Original Article

Efficacy of matrix rhythm therapy (MaRhyThe©) over conventional therapy on radiation induced trismus-A pilot randomised control trial

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ABSTRACT

Background and Objectives: Prevalence of radiation induced trismus in head and neck cancer (HNC) is 38% to 42% globally. Radiation induced trismus depends on the dosage of the radiation therapy and the surgical procedure. Myofascial release (MFR) and Matrix rhythm therapy (MaRhyThe©) are techniques used to treat the myofascial pain and muscular restriction. The present study aimed to compare the effect of MFR and MaRhyThe© on pain, mouth opening, TMJ disability index (TDI), Gothenburg Trismuus Questionnaire (GTQ), Functional Intraoral Glasgow Scale (FIGS) and quality of life in participants with Radiation induced trismus.

Materials and Methodology: About 30 participants in age group of 18 to 65 years diagnosed with radiation induced trismus were included in the study. All the participants were randomly allocated in 2 groups MFR group and MaRhyThe© group. Both the group received structured exercise program. Primary outcomes were Visual Analogue Scale (VAS), Vernier Caliper reading for maximum mouth opening. Secondary outcome measure viz. GTQ, TDI, FIGS and Functional Assessment of Cancer Therapy-Head and Neck (FACT-HN) all obtained values were analyzed at the end of 4th week.

Results: The present study demonstrated significant improvement in terms of reduction in pain, improvement in maximum mouth opening and in GTQ, TMD, FIGS, and FACT-HN scores in all the participants in both group ($p \leq 0.05$). However, the groups showed equal effectiveness in the treatment of radiation induced trismus.

KEY WORDS: Head and neck Cancer, myofascial release, radiation therapy, trismus

INTRODUCTION

Head and Neck Cancers (HNC) refers to malignancies that originate in the head and neck area, as per the National Cancer Institute.[1] The most prominent malignant tumor in India is squamous cell carcinoma (SCC) of the buccal cavity, which is usually induced by betel quid and cigarette use, as well as alcohol intake, which is particularly widespread in the Indian population.[2] HNC account for 30–40% of all cancers in India and is the world's sixth most prevalent cancer.[3] Surgery, radiation therapy (RT), and chemotherapy (CT) are the most common treatments for HNC, and they can be given separately or in combination.[4,5] The management technique chosen is determined on the patient's condition, tumor origin, and clinical stage.[5] Radiotherapy is a type of physical treatment that can be used to destroy cancer cells. The radiation is referred to as ionizing radiation because it forms ions and deposits energy in the cells of the tissues it passes through.[6] The radiation dosage today comprises of 1.5 to 3Gy daily fractions spread out over many weeks.[7] A maximum dosage of 65–70Gy is usually recommended with a treatment regimen of 1.5–3 Gy daily. Though radiation therapy (RT) is the most common for the cancer treatment, the damages are pronounced and is known to cause damage to blood vessels nourishing muscles, neurons, and bones, leading to "radiation fibrosis syndrome."[8]

RT in the HNC area may produce both immediate and long-term side effects in patients. Mucosal toxicity and/or mucositis, dry mouth, taste alterations,

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difficulty in swallowing, radiation induced trismus, and vascular reactivity in the irradiated area are some of the common deleterious consequence. These side effects add to low quality of life.[9] Generally, a mouth opening of fewer than 20 mm and less than 40 mm is defined as trismus. However, Dijkstra's definition of trismus, which is defined as a maximal mouth opening of less than 35 mm, is routinely utilized in trismus testing in HNC patients.[10-12] Radiation induced trismus is a recognized frequent effect of post-radiation to the tongue, tonsil, retromolar trigone, soft palate, masseter muscles, pterygoid muscles, and the temporomandibular joint.[13] Biting, chewing, listening, and laughing get painful when patients have trismus. As a consequence of inadequate oral health, it also exacerbates periodontal disease and dental caries in the majority of cases.[14,15] Oral complications caused by RT are complex, and can have a negative effect on QOL and may lead to serious clinical problems.[16] The function of physiotherapy in the rehabilitation of participants with oral cancer include exercises for head and neck and jaw stretching exercises. It prevents multiple complications arising because of cancer treatments. Prevention can be done by starting exercises in persons who are thought to be at high risk of radiation induced trismus.[2,7] In general physiotherapy practice mouth opening is measured using the 3-finger method, ice cream stick method or by using the vernier caliper.

