Manual therapy for chronic migraine: a randomized clinical trial

Terapia manual para migrânea crônica: um ensaio clínico randomizado

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Abstract

Introduction: Chronic migraine is a common neurological condition, especially among women, and significantly affects quality of life and productivity. Although pharmacological treatment is the main strategy, its limited effectiveness and adverse effects justify the search for complementary approaches such as manual therapy (MT). **Objective:** To analyze the effectiveness of MT on pain intensity, frequency of episodes, disability, self-efficacy, sleep quality, and quality of life in adults with chronic migraine. **Methods:** A randomized controlled clinical trial was performed with 40 adults with chronic migraine. Participants were randomly allocated to a control group (CG; n = 20) or a manual therapy group (MTG; n = 20). The MTG received ten MT sessions, once a week for 12 weeks. Both groups continued the use of pharmacological treatment. The choice of MT was based on its potential to modulate pain and improve musculoskeletal function. Outcome measures included: HIT-6, MIDAS, PSQI-BR, SF-36, and HMSE-10. **Results:** Mean age was 36.7 ± 10.2 years. The intervention was associated with a significant improvement in the total HIT-6 score ($p = 0.014$) and in the domains of physical limitations ($p = 0.02$) and general health status ($p = 0.03$) of the SF-36. The proportion of participants with severe disabilities was 57.1% in the CG and 21.4% in the MTG ($p < 0.05$). The median cervical flexion was -10.0° in the CG and 5.0° in the MTG ($p = 0.005$). **Conclusion:** MT associated with pharmacological treatment demonstrated positive outcomes and may be an effective approach for managing chronic migraine.

Keywords: Migraine disorders. Manual therapy. Self-efficacy. Quality of life.

Resumo

Introdução: *A migrânea crônica é uma condição neurológica comum, especialmente em mulheres, e afeta significativamente a qualidade de vida e a produtividade. Embora o tratamento farmacológico seja a principal estratégia, sua eficácia limitada e seus efeitos adversos justificam a busca por abordagens complementares, como a terapia manual (TM).* ***Objetivo:*** *Analisar a eficácia da TM na intensidade da dor, frequência dos episódios, incapacidade, autoeficácia, qualidade do sono e qualidade de vida em adultos com migrânea crônica.* ***Métodos:*** *Um ensaio clínico randomizado controlado foi realizado com 40 adultos com migrânea crônica. Os participantes foram alocados aleatoriamente em grupo controle (GC; n = 20) ou grupo de terapia manual (GTM; n = 20). O GTM recebeu dez sessões de TM, uma vez por semana, durante 12 semanas. Ambos os grupos continuaram o uso do tratamento farmacológico. A escolha pela TM foi baseada em seu potencial para modular a dor e melhorar a função musculoesquelética. As medidas de desfecho incluíram: HIT-6, MIDAS, PSQI-BR, SF-36 e HMSE-10.* ***Resultados:*** *A média de idade foi de 36,7 ± 10,2 anos. A intervenção foi associada a uma melhora significativa na pontuação total do HIT-6 (p = 0,014) e nos domínios de limitações físicas (p = 0,02) e estado geral de saúde (p = 0,03) do SF-36. A proporção de participantes com incapacidade severa foi de 57,1% no GC e 21,4% no GMT (p < 0,05). A flexão cervical mediana foi de -10,0° no GC e 5,0° no GMT (p = 0,005).* ***Conclusão:*** *A TM associada ao tratamento farmacológico demonstrou resultados positivos e pode ser uma abordagem eficaz para o manejo da migrânea crônica.*

Palavras-chave: *Transtornos de migrânea. Terapia manual. Autoeficácia. Qualidade de vida.*

Introduction

Migraine is a neurological disease characterized by intense, throbbing headaches that affect millions of people worldwide. It represents one of the most disabling conditions.[1-3] In Brazil, migraine is the fourth most prevalent disorder, affecting 15.8% of the population.[2] Emotional factors, inadequate diet, irregular sleep, interpersonal conflicts, anxiety, depression, and stress may trigger migraine symptoms.[4]

Women are the most affected by migraine, experiencing frequent episodes during the productive and reproductive years.[5] The limitations associated with the symptoms and the potential side effects of the pharmacological treatment contribute to significant impacts of migraine on productivity.[6] Furthermore, its impact on quality of life is a public health challenge.[4]

Pharmacological treatment is the first line of treatment options for treating and preventing migraines.[7] However, its effectiveness varies[8] and side effects might limit treatment adherence.[9] The search for non-pharmacological treatment has increased in recent years with scientific support. Acupuncture, self-management techniques, pain neuroscience education, relaxation strategies, and physiotherapy, for example, are widely used to manage migraines successfully.[10]

Among physiotherapy interventions, manual therapy (MT) techniques may reduce the pain intensity, frequency, and duration of symptoms associated with headaches.[11] In this context, MT may contribute to improving the range of motion and triggering neurophysiological responses that modulate pain, similar to pharmacological treatment, which can enhance the quality of life in individuals with migraine.[10]

Psychosocial factors, fear-related beliefs, and self-efficacy are important in the rehabilitation of chronic migraine.[12] Thus, the evaluation of self-efficacy optimizes the selection of self-management strategies for specific individuals, favoring autonomy and confidence through changes and challenging unhelpful beliefs.[13]

Previous studies have examined the effects of physiotherapy interventions on self-efficacy in chronic pain.[14-16] However, no specific studies have been found investigating the effects of physiotherapy on self-efficacy in managing migraines. In this context, the significant disability associated with chronic migraine and the need for complementary non-pharmacological interventions that may improve patients' functionality and well-being support further investigation in this area.

