RESEARCH PAPER

Effect Of T-Scan-Guided Hard Occlusal Splint, Soft Splint, And Low-Level Laser Therapy On Pain And Maximum Mouth Opening In Occluso-Muscle Disorder Patients: A Randomized Clinical Trial

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ABSTRACT

Background and aim: Temporomandibular disorders frequently cause masticatory pain and restricted mandibular movement. To evaluate and optimize conservative treatment modalities, this randomized clinical trial compared the efficacy of a T-Scan-guided hard stabilization splint, a soft occlusal splint, and low-level laser therapy on pain intensity and maximum mouth opening in patients with occluso-muscle disorder.

Materials and Methods: Forty-five patients aged 18–35 years diagnosed with predominantly muscular TMD were randomly allocated into three equal groups (n = 15). Group I received a T-Scan-guided hard stabilization splint, Group II received a soft occlusal splint, and Group III was treated with low-level laser therapy using an 810-nm diode laser. Pain intensity was assessed using a 10-cm Visual Analogue Scale (VAS), while maximum mouth opening (MMO) was measured using a digital caliper. Measurements were recorded at baseline and after 2, 4, and 6 months. Data were analyzed using one-way ANOVA, repeated-measures ANOVA, Fisher's Least Significant Difference (LSD) post hoc testing, and Bonferroni correction.

Results: No statistically significant differences were observed among the groups at baseline for pain intensity ($P = 0.136$) or maximum mouth opening ($P = 0.627$). Significant between-group differences were observed at 2, 4, and 6 months for both outcomes ($P < 0.001$). Pain intensity decreased progressively in all groups, with the greatest reduction observed in Group I. At 6 months, the mean pain scores (± standard deviation) were 1.13 ± 0.48, 4.49 ± 0.35, and 1.87 ± 0.44 for Groups I, II, and III, respectively. Maximum mouth opening increased progressively in all groups, reaching 39.93 ± 0.88, 37.20 ± 1.26, and 38.40 ± 1.12 mm at 6 months in Groups I, II, and III, respectively. Within-group analyses demonstrated highly significant improvements over time in all three groups ($P < 0.001$).

Conclusion: All three treatment modalities produced significant improvements in pain intensity and maximum mouth opening. The T-Scan-guided hard stabilization splint demonstrated the greatest overall improvement among the tested interventions. Computerized occlusal analysis may therefore play a useful role in optimizing stabilization splint therapy for patients with predominantly muscular TMD.

Keywords: Temporomandibular disorders; Occlusal splint; T-Scan; Low-level laser therapy; Photobiomodulation; Pain; Maximum mouth opening.

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INTRODUCTION

Temporomandibular disorders (TMDs) comprise a heterogeneous group of musculoskeletal and neuromuscular conditions affecting the temporomandibular joints, masticatory muscles, and associated structures[1]. They commonly present with pain, restricted mandibular movement, joint sounds, and functional impairment, with myogenous and arthrogenous conditions representing the primary clinical subgroups[2].

Occluso-muscle disorder (OMD) is characterized by pain and dysfunction resulting from hyperactive, uncoordinated muscle activity triggered by deflective occlusal interferences during physiologic jaw movement and noxious oral habits[3-4]. Muscle spasms typically arise from occlusal surface friction and prolonged disclusion time, which overcompress the periodontal ligament mechanoreceptors of posterior teeth. This compression induces muscular hyperfunction and localized ischemia, ultimately leading to muscle fatigue and restricted mandibular mobility[5-6].

OMDs are managed using a variety of invasive and noninvasive modalities, including physical therapy, stretching, massage, electrotherapy, botulinum toxin injections, acupuncture, ultrasound, dry needling, occlusal splint therapy, and low-level laser therapy (LLLT)[7-8]. Occlusal splint therapy is among the most frequently used conservative approaches for managing TMD-related symptoms. Stabilization splints are designed to provide a stable occlusal platform, which may reduce abnormal loading and modify neuromuscular activity. However, the clinical effectiveness of occlusal interventions remains a subject of ongoing debate; recent systematic reviews have highlighted substantial heterogeneity and methodological limitations within the available evidence[9].