MaRhyThe operates on the idea that cells in the body vibrate or oscillate at a frequency of 8–12 Hz, hence maintaining the body's physiological function.[17,18] The therapy appears to restore normal tissue resonance, and the vibrations produced by the device remove the extracellular matrix, therefore boosting venous and lymphatic circulation.[19] The gadget generates oscillations of the same frequency as cellular oscillations and can be used for therapeutic reasons in a variety of musculoskeletal diseases.[20] Myofascial release (MFR) is a manual procedure for treating chronic pain caused by myofascial pain dysfunction syndrome. Since MFR focuses specifically on the restricted myofascial causes, it is used to release restrictions within the muscles and fascia. The application of low-load, prolong stretches to the myofascial complex restores optimum length, reducing discomfort and improving function.[21,22] MFR for the masseter and temporalis muscles has been demonstrated to promote flexibility by directly disrupting the muscle's stress–strain curve principle, resulting in increased muscle tissue elongation.[23] There seems to be a lack of evidence regarding utilization of MaRhyThe© as a treatment approach in radiation induced trismus. Hence the present study was conceptualized to look at the impact of matrix rhythm therapy (MRT) as a novel treatment option and to compare its effect with the conventional treatment (MFR) in radiation induced trismus.

METHODS

The Institutional Ethical Committee provided ethical approval (IEC). The study was registered under the Clinical Trial Registry—India. The pilot randomized control trial-experimental study was conducted in KLE hospital and medical research center and KLE's Belgaum Cancer Hospital, Belagavi, Karnataka over a period of 1 year. Sample Size was determined using the formula $n = \frac{2(Z_\alpha + Z_\beta)^2 * \sigma^2}{d^2}$. Thirty participants were recruited for the study [Figure 1]. All the patients in the age of 18–65 years and diagnosed with Head and neck Cancer and received Radiation therapy for the same and diagnosed with radiation induced trismus by Radiation Oncologist with a mouth opening less than or equal to 35 mm, and willing to participant in the study were enrolled in the study. Patients with any signs of oral mucositis. Oral pain/facial pain on VAS scale ≥7/10, also diagnosed with Bell's Palsy/trigeminal neuralgia/facial palsy, Facial lymphedema [as suggested by radiation oncologist]. Sensitive skin, radiation burn or active infection. [as suggested by radiation oncologist]. Participants with any previous history of trismus were all excluded from the study.

The primary outcome measures used in the study were the VAS scores.[24]

and measurement of maximum mouth opening using vernier caliper[25] and the scores were recorded at baseline (BL), at the end of 1st, 2nd, and 3rd week post intervention. And the secondary outcome measures were recorded on the baseline and at the end of 3rd week. the secondary outcome measures were Gothenburg Trismus Questionnaire Score (GTQ),[26] TMJ Disability Index (TDI), Functional intraoral Glasgow scale (FIGS),[27] and Functional Assessment of Cancer Therapy—Head and Neck (FACT H and N).[28]

Measurement of mouth opening

A vernier caliper was used to record the MMO, with patients in an erect position [Figure 2]. Instruct patient to open mouth as much as possible, whereas the investigator assessed maximum at midline, the distance between the incisor margins of the maxillary central incisor and the mandibular central incisor.

Protocol and intervention

INTERVENTION: 2 Sessions/week for 3 weeks = 6 sessions.

The participants in the study were allocated into 2 groups: MFR and Matrix rhythm therapy group and both the groups were given mouth opening exercises.

