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Review Article

A Literature Review on Physiotherapy in Trismus

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Trismus, which is characterized by restricted mouth opening, has a substantial impact on the quality of life in people with head and neck cancer, oral submucous fibrosis, and other disorders. It interferes with fundamental tasks such as eating, speaking, and oral hygiene. Physiotherapy, which includes jaw mobilizing devices, guided exercises, manual therapy, and adjunct technologies like ultrasound and laser, is critical in the management of trismus. This review highlights recent information on physiotherapeutic therapies for trismus, assesses their effectiveness, and examines important obstacles such as patient compliance and the lack of standardized treatment regimens. It also looks ahead to future opportunities such as individualized rehabilitation treatments and upcoming technologies. The review contains current clinical studies and randomized controlled trials on exercise-based therapies, manual approaches, and technological applications. It also takes into account patient-reported outcomes and diverse treatment techniques. The findings indicate that physiotherapy, particularly when combined with planned exercises and technology, greatly improves mouth opening and overall quality of life. However, variation in treatment regimens and patient compliance remains an issue. Moving toward tailored therapy and integrating technology such as virtual reality and artificial intelligence could assist improve outcomes. Large-scale research is required to develop standardized, evidence-based standards for providing consistent and effective care.

Keywords: Trismus, Physiotherapy, Jaw Mobilizing Devices, Manual Therapy, Maximal Interincisal Opening, Head and Neck Cancer, Oral Submucous Fibrosis, Rehabilitation, Adherence, Technological Innovations.

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Introduction

Trismus, commonly referred to as lockjaw, is a condition characterized by a restricted ability to open the mouth due to muscular or joint dysfunction. Clinically, it is often defined as a maximal interincisal opening (MIO) of less than 35 mm, a threshold commonly used in studies focusing on head and neck cancer (1). This limitation can result from several underlying causes, such as radiation-induced fibrosis,

surgical interventions, or diseases affecting the masticatory muscles and temporomandibular joint (2).

Prevalence and Impact on Quality of Life

Trismus is a common complication among patients undergoing treatment for head and neck cancers, with prevalence rates ranging from 8% to 42%, depending on the criteria and population studied (3,4). This condition adversely impacts patients' ability to perform basic functions such as eating, speaking, and maintaining oral hygiene. Consequently, it leads to malnutrition, weight loss, social isolation, and a significant reduction in health-related quality of life (5). Trismus has been reported as one of the most burdensome sequelae of head and neck cancer treatment, second only to xerostomia (4).

Etiology

The etiology of trismus is multifactorial. In head and neck cancer patients, the condition often arises as a side effect of radiotherapy, where radiation-induced fibrosis leads to muscle contracture and joint stiffness (2,3). Surgical interventions, such as those involving resection of the temporomandibular joint or masticatory muscles, can also contribute to trismus (4). Another common cause is oral submucosal fibrosis, a chronic disease that reduces fibroelasticity in the oral mucosa, predominantly seen in betel quid chewers (6). These etiological factors emphasize the complexity of managing trismus, requiring a multidisciplinary approach.

Role of Physiotherapy in Management

Physiotherapy plays a pivotal role in managing trismus by improving jaw mobility, reducing pain, and enhancing overall function. Common physiotherapeutic interventions include structured exercise programs, jaw mobilizing devices like TheraBite and Dynasplint, and manual therapy targeting the masticatory muscles (2,4). Evidence supports that combining active stretching exercises with technological or manual interventions can yield better outcomes compared to unassisted exercise alone (5,6). Physiotherapy not only helps in alleviating physical symptoms but also contributes to improving patients' psychosocial well-being and quality of life.

Pathophysiology of Trismus

Mechanisms of Muscle Fibrosis and Scar Formation

Trismus often arises from pathological changes in the soft tissues and muscles of the jaw, particularly fibrosis and scar formation. Fibrosis is primarily caused by chronic inflammation, leading to excessive collagen deposition and reduced tissue elasticity (3). In head and neck cancer, this process is exacerbated by treatments like radiotherapy and surgery, which induce injury and subsequent fibrotic remodelling of the affected tissues (4). The fibrosis restricts the movement of masticatory muscles, including the masseter, temporalis, and pterygoid muscles, thereby impairing normal jaw opening (2). Scar tissue formation, particularly after surgical interventions, further contributes to reduced mobility by creating stiff, inelastic bands in the surrounding tissues (6).

