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Developing an Integrated Acupuncture Protocol for Treating Medial Tibial Stress Syndrome: A Delphi Consensus Study

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The present study employs the Delphi method to devise a consensus-based protocol for utilizing integrated acupuncture in treating medial tibial stress syndrome (MTSS). Twenty acupuncture experts contributed opinions across six key themes, including diagnosis, acupuncture points, additional Traditional Oriental Medicine modalities, treatment rationale, treatment duration/frequency, and integration of yoga/naturopathic therapies. Consensus, defined as a 70% agreement or higher, was reached on all themes, reflecting a collective acknowledgment of the necessity for a holistic approach to MTSS management. The final protocol includes six diagnostic criteria, six acupuncture points, one additional modality, two Traditional Oriental Medicine therapies, four treatment rationales, and six yoga/naturopathic therapies. The present comprehensive protocol offers valuable guidance for healthcare professionals seeking an integrated approach to MTSS management.

Keywords: Acupuncture therapy; Athletic injuries; Delphi technique; Medial tibial stress syndrome; Traditional Chinese medicine

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INTRODUCTION

Medial tibial stress syndrome (MTSS) is one of the injuries of the lower extremity and is considered one of the most common causes of exertional pain among athletes. MTSS occurs due to repetitive use or overuse of the tibial bone and surrounding musculature [1]. MTSS patients present with vague and diffuse pain in the lower limbs that aggravates with exercise or repetitive activities using the legs [2]. Inflammation, periosteal muscular traction, and stress reactions in the bone are proposed as the probable reason for the occurrence of MTSS [3]. The prevalence of MTSS is increasing, particularly among physically active individuals, such as recreational runners, with a prevalence rate ranging from 13.2% to 17.3% [4,5].

The usefulness of Traditional Oriental Medicine as a promising tool in the management of musculoskeletal disorders is well known [6]. The recent advances in the research and training on acupuncture have enabled acupuncturists to explore diverse clinical fields. The use of acupuncture as a potential tool in treating sports injuries is gaining momentum owing to its impact on the nervous system, immunomodulatory potential, and ability to alter the pain perception [7]. A recent case series reported the usefulness of western acupuncture in treating the pain associated with MTSS [8]. Acupuncture combined with sports medicine reportedly has superior analgesic effects as compared to sports medicine alone [9].

Aside from the two abovementioned studies, studies on the effectiveness of acupuncture in MTSS are lacking. According to a recent review highlighting conservative treatment options for MTSS, there is no conclusive evidence available to date about the usefulness of acupuncture in managing MTSS; hence, there is a need for research in this area to explore whether the overwhelming benefits of acupuncture in managing musculoskeletal disorders proposed by previous studies can be extrapolated to MTSS [1].

India is one among the many countries with licensed medical practitioners using acupuncture for various clinical conditions. In India, acupuncture is officially practiced by yoga and naturopathic physicians, and, commonly, the practitioners use a Traditional Oriental Medicine-based integrated acupuncture model to treat various conditions. In India, acupuncture is often integrated with various yoga and naturopathic interventions, including hydrotherapy, heliotherapy, and massage, mud, yoga, and fasting and diet therapies [10,11]. Indian yoga and naturopathic physicians treat various types of sports injuries, including MTSS, using integrated acupuncture practice. However, there are no standard protocols or guidelines available that can enhance the clinical practice and research in this area.

The present study, through a Delphi process, aimed to develop an adequate integrated acupuncture protocol for treating MTSS by expert consensus.

METHODS

The present study utilized the Delphi method, which is a systematic process that uses a collection of questions with a controlled feedback mechanism to pool the knowledge and expertise of selected experts [12]. This method was primarily adapted as it was suitable for our study objective of creating a consensus guideline on the integrated acupuncture protocol of MTSS among diverse acupuncture practitioners who graduated from different medical schools. The present study was approved by the Institutional Ethics Committee of Sant Hirdaram Medical College of Naturopathy & Yogic Sciences, Bhopal (Approval number: SHMCNYS/IEC/43).