Myofascial Release (MFR) technique was given in circular motion by the therapist, with three finger contact and longitudinal tissue stretch to the tight palpated muscles of mastication (medial pterygoid, lateral pterygoid, and masseter). The duration of intervention was 15 minutes. The intervention was given for 2 days per week for 3 weeks.

Participant position: The patient was in supine lying position.

Therapist position: Seated towards head end of the patient.[21,23]

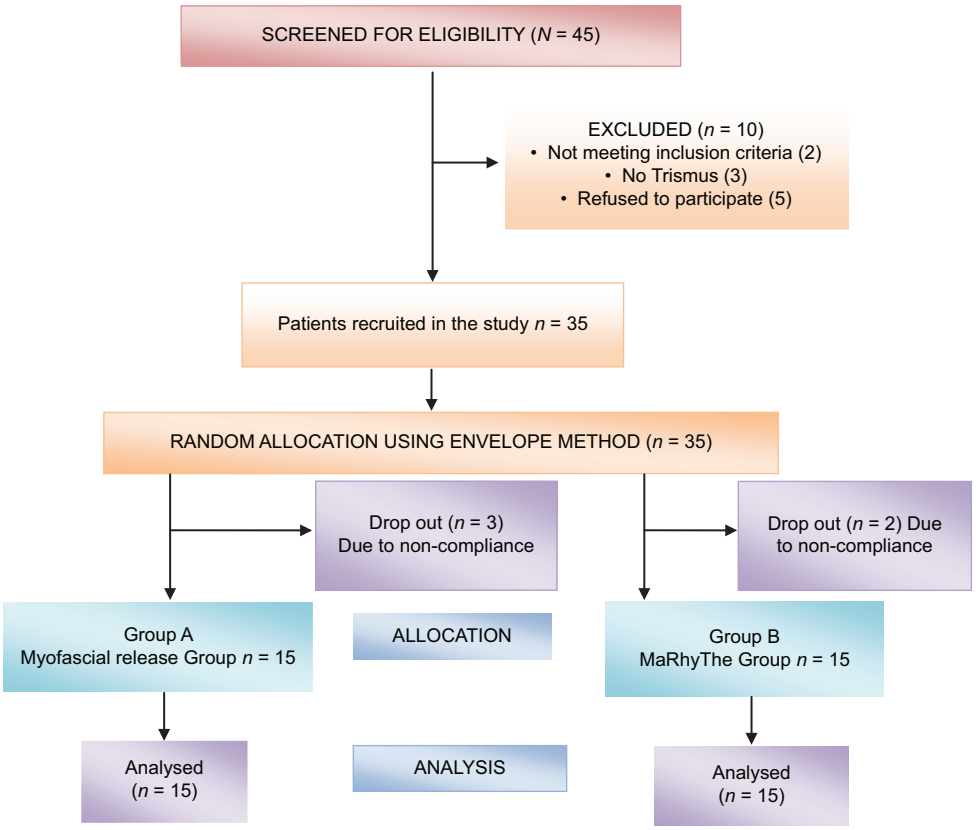

Figure 1: Consort flow chart

Figure 2: Measuring of the maximum mouth opening using a vernier caliper

Matrix rhythm group: The patients were asked to lie comfortably in a supine posture. The muscles of the anterior neck and lower face were to be treated Friction was avoided by the use of talcum powder over the treatment area which is been produced by the Matrix Mobile®. The vibration frequency of the device ranges from 8 to 12 Hz. The longitudinal stroking method was used with the hand-held Matrix Mobil® device. The treatment time for each patient was 45–60 minutes/session.[29]

Mouth opening exercise protocol:

The exercise program consisted of 3-weeks designed mouth opening exercise program with 3 times per day. It consisted of three steps:

1. Jaw movements comprising of jaw opening and sideway movements of jaw without using jaw device. Participants were asked to do 10 repetitions actively or as much as they can do in each second. The participants were in sitting position.
2. Passive stretching: Participant was asked to stretch the jaw by using his/her index finger and thumb with 30 seconds hold and 5 repetitions. The participant was in sitting position.
3. Bite towards resistance: Participant was asked to be in a supine position and therapist stands towards head of the participants applying resistance by using therapist finger and participant was asked to bite toward resistance (5 repetitions).