Therefore, this study aims to assess the effects of MT techniques on the intensity, frequency of episodes, disability, self-efficacy, sleep quality, and quality of life in adults with chronic migraine.

Methods

This is a blinded, randomized, controlled clinical trial. A block randomization method was used to divide participants into two groups: the MT group (MTG) encompassed pharmacological treatment and MT, and the control group (CG) encompassed pharmacological

treatment only. The MTG underwent ten sessions, each lasting 30 minutes on average, for 12 weeks, as detailed below (adapted from Odell et al.[17]):

1. To identify complaints.
2. To assess upper body posture, defined from the thoracolumbar junction in a cephalic direction.
3. To assess active and passive neck range of motion.
4. To assess tension points in the shoulder girdle, neck, and head.
5. To assess the temporomandibular joint.
6. To identify which areas were treated in the sitting, supine, and prone positions.
7. To administer MT using tension point inhibition; joint mobilization; pompage; joint traction, myofascial manipulation, and stretching. The techniques used were chosen based on the baseline assessment.
8. To register the MT protocol used after each session.
9. To register adverse effects related to MT.
10. To follow the average duration of 30 minutes.

The therapist applying MT had a postgraduate degree with an emphasis on MT and over five years of clinical experience. The treatment was documented in medical records. The CG was monitored by phone regarding treatment adherence and complaints. All participants were assessed during screening and after 12 weeks. They were seen at a neurology outpatient clinic from March to August 2023.

Participants were recruited through a list provided by a neurologist with expertise in headaches, containing names and relevant information of 286 patients diagnosed with migraine being followed up from August 2018 onwards.

Inclusion and exclusion criteria

Participants were aged between 18 and 59 years, of both sexes, residing in Parnaíba (Piauí, Brazil), diagnosed with chronic migraine according to the International Classification of Headache Disorders (ICHD-3) criteria,[18] under clinical monitoring for at least three months, and presenting symptoms for more than 12 months. Exclusion criteria included contraindications for MT; uncontrolled blood pressure; systemic diseases; pregnancy or lactation; neurological deficits or cognitive impairments; those currently receiving MT treatments or within the previous three months; who developed migraine symptoms after the age of 50; and those reporting worsening pain with postural changes or when using the Valsalva maneuver. For MTG, failure to attend five sessions resulted in the patient's exclusion from the study. Changes in medical condition during the treatment leading participants to meet the exclusion criteria also resulted in exclusion from the study.

Data collection

Trained and blinded researchers conducted the assessments. Four domains were covered:

i. Anamnesis and physical examination: A pre-developed form was used to gather information on personal data, history of the current illness, and previous medical and family history. A physical examination included a postural assessment, testing of joints, muscles, and ligaments, palpations, and measurement of range of motion by goniometry.

ii. Impact of headaches on personal and professional life: The Headache Impact Test (HIT-6)[19,20] assessed functionality, vitality, cognitive function, and psychological distress. The disability caused by headaches in terms of lost work/leisure days was measured using the Migraine Disability Assessment test (MIDAS),[21] and the clinical characteristics of migraines were monitored through a headache diary.

iii. Sleep quality: The Pittsburgh Sleep Quality Index - PSQI-BR[22] was used to identify good or poor sleep quality and sleep disorders.

iv. Quality of life: The Brazilian version of the 36-Item Short Form Health Survey (SF-36)[23] and the short version of the Headache Management Self-Efficacy Scale (HMSE-10)[24] were used to evaluate the impact of changes in daily habits on quality and health maintenance.

Sample size calculation

The sample size was calculated based on a previous study by Espí-López et al.,[25] considering a power of 80% and an effect size of 0.5. The calculation resulted in a minimum of 12 participants per group. However, an additional 60% was added during recruitment to account for possible dropouts, totaling 40 participants (20 per group).

Statistical analysis

The data were organized to allow comparison between groups. For analysis purposes, the differences between assessments for each variable were considered. Numerical variables were presented as mean and

standard deviation (normal distribution) or as median and interquartile range (non-normal distribution). Student's T test was used for independent samples, and Mann-Whitney test was used for between-group comparisons, depending on the data normality. For the variables disability (MIDAS) and sleep quality (PSQI), the Z-test for proportions was applied. Data normality was verified using the Lilliefors test. The calculations were performed using Prism 5.0 (GraphPad software, MA, USA). A p-value of < 0.05 was adopted for all analyses.

Ethical approval

This study was approved by the ethics and research committee of the Federal University of Delta do Parnaíba (protocol number 6.068.425). The study was published in the Brazilian Registry of Clinical Trials (ReBEC) under the number RBR-3c5qvtt. All participants signed the informed consent form.

