

## Dry Needling of Trigger Points with and Without Paraspinal Needling in Myofascial Pain Syndromes in Elderly Patients

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### ABSTRACT

**Objectives:** To compare the efficacies of dry needling of trigger points (TrPs) with and without paraspinal needling in myofascial pain syndrome of elderly patients.

**Design:** Single-blinded, randomized controlled trial.

**Subjects:** Forty (40) subjects, between the ages of 63 and 90 with myofascial pain syndrome of the upper trapezius muscle.

**Interventions:** Eighteen (18) subjects were treated with dry needling of all the TrPs only and another 22 with additional paraspinal needling on days 0, 7, and 14.

**Results:** At 4-week follow-up the results were as follows: (1) TrP and paraspinal dry needling resulted in more continuous subjective pain reduction than TrP dry needling only; (2) TrP and paraspinal dry needling resulted in significant improvements on the geriatric depression scale but TrP dry needling only did not; (3) TrP and paraspinal dry needling resulted in improvements of all the cervical range of motions but TrP dry needling only did not in extensional cervical range of motion; and (4) no cases of gross hemorrhage were noted.

**Conclusions:** TrP and paraspinal dry needling is suggested to be a better method than TrP dry needling only for treating myofascial pain syndrome in elderly patients.

### INTRODUCTION

Myofascial pain syndrome (MPS) is the most common cause of musculoskeletal pain characterized by trigger points (TrPs) in a taut band of muscle fibers, limited range of motion in joints, referred pain and local twitch response (LTR) during mechanical stimulation of TrP.<sup>1</sup> TrPs are discrete, focal, hyperirritable spots located in a taut band of skeletal muscle, and active TrPs cause pain at rest and general motor dysfunction.<sup>2,3</sup> Palpation of a hypersensitive bundle or nodule of muscle fiber of harder than normal consistency is the physical finding most often associated with a TrP and localization of it is based on the physician's sense of feel, assisted by patient expressions of pain and by visual and palpable observations of LTR.<sup>2</sup> Mechanical stimulation and inactivation of TrPs, from which the pain is emanating, are essential for successful management of MPS.<sup>4</sup> Hong<sup>5</sup>

also revealed that LTRs induced during TrP inactivation resulted in better effects in his study. The treatments most commonly utilized for this purpose are dry needling of the TrP, injection treatments with local anesthetics or saline, sprays, and stretching.<sup>2,6</sup> Historically, the method that must take pride of place as having been the first to be used, in the 7th century AD by the Chinese physician Sun Ssu-Mo, is dry needling, of what he called *Ah-Shis* points.<sup>7</sup> Clearly, from his description of them, they are what are currently referred to as TrPs.<sup>4</sup> Several studies<sup>1,5,6,8</sup> surveyed the effects of TrP injection therapy or TrP dry needling using a syringe. However, none of the articles address which treatment is the most effective. However, previous clinical studies<sup>5,6</sup> demonstrated that dry needling into the trigger point is as effective as the injection of local anesthetics in inactivating a TrP. Gunn<sup>9</sup> suggested that a "hollow needle" induces more tissue injury.

TABLE 1. CHARACTERISTICS OF STUDY SUBJECTS (MEAN  $\pm$  SD)

Groups	Number	Gender (M/F)	Age	BMI (kg/m <sup>2</sup> )
DRY	18	(1/17)	79.22 $\pm$ 6.80	24.50 $\pm$ 3.27
IMS	22	(3/19)	76.27 $\pm$ 8.63	24.02 $\pm$ 3.39
<i>p</i> value <sup>a</sup>			0.234	0.648
Total	40	(4/36)	—	—

<sup>a</sup>Analyzed by Student's *t*-test.

SD, standard deviation; M, male, F, female; BMI, body-mass index; DRY, trigger point dry needling only group; IMS, trigger point and paraspinal dry needling group.

