R E S E A R C H

Immediate Effects of Fascial Manipulation on Pain in Patients with Myofascial Densification and Central Sensitization: A Case Series

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Background: The deep fascia is increasingly recognized as a potential source of pain, with densification manifesting as discomfort at myofascial points. Central sensitization (CS) significantly influences pain sensitivity, resulting in temporal, spatial, and threshold alterations in both acute and chronic pain conditions.

Purpose: This case series investigates the immediate effects of fascial manipulation (FM) on pain at myofascial densified points (MDPs) and on clinical measures of CS.

Methods: A total of 10 patients, aged 18–45 years, experiencing pain at MDPs were screened and selected based on specific criteria. Baseline measurements for the Visual Analog Scale (VAS) and the Central Sensitization Inventory (CSI) were collected. Densification points were identified and treated in a single session following the Stecco FM guidelines. Post-intervention values were recorded immediately after FM.

Results: The study demonstrated a significant reduction in pain following FM ($p \leq 0.05$). Mean VAS scores decreased from 07.33 ± 00.82 pre-intervention to 01.16 ± 01.17 post-intervention, while mean CSI scores decreased from 50.33 ± 07.65 to 30.00 ± 05.17.

Conclusion: The findings of this case series suggest that FM may produce immediate reductions in pain in patients presenting with myofascial densification and features of CS.

KEYWORDS: Fascial manipulation; pain; myofascial densified points; central sensitization; densification; case series

INTRODUCTION

In a healthy musculoskeletal and visceral system, fascia offers stability to body structures while permitting essential mobility.[(1)] Fascia performs several important functions, including structural support for surrounding tissues, transmission of mechanical forces generated by muscle contraction, and facilitation of smooth movement by reducing friction between adjacent structures. Alteration to the fascial system may result in dysfunction, potentially leading to impaired mobility, which may contribute to pain.[(1)] Consequently, encapsulated mechanoreceptors and proprioceptors embedded within the deep fascia may undergo structural and functional changes. One such change is fascial densification defined as increased viscosity of the extracellular matrix (ECM) resulting from hyaluronan (HA) aggregation and a reduced water-binding capacity.[(2)] Persistent nociceptive input from a primary pathology of somatic or visceral origin leads to the development of central sensitization (CS) within the dorsal horn of the spinal segments innervating pathological tissues.[(3,4)] The International Association for the Study of Pain (IASP) defines CS as an increased responsiveness of nociceptive neurons in the central nervous system to normal or sub threshold afferent input.[(5)] CS contributes to many of the temporal, spatial, and threshold changes in pain sensitivity in both acute and chronic clinical pain conditions. It reflects the fundamental role of the central nervous system in the development of pain hypersensitivity.[(2)]

Several therapeutic approaches target fascial dysfunction. Among these, fascial manipulation (FM) specifically aims to identify and treat areas of fascial densification within the fascia and myofascial unit.[1,2]

Myofascial densified points (MDPs) are areas where unremitting, nonphysiological tension within the muscle and its surrounding fascia leads to the accumulation of HA and subsequent adaptive fibrosis, often resulting in localized or referred pain.[6,7] The prevalence of pain in patients with MDPs ranges from 20% in general musculoskeletal conditions to as high as 93% in specialized pain populations.[8] Deep fascia, a dense connective tissue, has been identified as a potential contributor of pain in this syndrome.[7] Fascial densification, a pathological change associated with MDPs, is characterized by increased thickness and reduced pliability of the fascial tissues.[1,7] FM has been shown to improve range of motion and reduce symptoms in athletes.[9] Stecco FM has been shown to significantly reduce densifications within various levels of the fascia.[5] Recent studies have also shown that FM can shorten rehabilitation times.[10]

CS, a process involving neuroplastic changes within the central nervous system, has been recognized as a key contributor to the development and maintenance of pain hypersensitivity in various clinical pain conditions.[11] It manifests as alterations in pain perception, including increased sensitivity to pain (hyperalgesia), pain spreading to non-injured areas (referred pain), and a lower pain threshold (allodynia).[12] Painful stimulation of latent myofascial trigger points can initiate widespread CS.[13] The involvement of CS in pain over MDPs has been well documented, highlighting the importance of understanding its role in the condition.[11] The Central Sensitization Inventory (CSI) is a valuable tool for the assessment and evaluation of CS.[10,11]