Occlusal splints may be fabricated from rigid or resilient materials. Hard stabilization splints provide a relatively stable and adjustable occlusal surface, whereas soft splints provide a resilient interface that may improve comfort and reduce the mechanical consequences of parafunctional activity. Clinical studies comparing hard and

soft splints have reported improvement with both modalities, although the magnitude and timing of improvement may differ between treatment approaches[10].

Objective assessment of occlusal contacts has become increasingly accessible through computerized occlusal analysis systems. The T-Scan system, in particular, provides dynamic data on the timing and relative distribution of occlusal contacts, assisting clinicians in identifying premature or imbalanced contacts that are difficult to detect using conventional articulating materials. While clinical research has demonstrated favorable outcomes following stabilization splint therapy supported by T-Scan technology, comparative evidence against other modalities remains limited[11-12].

Low-level laser therapy (LLLT), also known as photobiomodulation therapy, serves as an alternative conservative modality for managing TMD-related pain. Its proposed therapeutic mechanisms include the modulation of inflammatory processes, cellular activity, and pain perception. Extensive recent evidence robustly supports its clinical efficacy, consistently demonstrating significant reductions in pain and improvements in mandibular function[13-14]. However, the clinical application of LLLT is complicated by considerable variability in established treatment protocols. Specific application parameters—including wavelength, energy density, power, frequency, and treatment duration—have been shown to substantially influence clinical outcomes, underscoring the need for further well-controlled comparative studies[15].

Despite the increasing clinical adoption of both computerized occlusal analysis and photobiomodulation, few randomized clinical trials have directly compared T-Scan-guided stabilization splint therapy, soft splint therapy, and LLLT regarding both pain intensity and maximum mouth opening over an extended follow-up period. Therefore, the present randomized clinical trial aimed to evaluate and compare the efficacy of a T-Scan-guided hard stabilization splint, a soft occlusal splint, and LLLT on pain intensity and maximum mouth opening in patients with occluso-muscle disorder over a 6-month follow-up period.

MATERIALS AND METHODS

Study Design and Participants: This randomized clinical trial included 45 adult patients (23 females and 22 males), aged 18–35 years, diagnosed with predominantly muscular TMD (occluso-muscle disorder). Participants were recruited from the outpatient clinics of the Department of Removable Prosthodontics, Faculty of Dental Medicine, Al-Azhar University, Cairo, Egypt. Diagnosis was established using the validated algorithms of the contemporary Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) to ensure clinical reliability and validity[14]. The study protocol was ethically approved by the Research Ethics Committee of the Faculty of Dental Medicine for Boys, Al-Azhar University, Cairo, Egypt (Approval Code: 789/1784). The trial was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment.

Inclusion and Exclusion Criteria:

Participants were eligible for inclusion if they presented with one or more of the following clinical features: facial or masticatory muscle pain, localized tenderness involving the masseter and/or temporalis muscles, a reported history of parafunctional habits (such as clenching or bruxism), or clinical evidence of occlusal wear facets, tooth mobility, or occlusal interferences.

Patients were excluded from the study if they had a history of previous occlusal splint therapy, untreated dental caries, active periodontal disease, or recent trauma involving the painful region. Additionally, individuals presenting with predominantly intra-articular TMDs (such as osteoarthritis or capsulitis) or systemic pain conditions like fibromyalgia were excluded. Further exclusion criteria encompassed psychiatric illness, active drug addiction, pregnancy, active smoking, and the concurrent use of medications likely to influence muscle tone or pain perception, including muscle relaxants, corticosteroids, or antidepressants.

Sample Size Calculation and Randomization:

The sample size was calculated based on previously published data regarding pain outcomes following conservative TMD treatment. To detect a statistically significant difference with an alpha level of 0.05 and a statistical power of 80%, a minimum of 15 participants per group was deemed necessary. Accordingly, 45 participants were enrolled and randomly allocated into three equal groups (n = 15 per group):

- **Group I:** Received a T-Scan-guided hard stabilization splint.
- **Group II:** Received a soft occlusal splint.
- **Group III:** Received low-level laser therapy (LLLT).

Intervention Protocols:

Group I: T-Scan-Guided Hard Stabilization Splint. Preliminary impressions of both arches were obtained using irreversible hydrocolloid and poured immediately with Type III dental stone to produce diagnostic casts. Centric relation was recorded using bimanual manipulation with a 2–3 mm leaf gauge separator. A face-bow transfer was performed to relate the maxillary cast to the temporomandibular joints, and the casts were mounted on a semi-adjustable articulator.

