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Dry Needling versus Kinesiotaping for Upper Trapezius Trigger Points: A Randomized Controlled Trial

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ABSTRACT

Background: Myofascial pain syndrome involving the upper trapezius is a common musculoskeletal problem in adult males and is frequently associated with active trigger points, increased pain sensitivity, and changes in muscle structure. **Objective:** To compare the effects of dry needling and inhibitory Kinesio taping on pressure pain threshold and muscle thickness in males with upper trapezius myofascial pain syndrome. **Methodology:** This single-blinded randomized controlled trial included 60 male participants presenting with active trigger points in the upper trapezius muscle. Participants were randomly assigned to three equal groups. Group 1 underwent dry needling, Group 2 received inhibitory Kinesio taping, and Group 3 acted as the control group without intervention. Pressure pain threshold was measured using a pressure algometer, while ultrasound imaging was used to determine muscle thickness. Participants were excluded if they had a previous cervical spine surgery, neurological disease, systemic inflammatory condition, bleeding disorder, or were using anticoagulant drugs. Outcomes were recorded at baseline, on the 5th day after intervention, and again on the 10th day. Descriptive statistics were used for demographic and baseline data. Repeated-measure ANOVA was used to examine changes within groups and differences between groups over time. **Results:** Both the dry needling and inhibitory Kinesio taping groups demonstrated statistically significant improvements in pressure pain threshold following intervention ($p<0.001$) and significant reductions in upper trapezius muscle thickness ($p<0.05$). Both interventions were superior to the control group, which showed no significant changes in either outcome. No statistically significant difference was observed between the two treatment groups. **Conclusion:** Dry needling and inhibitory Kinesio taping were both beneficial in decreasing pain sensitivity and reducing muscle thickness in males with active trigger points in the upper trapezius. Despite differences in therapeutic approach, both interventions produced comparable clinical effects.

Keywords: Dry needling, Inhibitory Kinesio taping, Muscle thickness, Myofascial pain syndrome, Pressure pain threshold, Upper trapezius

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INTRODUCTION

Musculoskeletal disorders are still one of the main reasons for pain and disability around the world. They affect people of different ages and are common in many types of jobs. Among these problems, myofascial pain syndrome is often seen in clinical settings and plays an important role in long-lasting regional pain complaints.[1] It is mainly identified by myofascial trigger points, which are small sensitive spots present in tight bands of muscle. These points are usually painful when pressed and can cause pain not only at the exact spot but also in nearby or distant areas. This can make both diagnosis and treatment more difficult.[2] Trigger points are generally categorized as either active or latent. Active trigger points produce spontaneous pain that patients often recognize as familiar, whereas latent trigger points are usually asymptomatic until mechanical stimulation occurs.[3]

The transition from latent to active trigger points has been associated with repeated mechanical stress, poor posture, prolonged static muscle activity, and psychosocial factors, although the exact pathophysiological mechanisms remain incompletely understood.[4] Current theories suggest that sustained muscle overload may lead to local ischemia, altered calcium regulation, and energy crisis within muscle fibers, which then promotes persistent contracture and sensitization of nociceptors.[5] The upper trapezius muscle is one of the most commonly affected sites for the development of myofascial trigger points.[6] This muscle plays a crucial role in maintaining cervical posture and shoulder girdle stability, and it is continuously engaged during desk work, smartphone use, and other sedentary activities.

Prolonged forward head posture and sustained elevation of the shoulders may overload the upper trapezius, creating an environment conducive to trigger point formation.[7] Pain originating from trigger points in this muscle frequently radiates toward the posterior neck, occipital region, temporal area, or shoulder, often mimicking other cervical or headache disorders.[8] If myofascial pain in the upper trapezius is left untreated, it may progress into a chronic condition. Chronic pain is not only associated with reduced cervical range of motion but may also lead to compensatory postural adaptations and altered movement patterns.[9] Over time, these compensations can place additional strain on adjacent muscles and joints, further perpetuating the pain cycle. Functional limitations, reduced work productivity, and impaired quality of life are commonly reported by individuals with persistent MPS.[10]