In the pursuit of effective therapeutic interventions for pain over MDPs, various treatment modalities targeting the fascia have been explored.[6] There are various methods to manage and treat the pain over MDPs, some of which are medications, trigger point injections, other alternative therapies, physiotherapy exercises,[14] dry needling,[15] and ischemic compression.[16] Among these approaches, FM has gained attention for its target approach to resolving fascial densification.[17] FM involves applying manual deep friction to specific points on the deep muscular fascia, often distant from the site of pain. This approach allows the technique to be safely administered even during the acute phase of dysfunction. The hyperemia caused by FM may alter the ECM, thereby restoring fascial gliding.[17] FM is a manual therapy technique that employs specific maneuvers to restore normal gliding and sliding of fascial tissues, with the goal of reducing pain and functional impairments associated with MDPs.[18]

Existing research has primarily focused on pain associated with MDPs, with an emphasis on symptom reduction. Despite the clinical use of FM, there remains a substantial research gap in understanding its effects on CS and pain arising from MDPs. Although various methods exist for treating fascial dysfunction, evidence regarding the specific impact of FM on CS is limited. Therefore, the present study aims to address this gap and further explore the role of FM in modulating CS and associated pain in MDPs.

MATERIALS AND METHODS

After obtaining ethical approval (Reg. No: IPT/SU/FS/101/2022), this case series included a total of 10 patients (7 males and 3 females) with various musculoskeletal conditions presenting with MDPs. The participants were aged 18–45 years, with body mass indices ranging from 24.0 to 30.0 kg/m^2. Inclusion criteria were pain over MDPs rated >3 on the Visual Analog Scale (VAS), a CSI score >40, no ongoing pharmaceutical treatment, and no current physiotherapy treatment for the pain over MDPs. Subjects were recruited from the musculoskeletal physiotherapy outpatient clinic of Department of Physiotherapy, Srinivas Hospital, Mukka, Mangaluru, Karnataka, India (Table 1). Informed consent was taken from participants to participate in this study and for identification purposes. This study followed the 2013 Declaration of Helsinki for human studies.

Densification points within the fascial tissues were identified based on the Stecco FM assessment and treated during a single session using Stecco FM. A total of 15–30 glides at a depth of 1–4 cm of FM, delivered using the knuckle, base of thumb, or olecranon process of the elbow, were applied to the densified points during each session (Figures 1–4). Post-treatment assessments of movement were conducted immediately and again 7 days later, alongside evaluations using the CSI (Figure 5).

Data Analysis

Descriptive statistical analysis was used to compare the pre- and post-treatment VAS scores for pain over MDPs and measures of CS. The range of values of the true population mean was estimated to fall within the 95% confidence interval for the mean. The differences between the maximum and minimum values were estimated (Table 2).

RESULTS

As the data were normally distributed, paired sample *t*-tests were performed for two pairs of variables: pre-VAS vs. post-VAS, and pre-CSI vs. post-CSI (Figures 6 and 7). The paired comparison demonstrates significant improvements in both pain (VAS) and CS scores, with $p \leq 0.05$ (Table 3). The results of this study demonstrate a statistically significant reduction in pain levels following FM, suggesting that it may be effective for patients experiencing pain over MDPs and features of CS.

The results demonstrate a significant reduction in pain levels after FM. Both the VAS (mean difference: 6.166 ± 0.983) and the CSI (mean difference: 20.333 ± 6.831) showed statistically significant improvement after treatment ($p < 0.0001$), indicating the effectiveness of FM in these patients (Table 4).

DISCUSSION

Evidence indicates that pain over MDPs commonly originates from the muscle and surrounding fascia, often presenting as localized pain in a restricted area. Biotensegrity, fascial-integrity, and myofascial

TABLE 1. Selection Criteria

Inclusion Criteria	*Exclusion Criteria*
1. Age: 18–45 years 2. BMI: 24.0–30.0 kg/m^2 3. Pain over myofascial densified points: >3 on VAS 4. CSI ≥ 40 5. Not undergoing any pharmaceutical treatment 6. Not taking any other physiotherapy treatment for the pain over myofascial densified points	1. Severe neurological, psychological issues 2. Recent fractures or surgeries 3. Not willing to participate

BMI = body mass index; CSI = central sensitization inventory; VAS = visual analog scale.

FIGURE 1. Pre-FM movement testing of the scapula region by applying resistance to shoulder elevation. FM = fascial manipulation.