Recently, there appears to be growing interest in the intramuscular stimulation (IMS) technique developed by Gunn,<sup>9</sup> who regards nerve roots of associated segmental regions as causes and treatment targets of chronic pain. Based on "Cannon and Rosenblueth's Law of Denervation Supersensitivity,"<sup>10</sup> Gunn emphasized that, when a portion from a chain of nerve units is irritated, the receptor sensitivities to chemical stimuli in that point and the zones below it (muscles, skin, blood vessels, ligaments, periosteum) become abnormally increased and that these effects are maximized at the directly damaged sites.<sup>9,11</sup> Gunn also insisted that the most common sites of supersensitivity are skeletal muscles, and he believes that supersensitivity indeed leads to muscle shortening when a nerve unit is injured, and by which MPS is induced.<sup>9</sup> The IMS technique is grounded on a specific interpretation of neuroanatomy and neurophysiology of damaged segments in examining and managing various symptoms, so it is suggested that pain from denervation supersensitivities can be effectively treated only by IMS techniques.<sup>12</sup>

In this single-blinded randomized controlled trial, we evaluated and compared the efficacies and adverse events of dry needling of trigger points and IMS technique in myofascial pain syndrome of elderly patients.

## METHODS

### Participants

We selected 40 subjects with chronic MPS of the upper trapezius from four community-based facilities. Subjects were selected based on physical examinations and interviews after informed consents had been signed. Participants were randomized into two groups: (1) DRY (dry needling) group and (2) IMS (intramuscular stimulation) group. Under the following circumstances, participants were excluded from this study: (1) having myofascial trigger point injection, IMS, or dry needling within the 6 months immediately preceding this study; (2) having neck and/or shoulder surgery within 1 year preceding this study; (3) taking nar-

cotic medicine within 1 month preceding this study; (4) having symptoms and signs meeting the 1990 ACR (American College of Rheumatology) criteria for fibromyalgia; (5) having a diagnosis of cervical radiculopathy (in commonly defined meaning) or myelopathy; (6) having severe cardiovascular or respiratory diseases; (7) having evidence of a cognitive deficit or difficulty with communication; or (8) exhibiting inadequate cooperation. There was no significant difference between both groups concerning age, gender, and body-mass index (BMI) (Table 1).

### Treatment protocols

TrP needling was performed by the techniques suggested by Simons et al. as follows. The subjects were asked to lie in a prone position. The taut band, localized between the thumb and the index finger, was needled forward and backward repeatedly until there were no more LTRs.<sup>1</sup> The patients were treated at weeks 0, 1, and 2 using the techniques detailed below.

**Technique 1.** Dry needling group (DRY): TrP needling was done by the method described above with an acupuncture needle (Dong-Bang Korea, Seoul, Korea) that was made of stainless steel (diameter 0.30 mm, length 60 mm) fixed by a plunger-type needle holder (Neo-Doctor, Wonju, Korea) (Fig. 1).

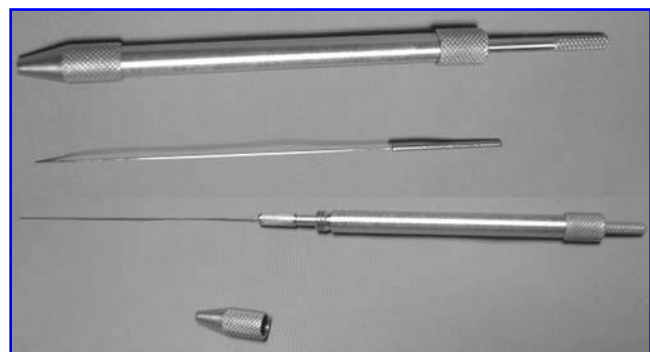


FIG. 1. Plunger-type needle holders and needles used in this study.

TABLE 2. SERIAL CHANGES IN VALUES OF PAIN AND DEPRESSION (MEAN ± SD)

Values	Day 0 (Pre-Tx)	Day 7	Day 14	Day 28	p-value <sup>a</sup>
<i>DRY group</i>					
VAS	6.98 ± 1.32	5.76 ± 1.79	4.69 ± 2.05	3.82 ± 2.47	<0.001
FACES	3.50 ± 0.71	3.11 ± 0.76	2.83 ± 0.99	2.11 ± 1.13	<0.001
PTS	2.44 ± 0.70	2.11 ± 0.83	1.94 ± 0.87	1.33 ± 0.69	<0.001
GDS-SF	5.44 ± 3.15			4.17 ± 3.68	0.085
<i>IMS group</i>					
VAS	6.71 (±1.84)	6.13 (±1.85)	4.54 (±1.82)	3.11 (±2.01)	<0.001
FACES	3.59 (±0.73)	3.27 (±0.77)	2.68 (±0.65)	1.68 (±0.84)	<0.001
PTS	2.36 (±0.66)	2.09 (±0.75)	1.59 (±0.73)	1.27 (±0.88)	<0.001
GDS-SF	5.41 (±3.63)	—	—	3.91 (±3.19)	0.024

<sup>a</sup>Analyzed by paired *t*-test between each values of day 0 and day 28.