Impact of Radiation Therapy on Jaw Mobility

Radiation therapy, a common treatment modality for head and neck cancer, is a major contributor to trismus due to its effect on both soft tissue and bone structures. Radiation-induced damage initiates a cascade of cellular events, including inflammation, endothelial damage, and the activation of fibroblasts, leading to chronic tissue fibrosis (5). The temporal and masseter muscles, as well as the temporomandibular joint (TMJ), are particularly susceptible to radiation-induced fibrosis, resulting in reduced maximal interincisal opening (MIO) (2). Additionally, radiotherapy often causes vascular compromise in the irradiated tissues, reducing oxygenation and exacerbating fibrotic changes (4). Studies have shown that patients receiving high doses of radiation (>60 Gy) are at a significantly higher risk of developing trismus, often within the first-year post-treatment (3).

2.3 Physiological Changes: Muscular Atrophy and Joint Dysfunction

Prolonged disuse and lack of mobility in the jaw muscles during and after cancer treatment can result in muscular atrophy and joint dysfunction. Disuse atrophy occurs when the masticatory muscles are underutilized, leading to a reduction in muscle mass and strength (5). This condition is further exacerbated by the effects of radiotherapy and surgery, which can disrupt the normal architecture of the temporomandibular joint (TMJ) and surrounding muscles (6). Joint dysfunction in trismus is often characterized by stiffness and limited range of motion, compounded by adhesions and fibrosis in the synovial joint capsule (4). These physiological changes collectively impair jaw opening, chewing, and speaking, severely affecting patients' quality of life.

Diagnostic Approaches

Maximal Interincisal Opening (MIO) Measurements

The Maximal Interincisal Opening (MIO) measurement is the most commonly used diagnostic tool for assessing the severity of trismus. It involves measuring the maximum distance between the upper and lower central incisors during mouth opening using a ruler or caliper (1). A value below 35 mm is typically considered indicative of trismus, with severe cases defined by MIO below 25 mm (2). MIO measurements are simple, non-invasive, and provide a quantifiable baseline to evaluate the effectiveness of treatment interventions. Regular MIO monitoring is critical in tracking disease progression, particularly in head and neck cancer patients undergoing radiotherapy (3).

Use of Imaging and Assessment Tools

In addition to MIO measurements, imaging techniques such as magnetic resonance imaging (MRI) and computed tomography (CT) are valuable for understanding the underlying anatomical and pathological changes in trismus. MRI is particularly useful for assessing soft tissue changes, including fibrosis and muscular atrophy, while CT provides detailed insights into bony structures and temporomandibular joint (TMJ) abnormalities (4). For instance, fibrosis and joint adhesions can be visualized using MRI, aiding in treatment planning (2). Emerging tools like ultrasound have also been explored for real-time evaluation of muscular stiffness and elasticity in trismus patients, offering a cost-effective alternative to traditional imaging methods (5).

Patient-Reported Outcome Measures

Patient-reported outcome measures (PROMs) are essential for understanding the functional and psychosocial impact of trismus. Tools like the Gothenburg Trismus Questionnaire (GTQ) and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) capture patient experiences related to jaw function, eating difficulties, and quality of life (2). PROMs complement objective measurements like MIO by providing insights into the patient's subjective symptoms, including pain, speech issues, and social isolation (3). These tools are increasingly used in clinical and research settings to evaluate treatment outcomes and guide rehabilitation strategies (5). Incorporating PROMs ensures a holistic approach to trismus diagnosis and management, addressing both clinical and patient-centered goals.

Methodology

A thorough literature search was performed utilizing databases such as PubMed, with keywords such as "trismus," "physiotherapy," "jaw mobilization devices," and "radiation-induced fibrosis."

Inclusion Criteria

1. Articles on physiotherapy treatment for trismus after head and neck cancer.
2. Studies on patients who had surgery, radiotherapy, or chemotherapy.
3. Articles focusing on physiotherapy interventions such as manual therapy, stretching exercises, jaw mobility devices, ultrasound therapy, and other physiotherapy-based approaches were included.
4. Prospective, retrospective, and randomized controlled trials (RCTs).
5. Articles published in the last 15 years and in English.

Exclusion criteria

1. Articles on trismus from other causes (e.g., trauma, TMJ disorders, infections, drugs, congenital issues).
2. Studies on patients who didn’t receive surgery, radiotherapy, or chemotherapy.
3. Articles older than 10 years.
4. Articles in languages other than English.

