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Effectiveness of therapeutic interventions on myofascial trigger points: Literature review

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Abstract

Introduction: Myofascial trigger points (MTrPs) are most prevalent cause for musculoskeletal pain in everyone at some point of life leading a motor, sensory and autonomic symptoms with variability in etiopathogenesis and currently many interventions are used for its management.

Aim of the study: This review is aimed to compare the overall effectiveness of different interventions used in treatment of myofascial pain linked to myofascial trigger points using literature.

Methodology: Using key terms, identified about 1527 studies published in Google Scholar, PubMed, and Scopus, and after retrieval and serial exclusion only 28 recent level I and II studies were included and used simple statistical methods to analyze data and formulate results.

Results & Discussion: Therapeutic modalities like Low Level Laser Therapy (LLLT), Extra Corporeal Shock Wave Therapy (ESWT) and minimally invasive techniques like dry needling, cupping, trigger point injections will give Immediate short-term results whereas manual techniques like Ischemic compression (IC), Muscle Energy Techniques (MET) shown long term effect compare with other techniques.

Conclusion: A Combination of manual therapy either with therapeutic modalities or with minimally invasive techniques are more effective form of treatment for Myofascial trigger points than any isolated intervention for long term effect on Pain, Range of Motion, Quality of life and overall improvement in functionality.

Keywords: Myofascial Trigger points; Myofascial Pain syndrome; Manual therapy and Physiotherapy intervention for Myofascial trigger point; MTrPs; Physiotherapy

1. Introduction

Myofascial trigger points (MTrPs) are prevalent with an incidence rate of 30–93% of musculoskeletal pain cases and lead to a painful experience almost everyone at some point in their lives [(1)(2)]. It is referred to as a highly sensitive area with a palpable nodule in the tight muscle band causing variable motor, sensory, and autonomic symptoms and Myofascial Pain Syndrome (MPS)[(1)(3)(4)(5)]. MTrPs potentially caused by trauma, muscle overuse, joint dysfunction, and psychological stress across age groups and genders are often observed in athletes and individuals with high physical activity [(1)(2)(6)].

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MTrPs can be identified by using clinical examination like palpation, imaging through the sono-elastography, Thermography and Algometer helps to identify active MTrPs and an ischemic environment within these points [2][6]. Pain, Restricted range of motion, muscle fatigue, and autonomic changes prominently affect various muscles like Masseter, upper Trapezius, Scalene, Sternocleidomastoid, Levator scapulae, Supraspinatus and Rhomboids in the neck and upper extremity whereas Quadratus lumborum, Gluteus Medius, Hamstrings, Soleus and gastrocnemius in the trunk and lower extremity[4][7][8]. MTrPs are either active or latent and Idiopathic in nature, peripheral mechanism that is due to decreased oxygen and nutrition supply, involuntary muscle contraction and ultimately increased metabolic demand within the tissue leads to muscular and soft tissue dysfunction[1][9].

Manual therapy interventions like ischemic compression, trigger point pressure release transverse friction massage, joint mobilization or manipulation, muscle energy techniques, and stretching are the strain-counter strain methods that improve muscle function by increasing oxygen and nutrient delivery to the affected area to reduce the pain and restore the normal function of the affected muscle[10][11] And it appeared as first-line treatment and is proposed to work by reducing the overlap between actin and myosin by stretching, therefore, normalization of the sarcomere[4][5][11]. Invasive treatments like Dry needling, Cupping, Acupuncture, and Other popular interventions are Noninvasive interventions include Extracorporeal shock wave therapy, light amplification by stimulated radiation emission (LASER), Ultrasound (US), Transcutaneous Electrical Nerve Stimulation (TENS), and a combination of stretching and strengthening exercises have also been effective to relive MTrPs[4].

Several Research articles and Systematic reviews have explored the effectiveness of various techniques, in myofascial trigger points and the effectiveness of physiotherapy interventions reducing pain and improving function for individuals with myofascial pain syndrome. Some of these studies also examine the impact of administering these interventions over different periods. This review aimed to assess the existing literature and compare the overall effectiveness of using different modalities and techniques for the treatment of myofascial pain linked to myofascial trigger points.