A wide range of conservative interventions has been proposed for the management of myofascial pain syndrome. These include manual therapy, stretching exercises, electrotherapy modalities, and needling techniques. Among these, dry needling has gained considerable attention over the past decade. Dry needling involves the insertion of a thin filiform needle directly into the trigger point with the aim of eliciting a local twitch response and reducing muscle hyperexcitability.[11] Several clinical trials have reported short-term improvements in pain intensity, pressure pain threshold, and functional outcomes following dry needling of the upper trapezius muscle.[12] However, as an invasive technique, dry needling is not without limitations. Concerns related to patient discomfort, risk of infection, and practitioner skill requirements have been highlighted in the literature.[13]

Inhibitory Kinesio taping represents a noninvasive therapeutic approach that has been increasingly used in musculoskeletal rehabilitation. This method involves the application of elastic adhesive tape along the affected muscle with the intention of reducing muscle activity, improving local circulation, and modulating sensory input.[14] The appeal of Kinesio taping lies in its simplicity, low cost, and minimal risk profile. Some studies have demonstrated beneficial effects of inhibitory taping on pain reduction and pressure pain threshold in individuals with myofascial pain, including those with upper trapezius involvement.[15]

Other investigations have reported inconsistent or minimal effects, suggesting that the clinical efficacy of this intervention may vary depending on application technique, patient characteristics, and outcome measures used.[16] When comparing dry needling and inhibitory Kinesio taping, existing evidence presents a mixed picture. Both interventions have been shown to produce improvements in pain-related outcomes, yet direct comparisons between the two modalities are relatively limited.[17] Moreover, much of the available research focuses primarily on subjective pain scores, while fewer studies have examined objective parameters such as pressure pain threshold or muscle morphology.[18] Muscle

thickness, as assessed through ultrasound imaging, has emerged as a valuable objective measure in the evaluation of myofascial pain. Changes in muscle thickness may reflect alterations in muscle tone, edema, or sustained contraction associated with active trigger points.[19] Similarly, pressure pain threshold is considered a reliable indicator of mechanical pain sensitivity and is frequently used to quantify treatment effects in myofascial pain research.[20] Despite the relevance of these outcomes, comparative data examining how dry needling and inhibitory Kinesio taping influence both muscle thickness and pressure pain threshold in upper trapezius MPS remain scarce.

Given the ongoing debate regarding the relative effectiveness of invasive versus noninvasive treatments, further investigation is warranted. Understanding whether these two commonly used interventions produce comparable physiological and clinical changes may assist clinicians in selecting the most appropriate treatment based on patient preference, tolerance, and clinical presentation. This study was conducted to examine and compare the effects of dry needling and inhibitory Kinesio taping on pressure pain threshold and muscle thickness in patients with upper trapezius myofascial pain syndrome.

METHODOLOGY

This study was carried out as a single-blind randomized controlled clinical trial. It aimed to compare the effects of dry needling and inhibitory Kinesio taping on pressure pain threshold (PPT) and muscle thickness in male adults with myofascial pain syndrome of the upper trapezius. The person who recorded the outcome measures did not know which treatment each participant received. This was done to reduce the chance of measurement bias. Ethical principles for research on human participants were followed throughout the study. Approval was obtained from the institutional ethics committee before the recruitment process started.

A total of 60 male adults with myofascial pain syndrome of the upper trapezius were included in the trial. They were recruited from outpatient physiotherapy clinics through convenience sampling. Participants were eligible if they were between 18 and 50 years of age, had at least one active trigger point in the upper trapezius, and had pain for more than four weeks. Active trigger points were confirmed using standard clinical findings. These included a palpable taut band, point tenderness, reproduction of the patient's usual pain on palpation, and a local twitch response.

Participants were not included if they had a previous cervical spine surgery, neurological disease, systemic inflammatory condition, bleeding disorder, or were using anticoagulant drugs. Those with an allergy to adhesive tape, pregnancy, or any recent treatment with dry needling or kinesio taping to the neck or shoulder area during the past three months were also excluded. Written informed consent was obtained from all participants before they entered the study.

After the initial assessment, the participants were randomly divided into three equal groups, with 20 subjects in each group. A computer-based randomization method was used to assign them. To keep the process unbiased, sealed opaque envelopes were prepared by an independent researcher who had no role in treatment or assessment. Group 1 was treated with dry needling, while Group 2 received inhibitory Kinesio taping. Group 3 was kept as the control group and did not receive any treatment during the study period. These participants were told to continue their normal daily routine. However, they were asked not to take any other treatment for neck or shoulder pain until the study was completed.