A maxillary stabilization splint was fabricated to cover all maxillary teeth, extending approximately 2 mm beyond the incisal edges of the anterior teeth and 2–3 mm onto the palatal surfaces. Canine guidance was incorporated to facilitate posterior disocclusion during lateral and protrusive movements. The splint was processed using heat-cured clear acrylic resin, then finished and polished.

Occlusal adjustment was subsequently performed using the T-Scan Novus computerized occlusal analysis system (Tekscan Inc., Boston, MA, USA). Dynamic occlusal information, including contact timing and relative force distribution, was assessed. Premature and excessive contacts were selectively adjusted, and the T-Scan analysis was repeated until an acceptable pattern of simultaneous bilateral contacts in centric relation and posterior disocclusion during eccentric movements was achieved.

Participants were instructed to wear the splint continuously, except during meals and the consumption of hot beverages. They were advised to clean the appliance daily using mild soap and a soft brush, and to store it in a ventilated container. Follow-up visits were scheduled after 1 week and monthly thereafter for evaluation and adjustment as required.

Group II: Soft Occlusal Splint. Maxillary and mandibular impressions were obtained using irreversible hydrocolloid and poured with Type III dental stone. A soft occlusal splint was fabricated from a 2–3 mm thermoplastic sheet using a vacuum-forming machine. The appliance was designed to cover the maxillary arch and extend partially onto the palatal surfaces. Margins were trimmed and polished to ensure patient comfort. Upon intraoral insertion, the retention, adaptation, and comfort of the appliance were evaluated, and pressure areas were relieved where necessary. Participants received identical instructions regarding appliance use, maintenance, and follow-up as Group I.

Group III: Low-Level Laser Therapy (LLLT). LLLT was performed using an 810-nm diode laser in continuous-wave mode. Each participant received 12 treatment sessions over 12 weeks (one session per week). The treatment was delivered to four bilateral trigger-point regions involving the masseter and temporalis muscles. A total energy dose of 360 J was distributed among the selected treatment sites, with an exposure time of 90 seconds per point. Trigger points were identified via palpation and marked using a standardized facial template. The skin was disinfected with 70% alcohol before irradiation. Both the operator and participant wore wavelength-specific protective eyewear. The laser probe was positioned perpendicular (90°) to the skin surface, maintaining gentle contact during irradiation.

Outcome Measures:

Pain Intensity: Pain intensity was evaluated using a 10-cm Visual Analogue Scale (VAS) at baseline and at 2, 4, and 6 months post-treatment. Participants indicated their perceived pain during maximum mouth opening, with 0 representing "no pain" and 10 representing the "worst imaginable pain".

Table 1: Comparison of pain scores among the studied groups at baseline and during the follow-up periods using One-Way ANOVA and LSD post hoc test.

Pain		Group I	Group II	Group III	Test value	P-value	Sig.
		No.= 15	No.= 15	No.= 15			
Baseline	Mean ± SD	8.63 ± 0.52	8.91 ± 0.41	8.5 ± 0.53	1.924	0.136	NS
	Range	8 – 9.5	8 – 9.5	7.5 – 9.5			
After 2 months	Mean ± SD	4.43 ± 0.53	7.09 ± 0.27	5.4 ± 0.47	96.575	0.000	HS
	Range	3.5 – 5.5	6.5 – 7.5	4.5 – 6			
After 4 months	Mean ± SD	2.53 ± 0.4	5.82 ± 0.29	3.1 ± 0.47	183.864	0.000	HS
	Range	2 – 3	5.5 – 6.5	2.5 – 4			
After 6 months	Mean ± SD	1.13 ± 0.48	4.49 ± 0.35	1.87 ± 0.44	167.484	0.000	HS
	Range	0.5 – 2	4 – 5	1 – 2.5			
Post Hoc analysis by LSD							

Maximum Mouth Opening (MMO): MMO was measured using a digital caliper between the incisal edges of the maxillary and mandibular central incisors. When applicable, the vertical overbite value was added to the measurement. Three consecutive measurements were obtained for each participant, and the mean value was recorded for statistical analysis.