2. Methodology

Using specific keywords like Myofascial Trigger points and physiotherapy interventions like Manual therapy, Electrotherapy, Invasive methods, and psychological interventions used for management across Google Scholar, PubMed, and Scopus for articles published between 2018-2024. Inclusion of articles only if Randomized controlled trials (RCTs), Systematic reviews and used any type of manual therapy intervention, invasive or noninvasive techniques and use of any Primary Outcome measure like Range of motion (ROM), Pressure pain Threshold (PPT), Pressure Pain Intensity (PPI), Visual Analogue Scale (VAS), Clinical efficiency short form-36(SF-36), Beck Depression inventory (BDI). Articles were excluded if the study of MTPs was not the main objective and subjects had an associated pathology, including mental disorders and Muscle injury if the subjects underwent relevant surgical treatments or post-surgical phase.

A total of 1527 studies were identified, of which 1296 articles are irrelevant and 231 articles are taken for abstract screening and 35 full text articles checked for eligibility and 28 level I and II evidenced studies as presented in Figure No.1.

Extracted data of 28 studies under Author and year of publication, Type of study, Population, Intervention, Outcome measures, conclusion, and level of evidence (LE) to examine the effect of various assessments and interventions on MPS and MTrPs as presented in Table No.1. using simple statistical based analysis of all the study parameters across the studies and results was obtained and used to formulate a comparative review of various Interventions on MTrPs.

