Comparison of the effects of superficial dry needling and sparrow pecking acupuncture on upper trapezius myofascial pain

M Fadly,1 H Mihardja,1* A Srilestari,1 and A B M Tulaar2

1Department of Medical Acupuncture, Faculty of Medicine, Universitas Indonesia, Jakarta, 10430, Indonesia
2Department of Medical Rehabilitation, Faculty of Medicine, Universitas Indonesia, Jakarta, 10430, Indonesia

*E-mail: hasanmihardja@gmail.com

Abstract. Myofascial syndrome is a group of symptoms and signs at one or more trigger points and is characterized by chronic muscle pain with increased sensitivity to pressure. Manual acupuncture with several stimulation techniques can be used to treat this condition. The purpose of the present study was to compare the superficial needling technique with the sparrow pecking technique in terms of pain reduction and change in pain threshold in myofascial pain syndrome (MPS) of the upper trapezius. A sample of 36 individuals was divided into two equal groups. The first group underwent superficial dry needling acupuncture, whereas the second group underwent sparrow pecking acupuncture. The intensity of pain was measured using the visual analog scale (VAS), and the pain stimulus threshold was measured using a pressure threshold meter (PTM) before treatment and at 0, 30, and 60 min after treatment. At 0 min, there was no mean difference between the superficial dry needling and sparrow pecking acupuncture in terms of pain scores or pain stimulus threshold. Overall, dry needling acupuncture and sparrow pecking both reduced pain and increased the pain stimulus threshold of myofascial pain in the upper trapezius, with no statistically significant difference.

1. Introduction
Myofascial pain is a muscle condition with local and referred pain complaints that are triggered at myofascial trigger points (TPs). A TP is perceived as a hard nodule or abnormal hardness in strained or stiff muscle fibers during palpation [1–3]. The myofascial syndrome was defined by Simons as a complex of sensory, motor, and autonomic symptoms caused by TPs [1]. TPs are categorized into two groups: active TPs and passive TPs. Active TPs result in spontaneous pain complaints that occur during rest or movement, whereas passive TPs result in pain caused by manual pressure [4].

Myofascial pain syndrome (MPS) is a type of musculoskeletal pain that is estimated to be prevalent in 85% of the population, which may potentially become more problematic in the near future [4, 5]. A study by Gerwin et al. on 1,504 subjects, 30–60 years of age, found that 37% of men and 65% of women experience MPS [5]. The Medical Rehabilitation Department of Cipto Mangunkusumo Hospital has reported that 4–25 patients were diagnosed with muscle spasm per month in 2015, with
the predominant location being the trapezius muscle. The prevalence was higher in the geriatric population because of muscle degeneration and in people with sedentary lifestyles [6].

Proper management is needed to increase the functional status of patients with MPS and to decrease recurrence. Studies on MPS management have been ongoing. MPS management includes pharmacological and nonpharmacological management [6,7]. Pharmacological management includes prescribing nonsteroidal anti-inflammatory drugs, muscle relaxants, benzodiazepine, serotonin and norepinephrine selective reuptake inhibitors, tricyclic antidepressants, and lidocaine patches [6]. Nonpharmacological measures include warm compress therapy, dry needling/injection, electrical stimulation (transcutaneous electrical nerve stimulation, TENS), low-energy light amplification by stimulated emission of radiation (LASER), ultrasound, extracorporeal shockwave therapy (ESWT) [7], integrated neuromuscular inhibition techniques (INITs), and massage effleurage [8]. Another measure is acupuncture, which involves direct needle puncture at the TP [9].

Acupuncture involves several stimulation techniques to increase the effectiveness of therapy, including one known as sparrow pecking. Based on previous studies in poststroke patients, sparrow pecking was found to increase the microcirculation better than superficial dry needling. No comparison of the effects of these two techniques in the treatment of patients with MPS has ever been reported. Therefore, the present study investigated the differences between superficial dry needling and sparrow pecking acupuncture in lowering the pain scale in patients with myofascial syndrome.