Statistical Analysis: Data were analyzed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was utilized to assess the normality of the data distribution. For between-group comparisons at each assessment period, a one-way analysis of variance (ANOVA) was performed, followed by Fisher's Least Significant Difference (LSD) post hoc test when appropriate. Changes over time within each treatment group were evaluated using repeated-measures ANOVA followed by Bonferroni post hoc comparisons. A *P*-value of ≤ 0.05 was considered statistically significant.

RESULTS

Pain Intensity:

At baseline, no statistically significant difference was observed in pain scores among the three groups (P = 0.136), indicating comparable baseline pain intensity. At 2, 4, and 6 months, highly significant differences were observed among the three groups (P < 0.001). Group I demonstrated the greatest reduction in pain, followed by Group III and Group II. LSD post hoc analysis showed statistically significant differences between all pairwise comparisons at each follow-up period (P < 0.001) (Table 1).

Within-group analysis demonstrated a progressive and highly significant reduction in pain intensity over time in all three groups (P < 0.001). Bonferroni post hoc analysis showed significant differences between all assessment time points within each group (P < 0.001) (Table 2).

Parameters	Group I Vs Group II	Group I Vs Group III	Group II Vs Group III
After 2 months	0.000	0.000	0.000
After 4 months	0.000	0.000	0.000
After 6 months	0.000	0.000	0.000

Table 2: Comparison of pain scores over time within each group using Repeated Measures ANOVA and Bonferroni post hoc test.

Pain		Baseline	After 2 Ms.	After 4 Ms.	After 6 Ms.	Test value•	P-value	Sig.
		No.= 15	No.= 15	No.= 15	No.= 15			
Group I	Mean ± SD	8.63 ± 0.52	4.43 ± 0.53	2.53 ± 0.4	1.13 ± 0.48	1366.714	0.000	HS
	Range	8 – 9.5	3.5 – 5.5	2 – 3	0.5 – 2			
Group II	Mean ± SD	8.91 ± 0.41	7.09 ± 0.27	5.82 ± 0.29	4.49 ± 0.35	621.432	0.000	HS
	Range	8 – 9.5	6.5 – 7.5	5.5 – 6.5	4 – 5			

Group III	Mean ± SD	8.5 ± 0.53	5.4 ± 0.47	3.1 ± 0.47	1.87 ± 0.44	659.508	0.000	HS
	Range	7.5 – 9.5	4.5 – 6	2.5 – 4	1 – 2.5			

Post Hoc analysis						
Parameters	**Baseline vs 2 Months**	**Baseline vs 4 Months**	**Baseline vs 6 Months**	**2 vs 4 Months**	**2 vs 6 Months**	**4 vs 6 Months**
Group I	0.000	0.000	0.000	0.000	0.000	0.000
Group II	0.000	0.000	0.000	0.000	0.000	0.000
Group III	0.000	0.000	0.000	0.000	0.000	0.000

Maximum Mouth Opening:

At baseline, no statistically significant difference was observed in maximum mouth opening among the three groups (P = 0.627). Significant differences were observed among the groups at 2, 4, and 6 months (P < 0.001). Group I demonstrated the greatest improvement in MMO, followed by Group III and Group II. LSD post hoc analysis showed significant differences in most pairwise comparisons. The comparison between Groups I and II at 2 months was not statistically significant (P = 0.091), whereas the remaining significant comparisons are presented in Table 3.

Table 4 presents the comparison of maximum mouth opening across different follow-up times within each group. There was a highly significant improvement in mouth opening in all groups, with continuous increases over time. Repeated Measures ANOVA with Bonferroni post hoc test showed highly significant differences (P < 0.01) between all time points within each group.

Table 3. Comparison of maximum mouth opening among the studied groups at baseline and during follow-up periods using One-Way ANOVA and LSD post hoc test.

