jaw Mobilizer make up the Therabite (TB) Jaw Motion Rehabilitation System. Squeezing the Therabite (TB) handle results in the stretching effects.

The study's findings showed that when employing Mixed MANOVA, there is a significant interaction effect between treatment and time ($F = 101.08$, $p = 0.001$). Treatment had a substantial principal result ($F = 3.18$, $p = 0.02$). A noteworthy principal result time was observed ($F = 810.10$, $p = 0.001$).

Comparing groups within: When comparing the VAS before and after treatment, there was a decline in study and control groups ($p > 0.001$). The percentage of the VAS change in study and control groups were 58.73 and 49.56% respectively. MMO increased statistically significantly after treatment compared to pretreatment in both the study and control groups ($p > 0.001$). The percentage of change in MMO at NHP, FHP and RHP in study was 26.66, 23.71 and 24.40 respectively and that in control group was 14.07, 10.27 and 9.18% respectively.

Comparing groups: There wasn't any appreciable distinction between the groups before treatment ($p > 0.05$). Following treatment, the study group significantly outperformed the control group in terms of MMO at NHP, FHP, and RHP, and the VAS significantly decreased ($p > 0.01$).

This study's findings showed a statistically significant decline in trismus and pain and the results indicated that the Therabite (TB) application following oral oncologic treatment significantly reduced the trismus and pain in the study group who treated by Therabite (TB) exercise plus manual therapy and basic medical care treatment when compared with the control group who treated by manual therapy and basic medical care treatment only.

The results of this investigation supported those of **Ezzat et al. [7],** who discovered that Therabite (TB) Jaw Motion Rehabilitation System (TJMRS) was created based on the idea of continuous stretching and passive motion, which has shown to be a successful method of reorganizing and regaining the jaw muscles' range of motion. As such, it can be applied when receiving radiation or chemotherapy to reduce the effect of trismus and thus mitigate pre-existing trismus. It is advised that the TJMRS treatment plan be chosen based on the patient's therapeutic condition and the underlying cause.

The results of this investigation endorsed the conclusions of **Montalvo et al. [8],** who reported that there are a number of ways to increase mouth opening, including

finger assistance, wooden tongue depressors, screws, spatulas, and stretching exercises, and more. The instruments are positioned between the lower and upper jaws, between the front teeth, and have the potential to loosen or dislodge crowns. They only result in basic static stretching and are challenging to use. By the end of the fourth week, the patients' mouth opening had improved their quality of life, including their ability to chew, speak, swallow, and maintain better oral hygiene".

The results of this investigation corroborated also those of **Pauli et al. [9],** who investigated the effects of jaw mobilising devices-assisted structured exercise on trismus, as well as the impact this has on the symptomatology of trismus and the patients' health-related quality of life (HRQL). Materials and techniques. Fifty patients with trismus, or a less than 35 mm is the Maximum Interincisal Opening (MIO), and head and neck cancer took part in a planned intervention programme with exercises for the jaw. The intervention group's patients engaged in regular check-ups during a 10-week fitness programme. The control group comprised 50 patients suffering from trismus and head and neck cancer. Their match with the intervention group was made based on age, comorbidity, gender, tumour location, and stage. Symptoms associated with trismus and HRQL were evaluated. Conclusions. The intervention group's mean MIO improvement three months after the intervention began was 6.4 mm (4.8-8.0), while the control group's was 0.7 mm (0.3-1.7) ($p<0.001$). The Gothenburg Trismus Questionnaire (GTQ) demonstrated statistically significant improvements in all domains, involving eating restriction ($p<0.05$), jaw-related issues ($p<0.001$), social functioning, role functioning, and overall quality of life (EORTC QLQ C30), as well as muscular tension ($p<0.001$). To sum up, we discovered that a regimented jaw exercise programme was successful in greatly increasing the mouth opening capacity. Patients who completed the structured exercise programme following cancer treatment reported better HRQL and fewer trismus-related symptoms in the patient-reported outcome questionnaires than those in the control group. This provided additional evidence for the impact on trismus objectively (MIO).

Consistent with the findings of **Senthilkumar and Tarun. [10],** who demonstrated that in individuals undergoing head and neck cancer treatment who have trismus brought on by radiation, exercises using devices to mobilize the jaw produce better results than no exercise at all. Their research has demonstrated that effects of radiation on trismus in this group can be relieved by exercises using wooden spatulas or Therabite (TB) before, during, and after radiotherapy. Patients who performed the exercises more frequently showed an increase in mouth opening, according to **Melchers et al**. The authors also discovered that maintaining the required effort required self-control and well-defined goals. Also demonstrated that, in patients with nasopharyngeal carcinoma receiving radiation therapy, rehabilitation training can halt the advancement of trismus. A number of studies have demonstrated that exercises for active range of motion or the use of wooden spatulas are just as effective as using a Therabite (TB). However, **Pauli et al. [11],** found that although compliance was similar, Therabite (TB) use was associated with a greater increase in mouth opening than the Engström device—a wooden clothes peg with a rubber band attached. A prior study by Buchbinder et al. also showed that Therabite (TB) was more effective than stretching without help or stretching with wooden spatulas, despite the fact that it only included a small number of patients.