SD, standard deviation; Tx, treatment; DRY, trigger point dry needling only group; VAS, visual analogue scale (0–10); FACES, Wong-Baker FACES pain scales (0–5); IMS, trigger point and paraspinal dry needling group; PTS, trigger point pain pressure threshold scores on thumb nail bed whitened; GDS-SF, Korean version of geriatric depression scales—short form.

*Technique 2.* IMS group (IMS): TrP needling was done with the same method used with the DRY group, and additional needling of multifidi muscles at the C3–C5 level by the technique recommended by Gunn<sup>9</sup> was also performed. Gunn believed that by “dry needling of a muscle and rotating it equipped with a plunger-type needle holder,” we could feel “grasping” of a muscle and produce stronger stimulation than just using “needle pecking.” This method Gunn suggested is called “grasping and winding up” and we chose it as the treatment method for the IMS group.

All forms of treatments were performed by the primary author, who completed the “Trigger Point Injection Training Course” held by the Korean Academy of Rehabilitation Medicine and the “Basic Course for Gunn’s IMS” by the Korean Society of Interventional Muscle and Soft Tissue Stimulation Therapy. The volunteers were instructed to continue self-stretching exercises<sup>1</sup> for the upper trapezius muscle three times per day until the next treatments.

*Outcome measures*

Patients described their current intensity of pain at the shoulder, neck, and headache based on a visual analogue scale (VAS) from 0 to 10, and Wong-Baker FACES pain scale (FACES) from 0 to 5. TrP pain pressure threshold scores (PTS) were obtained by placing the thumb to the skin covering the muscle containing the TrP in a perpendicular fashion and exerting pressure until there was whitening of the nail bed and then evaluating the pain intensity. Scoring was from 0 to 3 (0 no report of pain and no visible reaction, 1 report of pain, 2 painful tenderness and visible reaction on the face, and 3 severe pain and marked visible reaction or avoidance). All the results were obtained on days 0, 7, 14, and 28 just before each treatment.

A goniometer was used to measure passive ranges of motion (ROM) of the cervical spine during anterior flexion, extension (posterior flexion), lateral tilting to the right and left, and rotation to the right and left on days 0, 7, 14, and 28 just before each treatment.

Depression was evaluated using the Korean version of the Geriatric Depression Scale–Short Form (GDS-SF) on days 0 and 28.

We surveyed the number of cases and duration of post-treatment soreness at the second visits and number of cases of hemorrhage greater than 4 cm<sup>2</sup> at every visit. Interview-

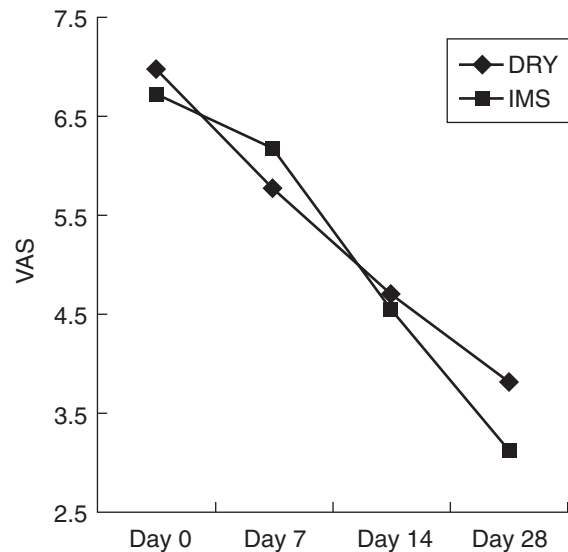
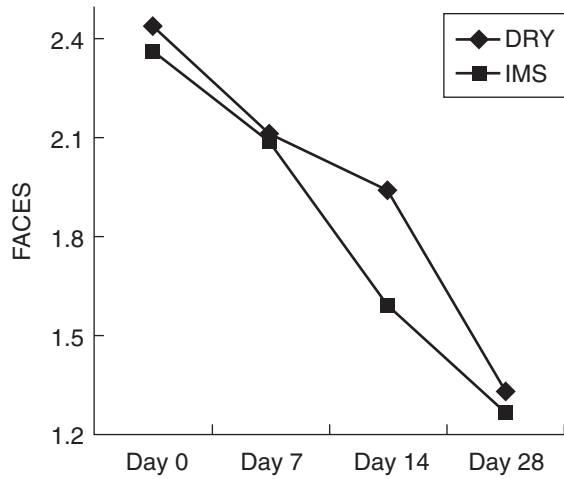