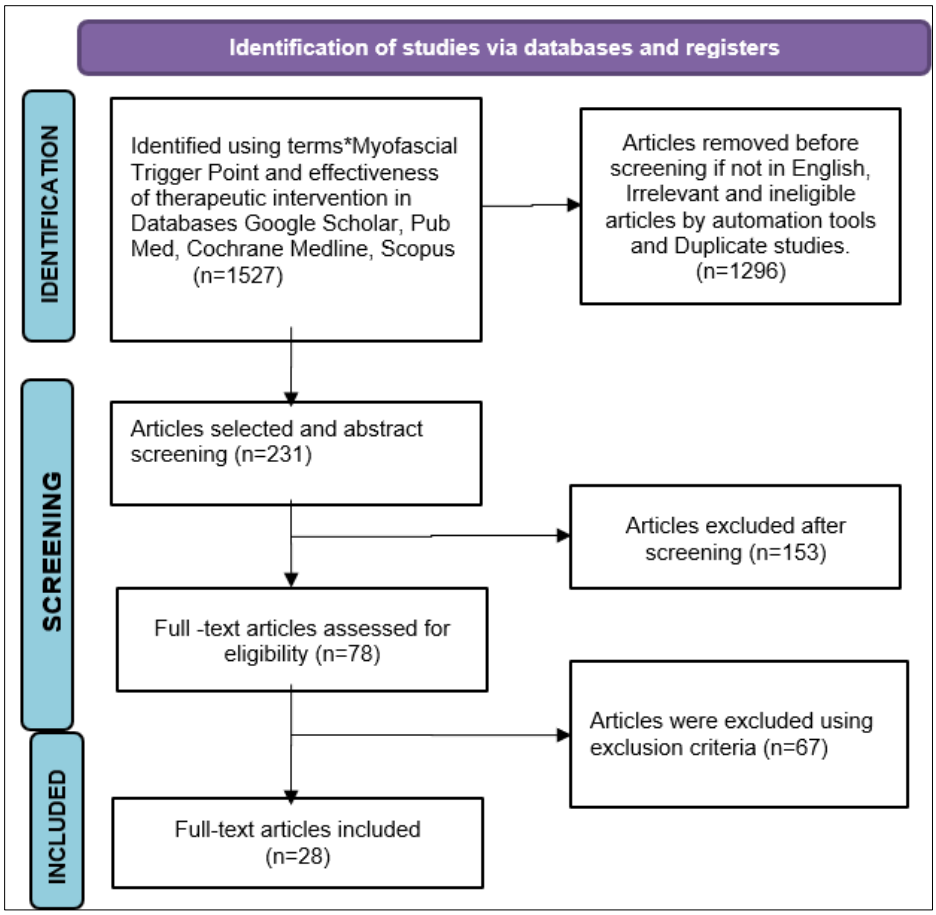

Figure 1 Prisma (2020) flow chart for the study

Table 1 Data characteristics of studies included

Author and year	Type of Study	Population (n)	Intervention Used	Outcome measures	Conclusion	LE*
Ramadan et al. 2024 [12]	RCT	90	Low-Level Laser Therapy (Sessions/week), Group I (n=30): 1, Group II (n=30): 2, Group III(n=30): 3	VAS MMO OHIP-14	Increasing the number of LLLT sessions reduces pain relief, and improves MMO and quality of life.	I
Xiong et al. 2024 [13]	Systematic review	852 (10 RCTs)	Acupuncture Group (n=427). Control Group (n=425).	VAS PPT PRI	Acupuncture was significantly more effective than the control group	I
Aysegul et al. 2024 [14]	RCT	60	LLLT Group (n=30) Control Group(n=30)	VAS, PPT, BDI	LLLT more effective than the placebo in MPS patients.	I
Chang Liuet al.2023 [15]	Systematic review	(40 RCTS)	Manual therapy, LASER. ESWT and Placebo	VAS, PPT NDI NPAD	MT, Laser therapy, and ESWT were effective when compared with placebo.	I

Melissa et al.2023 [16]	RCT	40	IC (n=20) ESWT(n=20)	PPT,ROM Algometer MMT	IC and ESWT is effective in treatment of MTrPs of Triceps surae muscles	I
Ozyigit et al.2023 [17]	RCT	40	Laser group (n=20) ESWT(n=20)	VAS, PPT SF-36, BDI	Laser and ESWT effectively relieve MPS. Adding exercise enhances benefits.	I
Peijue He et al. 2023[18]	Systematic review	(25 RCTs)	Therapeutic modalities (ESWT, LT, TENS, Ultrasound, Biofeedback, Traction, FIR, Whirlpool bath)	VAS PPT,ROM NDI	Physical modalities could provide a safe and effective therapeutic option for MPS	I
AnleXu et al. 2023[19]	Systematic review	725 (15 RCTS)	Dry Needling, Ischemic Compression	PPT,ROM VAS, NDI NRS	DN is superior to IC in relieving pain and ROM immediately after treatment.	I
Karrar et al. 2022[20]	RCT	54	Group A (n=18) MET, Group B(n=18) SWT Group C(n=18) both MET and SWT	VAS PPT NDI	Combined therapy is superior to MET and SWT alone to reduce pressure pain in upper trapezius trigger points.	I
Bethers et al. 2021[6]	RCT	60	Group (n=30): PRT Group(n=30): Transverse Friction Massage (TFM)	VAS, PPT SWE US	Both PRT and TFM showed a significant in reducing pain and acutely muscle stiffness	I
Maria jose et al. 2021 [21]	Systematic review	768 (13 RCTs)	Manual therapy techniques IC,TFM,PRT,MET, Manipulation	ROM VAS	Manual Therapy can help increase ROM in people with MTrPs.	I
Dina Al-Amir et al. 2021[22]	RCT	60	Group A ESWT (n=20). Group B INI (n=20) Group C (n=20) ESWT+INI	NMJR, SSR, VAS, PPT	Combining ESWT and INI treats upper trapezius TrPs more effectively.	I
Mustafa et al.2021 [23]	Systematic review	88	Group 1 (n=26): KT, Group 2 (n=32): DN, Group 3 (n=30) Control	VAS, PPT NDI	DN or Taping enhances exercise therapy results	I
Maria jose et al2020.[4]	Systematic review	1221 (24 RCTs)	Physical exercise	ROM,PPT VAS, SF-36, BDI	Exercise programs are effective and can help treat Trigger points	I
Junaid et al.2020[7]	RCT	60	Group 1: PIR (20),Group2: MTrPs release (20) Group3 : Routine PT (20)	NPRS NDI ROM	Post-isometric relaxation quickly relieves acute neck pain and improves mobility.	I
Jennalyn lew et al. 2020[11]	Systematic review	241	Dry needling (DN) and Trigger point manual therapy (TMPT)	VAS, PPT, NDI.	DN and TMPT are equally effective for pain relief and improving function.	I