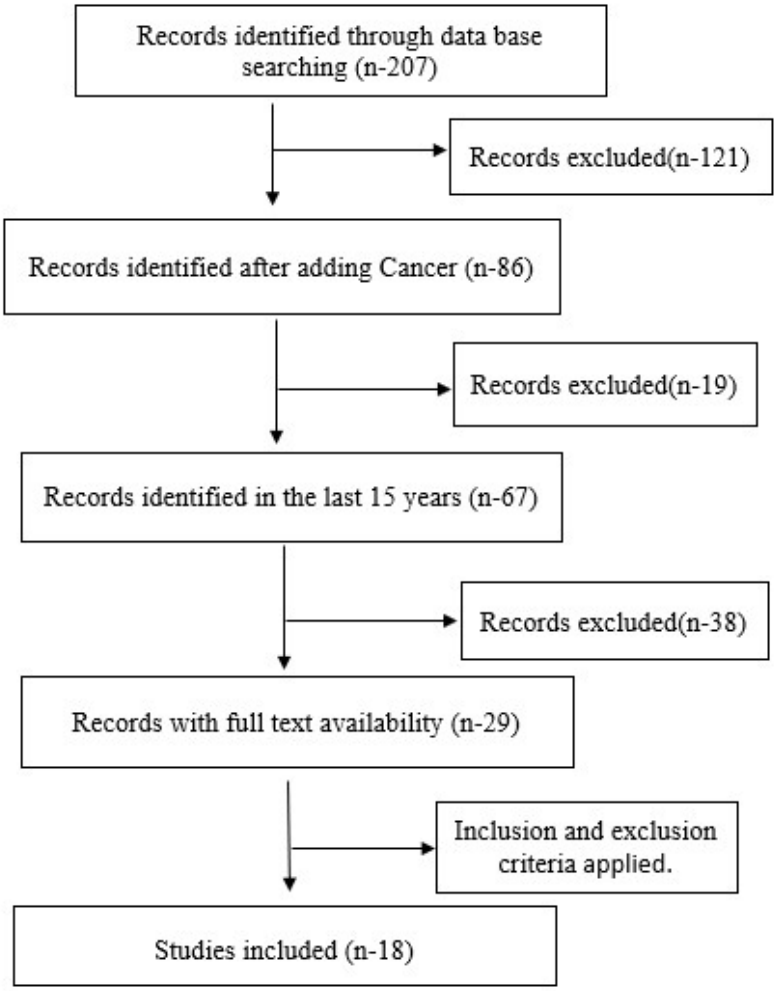

Fig 1:

Table 1: Review of Literature

S.n.	Author's name	Year of publication	Title	Type of study	Sample size	Duration	Result/ Conclusion
1	Rushil Deepak Tanna et al.	2023	Efficacy of matrix rhythm therapy (MaRhyThe©) over conventional therapy on radiation induced trismus-A pilot randomised control trial	Randomised control trial	30 samples	4 weeks	The study found significant improvements in pain reduction, maximum mouth opening, and GTQ, TMD, FIGS, and FACT-HN ratings for both groups ($p < 0.05$). However, the groups demonstrated equivalent efficacy in

							treating radiation-induced trismus.
2	Tsae-Jyy Wang et al.	2022	Effect of oral exercise on Trismus after oral cancer Radiotherapy: A Quasi Experimental Study.	Experimental Study.	69 sample	6 months	Oral exercises increased maximum mouth opening (MIO) by 4.2 mm in oral cancer patients' post-radiotherapy, improving jaw mobility over six months.
3	Shuzhen Chee et al.,	2021	Interventions for Trismus in Head and Neck Cancer Patients: A Systematic Review of Randomized Controlled Trials.	Systematic review	11 articles		Low-level laser therapy and low-intensity ultrasound coupled with exercise may be beneficial for patients with trismus.
4	Ove Karlsson et al.	2020	Jaw exercise therapy for the treatment of trismus in head and neck Cancer: a prospective three - year follow - up study.	Prospective study.	50 samples.	10 weeks	Jaw exercise therapy resulted in increased maximal interincisal (MIO), less trismus - related symptoms, and improved health - related quality of life. Jaw exercise should be initiated early, in a structured manner and continued long term.
5	Yousef E. Ezzat et al.,	2020	The role of exercise therapy in managing post - radiotherapy trismus in head and neck cancer	Case study	1 sample	6 weeks	Therabite Jaw Motion Rehabilitation System and wooden tongue depressors help to increase mouth opening significantly if used together and alternatively.
6	Charlotte et al	2020	Impact of exercise with TheraBite device on trismus and health-related quality of life: A prospective study	prospective study	15 samples	10 weeks + 6 months follow up	Exercise with the TheraBite device significantly improved maximum mouth opening (MIO) by 3.5 mm post-exercise and 4.7 mm at 6 months. Patients also reported fewer trismus-related