Results

Of the 286 participants with migraine, only 40 met the inclusion criteria. They were randomized into the two groups (CG, n = 20, and MTG, n = 20). Six participants of the CG and five of the MTG did not complete the study, resulting in a dropout rate of 37.9%.

The data of 29 participants were analyzed. Participants were predominantly women (96.6%), with a higher education level (58.6%), employed in either the formal or informal job market (65.5%), and with a family income of one to three minimum wages (68.9%), as shown in Table 1. The CG had a mean age of 36.7 ± 10.2 years and the MTG of 39.1 ± 9.5 years (p = 0.529). The mean onset of migraine symptoms in the CG was 19.7 ± 7.6 years and in the MTG was 19.3 ± 9.8 years (p = 0.614). The CG reported a mean medical follow-up of 10.0 ± 15.5 months, while the MTG of 11.5 ± 19.3 months (p = 0.760).

Table 1 - Sociodemographic profile, health conditions and lifestyle of the participants

Variables	Manual therapy group (n = 15)	Control group (n = 14)	Total (n = 29)
Gender			
Male	–	1 (7.1)	1 (3.4)
Female	15 (100)	13 (92.9)	28 (96.6)
Age (years)*	**	**	
18 to 34	7 (46.7)	8 (57.1)	15 (51.7)
35 to 59	8 (53.3)	6 (42.9)	14 (48.3)
Marital status			
Single	12 (80.0)	7 (50.)	19 (65.5)
Married	3 (20.0)	4 (28.6)	7 (24.1)
Other	–	3 (21.4)	3 (10.4)
Education level			
Incomplete elementary	1 (6.7)	1 (7.1)	2 (6.9)
Elementary	2 (13.3)	2 (14.3)	4 (13.8)
High school	3 (20.0)	3 (21.4)	6 (20.7)
Higher education	9 (60.0)	8 (57.2)	17 (58.6)
Job market formal/informal			
Yes	11 (73.3)	8 (57.1)	19 (65.5)
No	4 (26.7)	6 (42.9)	10 (34.5)
Family income (minimum wage)			
1 to 3	9 (60.0)	11 (78.6)	20 (68.9)
3 to 5	5 (33.3)	3 (21.4)	8 (27.7)
5 to 10	1 (6.7)	–	1 (3.4)

Note: *Age division stipulated based on the median age of research participants. **Mean age: control group: 36.7 ± 10.2 years; manual therapy group: 39.1 ± 9.5 years. Data presented as n (%).

Table 1 - Sociodemographic profile, health conditions and lifestyle of the participants (continued)

Variables	Manual therapy group (n = 15)	Control group (n = 14)	Total (n = 29)
Physical activity			
Yes	7 (46.7)	8 (57.1)	15 (51.7)
No	8 (53.3)	6 (42.8)	14 (48.3)
Smoking			
Yes	–	1 (7.1)	1 (3.4)
No	14 (93.3)	12 (85.7)	26 (89.6)
Former smoker	1 (6.7)	1 (7.1)	2 (6.9)
Alcohol consumption			
Yes	5 (33.3)	5 (35.7)	10 (34.5)
No	10 (66.7)	9 (64.3)	19 (65.5)
Comorbidities*			
Yes	11 (73.3)	7 (50.0)	18 (62.1)
No	4 (26.7)	7 (50.)	11 (37.9)

Note: *Coexisting conditions that can influence the clinical course, prognosis, and treatment response of migraine, such as psychiatric disorders, cardiovascular, gastrointestinal, and rheumatic diseases. Data presented as n (%).

Regarding health conditions and lifestyle, most participants were engaged in physical activity (51.7%), mainly those in the CG (57.1%). As for smoking, 89.6% of the participants reported being non-smokers. In terms of alcohol consumption, there were no differences in the number of drinkers between groups, and 89.6% of the participants reported not drinking alcoholic beverages. Clinically diagnosed comorbidities were present in 62.1% of the sample, being more common in the MTG (62.1%) (Table 1).

Clinical characterization of chronic migraine

The most prevalent characteristics of headache were unilateral pain (62.1%), pulsating or throbbing pain (96.6%), moderate to severe intensity (86.2%), and an average frequency of one to four headache days per month (41.4%). Associated symptoms were nausea/vomiting (82.7%), photophobia (86.2%), phonophobia (89.6%), osmophobia (62.1%). There was worsening of pain during physical activity (82.7%) (Table 2).

Table 2 - Clinical characteristics of patients with migraine

Pain characteristics	Manual therapy group (n = 15)	Control group (n = 14)	Total (n = 29)
Localization			
Unilateral	8 (53.3)	10 (71.4)	18 (62.1)
Bilateral/Diffuse	7 (46.7)	4 (28.6)	11 (37.9)
Quality			
Pulsating/throbbing	14 (93.3)	14 (100)	28 (96.6)
Dull	1 (6.7)	–	1 (3.4)
Frequency			
< 1x/week	3 (20.0)	–	3 (10.3)
1 to 4 days/month	5 (33.3)	8 (57.2)	12 (41.4)
5 to 8 days/month	4 (26.7)	3 (21.4)	8 (27.6)
9 to 14 days/month	2 (13.3)	2 (14.3)	4 (13.8)
≥ 15 days/month	1 (6.7)	1 (7.1)	2 (6.9)

Note: Data presented as n (%).