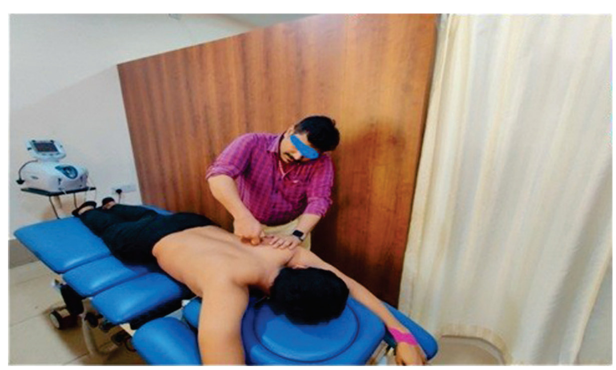

FIGURE 2. Fascial manipulation of trigger points in the lower scapular region. Based on the depth of densification, fascial manipulation was given over the retro-thoracic (RE-TH) point using the knuckle of the index finger by the therapist.

FIGURE 3. Pre-FM movement testing of the genu region by applying resistance to internal rotators of the hip joint. FM = fascial manipulation.

FIGURE 4. Fascial manipulation of densified points in the genu region.

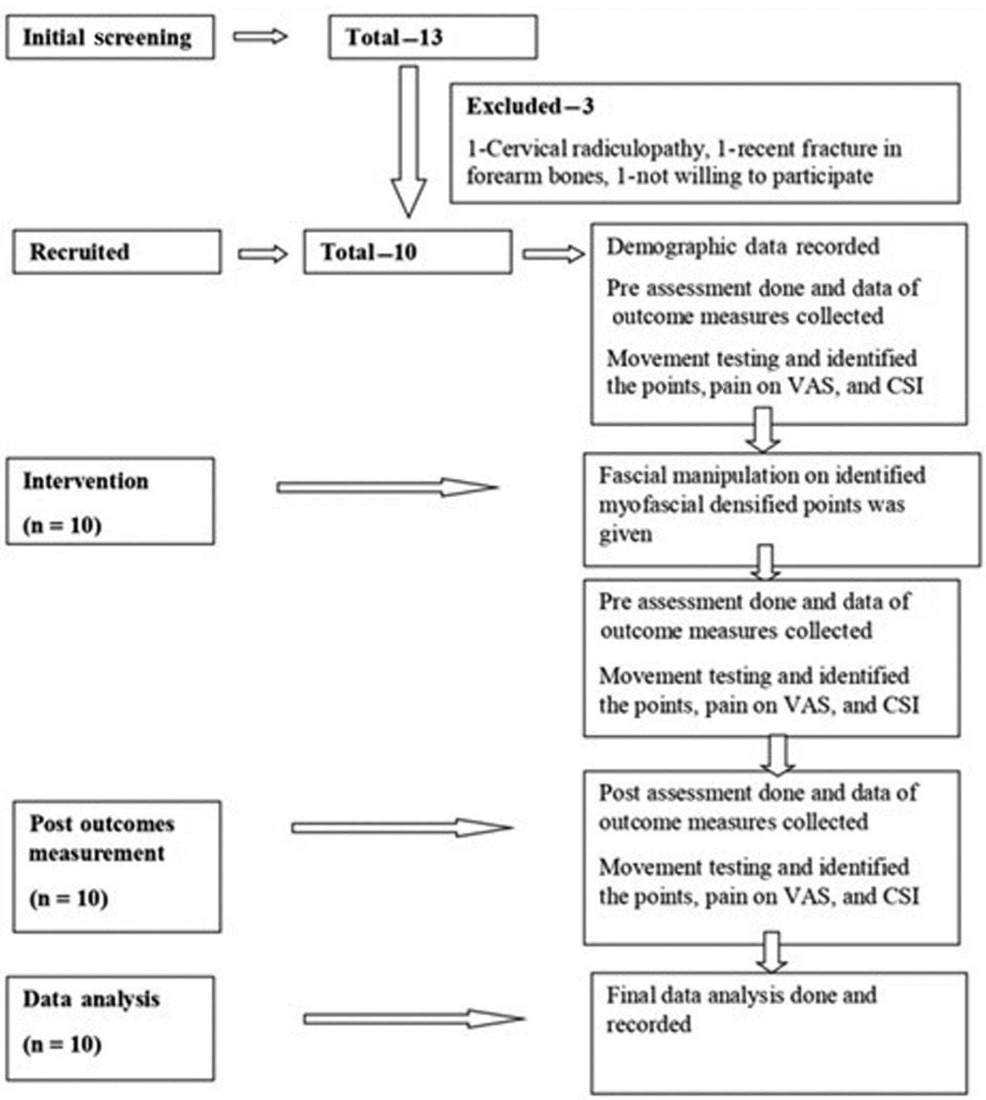

FIGURE 5. Case series flow chart.