MMO		**Group I**	**Group II**	**Group III**	**Test value**	**P-value**	**Sig.**
		No.= 15	**No.= 15**	**No.= 15**			
Baseline	Mean ± SD	27.50 ± 1.23	28.10 ± 1.32	27.70 ± 1.40	0.585	0.627	NS
	Range	25 – 30	25 – 31	25 – 31			
After 2 Months	Mean ± SD	33.60 ± 1.25	30.8 ± 1.47	31.53 ± 1.41	14.628	0.000	HS
	Range	32 – 35	28 – 33	29 – 34			
After 4 Months	Mean ± SD	36.80 ± 1.01	33.73 ± 1.03	34.87 ± 1.06	34.951	0.000	HS
	Range	36 – 38	32 – 35	33 – 36			
After 6 Months	Mean ± SD	39.93 ± 0.88	37.20 ± 1.26	38.40 ± 1.12	41.276	0.000	HS
	Range	39 – 41	35 – 39	37 – 40			

Post Hoc analysis by LSD			
Parameters	**Group I Vs Group II**	**Group I Vs Group III**	**Group II Vs Group III**
Baseline	0.563	0.492	0.812
After 2 Months	0.000	0.000	0.091
After 4 Months	0.000	0.000	0.013
After 6 Months	0.000	0.000	0.020

Table 4: Comparison of maximum mouth opening over time within each group using Repeated Measures ANOVA and Bonferroni post hoc test.

MMO		**Baseline**	**After 2 Ms**	**After 4 Ms**	**After 6 Ms**	**Test value**	**P-value**	**Sig.**
		No.= 15	**No.= 15**	**No.= 15**	**No.= 15**			
Group I	Mean ± SD	27.50 ± 1.23	33.60 ± 1.25	36.80 ± 1.01	39.93 ± 0.88	247.135	0.000	HS
	Range	25 – 30	32 – 35	36 – 38	39 – 41			
Group II	Mean ± SD	28.10 ± 1.32	30.8 ± 1.47	33.73 ± 1.03	37.20 ± 1.26	661.447	0.000	HS
	Range	25 – 31	28 – 33	32 – 35	35 – 39			
Group III	Mean ± SD	27.70 ± 1.40	31.53 ± 1.41	34.87 ± 1.06	38.4 ± 1.12	286.108	0.000	HS
	Range	25 – 31	29 – 34	33 – 36	37 – 40			

Post Hoc analysis						
Parameters	**Baseline vs 2 months**	**Baseline vs 4 months**	**Baseline vs 6 months**	**2 vs 4 months**	**2 vs 6 months**	**4 vs 6 months**
Group I	0.000	0.000	0.000	0.000	0.000	0.000
Group II	0.000	0.000	0.000	0.000	0.000	0.000
Group III	0.000	0.000	0.000	0.000	0.000	0.000

DISCUSSION

The present randomized clinical trial evaluated the efficacy of a T-Scan-guided hard stabilization splint, a soft occlusal splint, and low-level laser therapy (LLLT) on pain intensity and maximum mouth opening (MMO) in patients with predominantly muscular TMD. All three treatment groups demonstrated significant improvements in both clinical outcomes over the 6-month follow-up

period. However, the T-Scan-guided hard stabilization splint demonstrated the greatest overall reduction in pain and the most substantial increase in MMO.

The improvement observed across all treatment groups aligns with contemporary evidence supporting the conservative management of myogenous TMD. Nevertheless, the magnitude of benefit associated with occlusal interventions should be interpreted cautiously; a recent Cochrane review of 57 randomized clinical trials involving 2,846 participants concluded that the certainty of evidence for many clinically important outcomes remains very low due to methodological limitations, heterogeneity, and imprecision[11].

Group I demonstrated the greatest improvement in both outcome measures. A plausible explanation for this finding is the capacity of computerized occlusal analysis to provide dynamic data regarding occlusal contact timing and relative force distribution. This facilitates a more controlled and precise adjustment of the stabilization splint compared to the conventional visual assessment of articulating markings. The clinical relevance of T-Scan-supported stabilization splint therapy has been corroborated by recent investigations. For instance, Loan et al. reported favorable treatment outcomes in patients with TMD treated with T-Scan-supported stabilization splints[16]. Their study, which included 36 patients diagnosed according to DC/TMD criteria, demonstrated significant clinical improvements, providing contemporary support for the use of T-Scan-assisted splint therapy.

However, the present findings should not be interpreted as definitive evidence that T-Scan is universally superior to conventional occlusal adjustment. A recent randomized clinical trial involving 28 patients with myofascial TMD found that stabilization splints equilibrated using either T-Scan or articulating foil both produced significant improvements, with no significant between-group differences detected at 1 and 3 months[17]. The discrepancies between those findings and the present study may be attributed to variations in sample size, splint fabrication, patient selection criteria, treatment protocols, and the duration of follow-up. In the present study, the follow-up period extended to 6 months and evaluated both pain intensity and MMO, which may have allowed the long-term clinical differences between the treatment protocols to become more apparent.