These exercises were performed 3 times per day by every patient. Participants were asked to relax in between sessions.[26,30]

RESULTS

To evaluate the findings obtained, statistical analysis was performed using Statistical Package of Social Sciences (SPSS) version 23 (International Business Machines [IBM] Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0.). The data was entered into an excel spreadsheet, tabulated, and statistical analysis was performed on it. The study used a variety of statistical measures, including mean, standard deviation, and percentages. The normality of all the

parameters was determined by the Kolmogorov Smirnov test. To compare mean/distributions at different time points (at baseline, at 1st, 2nd, and 3rd week) between the 2 groups, the independent *t*-test was used. Dependent *t*-test were used to compare the mean/distributions within the groups for all variables. The level of significance was set at $P \leq 0.05$. The demographic profile of all the patients in the study. A total of thirty (n = 30) Patients out of which 28 were males and 2 were females. [Table 1] The mean age group of participants in Matrix Rhythm group was 52 and in the Myofascial group were 43.13. The dosage and the Fractions of radiation received in both the groups were same i.e., 62Gy and 31 fractions of radiation therapy [Table 2].

The pain in terms of VAS and MMO in at different time point and both the groups show a statistically significance at all the time frames [Table 3] [Figures 3 and 4]. In both the groups, (myofascial and Matrix rhythm), there is a statistical significance at all time points in GTQ, TMD and in FIGS the secondary outcome measures used in the study. For the FACT H and N total, PWB, EWB, and additional component score was found to be statistically significant in both the groups, whereas in terms of SWB and FWB there was a difference in score at the end of 3 weeks of intervention in both the groups however it was not statistically significant.

[Table 4]. VAS score from 3 time points (baseline, 1st, 2nd, and 3rd week) were compared or both the groups. the vas score reduced from baseline to end of 1st week. Whereas, the scores were observed to increase in 2nd and 3rd week. However the difference was not statistically significant. [Table 5] The MMO measured at 3 time points was compared. The change in the mouth opening in both the groups was compared, and it was observed that the scores increased from the baseline to the end of 2nd and 3rd week, and those in the matrix rhythm therapy group were more when compared to the Myofacial group. These differences in the mean scores were found to be statistically significant. [Table 6].

The scores on outcome measure such as GTQ, TMD, FIGS and FACT-HN were measured between both the groups (Matrix rhythm therapy and Myofascial). The difference between the