TABLE 2. Demographic Details of Participants with FM Chart

S. No.	*Age*	*Gender*	*Height (cm)*	*Weight (kg)*	*BMI (kg/m²)*	*Conditions*	*Duration*	*Point 1*	*Point 2*	*Balancing Point*
1	27	M	172	86	29.05	Knee tendinopathy	6 months	Ante-genu	Extra-genu	Retro-genu
2	30	M	167	74	26.52	Knee tendinopathy	5 months	Intra-genu	Medio-genu	Ante-genu
3	44	M	164	66	24.54	Frozen shoulder	8 months	Extra-thoracic	Retro-humerus	Retro-thoracic
4	26	F	159	69	27.22	Repetitive stress injury (wrist tendinitis)	3 months	Retro-carpus	Medio-carpus	Intra-carpus
5	25	F	161	58	22.31	Patellofemoral pain syndrome	6 months	Intra-talus	Medio-talus	Ante-talus
6	29	M	174	78	24.60	Knee tendinopathy	7 months	Ante-genu	Retro-genu	Extra-genu
7	35	M	172	74	25.00	Sciatic muscle strain	12 months	Extra-genu	Retro-genu	Later-genu
8	37	M	166	68	24.63	Plantar fasciitis	8 months	Medio-pes	Intra-pes	Ante-pes
9	41	F	163	64	24.06	Non-specific neck pain	12 months	Retro-colli	Extra-colli	Ante-colli
10	38	M	170	72	24.91	Rotator cuff impingement	12 months	Ante-humerus	Intra-humerus	Later-humerus

BMI = body mass index; F = female; FM = fascial manipulation; M = male.

chains are existing theoretical models of fascia. They describe how the fascial continuum contributes to and integrates with human movement.[9–11]

The results of this study support the use of FM based on the Stecco approach, which may provide therapeutic benefit. Indirect fascial techniques may reduce neural input and mechanical loading within fascial structures. This process can unload muscle spindles while loading Golgi tendon organs, thereby altering the pattern of sensory input to the facilitated spinal segments. As a result, nociceptive activity may be reduced, potentially improving maladaptive movement patterns that develop as protective neuroplastic adaptations and contribute to CS and pain.

Bordoni and Marelli highlighted that the fascial continuum facilitates movement and acts as a source of inflation in a reciprocal interrelation, which influences the cognitive aspect.[19] Shigetoh et al. explained that pain, catastrophization, and helplessness may occur as a result of alterations in neuroplasticity associated with CS. CS influences pain prognosis and plays a crucial role in pain hypersensitivity by contributing to temporal summation, spatial expansion, and lowered thresholds through neuroplastic changes within the central nervous system.[20] Thus, the outcomes of this study support the role of CS in pain associated with MDPs and highlight the potential relevance of fascia-based therapeutic interventions such as the Stecco approach.

A previous study by Urits et al. focused on managing pain over MDPs alone.[14] However, the present study addressed both CS and pain over MDPs by including 10 patients suffering from both conditions.

Limitations

The major limitation of this study is that it was designed as a case series without a sham or placebo control group, and it included heterogeneous conditions. Additionally, there was no post-treatment follow-up to assess the long-term effects of FM on specifically diagnosed points of densification. Therefore, the results of this study cannot be generalized. The preliminary nature of these findings is largely due to the small sample size and lack of follow-ups.