The findings of this study were corroborated by the findings of **Montalvo et al. [5],** who regardless of the length of time since cancer treatment, saw a significant improvement in mouth opening and an improved quality of life following structured exercise with the jaw-mobilizing device for patients with trismus.

Similarly, **Heres et al. [12]**, indicates that, in the Netherlands, using tuberculosis (TB) instead of the use of physical therapy (PT) to treat acute myogenic TMD has a very high chance of being more affordable based on the evidence currently available. It has previously been demonstrated that Therabite (TB) treatment improves mandibular function more quickly and strongly than physical therapy (PT) when treating acute cancer. As of right now, it has also been demonstrated to be a more cost-effective treatment option for patients with acute myogenic TMD.

Pauli et al. [13], demonstrated that using a jaw exerciser as part of a structured intervention helped patients open their mouths more and experience fewer symptoms associated with trismus. During the first four weeks of exercise, they observed the biggest improvement in mouth opening. Similarly, **Baranano et al. [14],** found that the first six weeks of exercise exhibited the largest increase in MIO in a study involving patients with head and neck cancer who were using the Therabite (TB) Trismus System. **Wang et al** shown that MIO decreases at a rate of 2.4% per month after radiation therapy, and that the majority of trismus cases can be detected within the first nine months after radiation therapy. Patients were enrolled in this study 2.5 (Therabite) (TB) months on average after completing radiation therapy. It has been demonstrated that beginning exercise early increases the likelihood to increase oral opening. However, early exercise initiation necessitates routine monitoring of symptoms of trismus and MIO. Similarly, **Tang et al.** [15] treated patients with nasopharyngeal carcinoma and trismus several years after radiation therapy, and whose mouth opening capacity at inclusion was significantly more limited than in the current study (mean, 18.9 mm). They observed that manual stretching or Therabite (TB) exercise stopped trismus from progressing further, but they saw not better. implying that trismus may be challenging to treat if years have passed since treatment; however, exercise can prevent the condition's progression and preserve jaw function regardless of the condition's initial functional level.

Brochado et al. [16], showed that jaw movement improvement, pain relief, and a reduction in anxiety symptoms are all facilitated by manual therapy (MT). Tissue manipulation improves range of motion, muscle relaxation, and fibrocartilage nutrition. Furthermore, the TMJ's musculature and ligaments that are subjected to massage, traction, and mobilization have a tendency to become more relaxed, which enhances tissue compliance and vascularization while reducing pain and expanding range of motion. When the procedures were used independently or in conjunction with other therapeutic resources, the outcomes were favorable, supporting the significance of MT in the treatment of TMJD.

In keeping with the finding of **Shimada et al. [17],** the current research demonstrated that There was a noticeable improvement in jaw mobility and pain intensity with exercise therapy. Myalgia and arthralgia, two painful TMJD conditions, seem to respond well to manual therapy, which includes voluntary jaw exercises and passive jaw mobilization with oral appliances.

Patients with TMJD can experience less pain and more capacity with supervised exercise. The results suggest that individuals with TMJD associated with widespread pain and those with localized/regional TMJD pain benefit from activating the jaw motor system through exercise **Häggman-Henrikson et al. [18].**

Regarding to the Therabite (TB), our results disagree with the work of **Charters et al. [19],** who found that Patients with established trismus can benefit from trismus devices that increase the MIO by applying force to the jaw. Their effectiveness in preventing trismus during radiation therapy has not been established, though, and a

number of important obstacles, including expense, adherence to exercise regimens, and safety issues, have been shown in the context of intervention.

Conclusion:

These results suggested that Therabite (TB) exercise provides positive effects for treatment of Temporomandibular joint dysfunction (TMJD) and trismus following oral oncologic treatment. Therabite (TB) exercise application after oral oncologic treatment has a significant effect on decreasing the trismus level and pain after 2–3 month post chemo-radio therapy.

A conflict of interest:

The writers attested that there is no conflict of interest exists. in the content of this article.