Table 2 - Clinical characteristics of patients with migraine (continued)

Pain characteristics	Manual therapy group (n = 15)	Control group (n = 14)	Total (n = 29)
Intensity			
Mild (VAS 1 to 4)	3 (20.0)	3 (21.4)	4 (13.8)
Moderate/Severe (VAS 5 to10)	12 (80.0)	9 (78.6)	25 (86.2)
Associated symptoms			
Nausea/vomiting	14 (93.3)	10 (71.4)	24 (82.7)
Aura	10 (66.7)	6 (42.6)	9 (31.0)
Photophobia	13 (86.7)	12 (85.7)	25 (86.2)
Phonophobia	14 (93.3)	12 (85.7)	26 (89.6)
Osmophobia	10 (66.7)	8 (57.6)	18 (62.1)
Worsened by physical activity	14 (93.3)	10 (71.4)	24 (82.7)

Note: VAS = Visual analogue scale. Data presented as n (%).

Assessment of cervical mobility

Table 3 describes the comparison between groups for cervical range of motion, assessed by goniometry. The median cervical flexion was -10.0° in the CG and 5.0° in the MTG. The difference between the observed medians was 15.0° (p = 0.005), suggesting a significant increase in cervical flexion in the MTG. However, the values for cervical extension, right and left lateral flexion, and right and left rotations were not significantly different between groups (p > 0.05).

Table 3 - Comparison of cervical range of motion between manual therapy group (MTG) and control (CG)

Parameters	MTG	CG	p-value
Flexion[2]	5.0 ± 19.5	-10.0 ± 9.0	0.005*
Extension[1]	3.01 ± 7.4	-4.3 ± 14.0	0.227
Right lateral flexion[2]	0.01 ± 2.0	-4.0 ± 14.5	0.106
Left lateral flexion[1]	-2.9 ± 9.9	-3.8 ± 5.8	0.781
Right rotation[1]	1.8 ± 9.9	1.2 ± 14.2	0.898
Left rotation[1]	9.1 ± 17.8	1.4 ± 15.5	0.226

Note: [1]Mean ± standard deviation; [2]Median ± interquartile range. *p < 0.05.

Comparison of the scores of the instruments

A statistically significant improvement in the total HIT-6 score was observed for the MTG (7.6 ± 7.6; p = 0.014) compared to the CG (-1.9 ± 11.7). Although the MTG also showed a reduction in the number of days with pain (MIDAS), pain intensity (VAS), and sleep quality (PSQI) when compared to the CG, this difference was not statistically significant (p > 0.05). No changes were observed between groups for headache self-efficacy (HMSE-10), as shown in Table 4.

Table 4 - Comparison of the HIT-6 scores, days of pain (MIDAS), pain intensity (VAS), self-efficacy (HMSE-10), and sleep quality (PSQI) between manual therapy group (MTG) and control (CG)

Parameters	MTG	CG	p-value
HIT-6[1]	7.6 ± 7.6	-1.9 ± 11.7	0.015*
MIDAS[1]	3.1 ± 19.7	3.4 ± 8.7	0.959
VAS[2]	0.0 ± 3.5	-1.0 ± 0.8	0.169
HMSE-10[1]	-1.9 ± 6.6	-1.9 ± 8.1	0.997
PSQI[1]	1.2 ± 5.4	1.5 ±3.4	0.861

Note: [1]Mean ± standard deviation; [2]Median ± interquartile range. HIT-6 = Headache Impact Test; MIDAS = Migraine Disability Assessment Test; VAS = Visual Analogue Scale; PSQI-BR = Pittsburgh Sleep Quality Index; HMSE-10 = Headache Management Self-efficacy Scale. *p < 0.05.

Overall, participants in the MTG had better scores for the SF-36 questionnaire compared to the CG (Table 5). However, the differences between groups were only significant for the domains of physical functioning (p = 0.02) and general health status (p = 0.03).

Table 5 - Comparison of the 36-Item Short Form Health Survey questionnaire between groups

Domains	MTG	CG	p-value
Physical functioning[2]	10.0 ± 20.0	7.9 ± 23.9	0.239
Role-physical[2]	0.0 ± 75.0	0.0 ± 18.8	0.021*
Bodily pain[1]	11.0 ± 17.8	0.2 ± 25.9	0.199
General health[1]	12.9 ±14.2	0.8 ± 14.9	0.032*
Vitality[1]	8.0 ± 23.6	-8.6 ± 19.8	0.050
Social functioning[2]	0.0 ± 25.0	0.0 ± 25.0	0.647
Role-emotional[2]	0.0 ± 0.0	0.0 ± 33.5	0.678
Mental health[1]	9.9 ± 18.3	0.3 ± 11.1	0.100

Note: MTG = manual therapy group; CG = control group. [1]Mean ± standard deviation; [2]Median ± interquartile range. *p < 0.05.