Nasb et al. 2020[24]	RCT	24	Group (n=9): Dry cupping Group (n=7): IC Group(n=8): DC +IC	PPT, NDI, and NROM	Both Dc and IC are effective but combination is more superior effect on MTrPs	I
Ahmed et al 2020[25]	RCT	50	Group A (n=25): CT Group B (n=25): HILT	VAS	HILT significantly effective as a PT modality for patients with cervical MTrPs	I
Shuo luan etal.2019[26]	RCT	65	ESWT (n=32) DN group (n=33)	VAS, PPT NDI, SWE	SWT and DN are equally effective on trigger point pain.	I
Zhang et al. 2019[27]	Systematic review	959 (20 RCTs)	Kinesiotaping	VAS PPT ROM	KT reduces pain and improves movement in MPS patients	I
Akiko et al. 2019[28]	RCT	40	Control group (n=20), Group (n=20): MPS (Stretching +Massaging-10, TPI-10)	VAS, PPT	SM and DN may work differently to relieve muscle pain, requiring more study.	I
Moraska et al.2018[9]	RCT	25	Massage group (n=12) Sham US group (n =13)	PPT	Massage can effectively treat TrPs by improving muscle metabolism.	I
Sara et al. 2018[10]	Systematic review	22 RCTs	Aerobic exercise of any intensity (i.e., swimming, walking, running)	PPT, VAS Algometer NDI,ROM	Water exercise reduces pain and trigger points more effectively.	I
Zahra et al.2018 [29]	RCT	30	Group A- IC (n=15) Group B-MET(n=15)	VAS ,NDI ,NPRS	MET works better than IC to relieve upper trapezius pain and improve movement.	I
Mary et al. 2018 [30]	RCT	70	Burst TENS +CT(n=23) AMF-CT(n=25) Sham CT(n=22)	PPT, ROM	High-intensity TENS effective than low-intensity TENS on pain & movement.	I
Kashyap et al. 2018 [31]	RCT	45	Group A- MPRT (n=15) Group B-MET (15) Group C(n=15) CT	PPT VAS NDI	MPT and MET are equally effective in relieving neck pain and improving Function	I
Rodrígueet al 2018. [32]	RCT	41	MRT group (n=20) PT group (n=21)	VAS PPT	MRT is more effective than PT for short-term pain relief in patients with neck pain.	I
César et al. 2018 [33]	RCT	66	Active and Latent TrP-DN Group (n = 33) and Active TrP-DN Group (n = 33)	VAS, PPT Grip Strength	One dry needling session can reduce shoulder pain in older adults.	I

List of abbreviations used in table : *L E -Level of evidence , (1) Visual Analogue Scale (VAS) score, (2) Pain Pressure Threshold (PPT), (3) Range of motion (ROM), (5) Neck Disability Index (NDI), (6) Medical Outcomes Study 36-item Short Form health survey (SF-36), (7) Beck Depression Inventory score(BDI) (8) Beck Depression Questionnaire score (9) Numerical Pain Rating Scale(NPRS), 10)Shear Wave Elastography(SWE) (11)Maximum Mouth Opening (MMO), (12) Oral Health Impact Profile-14 (OHIP-14), (13)Sympathetic Skin Response (SSR), (14) Neuromuscular junction response (NMJR), (15)Pain Rating Index (PRI) (16)Present pain intensity (PPI).

3. Results and analysis

The study comprising a total population of 5,798 of all the included studies which studied on various interventions for the management of Myofascial trigger points (as shown in Table No.1) and shown variability in results.

- **Manual Therapy:** A total of 25 studies reviewed the effects of manual therapy techniques on myofascial pain syndrome and MTrPs. Numerous types of techniques were described, including Instrument Assisted Soft tissue mobilization (ISTAM), Ischemic compression, Positional release techniques, Massage, Muscle energy technique and Kinesiotaping. Some studies focused on one technique while others employed a mixture of manual therapy with other modalities in combination and out of all techniques MET[7][20][30][32] was significantly caused long term benefits especially reciprocal inhibition and Post isometric relaxation can actively cause the changes in tension of Muscle Spindle and improving the efficiency of muscle contraction and function. While studies resulted sustained, tolerable ischemic compression [16][24]over trigger point can causes temporarily restriction of blood flow to the area of compression and effective in decreasing pain and muscle tension.