SELECTION OF STUDY PARTICIPANTS

Twenty acupuncturists, both male and female, from India and Nepal who primarily practice acupuncture were invited to participate in the study using the Delphi process. The criteria for identifying the potential participants were as follows: participants should have a minimum of 5 years of experience in the field of integrated acupuncture, or involved in treating sports injuries using integrated acupuncture, or any experts recommended by participants meeting the abovementioned criteria.

PROCEDURE

1. Selection of items

The initial pool of questions was developed by a team of principal investigators comprising three trained acupuncturists with postgraduate degree in acupuncture (Doctor of Medicine in acupuncture and energy medicine) and three senior yoga and naturopathic researchers. The questions formulated were intended to achieve the final goal of the Delphi process, which included the following domains:

- Basic details about MTSS, Traditional Oriental Medicine-based diagnosis for MTSS, Traditional Oriental Medicine-based therapies for MTSS, rationale for the use of Traditional Oriental Medicine-based therapies, acupuncture points used, frequency of treatments, and other integrated therapies used and its rationale.
- The participants' demographic characteristics, such as age, sex, years in practice, typical flow of patients with sports injuries, acupuncture style practiced, type of practice setup, and acupuncture qualification and experience in the field of clinical practice/research.

The participants received an email inviting them to participate in the Delphi process. Additionally, the details of the Delphi process were explained to all the participants through a phone call. The participants' basic demographic details were gathered using an online Google form after obtaining their consent. If they agreed to participate, all panel experts received an email with a document containing the questionnaire. Before distributing the questionnaires to the participants, a pilot study implemented within the department of acupuncture and energy medicine of a private yoga and naturopathy medical college.

The participants were asked to provide their opinions regarding the acupuncture treatment parameters for athletes with MTSS during the first round of the Delphi. The experts' open opinions regarding the diagnosis, numerous treatment modalities they employ, recommended treatment duration and frequency, and justification for the prescription were requested. The participants were given the chance to offer further feedback on the other aspects of the treatment. The goal of the first round was to gather various expert viewpoints on MTSS diagnosis and therapy. A summary report on the first round's outcomes was distributed to the participants after the analysis, and they were invited to take part in the second round of the Delphi.

In the second round, the participants were asked to express their opinions by rating statements using a five-point Likert scale for agreement ("strongly agree," "agree," "neutral," "disagree," "strongly disagree"). To reach a consensus, at least 70% of the respondents to each statement had to strongly agree on something before it could be kept. Only three rounds of Delphi were required to obtain an agreement.

In the third round, the participants were given a sequence of themes that did not obtain the predicted consensus agreement in the second round. We sought for a 70% agreement (among those responding to each statement) to reach a consensus.

DATA ANALYSIS

The data in the form of an electronic document that were sent via email were collected, and the responses included extensive comments that could be downloaded. The data was analyzed using a descriptive analysis and presented as percentages.

RESULTS

Among the 20 invited experts, 15 agreed to participate in the study, with 13 having completed all three rounds. The participants' detailed demographic characteristics are outlined in Table 1.

1. First round of the Delphi process

In the first round, the participants responded to all the open-ended questions provided by the Delphi team. We identified 14 different Traditional Oriental Medicine-based diagnostic criteria during the first round, and nearly six experts provided more than one diagnostic criteria. Similarly, approximately 14 types of Traditional Oriental Medicine-based techniques were also used along with acupuncture by the experts in their practice. Moreover, the experts reported that nine theories were used as the rationale for performing these treatments. Similarly, nine different expert-proposed procedures were identified to improve the effects of acupuncture as treatment for MTSS. In the first round, the experts presented 17 integrated therapies for MTSS in addition to acupuncture and other Traditional Oriental Medicine-based techniques. The excerpts of the first round of the Delphi process are presented in the Supplementary Material 1.