Table 6 presents the results of the Z-test for proportions for disability (MIDAS) and sleep quality (PSQI) questionnaires. The proportion of participants with severe disability was 57.1% in the CG and 21.4% in the MTG, with a statistically significant difference (p < 0.05), highlighting the positive effect of MT on disability. Regarding sleep quality, although the proportion of participants with good sleep quality was higher in the MTG (35.2%) than in the CG (21.4%), no statistical difference was observed (p > 0.05).

Table 6 - Comparison of disability (MIDAS) and sleep quality (PSQI) between manual therapy group (MTG) and control (CG)

Variables	n	Proportion	p-value
Degree of disability (severe)			
MTG	3	0.214	0.042*
CG	8	0.571	
Sleep quality (good)			
MTG	5	0.357	0.404
CG	3	0.214	

Note: MIDAS = Migraine Disability Assessment test; PSQI = Pittsburgh Sleep Quality Index.*p < 0.05.

Discussion

Previous studies have associated female gender,[26,27] age,[28,29] educational level,[30] lifestyle,[31,32] and comorbidities[33,34] as risk or triggering factors for migraine. In addition, demographic data may negatively impact marital relationships and professional and financial stability.[35]

The characteristics of migraine in the studied population are consistent with the criteria established by the ICHD-3.[18] Nonetheless, osmophobia is not included in these criteria despite proven accuracy in differentiating migraine from tension-type headaches.[36] Moreover, odors as a triggering factor for pain attacks are only observed in patients with migraine, distinguishing it from other primary headaches.[37]

Cervical mobilization, manipulation, and exercise are often used as effective treatments for musculoskeletal cervical pain and headaches and are recommended in clinical practice guidelines.[38] Our results showed that MT had a significant effect on increasing cervical flexion range of motion. Di Antonio et al.[39] reported that participants with episodic migraine exhibited reduced cervical flexion and rotation compared to those without migraine. These impairments may be related to the increased duration, disability, and sensitivity caused by headaches. Rezaeian et al.[40] observed that myofascial release techniques and stretching led to significant improvement in the range of motion of all cervical movements, consequently reducing the frequency, duration, and severity of migraine attacks among the included population.

Participants with migraine had a reduced range of movement for cervical flexion and rotation. One possible explanation for this limitation may be the tissues connecting the rectus muscle of the posterior minor head to the dura mater, forming a myodural bridge.[41] This connection pulls on the dura mater when the rectus posterior minor muscle is stretched during upper cervical flexion or rotation, causing increased sensitivity and limiting craniocervical flexion.[42] Other factors limiting cervical movement include weakness of the neck muscles,[43-44] the association between forward head posture and thoracic kyphosis,[45] and reduced cervical range of motion,[46] also observed in individuals with migraine.

In this study, MTG showed improvement in the total HIT-6 score compared to the CG. The HIT-6 scores reflect treatment changes and are validated for chronic migraine.[47] For instance, Celenay et al.[48] investigated the effects of connective tissue massage on pain characteristics using the HIT-6 and found a significant change compared to the CG. Osteopathic approaches combined with pharmacological treatment also showed a significant difference in overall HIT-6 scores, according to Cerritelli et al.[49]

For quality of life, participants in the MTG had statistically better outcomes compared to the CG in physical functioning and general health status domains. MT encompasses various techniques considered effective for improving quality of life.[50,51] Voigt et al.[51] assessed the effectiveness of a ten-week MT program in participants with migraine, and similar results were reported for the physical component.

A significant improvement was observed when comparing the results of severe disability between groups based on the MIDAS questionnaire, suggesting that the MT reduced disability. Munõz-Gómez et al.[52] also observed an average reduction in disability caused by migraine after eight weeks of treatment using joint techniques ($p < 0.05$). These findings are relevant as migraine is the second leading cause worldwide of years lived with disability and the leading cause considering individuals under 50 years of age, regardless of sex.[1,53]

The MTG showed improvement in pain intensity and frequency of episodes, although not statistically significant. These findings contrast with those reported in the literature, where MT significantly reduced both outcomes.[49,52] No previous studies on MT interventions for migraine patients have used the HMSE-10 questionnaire as an outcome measure. Nevertheless, this tool was used in studies with tension-type headaches, and a significant increase in reported self-efficacy was observed after physical therapy treatment, based on the Functional Behavioral Analysis.[54]

For sleep quality, the proportion of participants with good sleep quality was higher in the MTG, although not statistically significant. Duan et al.[55] systematically analyzed the associations between sleep quality and the risk of developing migraine. The authors observed that approximately two-thirds of patients with poor sleep quality had a significantly increased risk of developing migraine. They also reported that the PSQI score was identified as having a good diagnostic specificity for migraines and recommended to be used as a reference index to predict this condition, which highlights the importance of this questionnaire for the prevention and screening of migraines.

Regarding study strengths and limitations, the randomized controlled design strengthens the internal validity of the results. The use of validated instruments to assess pain, disability, and quality of life enhances the reliability of the results. Limitations include the relatively small sample size, which may limit the generalizability of the results. The lack of a placebo group makes it difficult to attribute the observed effects solely to MT. The follow-up period may be considered short for evaluating the long-term effects of MT, and the absence of subgroup analysis (e.g., by age, sex, or duration of migraine) may limit the ability to identify potential differences in the effects of MT across different subgroups.