Table 1: Demographic profile of all the patients in the study

	Matrix rhythm therapy group (*n*=15)	%	Myofascial group (*n*=15)	%	Total (*n*=30)	%
Gender						
Male	14	93.33	14	93.33	28	93.33
Female	1	6.67	1	6.67	2	6.66
Type of Cancer						
Hard-soft palate	1	6.67	0	0.00	1	3.33
Larynx	1	6.67	0	0.00	1	3.33
Lateral tongue	0	0.00	1	6.67	1	3.33
Lower Rt GBS	0	0.00	1	6.67	1	3.33
Lt BM	6	40.00	4	26.67	10	33.33
Lt Parotid	1	6.67	1	6.67	2	6.66
Lt RMT +GBS	0	0.00	1	6.67	1	3.33
Rt BM	6	40.00	5	33.33	11	36.66
Tongue	0	0.00	2	13.33	2	6.66
Staging of Cancer						
T1N0M0	1	6.67	2	13.33	3	10.00
T2N0M0	4	26.67	0	0.00	4	13.33
T2N1M0	0	0.00	4	26.67	4	13.33
T3N0M0	4	26.67	3	20.00	7	23.33
T3N1M0	2	13.33	0	0.00	2	6.66
T4aN0M0	0	0.00	3	20.00	3	10.00
T4aN2bM0	0	0.00	2	13.33	2	6.66
T4aN3M0	1	6.67	0	0.00	1	3.33
T4bN2M0	0	0.00	1	6.67	1	3.33
T4N0M0	2	13.33	0	0.00	2	6.66
T4N2M0	1	6.67	0	0.00	1	3.33
Surgery						
Chemo-therapy	3	20.00	4	26.67	7	23.33
Commando with PMMC flap	7	46.67	6	40.00	13	43.33
Commando with PMMC flap + Chemo therapy	3	20.20	1	6.67	4	13.33
Hemiglossectomy	0	0.00	1	6.67	1	3.33
Lateral tongue excision	0	0.00	1	6.67	1	3.33
Modified neck dissection	1	6.67	0	0.00	1	3.33
Parotidectomy	1	6.67	0	0.00	1	3.33
Total parotidectomy with SOND + Chemo-therapy	0	0.00	1	6.67	1	3.33
WLE +SOND	0	0.00	1	6.67	1	3.33
Total	15	100.00	15	100.00	30	100.00

RMT - Etromolartrigone, GBS - Gingivobuccal sulcus, BM - Buccal mucosa, Rt - Right, Lt - Left, COMMANDO - Combined mandibulectomy and neck dissection operation, PMMC - Flap-pectoralis major mayocutaneous flap, SOND - Supraomohyoid neck dissection, WLE - wide local excision

Figure 3: Pre and Post comparison of the maximum mouth opening after 6 sessions of matrix rhythm therapy. Pre-intervention at Baseline Post-intervention after 3 weeks

Figure 4: Pre and post comparison of the maximum mouth opening after Myofascial release. Pre-intervention Post-intervention

Table 2: Age Distribution, Dosage and Fractions of Radiation received by all the patients in the study

Variables	Mean and SD		*d*
	Matrix rhythm therapy group	Myofascial group	
Age	52.13±11.56	43.13±0.49	0.18
Dosage of Radiation	62.13±3.81	62.67±3.52	0.08
Fraction of Radiation	31.13±1.73	31.53±1.77	0.09

Table 3: Week wise changes of primary outcome measures (VAS and Maximal Mouth opening) of all the patients in the study

Variables	Group	Changes from	Mean Diff.	% of change	*P*
VAS	Matrix rhythm therapy group	BL-1W	0.80	20.00	0.0007*
		BL-2W	1.47	36.67	0.0007*
		BL-3W	2.53	63.33	0.0086*
	Myofascial group	BL-1W	0.87	18.06	0.0010*
		BL-2W	2.00	41.67	0.0007*
		BL-3W	2.93	61.11	0.0128*
MMO	Matrix rhythm therapy group	BL-1W	−2.80	−29.83	0.0001*
		BL-2W	−5.40	−57.57	0.0001*
		BL-3W	−8.31	−88.60	0.0001*
	Myofascial group	BL-1W	−1.72	−20.11	0.0118*
		BL-2W	−3.14	−36.75	0.0001*
		BL-3W	−4.74	−55.54	0.0001*

*Level of significance set at *P*=0.05. BL - Baseline, 1W - After 1 week of intervention, 2W - After 2 weeks of intervention, 3W - After 3 weeks of intervention, VAS - Visual analogscale, MMO - Maximum mouth opening

mean scores of FIGS between both the groups was found to be statistically sign at the baseline. Other hand there was difference found in the scores of other outcome measures, however, they were not statistically significant [Table 7].

DISCUSSION

The present study was undertaken to compare the effect of Myofascial release and Matrix Rhythm Therapy (MaRhyThe©) on pain, Mouth opening, TMJ disability index, GTQ, FIGS, and Quality of life in radiation induced trismus.