2. Second round of the Delphi process

In the second round of the Delphi process, we collapsed all the responses and compiled them into specific points, as we sought to obtain a consensus for the development of an integrated acupuncture protocol for MTSS. As discussed earlier, the experts gave their responses using a Likert scale, indicating their agreement or disagreement with the responses provided by the other experts (including their own response). All the experts were blinded to the study data, so they do not have access to the information about whose response they are voting

Table 1. Demographic characteristics of the experts

Characteristic	Value (n = 13)
Sex	
Female	9 (69)
Male	4 (31)
Age (y)	
25–34	3 (23)
35–44	4 (31)
45–54	6 (46)
Highest qualification in the field of acupuncture	
Fellowship program in acupuncture	1 (8)
Postgraduate diploma in acupuncture	2 (15)
Bachelor's degree	4 (31)
Postgraduate degree	6 (46)
Years of experience in acupuncture	
6–10	4 (31)
10–20	3 (23)
21+	6 (46)
Region of practice in India/country of practice	
Nepal	1 (8)
Southern part of India	6 (46)
Central India	3 (23)
Northern part of India	3 (23)
Style of acupuncture practiced	
Traditional Chinese medicine	11 (85)
Western acupuncture	2 (15)
Acupuncture patients with sports injury seen/wk	
0–20	5 (38)
21–35	4 (31)
35+	4 (31)
Percentage of patients with MTSS	
0–5	1 (8)
6–10	9 (69)
11–15	3 (23)
Country of acupuncture training	
China	1 (8)
India	12 (92)
Type of expertise	
Academicians and clinicians	5 (39)
Clinicians	6 (46)
Academics and policy making	2 (15)

Values are presented as number (%).

for or against.

1) Diagnosis of medial tibial stress syndrome

We obtained a 70% consensus (strong agreement) for two diagnostic criteria for MTSS at the end of the second round, viz., liver Qi stagnation or blood stasis leading to inflammation and diagnosis as per the pain location. Further, four other diagnostic criteria—kidney Yin deficiency, kidney Qi deficiency, purple discoloration of the tongue with a white coating, presence of localized pain that is relieved by rest and aggravated by exercise, and swollen, painful muscle indicates stagnation of blood, and Qi—received a 61–62% consensus. The other items proposed during the first round did not obtain the expected consensus.

2) Use of other Traditional Oriental Medicine-based modalities

More than ten (77%) experts recommended that the dietary changes for 4–12 weeks for nourishing the blood and moving Qi, as well as the inclusion of anti-oxidant-rich and anti-inflammatory food choices. A diet high in protein, calcium, phosphorus, and vitamin D for 4–12 weeks was recommended by 61% of participants. The other modalities introduced during the first round did not receive the expected level of agreement.

3) Rationale for choosing Traditional Oriental Medicine-based modalities for medial tibial stress syndrome

The majority (> 70%) of the participants agreed on three probable rationales—acupuncture helps in alleviating pain and inflammation, nourishes Yin and blood, and reduces dampness; tonifies spleen Qi through reinforcement; and acupuncture with manual stimulation and moxibustion relieves yang deficiency—for prescribing Traditional Oriental Medicine-based modalities. The rationale that Traditional Oriental Medicine treats a condition from the root cause, tonifying the kidney Qi, liver, and blood, received a 61% consensus.

4) Additional acupuncture treatment with the suggested duration

We could not reach a consensus on this theme at the end of the second round. Among the proposed therapeutic approaches, acupuncture with manual stimulation and electroacupuncture for 20 minutes and cupping for 10 minutes per sitting for 10 days received a consensus of 61% and 54%, respectively. The other recommended methods were not agreed upon by the experts.

5) Recommendation on integrating yoga and naturopathic therapies with Traditional Oriental Medicine

By the end of the second round, the recommendations, such as calf muscle stretching, alternate hot and cold compress to the legs, yoga stretches for 15–20 minutes daily, hot foot bath with magnesium sulfate, and sun exposure, had reached the intended unanimity. The practice of loosening exercises achieved an acceptance rate of 61%; however, the remaining recommendations did not achieve the expected consensual set point.