Conclusion

The combination of TM techniques with pharmacological treatment showed positive results across various outcomes, emerging as a possible effective approach to treat patients with chronic migraine. Self-efficacy did not show differences between groups and may not be a predictive factor for the success of the therapy. MT appears to be an option to improve cervical flexion.

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Authors' contributions

All authors contributed equally and approved the final version.

Data availability statement

Research data is not available.

References

1. Steiner TJ, Stovner LJ, Vos T, Jensen R, Katsarava Z. Migraine is first cause of disability in under 50s: will health politicians now take notice? J Headache Pain. 2018;19(1):17. https://doi.org/10.1186/s10194-018-0846-2

2. Rice ASC, Smith BH, Blyth FM. Pain and the global burden of disease. Pain. 2016;157(4):791-6. https://doi.org/10.1097/j.pain.0000000000000454

3. Steiner TJ, Stovner LJ, Vos T. GBD 2015: Migraine is the third cause of disability in under 50s. J Headache Pain. 2016;17(1):104. https://doi.org/10.1186/s10194-016-0699-5

4. Hubig LT, Smith T, Chua GN, Lloyd AJ, Powell L, Johnston K, et al. A stated preference survey to explore patient preferences for novel preventive migraine treatments. Headache. 2022;62(9):1187-97. https://doi.org/10.1111/head.14386

5. Brixner DI. Prevalence and burden of migraine and the impact on managed care. Manag Care. 2007;16(7 Suppl 7):2-3. https://pubmed.ncbi.nlm.nih.gov/17927085/

6. Rodríguez-Almagro D, Barassi G, Bertollo M, Obrero-Gaitán E, Di Iorio A, Prosperi L, et al. Manual therapy approach to the extraocular muscles in migraine treatment: a preliminary study. Adv Exp Med Biol. 2022;1375:29-37. https://doi.org/10.1007/5584_2021_704

7. Marmura MJ, Silberstein SD, Schwedt TJ. The acute treatment of migraine in adults: the American Headache Society evidence assessment of migraine pharmacotherapies. Headache. 2015;55(1):3-20. https://doi.org/10.1111/head.12499

8. Smitherman TA, Walters AB, Maizels M, Penzien DB. The use of antidepressants for headache prophylaxis. CNS Neurosci Ther. 2011;17(5):462-9. https://doi.org/10.1111/j.1755-5949.2010.00170.x

9. Silva Neto RP, Barbosa JMS, Almeida KJ. Analysis of the package inserts of migraine prophylactics. Headache Med. 2010;1(1):12-6. https://doi.org/10.48208/HeadacheMed.2010.4

10. Chaibi A, Russell MB. A risk-benefit assessment strategy to exclude cervical artery dissection in spinal manual-therapy: a comprehensive review. Ann Med. 2019;51(2):118-27. https://doi.org/10.1080/07853890.2019.1590627

11. Tolentino GA, Florencio LL, Pinheiro CF, Dach F, Fernández-de-Las-Peñas C, Bevilaqua-Grossi D. Effects of combining manual therapy, neck muscle exercises, and therapeutic pain neuroscience education in patients with migraine: a study protocol for a randomized clinical trial. BMC Neurol. 2021;21(1):249. https://doi.org/10.1186/s12883-021-02290-w

12. Hayward R, Stynes S. Self-efficacy as a prognostic factor and treatment moderator in chronic musculoskeletal pain patients attending pain management programmes: A systematic review. Musculoskeletal Care. 2021;19(3):278-92. https://doi.org/10.1002/msc.1533

13. Garrin JM. Self-efficacy, self-determination, and self-regulation: The role of the fitness professional in social change agency. J Soc Change. 2014;6(1):41-54. https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=1065&context=jsc

14. Souza CM, Martins J, Libardoni TC, Oliveira AS. Self-efficacy in patients with chronic musculoskeletal conditions discharged from physical therapy service: A cross-sectional study. Musculoskeletal Care. 2020;18(3):365-71. https://doi.org/10.1002/msc.1469

15. Thompson DP, Antcliff D, Woby SR. The role of self-efficacy and catastrophizing in explaining improvements in disability, pain, and fatigue among patients with chronic widespread pain treated with physiotherapy: An exploratory analysis. Physiotherapy. 2022;114:96-102. https://doi.org/10.1016/j.physio.2021.03.009

16. Varkey E, Dahlbäck A, Thulin M, Börjesson M, Arvidsson D, Fridolfsson J, et al. Physical activity, self-efficacy, and quality of life in patients with chronic pain, assessed during and 1 year after physiotherapy rehabilitation: A prospective follow-up study. Disabil Rehabil. 2022;44(22):6730-7. https://doi.org/10.1080/09638288.2021.1971305

17. Odell J, Clark C, Hunnisett A, Ahmed OH, Branney J. Manual therapy for chronic migraine: a pragmatic randomised controlled trial study protocol. Chiropr Man Therap. 2019;27:11. https://doi.org/10.1186/s12998-019-0232-4