Regarding the soft occlusal splint, Group II also demonstrated significant improvements in both pain and MMO. This is consistent with previous randomized trials, such as the study by Poorna et al., which compared hard and soft splints in TMD patients and reported significant clinical improvements with both modalities, albeit with earlier symptom resolution observed with the hard splint[18]. In accordance with these findings, the present study demonstrated a greater overall improvement with the rigid T-Scan-guided splint than with the soft splint. This disparity likely occurs because a hard appliance provides a stable, reproducible occlusal surface that can be selectively adjusted, whereas the resilient material of a soft appliance is susceptible to deformation under functional loading. Despite this proposed biomechanical advantage, contemporary evidence does not establish the universal superiority of hard splints for all TMD patients. As highlighted by the 2024 Cochrane review, the available evidence regarding occlusal interventions remains uncertain, emphasizing the necessity for adequately powered randomized trials with standardized outcomes and extended follow-up periods[11].

Group III (LLLT) likewise showed substantial improvements in both clinical outcomes. These results align with recent systematic reviews demonstrating the beneficial therapeutic effects of photobiomodulation in patients with TMD. Farshidfar et al. reported promising effects of LLLT on pain intensity and mandibular function, despite considerable variation in applied treatment protocols[19]. Similarly, a 2025 systematic review of 44 randomized clinical trials (1,816 participants) reported significant reductions in pain and improvements in mandibular function following LLLT, while reiterating that treatment outcomes are heavily dependent on wavelength, energy density, and treatment duration[20]. A subsequent 2026 meta-analysis of 40 trials further confirmed that specific parameters—such as wavelength, output power, frequency, and duration directly influence pain and functional outcomes, highlighting the importance of protocol optimization[21].

The present study utilized an 810-nm diode laser, falling within the established therapeutic wavelength range for TMD-related photobiomodulation. The significant clinical improvements observed in Group III further substantiate the growing body of evidence supporting LLLT as an effective conservative modality. Notably, recent evidence indicates that photobiomodulation is effective for both muscular and articular TMD presentations, as demonstrated by a 2025 meta-analysis of 18 trials (1,038 participants)[22]. However, the magnitude of improvement in Group III was marginally lower than that achieved with the T-Scan-guided stabilization splint. This variance likely stems from their fundamentally different therapeutic mechanisms: LLLT acts primarily through localized biological photobiomodulation and analgesia, whereas stabilization splint therapy provides continuous mechanical modification of the occlusal environment.

Synthesizing these findings, the present study highlights that while all three interventions provide clinically meaningful benefits, they operate through distinct mechanisms. At the 6-month assessment, Group I exhibited the lowest mean pain score and the greatest mean MMO, Group III demonstrated an intermediate therapeutic response, and Group II showed the least comparative improvement. The hard stabilization splint likely succeeds by providing continuous mechanical stabilization and a reproducible occlusal surface; the soft splint offers resilient joint protection and symptom relief; and LLLT delivers targeted biological analgesic effects.

Although T-Scan-guided splints demonstrated superior outcomes within this specific protocol, these findings should not be broadly generalized, as current comprehensive reviews lack sufficient evidence to establish the definitive superiority of any single occlusal approach. Clinically, computerized occlusal analysis provides dynamic, reproducible data on contact timing and force distribution, effectively optimizing stabilization

splints for predominantly muscular TMD. However, absent a consensus on its universal superiority over conventional methods[17], future research must directly compare T-Scan against conventional adjustment protocols utilizing larger cohorts, extended follow-up periods, objective compliance monitoring, and electromyographic evaluations.

CONCLUSION

All three treatment modalities significantly improved pain intensity and maximum mouth opening over six months. The T-Scan-guided hard stabilization splint yielded the greatest overall improvements, followed by low-level laser therapy, then soft splint therapy. These findings demonstrate the clinical value of computerized occlusal analysis for optimizing splint adjustments in predominantly muscular TMD. However, larger-scale trials with extended follow-ups, objective compliance monitoring, and neuromuscular assessments are required to definitively confirm this efficacy.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

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