- **Invasive Techniques:** A total of 6 studies (n =577) reviewed regarding the effectiveness of dry needling, trigger point injection, acupuncture, cupping, on myofascial trigger points and identified that Dry needling [11][19][23][26][28][34]is the fastest and most effective means to reduce pain, as compared to other conventional interventions. Dry needling mechanism reported across studies was by stimulation of trigger point increases the flow of acetylcholinesterase there by normalizes muscle tone and the neurological interface thus correcting bradykinin, calcitonin gene-related peptide, and substance P levels in the affected muscle. A Trigger Point Injection [29]technique is directly targeting and deactivating the hyperirritable areas within the muscle, thereby relieving pain and promoting muscle relaxation. The injections typically contain a combination of medications, such as local anesthetics, corticosteroids, or saline solution, which act to alleviate pain and inflammation while facilitating muscle healing.

- **Therapeutic Interventions:** Total 15 studies (n=346) focused on non-invasive techniques, whereas Extracorporeal shock wave therapy (ESWT) in 5 studies, 6 studied on Laser therapy, 1 on TENS, 1 on Ultrasound and 5 studied as combination with conventional physiotherapy protocols. ESWT was as effective as dry needling in relieving pain, improving function, and reducing shear modulus in managing MTrPs[15][16][17][20][22]. Six studies shown that Low-level laser therapy (LLLT)[12][14][15][17][18] [25] is one of the recent treatment modalities reduced the pain and improved quality of life for individual with Myofascial Pain Syndrome at the Upper Back, Masseter, Mechanical neck pain.

4. Discussion

Many Interventions in study included alone improved results, somehow the combination of interventions was proved to be superior than isolated intervention on various outcome measures used. (as shown in Figure No.2).

- **Manual therapy:** Zahra Gilani et al. (2018) concluded that MET is superior to IC in treatment of upper trapezius MTrPs and effective on pain and ROM whereas Kashyap et al. (2018) seen MET and the MPR techniques are equally effective on neck disability in patients with nonspecific neck pain but Junaid et. (2020) concluded that Isometric relaxation technique had more and faster effect in decreasing pain, improving mobility in individuals with acute neck pain. Aleksandra et al. in 2018 identified that the single session of IC can decrease stiffness of upper trapezius among the professional basketball players and Melissa et al. (2023) studied on IC along with ESWT in management of TrPs in Triceps surae muscles and seen positive results but Anle Xu et al.(2022) studied on patients with neck pain and proved that DN gives better immediate results than IC. Combination therapy is effective than single therapeutic technique in Nonspecific neck pain from the result of Karrar et al. (2022) used MET with SWT in upper trapezius trigger points and Nasb et al.(2020) used IC and DC and this the combination approach showed significantly higher and faster improvement.

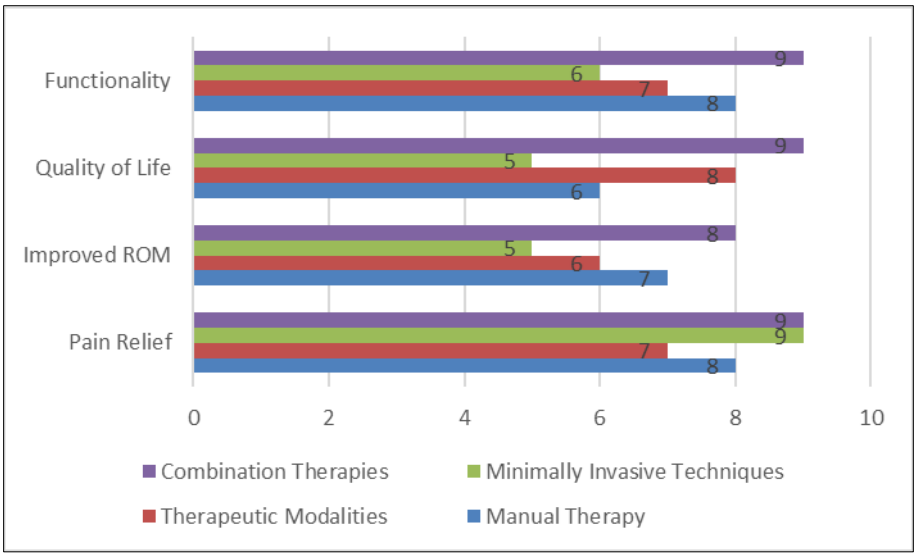

Figure 2 Bar chart illustrating the effectiveness of different type of intervention across the specified outcome *measures (Source: Generated using study data)*