18. Headache Classification Subcommittee of the International Headache Society. The International Classification of Headache Disorders, 3rd edition. Cephalalgia. 2018;38(1):1-211. https://doi.org/10.1177/0333102417738202

19. Kosinski M, Bayliss MS, Bjorner JB, Ware Jr JE, Garber WH, Batenhorst A, et al. A six-item short-form survey for measuring Headache Impact: The HIT-6™. Qual Life Res. 2003;12(8):963-74. https://doi.org/10.1023/a:1026119331193

20. Pradela J, Bevilaqua-Grossi D, Chaves TC, Dach F, Carvalho GF. Measurement properties of the Headache Impact Test (HIT-6™ Brazil) in primary and secondary headaches. Headache. 2021;61(3):527-35. https://doi.org/10.1111/head.14049

21. Fragoso YD. MIDAS (Migraine Disability Assessment): A valuable tool for work-site identification of migraine in workers in Brazil. Sao Paulo Med J. 2002;120(4):118-21. https://doi.org/10.1590/s1516-31802002000400006

22. Bertolazi NA, Fagondes SC, Hoff LS, Dartora EG, Miozzo ICS, Barba MEF, et al. Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index. Sleep Med. 2011; 12(1):70-5. https://doi.org/10.1016/j.sleep.2010.04.020

23. Ciconelli RM, Ferraz MB, Santos W, Meinão I, Quaresma MR. Tradução para a língua portuguesa e validação do questionário genérico de avaliação de qualidade de vida SF-36 (Brasil SF-36). Rev Bras Reumatol. 1999;39(3):143-50.

24. Vieira RVA, Kowacs F, Londero RG, Barea LM, Grassi V, Ligório IS, et al. Brazilian version of headache management self-efficacy scale. Headache Med. 2021;12(3):247-54. https://doi.org/10.48208/HeadacheMed.2021.36

25. Espí-López GV, Ruescas-Nicolau MA, Nova-Redondo C, Benítez-Martínez JC, Dugailly PM, Falla D. Effects of soft tissue techniques on headache impact, disability, and quality of life in migraine sufferers: a pilot study. J Altern Complement Med. 2018;24(11):1099-107. https://doi.org/10.1089/acm.2018.0048

26. Akram H, Miller S, Lagrata S, Hariz M, Ashburner J, Behrens T, et al. Optimal deep brain stimulation site and target connectivity for chronic cluster headache. Neurology. 2017;89(20): 2083-91. https://doi.org/10.1212/wnl.0000000000004646

27. Vetvik KG, MacGregor EA. Sex differences in the epidemiology, clinical features, and pathophysiology of migraine. Lancet Neurol. 2017;16(1):76-87. https://doi.org/10.1016/s1474-4422(16)30293-9

28. Baigi K, Stewart WF. Headache and migraine: a leading cause of absenteeism. Handb Clin Neurol. 2015;131:447-63. https://doi.org/10.1016/b978-0-444-62627-1.00025-1

29. Raggi A, Covelli V, Leonardi M, Grazzi L, Curone M, D'Amico D. Difficulties in work-related activities among migraineurs are scarcely collected: results from a literature review. Neurol Sci. 2014;35(Suppl 1):23-6. https://doi.org/10.1007/s10072-014-1736-2

30. May A, Schulte LH. Chronic migraine: risk factors, mechanisms and treatment. Nat Rev Neurol. 2016;12(8):455-64. https:// doi.org/10.1038/nrneurol.2016.93

31. Agbetou M, Adoukonou T. Lifestyle modifications for migraine management. Front Neurol. 2022;13:719467. https://doi.org/10.3389/fneur.2022.719467

32. Seng EK, Martin PR, Houle TT. Lifestyle factors and migraine. Lancet Neurol. 2022;21(10):911-21. https://doi.org/10.1016/s1474-4422(22)00211-3

33. Buse DC, Reed ML, Fanning KM, Bostic R, Dodick DW, Schwedt TJ, et al. Comorbid and co-occurring conditions in migraine and associated risk of increasing headache pain intensity and headache frequency: results of the Migraine in America Symptoms and Treatment (MAST) Study. J Headache Pain. 2020;21(1):23. https://doi.org/10.1186/s10194-020-1084-y

34. Kazeminasab S, Nejadghaderi SA, Amiri P, Pourfathi H, Araj-Khodaei M, Sullman MJM, et al. Neck pain: global epidemiology, trends, and risk factors. BMC Musculoskelet Disord. 2022;23(1):26. https://doi.org/10.1186/s12891-021-04957-4

35. Buse DC, Fanning KM, Reed ML, Murray S, Dumas PK, Adams AM, et al. Life with migraine: effects on relationships, career, and finances from the Chronic Migraine Epidemiology and Outcomes (CaMEO) Study. Headache. 2019;59(8):1286-99. https://doi.org/10.1111/head.13613

36. Silva-Néto RP, Peres MFP, Valença MM. Accuracy of osmophobia in the differential diagnosis between migraine and tension-type headache. J Neurol Sci. 2014;339(1-2):118-22. https://doi.org/10.1016/j.jns.2014.01.040