							symptoms and better quality of life.
7	Sarah J et al	2019	The use of stretching devices for treatment of trismus in head and neck cancer patients: a randomized controlled trial	Randomized control trial.	27 samples	3 months	Both TheraBite and Dynasplint Trismus System increased mouth opening, with TheraBite® improving by 3.0 mm and Dynasplint by 1.5 mm. However, there was no significant difference between the two devices. High attrition rates and patient challenges (pain, device fitting issues, medical deterioration) affected adherence.
8	Vyoma Bharat Dani et al.	2018	The effectiveness of therapeutic ultrasound in patients with oral submucosal fibrosis	Randomized control trial.	20 samples	1 week	Therapeutic ultrasound with exercises improved mouth opening more than exercises alone in patients with oral submucosal fibrosis.
9	Yu – Hsuan Li et al.	2018	Mouth - opening device as a treatment modality in trismus patients with head and neck cancer and oral submucous fibrosis: a prospective study	Prospective study	60 samples	12 weeks	Using an open-mouth exercise equipment improved overall mouth opening range, health-related quality of life, and reduced trismus symptoms.
10	Hany Mohamed Elgohary et al.	2018	Effect of Ultrasound, Laser, and Exercises on Temporomandibular Joint pain and Trismus Following Head and Neck Cancer	Randomized clinical trial	60 samples	4 weeks	The low - intensity ultrasound (LIUS) and traditional exercise therapy (TET) are more effective than low - level laser therapy (LLLT) and/or traditional exercise therapy (TET) in reducing TMJ pain and trismus following head and neck cancer.

11	Padma-nidhi Agarwal et al.	2016	Trismus in oral cancer patients undergoing surgery and radiotherapy.	Observational study	30 samples		After radiotherapy, those who received physiotherapy had significantly better outcomes compared to those who did not.
12	Jolanda I. Kamstra et al	2016	Dynasplint Trismus System exercises for trismus secondary to head and neck cancer: a prospective explorative study.	Prospective Explorative study.	18 samples	16 weeks	The exercise program increased mouth opening by 7.1 mm, but one-third of the gain was lost over time. Patients saw benefits but found the exercises difficult.
13	Nina Pauli et al.,	2016	Exercise intervention for the treatment of trismus in head and neck cancer – a prospective two - year follow	Prospective study	50 samples	10 weeks	Compared to the control group, the intervention group had a higher MIO and reported fewer jaw-related issues after two years of follow-up.
14	Anne Scher-penhuize n et al.	2015	The effect of exercise therapy in head and neck cancer patients in the treatment of radiotherapy - induced trismus: A systemic review	Systemic review	5 articles		Exercise therapy effectively alleviated trismus symptoms.
15	Jolanda I. Kamstra et al.	2015	Exercise therapy for trismus secondary to head and neck cancer: A systemic review	A systemic review	20 articles		Exercise therapy helped improve mouth opening in some cases, but no method was clearly the best.
16	Nina Paul et al.	2014	Treating trismus: A prospective study on effect and compliance to jaw exercise therapy in head and neck cancer	prospective study	50 samples	10 weeks	Jaw exercise therapy helped enhance mouth opening capacity and reduce trismus symptoms. Both jaw devices demonstrated similar efficiency and exercises compliance.
17	Nina Paul et al	2013	Exercise intervention for the treatment of	Randomized clinical trial	50 samples	10 weeks	The systematic jaw workout program significantly

			trismus in head and neck cancer				enhanced mouth opening capability. Benefits include improved health-related quality of life and reduced trismus-related symptoms.
18	Lisette van der Molen et al.,	2010	A randomized preventive rehabilitation trial in advanced head and neck cancer patients treated with chemoradiotherapy: feasibility, compliance, and short-term effects.	Randomized controlled trial	49 samples	10 weeks	Preventive rehabilitation exercises were feasible and well-tolerated, leading to significant decreases in mouth opening, oral intake, and weight. However, the rehabilitation program resulted in fewer patients remaining tube-dependent compared to previous studies, indicating some benefit.