- **Minimally Invasive techniques:** César Calvo-Lobo et al. (2018) found that a single session of DN can effectively reduce pain intensity and the irritability of satellite MTrPs in the referred pain area, providing short-term relief for older adults with nonspecific shoulder pain. Similarly, Fatih Yasar et al. (2021) suggested that adding an exercise program alongside DN and KT can further enhance treatment outcomes in individuals with MPS. In addition, studies by Shuo Luan et al. (2019) and Jennalyn Lew et al. (2020) demonstrated that DN is as effective as ESWT and manual trigger point therapy in reducing pain and improving function in MTrPs for short to medium duration, with no clear evidence supporting the superiority of one treatment over the others. Out of all studies, Xiong et al. (2024) found that acupuncture was more effective in reducing pain and improving mobility in people with myofascial trigger points (MTrPs). Similarly, Akiko Okada-Ogawa et al. (2018) studied the TPI technique to reduce pain in MTrPs and the obtained results are inconclusive with individual variability. In addition, Nasb (2020) found that combining cupping therapy with IC significantly improved MTrPs symptoms.
- **Therapeutic modalities:** Evidence suggests that Therapeutic modalities such as Extra Corporeal Shock Wave Therapy (ESWT), Light Amplification by Stimulated Radiation Emission(LASER), Transcutaneous Electrical Nerve Stimulation (TENS),Ultrasound (US)have individual effects in treating MTrPs. ESWT was a recent electrotherapy intervention that proved its significant effect on MTrPs in all the studies. Shuo Laun et., al 2019 identified that it can show similar improvements like Dry needling on MTrPs. ESWT was studied in combination with Ischemic compression, neural Inhibitory techniques, massage therapy and Muscle energy Techniques by Melissa et., al (2023), Dina Al-Amir et,.al(2021), Karrar et., al (2022) respectively and evidenced the significant increase when it combined. Elif ozyigit et.al (2023) and Chang liu et al. (2023) compared the effectiveness of ESWT with Laser and stated that It has significantly improved as per with Laser therapy and showed better results when combined. In a study by Ahmed S e t al (2023) on effect of KT for Masticator Myofascial pain syndrome shown that KT is always used as adjacent intervention to other modalities. By a Zhang et al. (2019) Kinesio Taping could also be recommended to relieve pain in MTrPs and other routine interventions usually linked with stretching, hot packs, Aerobic, active exercise, and strength exercises are effective approach in the treatment of pain intensity, pressure pain threshold, and range of motion among patients with MTrPs.
- While anxiety and depression are also some of the major causative factors for MTrPs, although there are limited studies on addressing psychological issues are that associated with the prognosis of MTrPs. Moreover, techniques such as Cryotherapy, Stretching, Kinesio taping, Acupuncture, and Cupping have been shown to help manage MTrPs, but there are very few studies examined their effectiveness.

4.1. Limitation of study

Heterogenicity of studies on location of the MTrPs and interventions used and not considered dosage parameters of particular technique on specific type of trigger points location and chronicity, behind in generalize the treatment interventions and also addressing the prevention strategies for MTrPs.

5. Conclusion

A combination of manual therapy either with therapeutic modalities or with minimally invasive techniques are more effective form of treatment for Myofascial trigger points than any isolated intervention for long term effect on Pain, Range of Motion, Quality of life and overall improvement in functionality. Minimally invasive techniques like Dry needling and Trigger point Injections provide quick and short-term relief, while manual therapy techniques like Ischemic Compression, Muscle energy techniques significantly help in long-term management of Trigger Points where as therapeutic modalities like Extra corporal Shock Wave Therapy and Low level Laser Therapy (LLLT) are more effective as first line interventions and Studies focused less on psychological factors in the management which intends the need of more studies specially addressing it.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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