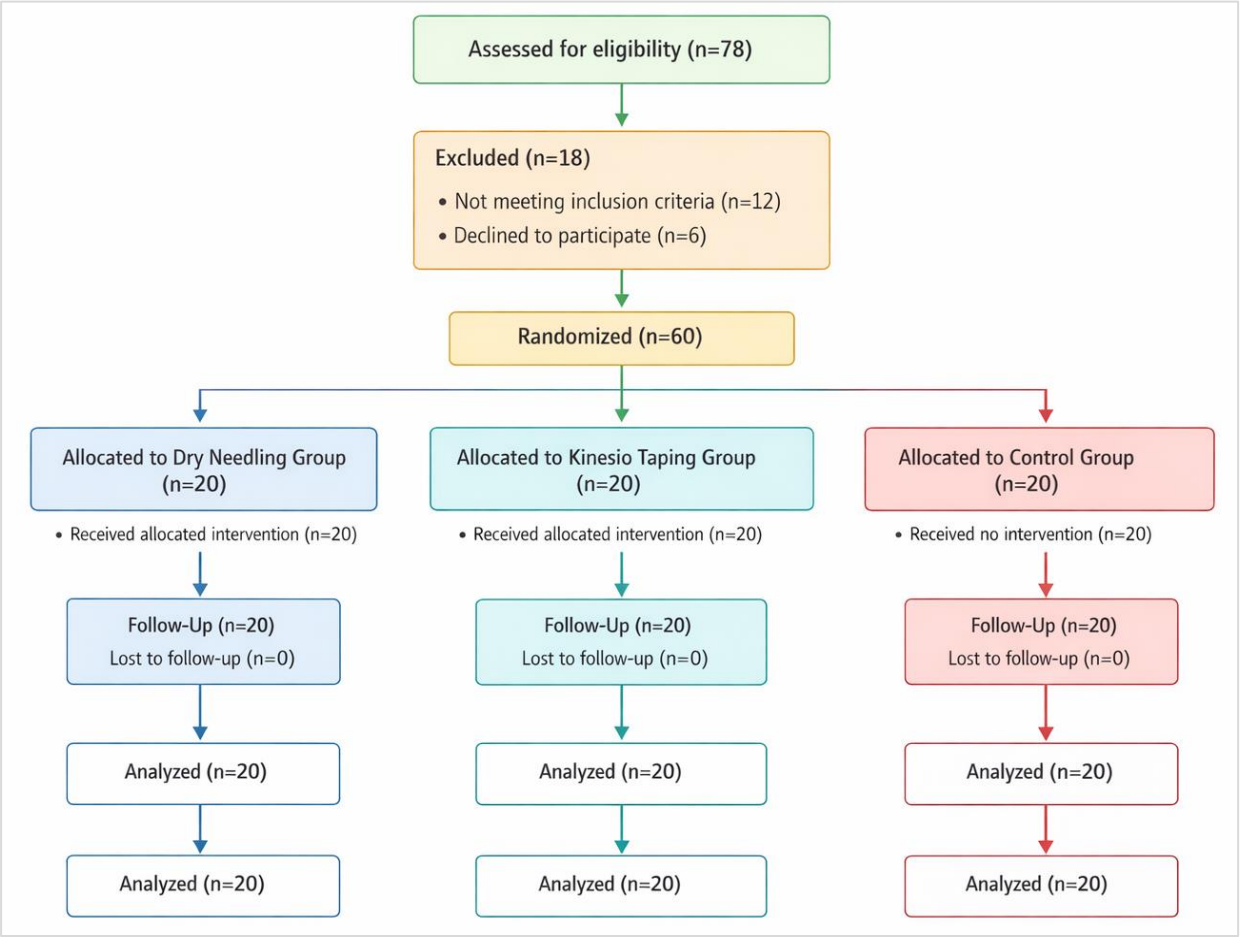
The dry needling group received two treatment sessions, with a gap of three days between them. The procedure was carried out by a licensed physiotherapist who was experienced in dry needling. A sterile disposable filiform needle was inserted into the active trigger point in the upper trapezius muscle. A quick in-and-out technique was used. The needle was moved until a local twitch response appeared or the tissue tension was reduced. Each trigger point was treated for about 5 to 7 minutes. Proper infection control measures were followed in every session. The inhibitory Kinesio taping group also received two sessions, separated by three days.