FIG. 2. Serial changes of visual analogue scale (VAS). (*p* = 0.238 for time\*group interaction by repeated-measures analysis of variance).

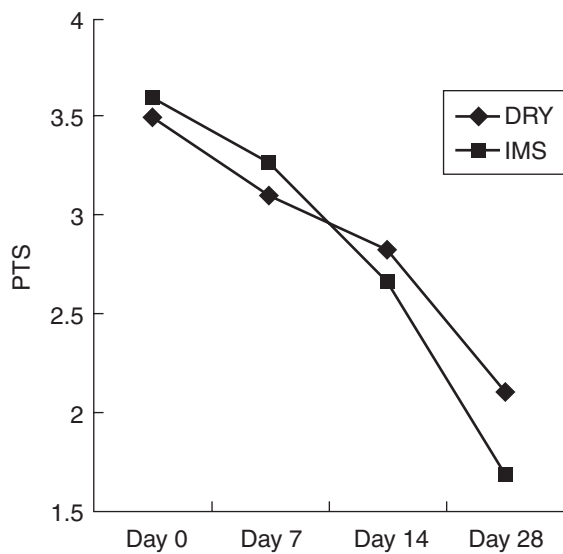


**FIG. 3.** Serial changes of Wong-Baker FACES Scale (FACES). ( $p = 0.088$  for time\*group interaction by repeated-measures analysis of variance).

ers were the staff employed by each facility who possessed educational qualifications equal to or higher than those of high-school graduates. All physical examinations were performed by the author, a family physician and an authorized geriatrician, and were supervised by two residents of family medicine. All results were yielded after agreement.

**Blinding**

The volunteers were not informed of which group they were included in, and took treatment in prone posture so as not to recognize which methods they were receiving. Likewise, when performing the physical examinations, the author did not know to which group the subjects had been assigned.



**FIG. 4.** Serial changes of Pain Pressure Threshold Scores (PTS). ( $p = 0.402$  for time\*group interaction by repeated-measures analysis of variance).

**Statistical analysis**

Age and BMI of the subjects and adverse events were compared by Student’s *t*-test and chi-squared test. Paired *t*-tests were used to compare VAS, FACES, PTS, and GDS-SF values between those of days 0 and 28, and changes of above pain-related values according to time were compared by repeated-measures analysis of variance. Local twitch responses between both groups at each session were compared by Fisher’s exact test. Statistical significance was accepted at 0.05.

**RESULTS**

**Pain**

Significant improvements were observed in VAS, FACES, and PTS at the end of the first month in both groups (Table 2). There was no significant pretreatment (day 0) and post-treatment (days 7, 14, and 28) difference of VAS, FACES, and PTS between both groups ( $p > 0.05$  by Student’s *t*-test).

There were no significant interactions between time and type of treatment in VAS and PTS. FACES difference showed borderline significant interactions ( $0.05 < p < 0.10$ ) (Figs. 2–4).

Both groups showed significant improvements in VAS, FACES, and PTS, except VAS and FACES in the DRY group between days 7 and 14 and PTS in the IMS group between days 0 and 7 ( $p > 0.05$  by paired *t*-test).

**Depression**

There was no significant difference in values of GDS-SF before treatment and after 1 month in the dry needling group. Only the IMS group showed significant improvement (Table 2).