14 males and 1 female were included in both the groups with average age of 52.13 ± 11.56 in the MFR group and 43.13 ± 6.49 years in matrix rhythm therapy group. A clear male dominance was evident in the current study with twenty-eight (28) male and only two (2) female participants. This male dominance of the HNC was observed in other studies that may be co-related to the consumption of tobacco in form of smoking or in smokeless forms, betel quid chewing which leads to the heads and neck cancers, which is very common in developing countries such as India.[2,31] The occurrence of HNC in females was found to be low when compared with males because the females are more often in the indoor settings and are not frequently exposed to the carcinogenic agents and in India the consumption of tobacco is comparatively less among females.[31]

The primary treatment options available for HNC are surgery and/chemotherapy and/combination of chemo radiotherapy. These different types of treatment frequently lead to trismus, dysphagia, anxiety, depression, mucositis, and xerostomia. Incidence of radiation induced trismus in HNC patients is 38% to 42%. Radiotherapy alone has found to have major impact on oral and mandibular function. Pain and restricted cervical ROM are common complaints reported by the patients. Anxiety and depression disorders are experience by the HNC patients during treatment period. The present study also demonstrated similar problems related to HNC treatment associated with trismus and shown significant improvement in all the outcome variables in relation to pain, mouth opening and quality of life.[4,32]

Radiation induced trismus is the most common complaint that occurs in the patients receiving RT for the HNC. Literature suggests that, the primary factor to restrict jaw movement is formation of collagen in muscles due to radiation, or surgery, or both, lead to fibrosis and contraction of muscles used for closing mouth and mastication.[4] and/or due to the effect of radiation alone which causes a decrease in the thickness of the joint and increase of condyle irregularity (CI) and joint vascularity (JV).[33] Matrix Rhythm therapy has proved to be an effective tool for the reducing pain by increasing the

Table 4: Comparison of the score at Baseline and at the end of third week on secondary outcome (GTQ, TMD, FIGS, FACT H and N) measure used in the study

Variables	Groups	Mean diff.	% of change	*P*
GTQscores	Matrix rhythm therapy	27.87±10.33	41.06	0.0001*
	Myofascial	31.53±9.16	47.54	0.0001*
TDI scores	Matrix rhythm therapy	32.60±11.31	40.95	0.0001*
	Myofascial	37.33±11.02	45.60	0.0001*
FIGS score	Matrix rhythm therapy	−2.00±1.25	−20.98	0.0001*
	Myofascial	−2.87±1.19	−34.13	0.0001*
FACT H and N (total score)	Matrix rhythm therapy	11.93±6.65	11.65	0.0001*
	Myofascial	11.15±10.2	10.82	0.0008*
PWB	Matrix rhythm therapy	3.27±3.03	17.44	0.0009*
	Myofascial	3.15±3.62	16.72	0.0046*
SWB	Matrix rhythm therapy	0.77±2.23	2.90	0.2005
	Myofascial	0.93±2.97	3.57	0.2436
EWB	Matrix rhythm therapy	2.76±2.71	13.66	0.0015*
	Myofascial	1.57±2.81	7.58	0.0486*
FWB	Matrix rhythm therapy	1.87±4.21	8.51	0.1077
	Myofascial	1.40±4.37	6.56	0.2353
Additional	Matrix rhythm therapy	3.33±3.35	14.62	0.0018*
	Myofascial	4.27±2.43	18.44	0.0001*

*Level of significance set at *P*=0.05. GTQ - Gothenburgtrismus questionnaire score, TDI - TMJ disability Index, FIGS - Functional intraoral Glasgow scale, FACT H and N - Functional assessment of cancer therapy -head and neck, PWB - Physical well-being, SWB - Social well-being, EWB - Emotional well-being, FWB - Functional well-being

Table 5: Between group comparison of Pain in terms of VAS score at different time points in the study