The tape was applied by a trained physiotherapist according to the standard inhibitory taping method. It was placed from the insertion of the muscle towards its origin, with very light stretch, while the muscle was kept in a lengthened position. The tape was left in place for up to 72 hours unless the participant developed skin irritation. Each participant was given instructions about tape care

and was told to remove it if itching, discomfort, or any allergic reaction appeared. The control group did not receive any therapeutic procedure during the study. Their assessment schedule remained the same as the other two groups. Pressure pain threshold was measured with a handheld pressure algometer. The reading was taken over the marked trigger point of the upper trapezius. Pressure was increased gradually at a constant speed until the participant reported the first feeling of pain. At each assessment, three readings were taken with a 30-second break between them. The average of these readings was used for analysis. Muscle thickness was measured with diagnostic ultrasound. During this test, the participant remained seated in a standard position with the arms relaxed.

The ultrasound probe was placed at a fixed anatomical point and held perpendicular to the muscle fibers. Three images were taken at each session, and the mean value was recorded to improve consistency. The outcomes were measured at three stages: before treatment, five days after the second session, and ten days after the intervention period. All measurements were taken by the same blinded examiner so that the procedure stayed consistent. The data were analyzed using SPSS version 22. Descriptive statistics were used for demographic and baseline data. Repeated-measures ANOVA was used to examine changes within groups and differences between groups over time. The significance level was kept at $p<0.05$. Before the main analysis, the normality of the data was also checked.

Figure 1: CONSORT Diagram



RESULTS

A total of 60 male participants diagnosed with active myofascial trigger points in the upper trapezius muscle completed the study. Participants were randomly assigned to the dry needling group, inhibitory Kinesio taping group, or control group, with 20 individuals in each group. All participants completed the intervention and follow-up assessments, and no adverse events were reported. Baseline demographic and clinical characteristics are presented in Table 1. The mean age of participants ranged from 33.9 to 35.1 years across the three groups, with no statistically significant differences. Body mass index values were also similar, indicating comparable body composition among groups. The average duration of symptoms was approximately seven months in all groups,

suggesting a similar chronicity of myofascial pain at study entry. Importantly, baseline pressure pain threshold and upper trapezius muscle thickness values did not differ significantly between groups. This confirms that all groups started the study with comparable pain sensitivity and muscle characteristics, allowing observed post-intervention changes to be attributed to the applied treatments rather than pre-existing differences.

Changes in pressure pain threshold over time are summarized in Table 2. At baseline, all groups demonstrated low PPT values, reflecting heightened pain sensitivity associated with active trigger points. After intervention, both treatment groups showed marked improvements. In the dry needling group, PPT increased substantially by day 5 and continued to improve by day 10, indicating a progressive reduction in pain sensitivity. A similar pattern was observed in the inhibitory Kinesio taping group, with significant increases in PPT at both follow-up points. These improvements were statistically significant within each intervention group ($p<0.001$).

In contrast, the control group showed only minimal changes in PPT across the same time points. These changes were not statistically significant, suggesting that natural recovery or repeated measurements alone did not meaningfully influence pain sensitivity. Between-group analysis demonstrated that both intervention groups had significantly higher PPT values compared with the control group at day 5 and day 10. However, no significant difference was detected between the dry needling and Kinesio taping groups, indicating that both interventions were similarly effective in improving pressure pain tolerance. Upper trapezius muscle thickness results are presented in Table 3. At baseline, muscle thickness values were similar across all groups, confirming equivalent muscle status before intervention.

Following treatment, both the dry needling and inhibitory Kinesio taping groups demonstrated significant reductions in muscle thickness at day 5, with further reductions observed at day 10. These findings suggest a decrease in localized muscle tension or sustained contraction after intervention. The reductions were statistically significant for both groups, with slightly greater numerical reductions observed in the dry needling group, although this difference was not statistically significant. The control group showed no meaningful change in muscle thickness across the study period. This supports the interpretation that the observed reductions in the intervention groups were treatment-related rather than due to time or measurement variability.

To assess the clinical relevance of the observed changes, effect sizes were calculated at day 10 and are shown in Table 4. Both intervention groups demonstrated large effect sizes for pressure pain threshold improvements, indicating clinically meaningful pain reduction. Moderate effect sizes were observed for muscle thickness reduction, suggesting a meaningful but less pronounced structural change. The control group showed negligible effect sizes for both outcomes.