6) Recommended acupuncture points

During the first round, the experts proposed SP 6, SP 8, SP 9, ST 36, GB 34, BL 58, KI 3, LR 3, LR 8, LI 4, Ashi, and motor points of the soleus, gastrocnemius, and tibialis anterior for the management of MTSS. Among these proposed points, a consensus (≥ 70%) was achieved for only six acupuncture points by the end of the second round. Therefore, due to the disagreement exceeding 70% for the remaining points, they were not included in the subsequent rounds.

3. Third round of the Delphi process

In the third round of the Delphi process, we reintro-

Table 2. Final protocol for the use of integrated acupuncture therapy for the management of MTSS

Components of protocol	Recommendations
Diagnosis (diagnosis differs individually and based on the cause of MTSS according to Traditional Oriental Medicine)	Liver Qi stagnation or blood stasis leading to inflammation
	Kidney Qi deficiency
	Kidney Yin deficiency
	Purple color tongue with white coating
	Location of the pain involves connective tissues and bones
	Localized pain relieves on rest and aggravates on exercise, swollen, painful muscle indicates stagnation of blood and Qi
Acupuncture points recommended for MTSS	LR 3
	LI 4
	KI 3
	GB 34
	SP 9
	SP 6
Recommended acupuncture modalities along with needling	Acupuncture with manual stimulation for 20–30 minutes for 10 consecutive days once a month for 3 months
Recommended additional modalities of Traditional Oriental Medicine other than acupuncture	Dietary modification for 4–12 weeks to nourish blood and move Qi, inclusion of anti-oxidant rich foods and anti-inflammatory diet, protein, calcium, phosphorus, and vitamin D
Rationale behind choosing the treatment and its duration	Acupuncture points manages pain and inflammation, to move blood, nourish Yin and blood, to reduce dampness and Ashi-points reduces pain
	Spleen Qi can be tonified through reinforcing method
	Acupuncture for 30 minutes with manual stimulation maybe given, moxibustion to be used in case of yang deficiency
	Traditional Oriental Medicine identifies the root cause and creates a balance in the flow of Qi
Recommended yoga and naturopathy treatment in addition to Traditional Oriental Medicine	Hot foot bath with magnesium sulfate for 15–20 minutes
	Light massage with oil for 10–15 minutes
	Loosening exercises for 10–20 minutes
	Stretching of calf muscles for 10–15 minutes
	Alternate compress to leg for 20 minutes daily for 5 days
	Yoga stretches for 15–20 minutes daily
	Sunbath for 10–20 minutes between 10 AM and 3 PM

MTSS, medial tibial stress syndrome.

duced the questions and responses that received > 60% but < 70% consensus, as well as the themes not receiving a consensus in the second round of the Delphi process. We then asked the experts to re-examine their decision and provide a final consensus. In the third round, a consensus was achieved for the four additional diagnostic criteria, which only received 62% consensus in the second round. Similarly, a 77% consensus was achieved for the recommendation of a diet rich in protein, calcium, phosphorus, and vitamin D for 6–8 months as an additional Traditional Oriental Medicine modality. Tonifying the kidney Qi, liver, and blood, and balancing the Qi as the rationale for using Traditional Oriental Medicine therapies also achieved a 70% consensus among the experts.

The use of manual stimulation along with acupuncture also obtained a 77% consensus in the third round, as compared to a 61% consensus in the second round. Regarding the integrated therapies recommended along with acupuncture, loosening exercises and light massage therapy with oil also achieved a 70% consensus in the third round. The final recommended protocol for treating MTSS using an acupuncture protocol as per the expert consensus is presented in Table 2. The summary of consensus percentage in the second and third rounds is outlined in the Supplementary Material 1.

DISCUSSION

The present developed a consensus-based, comprehensive acupuncture protocol for the management of MTSS among athletes. The study experts provided insights on the specific points to be used, concomitant Traditional Oriental Medicine modalities, rationale for using acupuncture in conjunction with other Traditional Oriental Medicine modalities, role of additional procedures in addition to acupuncture, and the most commonly used yoga and naturopathic therapies. We were able to reach consensus on a protocol for MTSS management that can be used by integrated acupuncturists, particularly those from India, after two rounds of the Delphi procedure.