Results

Among the 18 studies examined, five indicated that mouth-opening devices, including TheraBite, Dynasplint, and tongue depressors, were effective in enhancing jaw mobility (Sarah J et al., 2019; Charlotte et al., 2020; Yu-Hsuan Li et al., 2018; Kamstra et al., 2016; Epstein et al., 2019).

Three studies demonstrated that low-intensity ultrasound (LIUS) combined with exercise therapy was more effective than low-level laser therapy (LLLT) paired with exercise in alleviating trismus and temporomandibular joint (TMJ) pain (Chee et al., 2021; Elgohary et al., 2018; Dani et al., 2018).

Eight studies underscored the advantages of structured exercise therapy, revealing significant enhancements in jaw function, pain alleviation, and overall quality of life (Karlsson et al., 2020; Pauli et al., 2016; Scherpenhuizen et al., 2015; Wang et al., 2022; Ezzat et al., 2020; Tanna et al., 2023; Kamstra et al., 2015; Li et al., 2018). Additionally, some research highlighted that initiating physiotherapy promptly following surgery, radiotherapy, or chemotherapy results in improved outcomes and a reduction in complications (Agarwal et al., 2016; Scherpenhuizen et al., 2015).

Discussion

This review focuses on the need of physiotherapy in the treatment of trismus, particularly in patients with head and neck cancer. Several research, such as Karlsson et al. (2020), Pauli et al. (2016), and Scherpenhuizen et al. (2015), underline the value of exercise treatment in improving mouth opening and minimizing trismus symptoms. While Karlsson et al. focused on the effects of structured jaw exercise therapy, Pauli et al. conducted a long-term follow-up study, demonstrating that exercise therapies can have long-term benefits. According to Scherpenhuizen et al., early beginning of physiotherapy after treatment improves outcomes.

According to Sarah J et al. (2019), Charlotte et al. (2020), and Yu-Hsuan Li et al. (2018), jaw mobilizing devices such as TheraBite and Dynasplint have a critical role in promoting maximal interincisal opening (MIO). Sarah J et al. examined TheraBite with Dynasplint, finding that while both devices enhanced mouth opening, major attrition rates and patient problems hampered adherence. Charlotte et al. discovered that utilizing the TheraBite device resulted in significant increases in mouth opening and quality of life after six months.

In addition to exercise treatment and jaw mobilization devices, Chee et al. (2021), Elgohary et al. (2018), and

Dani et al. (2018) found that combining physiotherapy with adjunct modalities such as ultrasound and low-level laser therapy (LLLT) resulted in greater outcomes. Elgohary et al. concluded that ultrasound was more effective than laser therapy for relieving TMJ pain and enhancing mouth opening. Chee et al. found that laser therapy improves the effects of exercise therapy, making it a promising adjunct to treatment.

Several studies highlight the value of early intervention. Agarwal et al. (2016) and Scherpenhuizen et al. (2015) found out that starting physiotherapy shortly after radiotherapy, chemotherapy, or surgery improved results significantly. Early rehabilitation reduces the progression of fibrosis and muscle contracture, making treatment more successful in the long term.

Tanna et al. (2023), Wang et al. (2022), and Ezzat et al. (2020) highlight the importance of systematic physiotherapy protocols, demonstrating that jaw exercises and mobilization techniques greatly enhance mouth opening and pain relief. Wang et al. discovered that mouth workouts enhanced MIO by 4.2 mm after therapy, hence increasing jaw function over time.

Furthermore, the influence of trismus on quality of life is of key importance. Trismus has a major impact on daily activities such as eating, speaking, and oral hygiene, resulting in psychosocial discomfort, according to Pauli et al. (2014) and Kamstra et al. (2016). Improving mouth opening through physiotherapy improves not only jaw function but also patient well-being and general quality of life.

Conclusion

This review emphasizes the importance of physiotherapy in the treatment of trismus in patients undergoing radiotherapy, chemotherapy, or surgical operations. Structured exercise programs, jaw mobilization tools, and ultrasound therapy have all been shown to improve jaw function and reduce discomfort. When started early and consistently, physiotherapy can be an important part of complete trismus management. However, further research is needed to address patient adherence issues and create standardized, evidence-based treatment methods.

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