Correlation analysis revealed a moderate, statistically significant negative relationship between changes in muscle thickness and changes in pressure pain threshold ($r= -0.46$, $p=0.003$). This indicates that greater reductions in muscle thickness were associated with larger improvements in pain tolerance, supporting a link between muscle tissue normalization and pain relief. Overall, both dry needling and inhibitory Kinesio taping resulted in significant.

Table 1: Demographic and baseline characteristics of participants

Variable	Dry Needling (n=20)	Kinesio Taping (n=20)	Control (n=20)	p-value
Age (years)	34.6 ± 7.2	33.9 ± 6.8	35.1 ± 7.5	0.81
BMI (kg/m^2)	24.8 ± 3.1	25.2 ± 2.9	24.6 ± 3.4	0.74
Symptom duration (months)	6.9 ± 2.3	7.1 ± 2.5	6.7 ± 2.1	0.86
Baseline PPT (kg/cm^2)	2.31 ± 0.42	2.28 ± 0.39	2.34 ± 0.41	0.92
Baseline muscle thickness (mm)	12.6 ± 1.4	12.8 ± 1.6	12.5 ± 1.5	0.88

Table 2: Changes in pressure pain threshold (kg/cm^2)

Time points	Dry Needling	Kinesio Taping	Control
Baseline	2.31±0.42	2.28±0.39	2.34±0.41
Day 5	3.05±0.47*	2.98±0.44*	2.38±0.40
Day 10	3.29±0.51*	3.21±0.48*	2.41±0.43

Table 3: Changes in upper trapezius muscle thickness (mm)

Time points	Dry Needling	Kinesio Taping	Control
Baseline	12.6±1.4	12.8±1.6	12.5±1.5
Day 5	11.9±1.3*	12.1±1.4*	12.4±1.6
Day 10	11.4±1.2*	11.6±1.3*	12.3±1.5

in pain sensitivity and reductions in upper trapezius muscle thickness in individuals, the improvement was similar between the two interventions, suggesting comparable clinical effectiveness. The observed correlation between reduced muscle thickness and increased pain tolerance further supports the role of muscle-related changes in pain reduction.

DISCUSSION

This randomized controlled trial investigated and compared the effects of dry needling and inhibitory Kinesio taping on pressure pain threshold and upper trapezius muscle thickness in patients with myofascial pain syndrome. The findings showed that both treatments led to significant improvement in pressure pain threshold and also reduced muscle thickness compared with the control group. There was no significant difference between the two treatment groups. This suggests that dry needling and inhibitory Kinesio taping may have similar short-term treatment benefits. The increase in pressure pain threshold observed in both treatment groups is consistent with previous research reporting reduced pain sensitivity following targeted interventions for myofascial trigger points.[16-18]

Pressure pain threshold is considered a reliable indicator of mechanical pain sensitivity and local nociceptive activity in myofascial pain syndrome. Improvements in PPT following dry needling are commonly attributed to mechanical disruption of taut muscle bands, normalization of excessive endplate activity, and modulation of peripheral and central pain mechanisms.[19] The present findings support these proposed mechanisms, as participants receiving dry needling demonstrated marked increases in PPT as early as five days after intervention, with further improvement observed at ten days.[20]

Inhibitory Kinesio taping also produced significant increases in pressure pain threshold, which aligns with several controlled trials and systematic reviews suggesting that Kinesio taping can modulate pain perception in myofascial pain conditions.[21] Although Kinesio taping does not directly penetrate muscle tissue, its effects are thought to occur through enhanced cutaneous stimulation, improved proprioceptive input, and altered afferent sensory feedback. These mechanisms may reduce nociceptive input at the spinal level and improve pain tolerance. The comparable magnitude of PPT improvement between the two interventions in this study suggests that both deep tissue stimulation and superficial sensory modulation can effectively influence pain processing in myofascial pain syndrome.[22]

Another important finding of this study is the significant reduction in upper trapezius muscle thickness observed in both intervention groups. Ultrasound-measured muscle thickness has been increasingly used as an objective marker of muscle tension, localized contracture, and altered tissue state associated with active trigger points.[23] The reduction in muscle thickness following dry needling may reflect decreased sustained muscle contraction, improved local circulation, and resolution of trigger point-related contracture. These structural changes may contribute to pain relief by reducing mechanical stress on nociceptors within the muscle tissue. The reduction in muscle thickness observed in the inhibitory Kinesio taping group is also noteworthy. Although Kinesio taping does not directly affect deep muscle fibers, previous studies suggest that prolonged taping may influence muscle tone and resting tension via neuromuscular mechanisms.[24]

The lifting effect of the tape on the skin is proposed to enhance lymphatic and blood flow, reduce local pressure, and indirectly decrease muscle stiffness. The present results suggest that these effects may be sufficient to produce measurable changes in muscle morphology over a short period.