**Local twitch responses during treatments**

LTRs were elicited in 80.0% (32/40) during the first treatments, and 97.5% (39/40) showed at least one LTR during the entire course of treatments. LTR eliciting rates were not significantly different between both groups on every treatment (Table 3). Only one subject from the DRY group never showed LTR.

TABLE 3. LOCAL TWITCH RESPONSES ELICITED DURING NEEDLE INSERTION (%)

Groups	Day 0	Day 7	Day 14
DRY	13/18 (72.2)	16/18 (88.9)	16/18 (88.9)
IMS	19/22 (86.4)	22/22 (100)	20/22 (90.9)
<i>p</i> -value <sup>a</sup>	0.237	0.196	0.617

<sup>a</sup>Analyzed by Fisher’s exact test.

DRY, trigger point dry needling only group; IMS, trigger point and paraspinial dry needling group.

TABLE 4. SERIAL CHANGES OF PASSIVE CERVICAL ROM<sup>a</sup> (MEAN ± SD)

Values	Day 0 (Pre-Tx)	Day 7	Day 14	Day 28	p-values <sup>b</sup>
<i>DRY group</i>					
Flexion	42.22 ± 9.11	50.00 ± 12.72	57.50 ± 16.91	68.89 ± 11.19	<b>&lt;0.001</b>
Extension	61.39 ± 15.89	61.94 ± 19.18	66.94 ± 17.75	67.72 ± 14.06	0.147
Tilting <sup>c</sup>	50.56 ± 13.16	61.94 ± 13.19	73.06 ± 17.67	70.00 ± 12.95	<b>&lt;0.001</b>
Rotation <sup>d</sup>	136.11 ± 17.70	132.78 ± 23.15	146.11 ± 17.37	148.06 ± 18.08	<b>0.012</b>
<i>IMS group</i>					
Flexion	49.09 (±10.08)	57.73 (±11.72)	67.05 (±14.36)	78.18 (±7.80)	<b>&lt;0.001</b>
Extension	64.09 (±16.08)	61.36 (±17.13)	69.32 (±15.14)	72.50 (±13.52)	<b>0.007</b>
Tilting <sup>c</sup>	58.86 (±21.15)	70.45 (±19.39)	79.77 (±25.52)	84.77 (±22.60)	<b>&lt;0.001</b>
Rotation <sup>d</sup>	138.18 (±24.91)	142.05 (±21.75)	152.50 (±16.74)	155.68 (±20.31)	<b>0.002</b>

Note: Bold italics denote statistically significant ( $p < 0.05$ ).

<sup>a</sup>Passive range of cervical motion in degrees of an angle.

<sup>b</sup>Analyzed by paired *t*-test between each values of day 0 and day 28.

<sup>c</sup>Tilting = right tilting + left tilting.

<sup>d</sup>Rotation = right rotation + left rotation.

SD, standard deviation; DRY, trigger point dry needling only group; IMS, TrP and paraspinal dry needling group.

*Passive cervical ROM*

All the passive ROMs improved except extension ROM in the DRY group (Table 4).

*Post-treatment soreness*

There were no significant differences in cases of post-treatment soreness and the duration of soreness. No case of visible subcutaneous hemorrhage (>4 cm<sup>2</sup>) was noted (Table 5).

**DISCUSSION**

*Pain*

Although both groups showed improvements in the VAS and FACES after 1 month, only FACES showed time\*group interaction with borderline significance favor-

ing the IMS group, and there was no significant interaction in VAS. The participants' average age was 78. Several studies<sup>13,14</sup> support the usefulness of FACES pain scales for people older than age 65. Therefore, these results suggest that IMS might reduce subjective pain sensation more effectively than dry needling if more subjectives are available.

Concerning serial changes in the VAS and FACES, IMS showed significant pain relief on every visit but the DRY group did not between day 7 and day 14. However, in the PTS, IMS did not show improvement between days 0 and 7. This phenomenon suggests that the IMS effect on subjective pain sensation may be more continuous and even than dry needling but not in objective initial pain.