37. Silva-Néto RP, Rodrigues AB, Cavalcante DC, Ferreira PHPB, Nasi EP, Sousa KMH, et al. May headache triggered by odors be regarded as a differentiating factor between migraine and other primary headaches? Cephalalgia. 2017;37(1):20-8. https://doi.org/10.1177/0333102416636098

38. Ferracini GN, Florencio LL, Dach F, Grossi DB, Palacios-Ceña M, Ordás-Bandera C, et al. Musculoskeletal disorders of the upper cervical spine in women with episodic or chronic migraine. Eur J Phys Rehabil Med. 2017;53(3):342-50. https://doi.org/10.23736/s1973-9087.17.04393-3

39. Di Antonio S, Arendt-Nielsen L, Ponzano M, Bovis F, Torelli P, Finocchi C, et al. Cervical musculoskeletal impairments in the 4 phases of the migraine cycle in episodic migraine patients. Cephalalgia. 2022;42(9):827-45. https://doi.org/10.1177/03331024221082506

40. Rezaeian T, Ahmadi M, Mosallanezhad Z, Nourbakhsh MR. The impact of myofascial release and stretching techniques on the clinical outcomes of migraine headache: A randomized controlled trial. J Res Med Sci. 2021;26:45. https://doi.org/10.4103/jrms.jrms_745_18

41. Kahkeshani K, Ward PJ. Connection between the spinal dura mater and suboccipital musculature: evidence for the myodural bridge and a route for its dissection--a review. Clin Anat. 2012;25(4):415-22. https://doi.org/10.1002/ca.21261

42. Liang Z, Thomas L, Jull G, Treleaven J. Cervical musculoskeletal impairments in migraine. Arch Physiother. 2021;11 (1):27. https://doi.org/10.1186/s40945-021-00123-0

43. Ferracini GN, Florencio LL, Dach F, Chaves TC, Palacios-Ceña M, Fernández-de-Las-Peñas C, et al. Myofascial trigger points and migraine-related disability in women with episodic and chronic migraine. Clin J Pain. 2017;33(2):109-15. https://doi.org/10.1097/ajp.0000000000000387

44. Luedtke K, Starke W, May A. Musculoskeletal dysfunction in migraine patients. Cephalalgia. 2018;38(5):865-75. https://doi.org/10.1177/0333102417716934

45. Celik TO, Gorgulu U, Kenar SG, Koca N, Yalcin E, Koymen I, et al. Evaluation of forward head posture and thoracic kyphosis in migraine. J Clin Neurosci. 2024;119:17-21. https://doi.org/10.1016/j.jocn.2023.11.018

46. Oliveira AB, Queiroz LP, Rocha-Filho PS, Sarmento EM, Peres MFP. Annual indirect costs secondary to headache disability in Brazil. Cephalalgia. 2020;40(6):597-605. https://doi.org/10.1177/0333102419889357

47. Rendas-Baum R, Yang M, Varon SF, Bloudek LM, DeGryse RE, Kosinski M. Validation of the Headache Impact Test (HIT-6) in patients with chronic migraine. Health Qual Life Outcomes. 2014;12:117. https://doi.org/10.1186/s12955-014-0117-0

48. Celenay ST, Coban O, Mete O, Karahan N. An investigation of the effects of connective tissue massage in women with migraine: A controlled clinical trial. J Bodyw Mov Ther. 2023;33:112-9. https://doi.org/10.1016/j.jbmt.2022.09.008

49. Cerritelli F, Ginevri L, Messi G, Caprari E, Di Vincenzo M, Renzetti C, et al. Clinical effectiveness of osteopathic treatment in chronic migraine: 3-armed randomized controlled trial. Complement Ther Med. 2015;23(2):149-56. https://doi.org/10.1016/j.ctim.2015.01.011

50. Maistrello LF, Rafanelli M, Turolla A. Manual therapy and quality of life in people with headache: Systematic review and meta-analysis of randomized controlled trials. Curr Pain Headache Rep. 2019;23(10):78. https://doi.org/10.1007/s11916-019-0815-8

51. Voigt K, Liebnitzky J, Burmeister U, Sihvonen-Riemenschneider H, Beck M, Voigt R, et al. Efficacy of osteopathic manipulative treatment of female patients with migraine: Results of a randomized controlled trial. J Altern Complement Med. 2011; 17(3):225-30. https://doi.org/10.1089/acm.2009.0673

52. Muñoz-Gómez E, Inglés M, Serra-Añó P, Espí-López GV. Effectiveness of a manual therapy protocol based on articulatory techniques in migraine patients: A randomized controlled trial. Musculoskelet Sci Pract. 2021;54:102386. https://doi.org/10.1016/j.msksp.2021.102386

53. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018;392(10159):1789-858. https://doi.org/10.1016/s0140-6736(18)32279-7

54. Söderlund A, Lagerlöf H. An individually tailored behavioral medicine treatment in physical therapy for tension-type headache - Two experimental case studies. J Pain Res. 2016;9: 1089-99. https://doi.org/10.2147/jpr.s121609

55. Duan S, Ren Z, Xia H, Wang Z, Zheng T, Liu Z. Association between sleep quality, migraine and migraine burden. Front Neurol. 2022;26:13:955298. https://doi.org/10.3389/fneur.2022.955298