Times	Mean and SD		*P*	*d*
	Matrix rhythm therapy group	Myofascial group		
BL	4.00±1.00	4.80±1.66	0.1249	0.19
1 week	3.20±0.86	3.93±1.16	0.1057	0.18
2 week	2.53±0.52	2.80±1.26	0.3401	5.86
3 week	1.47±0.92	1.87±0.83	0.2290	0.1
BL-1W	0.80±0.77	0.87±1.13	0.8519	0.01
BL-2W	1.47±0.83	2.00±1.46	0.3297	0.13
BL-3W	2.53±0.92	2.93±1.44	0.5338	0.1

*Level of significance set at *P*=0.05. BL - Baseline, 1W - After 1 week of intervention, 2W - After 2 weeks of intervention, 3W - After 3 weeks of intervention

Table 6: Between group Comparison of the maximum mouth opening at different time points in the study (Baseline, 1st, 2nd, and 3rd week) of all the patients in the study

Times	Mean and SD		*P*	*d*
	Matrix rhythm therapy group	Myofascial group		
BL	9.38±4.45	8.53±4.07	0.5923	0.12
1 week	12.17±5.14	10.25±4.85	0.3007	0.24
2 week	14.77±5.30	11.67±4.78	0.1030	0.39
3 week	17.68±5.61	13.27±4.61	0.0259*	0.55
BL-1W	2.80±1.31	1.72±2.30	0.1244	0.24
BL-2W	5.40±1.84	3.14±2.06	0.0037*	0.5
BL-3W	8.31±2.75	4.74±2.21	0.0005*	0.89

*Level of significance set at *P*=0.05. BL - Baseline, 1W - after 1 week of intervention, 2W - after 2 weeks of intervention, 3W - after 3 weeks of intervention

vascularity of the region and in improving the flexibility by directly affecting the stress strain curve of the muscle resulting in elongation of the muscle. Literature suggests that the use of MaRhyThe© is found to be safe and has shown good outcome among cancer patients as well.[29] A case report performed on a cancer patient with decubitus ulcer and it demonstrated that 12 sessions of MaRhyThe© showed significant improvement in reduction of pain and in the size of the decubitus ulcer.[34] Literature also states that MaRhyThe© is beneficial in patients with post dental procedure trismus and have found to have an effect on the pain and increased mouth opening.[29] In the current study similar results were obtained and it was observed that Matrix rhythm Therapy has an effect on pain, maximum mouth opening after 6 sessions of intervention.

Patients with HNC and undergone RT may experience side effects from the treatment which might harm the healthy skin and the tissue layer as well and this in turn leads to increased risk of infections, sensory abnormalities, and tissue fibrosis.[35] A case report suggests the MaRhyThe© had proved to have a greater improvement in patients with oral submucosal fibrosis in terms of pain and mouth opening. All 3 patients had a minimum improvement of 3 mm after 1 session of MaRhyThe©. This was also observed in the current study.[36]

Dose of Radiation and the fractionation are the prime aspect in patients receiving radiation therapy, the mean dose of Radiation in both the groups was 62Gy and the mean fractions of RT was 31#. The chances of Radiation induced trismus increases along with the increment in dose. These findings co-related with a study that stated that the average mean dose of radiation received by the patients was 41.1Gy and the patients with trismus were high in number.[33] Myofascial release technique which is used to treat pain associated with muscular dysfunction. It is application of low load; prolong stretches to myofascia which restores maximum length as a result pain reduces and improves function. Study stated that, MFR for the masseter and temporalis muscles improved the muscle flexibility by directly distressing the stress- strain curve principle of the muscles which resulting elongation of muscle tissue.[23,37]

Radiation induced trismus commonly treated by using jaw opening exercises, jaw stretching, Thera bite exercises and jaw stretcher along with range of motion exercise.[12]

Studies concluded that there is significant effect of Thera bite device exercise, use of dynasplint device, active ROM exercise, hold relax technique and manual jaw stretching on improvement in mouth opening in trismus population also reduces pain, anxiety, and depression in patients. The present study findings shown significant improvement in both the groups in terms of mouth opening, and reduction in pain and quality of life.[38,39]