Our study findings depict the complexity of acupuncture practice and the choice of interventions. The presence of multiple diagnostic criteria based on the Traditional Oriental Medicine guidelines for diagnosing MTSS reinforces the individualistic perspective of acupuncture, which considers every person to be different with varying body signs and syndromes. This also represents the need for performing a proper diagnosis in every MTSS patient, as non-individualized and non-diagnosis-mediated intervention delivery reportedly yields poor results [13]. The inclusion of a dietary change was the additional Traditional Oriental Medicine approach proposed unanimously by all the experts. Traditional Oriental Medicine considers food to possess different properties and confers substantial importance on dietary modification [14]. The expert opinion in this consensus reflects the same essence of the Traditional Oriental Medicine approach. Furthermore, the experts also provided appropriate rationales for the choice of the treatment modalities. This may strengthen the philosophically oriented clinical practice in India, where there are significant diversities in acupuncture education and practice [11].

The treatment protocol developed further gives guidance on the appropriate use of manual stimulation and additional alternative yoga and naturopathic therapies that can be used for managing MTSS along with acupuncture. This may be useful for Indian yoga and naturopathic physicians utilizing an integrated acupuncture model in treating various conditions. Furthermore, the availability of multiple options can provide practitioners with flexibility in choosing the desired therapy based on the individual patient's needs.

Acupuncture has shown increasing popularity as a potential rehabilitative measure in sports medicine to alleviate pain, manage injuries, and promote healing [7]. The effectiveness of acupuncture in managing musculoskeletal system disorders is attributed to its role in modulating the brain and autonomic nervous system functioning [15]. MTSS reportedly affects nearly 35% of physically active professionals, such as athletes, army personnel, and dancers. This report, however, is limited to two patients and does not employ a Traditional Oriental Medicine-based technique [8]. The present Delphi study provides a comprehensive protocol based on a Traditional Oriental Medicine perspective that can be readily integrated into the clinical settings in India that practice integrated acupuncture practice.

The strength of the present study includes its contribution to existing clinical practice by incorporating Traditional Oriental Medicine-based diagnosis and reaffirming its usefulness in treatment selection and therapeutic outcomes. Furthermore, the current consensus protocol was designed with the participation of experienced practicing acupuncturists with multi-faceted experience in clinical practice, policymaking, research, and acupuncture education, which strengthens the quality of the study recommendations. The present study has several limitations. First, all the responses received during the

first round of the Delphi process were not included in the subsequent rounds. This is largely due to the missing or unclear responses from some participants, which may be due to the diversity in their clinical approach, training, and understanding. Second, the responses provided here are based on the individual experience and expertise of the study participants; even though the experts were from various regions of the country, some therapies or approaches may have not been included or may have been under-represented in the present study protocol. Finally, our study methodology limited us from determining why an expert agreed or disagreed with a specific approach.

Nevertheless, the consensus protocol presented here represents a collective clinical recommendation that may be considered as a preliminary document that can foster clinical practice and research in the use of integrated acupuncture for managing MTSS.

AUTHOR CONTRIBUTIONS

Conceptualization: PMKN, GS, DS, MJ. Data curation: PMKN, GS, DS, MJ. Formal analysis: PMKN, GS, DS, MJ. Investigation: PMKN. Methodology: All authors. Project administration: PMKN, GS, DS, MJ. Resources: PMKN, GS, DS, MJ. Software: PMKN. Supervision: PMKN, GS, DS, MJ. Validation: PMKN, GS, DS, MJ. Visualization: PMKN. Writing – original draft: PMKN. Writing – review & editing: All authors.

CONFLICTS OF INTERESTS

The authors have no conflicts of interest to declare.

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None.

ETHICAL STATEMENT

The present study was approved by the Institutional Ethics Committee of Sant Hirdaram Medical College of Naturopathy & Yogic Sciences, Bhopal (Approval number: SHMCNYS/IEC/43).

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SUPPLEMENTARY MATERIALS

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