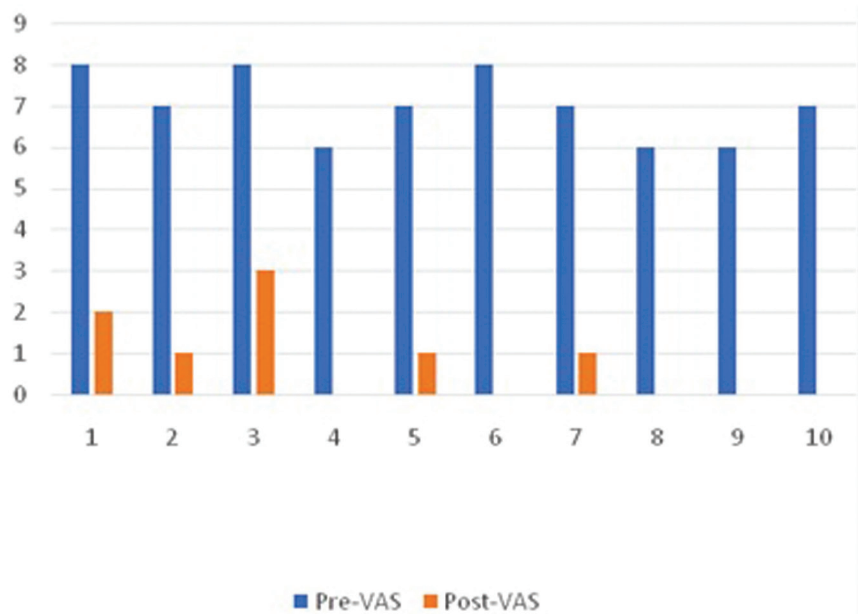

FIGURE 6. Pre- and post-intervention values of pain on VAS. VAS = Visual Analog Scale.

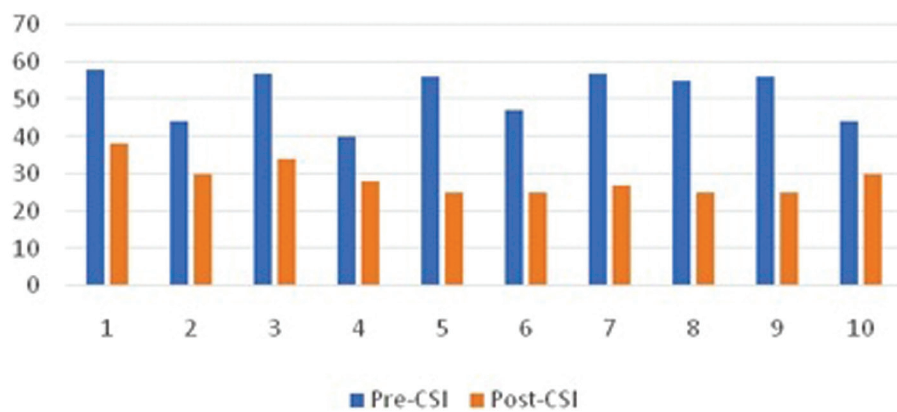

FIGURE 7. Pre- and post-intervention values of pain in CSI. CSI = Central Sensitization Inventory.

TABLE 3. Baseline Data Descriptive Statistics (n = 10)

Variables	*Mean ± SD*	*95% CI for Mean*	
		Upper	*Lower*
Age	31.33 ± 06.56	38.22	24.44
Pre-VAS	07.33 ± 00.82	8.19	6.47
Post-VAS	01.16 ± 01.17	2.39	−0.06
Pre-CSI	50.33 ± 07.65	58.37	42.29
Post-CSI	30.00 ± 05.17	35.43	24.56

CI = confidence interval; CSI = central sensitization inventory; SD = standard deviation; VAS = visual analog scale.

Future Recommendations

Further research with larger sample sizes is needed to investigate the long-term effects, underlying mechanisms, and clinical implications of FM as a therapeutic intervention for pain over MDPs and CS. Future studies should also incorporate additional outcome measures and multiple treatment sessions of the Stecco approach.

CONCLUSION

This case series suggests that FM may produce immediate reductions in pain, as

TABLE 4. Paired Sample *t*-test Results of Pre- and Post-intervention Values

Variables	*Paired Difference*			*t-Value*	*p-Value (Sig.)*
	Mean ± SD	*95% CI*			
		Lower	*Upper*		
Pre- and post-VAS	6.166 ± 0.983	5.134	7.198	15.363	0.000
Pre- and post-CSI	20.333 ± 6.831	13.164	27.502	7.291	0.001

CI = confidence interval; CSI = central sensitization inventory; SD = standard deviation; VAS = visual analog scale.

evidenced by improvements in the VAS and CSI scores in patients with pain associated with MDPs and CS.

AUTHOR CONTRIBUTIONS

Aishwarya Nitin Sonwane: conceptualized the study, involved in formal analysis, designed methodology, wrote the original draft, and administered the project. Madhuripu: conceptualized the study; investigated the study; wrote the original draft; wrote, reviewed, and edited the manuscript; and supervised the project. M. Premkumar: involved in formal analysis, collected data, designed methodology, and investigated the data. R. Kamalakannan: conceptualized the study, edited the manuscript, and supervised the project. V. R. Arun Krishnan: involved in formal analysis, collected data, and investigated the data. All authors read and approved the final version of the manuscript.

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CONFLICT OF INTEREST NOTIFICATION

The authors declare there are no conflicts of interest.

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