*Depression*

Only the IMS group showed significant improvement in GDS-SF scores after 4 weeks. Many surveys<sup>15-17</sup> revealed

TABLE 5. ADVERSE EVENTS AFTER EACH TREATMENT (MEAN ± SD)

Groups	Total subjects	No. of cases with soreness	Duration of soreness (days)	No. of cases with hemorrhage <sup>a</sup>
DRY	18	9 (50.0%)	1.83 (±2.28)	0 (0%)
IMS	22	12 (54.6%)	1.73 (±2.05)	0 (0%)
p-value	—	0.951 <sup>b</sup>	0.782 <sup>c</sup>	—

SD, standard deviation; DRY, TrP dry needling only group; IMS, TrP and paraspinal dry needling group.

<sup>a</sup>Hemorrhage: visible subcutaneous hemorrhage >4 cm<sup>2</sup>.

<sup>b</sup>Analyzed by chi-squared test.

<sup>c</sup>Analyzed by Student's *t*-test.



that depression in the elderly group has a positive correlation with pain intensity, so this favorable change in depression rates in the IMS group is thought to be associated with pain relief.

#### *Local twitch response*

In our study, 97.5% of patients showed LTR at least once, and this might have contributed to the favorable results. It also should be noted that, compared to the 70.7% LTR rate among younger subjects (in their early 40s) in the previous study,<sup>5</sup> most of our elderly subjects (average age: 78) showed LTR.

#### *Passive cervical range of motion*

Anatomically, the upper trapezius muscle is associated with neck extension, tilting, and rotation, so after release of the TrPs for the trapezius muscle, neck flexion, tilting, and rotational ROM can be increased with relatively little effect upon extensional ROM.

#### *Mechanisms of dry needling effect*

Eliciting the LTR via dry needling of TrPs often produces a therapeutic benefit.<sup>1</sup> However, the transformation of a tender nodule into an MPS is poorly understood. However, local muscle pain is known to be associated with the activation of muscle nociceptors by a variety of endogenous substances including neuropeptides, arachidonic acid derivatives, and inflammatory mediators, among others.<sup>18</sup> In a recent study, Shah et al.<sup>3</sup> found that dry needling and more specifically eliciting LTRs altered the local chemical milieu of active TrPs. More extended surveys should be made to reveal the exact mechanism of this effect.

#### *Mechanisms of intramuscular stimulation on myofascial pain syndrome*

Nerve roots are surrounded by nerve sheaths, cerebrospinal fluid and meninges, and adjacent networks of arterioles and venules are, therefore, loose. This structure makes nerve roots susceptible to mechanical injury or stimulation and leads to pain.<sup>19</sup> This hypothesis is associated with "Cannon and Rosenblueth's law of denervation supersensitivity"<sup>10</sup> and is the theoretical basis for IMS. With the IMS technique, it is likely that muscle fibers coil around the needle, which increases the level of stimulation. We believe more surveys should be performed to reveal whether this hypothesis is related to clinical results and to discover other theories.

#### *Adverse events*

Postneedling soreness is the result of local hemorrhages at the needling site and can be prevented by sufficient com-

pression after treatment.<sup>1</sup> In the current study, there was no case of gross hemorrhage in both groups. Gunn<sup>9</sup> insisted that thick and hollow needles can induce more tissue injuries than thinner pointed-tipped needles. In this study, we used pointed-tipped acupuncture needles and this might have induced fewer tissue injuries.

#### *Limitations of this study*

First, we measured the pain threshold with thumb pressure, not using an algometer. However, some surveys<sup>20,21</sup> indicate that digital and algometer measures are equally reliable, and the examination was executed by one blinded experienced physician under strict monitoring by two other doctors on every visit.

Second, all forms of treatments were performed by the author, and the procedures' administrators were not completely blinded from measuring outcomes except in the first visit, because we carried out every treatment right after each measurement. Therefore, bias in performance or signaling to the patients might have occurred. However, the primary author is certified and experienced in this field of treatments, and all the procedures were done using standard methods.

## CONCLUSIONS

Dry needling of TrPs with paraspinal needling resulted in slightly more continuous subjective pain reduction than dry needling of TrPs only and showed significant improvements on the geriatric depression scale. The former technique also showed improvements of all the cervical ROMs, but dry needling of TrPs only did not in extensional ROM. Overall, dry needling of TrPs with paraspinal needling is suggested to be a better method than dry needling of TrPs only for treating myofascial pain syndrome in elderly patients, but further studies with more subjects are needed for verification.

## ACKNOWLEDGMENTS

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