CONCLUSION

The current study demonstrates that there was an improvement in terms of reduction of pain and increase in the maximum mouth opening in both the groups and it also showed

Table 7: Between Group Comparison of all the secondary outcome measures used in the study (GTQ, TMD, FIGS and FACT H and N) of all the patients in the study

Variables	Times	Mean and SD		*P*	*d*
		Matrix rhythm therapy group	Myofascial group		
GTQ score	Baseline	67.87±13.94	66.33±10.24	0.7339	0.09
	3 week	40.00±12.29	34.80±8.68	0.1914	0.34
	BL-3W	27.87±10.33	31.53±9.16	0.3124	0.26
TDI score	Baseline	79.60±11.35	81.87±9.78	0.5627	0.15
	3 week	47.00±11.07	44.53±11.75	0.5588	0.15
	BL-3W	32.60±11.31	37.33±11.02	0.2553	0.3
FIGS score	Baseline	9.53±1.64	8.40±0.63	0.0188*	0.28
	3 week	11.53±1.77	11.27±1.10	0.6237	0.06
	BL-3W	−2.00±1.25	−2.87±1.19	0.0620	0.21
FACT H and N (Total Scores)	Baseline	102.40±8.05	103.03±14.43	0.8831	0.03
	3 week	114.33±9.90	114.19±13.72	0.9735	0.008
	BL-3W	11.93±6.65	11.15±10.12	0.8048	0.06
PWB	Baseline	18.73±3.61	18.84±4.61	0.9460	0.016
	3 week	22.00±3.0	21.99±2.45	0.9895	0.001
	BL-3W	3.27±3.03	3.15±3.62	0.9245	0.02
SWB	Baseline	26.63±2.49	26.13±2.79	0.6133	0.09
	3 week	27.40±1.18	27.07±1.71	0.5397	0.07
	BL-3W	0.77±2.23	0.93±2.97	0.8687	0.03
EWB	Baseline	17.44±4.67	19.10±3.74	0.2917	0.24
	3 week	20.20±2.86	20.67±3.44	0.6890	0.08
	BL-3W	2.76±2.71	1.57±2.81	0.2464	0.22
FWB	Baseline	20.07±4.47	19.93±4.95	0.9405	0.01
	3 week	21.93±3.95	21.33±4.61	0.7049	0.08
	BL-3W	1.87±4.21	1.40±4.37	0.7680	0.06
Additional	Baseline	19.47±2.77	18.87±4.27	0.6519	0.09
	3 week	22.80±4.30	23.13±5.30	0.8513	0.04
	BL-3W	3.33±3.35	4.27±2.43	0.3903	0.17

*Level of significance set at *P*=0.05. BL - Baseline, 1W - after 1 week of intervention, 2W - after 2 weeks of intervention, 3W - after 3 weeks of intervention, GTQ - Gothenburg Trismus Questionnaire Score, TDI - TMJ disability Index, FIGS - Functional intraoral Glasgow scale, FACT H and N - Functional assessment of Cancer therapy Head and neck, PWB - physical well-being, SWB - social well-being, EWB - emotional well-being, FWB - functional well-being

improvement in the scores of the secondary outcome measures GTQ, TDI, FIGS, and FACT H-N. The result of the current suggested that study concludes that MFR and Matrix rhythm therapy both are equally effective in treatment of radiation induced Trismus. However, Matrix Rhythm Therapy was found to be clinically significant in terms of patient satisfaction.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Implications of physiotherapy practice

The current study shows that matrix rhythm therapy is novel and can be used in clinical practice for the patients with Radiation Induced Trismus and among other cancer patients. The study also suggest that the intervention has a clinical impact in terms of improvement and may be performed using a larger sample size in a similar clinical setting.

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Conflicts of interest

There are no conflicts of interest.

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