Table 4: Effect size (Cohen's d) for primary outcomes at day 10

Outcome	Dry Needling	Kinesio Taping	Control
Pressure pain threshold	1.12 (large)	1.05 (large)	0.12
Muscle thickness	0.88 (moderate)	0.82 (moderate)	0.09

The absence of significant changes in pressure pain threshold and muscle thickness in the control group strengthens the internal validity of the findings and suggests that spontaneous recovery or repeated measurement alone did not account for the observed improvements. This further supports the conclusion that the observed changes were treatment-related.

The lack of significant differences between dry needling and inhibitory Kinesio taping across outcome measures is clinically relevant. While dry needling is often considered more potent due to its invasive nature, it also carries potential drawbacks such as discomfort, fear of needles, and risk of minor adverse effects. In contrast, Kinesio taping is noninvasive, generally well tolerated, and easy to apply. The comparable outcomes observed in this study suggest that inhibitory Kinesio taping may serve as a viable alternative for patients who are unwilling to undergo dry needling. This aligns with prior research indicating that conservative interventions can achieve outcomes similar to invasive techniques in selected populations.[17,18]

The moderate negative correlation found between reductions in muscle thickness and increases in pressure pain threshold further supports a relationship between structural muscle changes and pain modulation. Although causality cannot be established, this finding suggests that interventions that reduce excessive muscle tension may simultaneously improve pain sensitivity. Similar associations between muscle stiffness, trigger point activity, and pain thresholds have been reported in previous imaging and biomechanical studies.[25]

Despite its strengths, this study has some limitations. The follow-up period was relatively short, and therefore, the long-term sustainability of the observed effects remains unclear. Future studies with extended follow-up durations are needed to determine whether these improvements persist over time. Additionally, the study focused on objective outcomes such as PPT and muscle thickness; inclusion of patient-reported outcomes such as pain intensity, disability indices, and quality of life measures would provide a more comprehensive assessment of clinical effectiveness. The inclusion of female participants in future research would also improve generalizability, as sex-related differences in pain perception and muscle characteristics have been previously reported.

The findings of this study demonstrate that both dry needling and inhibitory Kinesio taping are effective interventions for improving pressure pain threshold and reducing upper trapezius muscle thickness in individuals with myofascial pain syndrome. The similar outcomes observed between the two techniques suggest that they may be equally beneficial in the short term, despite differing mechanisms of action. These results support the use of both invasive and noninvasive approaches in the management of myofascial pain syndrome and highlight the importance of individualized treatment selection based on patient preference, tolerance, and clinical context.

CONCLUSION

This shows that both dry needling and inhibitory Kinesio taping can be useful treatment options for people with myofascial pain syndrome of the upper trapezius. Each method produced a significant rise in pressure pain threshold and a reduction in muscle thickness when compared with the group that received no treatment. These changes suggest clear improvement in pain sensitivity as well as in the condition of the muscle tissue. No significant differences were observed between the intervention groups, suggesting comparable short-term clinical effectiveness despite their differing mechanisms of action.

The observed moderate inverse correlation between reductions in muscle thickness and improvements in pressure pain threshold further supports a potential relationship between structural muscle normalization and pain modulation. These findings highlight the clinical relevance of both invasive and noninvasive approaches, allowing treatment selection to be guided by patient preference, tolerance, and safety considerations. Future research should investigate long-term effects, functional outcomes, and the integration of these interventions within

multimodal treatment strategies.

DECLARATIONS

Availability of data and materials: Data will be made available upon request. The corresponding author will submit all dataset files.
Competing interests: None
Funding: No funding source involved.
CONSORT Guidelines: All methods were performed following the relevant guidelines and regulations.

AUTHOR CONTRIBUTIONS

HY: Conceived the study design, supervised data collection, and critically reviewed the manuscript.
MK: Drafted the manuscript, including the introduction and methodology sections.
IA: Prepared results and discussion section, and review of the final manuscript.
All authors had read and approved the final manuscript.

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