REFERENCES:

1. **Speight PM and Farthing PM (2018).**" The pathology of oral cancer. Br Dent J ;225 (9): 841-847.
2. **Irani S. (2020).**" New Insights into Oral Cancer-Risk Factors and Prevention: A Review of Literature." Int J Prev Med.; 11:202.
3. **Epstein JB and Miaskowski C (2019).** "Oral Pain in the Cancer Patient." J Natl Cancer Inst Monogr. 1; (53).
4. **Sandler ML, Lazarus CL, Ru M, Sharif KF, Yue LE, Griffin MJ, Likhterov I, Chai RL, Buchbinder D, Urken ML and Ganz C (2019).** "Effects of jaw exercise intervention timing on outcomes following oral and oropharyngeal cancer surgery: Pilot study" Head Neck ;41(11): 3806-3817.
5. **Montalvo C, Finizia C, Pauli N, Fagerberg-Mohlin B and Andréll P (2020):** "Impact of exercise with TheraBite device on trismus and health-related quality of life: A prospective study." Ear Nose Throat J ;96(1): 1-6.
6. **Elgohary, H. M., Eladl, H. M., Soliman, A. H.,Soliman, E. S. (2018):** "Effects of ultrasound, laser and exercises on temporomandibular joint pain and trismus following head and neck cancer." Annals of Rehabilitation Medicine, 42(6), 846.
7. **Ezzat YE, Sharka RM, Huzaimi AA, Al-Zahrani KM and Abed HH (2020).**" The role of exercise therapy in managing post-radiotherapy trismus in head and neck cancer." J Taibah Univ Med Sci ;16(1): 127-133.
8. **Montalvo C, Finizia C, Pauli N, Fagerberg-Mohlin B and Andréll P (2017)**."Impact of exercise with TheraBite device on trismus and health-related quality of life: A prospective study." Ear Nose Throat J ;96(1): E1-E6.
9. **Pauli N, Svensson U, Karlsson T and Finizia C (2016).**" Exercise intervention for the treatment of trismus in head and neck cancer - a prospective two-year follow-up study" Acta Oncol;55(6): 686-692.
10. **Senthilkumar S and Tarun S (2020**)." A Study on Effectiveness of Therabite Exercises to improve the Jaw Range of Motion in Trismus among Oral Cancer Patients." Research J. Pharm; 13(2): 519-522.
11. **Pauli N, Andréll P, Johansson M, Fagerberg-Mohlin B and Finizia C (2015)**." Treating trismus: A prospective study on effect and compliance to jaw exercise therapy in head and neck cancer." Head Neck ;37(12): 1738-1744.
12. **Heres Diddens A, Kraaijenga S, Coupé V, Hilgers F, van der Molen L, Smeele L and Retèl V (2017).** "The cost-effectiveness of TheraBite® as treatment for acute myogenic temporomandibular disorder". Cranio ;35(5): 290-297.

13. **Pauli N, Andréll P, Johansson M, Fagerberg-Mohlin B, Finizia C. (2014**). "Treating trismus: A prospective study on effect and compliance to jaw exercise therapy in head and neck cancer. Head Neck; 53(4): 502-509.

14. **Bara~nano CF, Rosenthal EL, Morgan BA and McColloch NL (2011)."** Magnuson JS. Dynasplint for the management of trismus after treatment of upper aerodiges-tive tract cancer: a retrospective study."Ear Nose Throat J;90: 584–590.
15. **Tang Y, Shen Q, Wang Y, Lu K, Wang Y and Peng Y. A (2011)** "randomized prospec-tive study of rehabilitation therapy in the treatment of radiation-induceddysphagia and trismus.Strahlenther Onkol.";187: 39–44.
16. **Brochado, F. T., Jesus, L. H., Carrard, V. C., Freddo, A. L., Chaves, K. D., & Martins, M. D. (2018).** "Comparative effectiveness of photobiomodulation and manual therapy alone or combined in TMD patients: a randomized clinical trial." Brazilian oral research; (32): 32-50.
17. **Shimada, A., Ishigaki, S., Matsuka, Y., Komiyama, O., Torisu, T., Oono, Y., Sasaki, K. (2019).** "Effects of exercise therapy on painful temporomandibular disorders." Journal of oral rehabilitation, 46(5): 475-481.
18. **Häggman-Henrikson, B., Wiesinger, B., Wänman, A. (2018).** The effect of supervised exercise on localized TMD pain and TMD pain associated with generalized pain. Acta Odontologica Scandinavica, 76(1), 6:12.
19. **Charters E, Dunn M, Cheng K, Aung V, Mukherjee P, Froggatt C, Dusseldorp Jr and Clark Jr (2022).**" Trismus therapy devices: A systematic review" Oral Oncol; 105728.