2. Methods
This was an experimental study with a randomized control trial design. In the study, an intervention group was treated using sparrow pecking acupuncture, and a control group was treated using superficial dry needling. The effects of the interventions were evaluated on the basis of the differences in pain before treatment and at 0, 30, and 60 min after treatment. This study was conducted at the acupuncture polyclinic of the Cipto Mangunkusumo Hospital, Jakarta, during August–November 2015.

The subjects were patients with upper trapezius myofascial syndrome who visited the acupuncture polyclinic of the Cipto Mangunkusumo Hospital and fulfilled the inclusion criteria. Consecutive sampling was used to categorize 36 patients into two groups, with 18 patients in each group. The inclusion criteria were upper trapezius MPS, 18–60 years of age, a minimum visual analog scale (VAS) score of 4, a PTM of less than 2.5 kg, and consent to participate in the study by signing an informed consent form. Exclusion criteria were fibromyalgia, consumption of analgesics or muscle relaxants, other treatments such as electrostimulation or ultrasound, a blood coagulation disorder or consumption of a blood diluent, fever (>38°C), blood sugar level ≥ 200 mg checked using a glucometer, pregnancy (from anamnesis), tumors, or infection in the area of the acupuncture site. Patients who did not complete the procedure were excluded.

The study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia-dr.Cipto Mangunkusumo Hospital (Ethical Review Grant Number: 786/UN2.F1/ETIK/2015). All subjects signed an informed consent form voluntarily and understood nondisclosure.

3. Results
Table 1 shows the characteristics of both subject groups. Most subjects were women with an education level of high school. Pain was experienced for more than 12 months intermittently. As seen in the statistical analysis results, there were no significant differences between the treatment and control groups, with a p value > 0.05 for each characteristic.
Table 1. Subjects’ characteristics.

| Variable               | Group A (n = 18) | Group B (n = 18) | p value |
|------------------------|------------------|------------------|---------|
| Age (years)            | Average (SD)     | 44.4 (9.55)      | 0.67*   |
|                        | Range            | 27–56            |         |
| Sex (n)                |                  |                  | 0.70**  |
| Male                   | 4                | 5                |         |
| Female                 | 14               | 13               |         |
| Marital status (n)     |                  |                  | 0.29**  |
| Married                | 17               | 15               |         |
| Single                 | 1                | 3                |         |
| Education (n)          |                  |                  | 0.90**  |
| Middle school          | 1                | 1                |         |
| High school            | 11               | 8                |         |
| Diploma                | 4                | 6                |         |
| Bachelor               | 2                | 3                |         |
| Occupation (n)         |                  |                  |         |
| Cleaning               | 3                | 3                |         |
| Laundry                | 7                | 1                |         |
| Administration         | 6                | 6                |         |
| Nurse                  | 3                | 4                |         |
| Courier                | -                | 3                |         |
| Illness duration (months) | Average (SD) | 13.5 (11.10)    | 0.63*   |
|                        | Range            | 1–36             |         |
|                        |                  | 1–72             |         |
| History of trauma (n)  |                  |                  | 0.67**  |
| Positive               | 3                | 4                |         |
| Negative               | 15               | 14               |         |

*Uji Mann–Whitney U test.  
**t-test.

Table 2 shows VAS scores of both groups measured before and 0, 30, and 60 min after treatment. There were no statistically significant differences in the VAS score between the groups in terms of each measurement (P > 0.05).

Table 2. Average differences between VAS scores of each group.

| Visual analog scale (VAS) | Group A (n = 18) | Group B (n = 18) | p value |
|---------------------------|------------------|------------------|---------|
| Pre                       | 4.2 (4.0)        | 4.3 (4.0)        | 0.46    |
| 0 min                     | 2.9 (3.0)        | 3.3 (3.0)        | 0.12    |
| 30 min                    | 2.7 (2.5)        | 2.9 (3.0)        | 0.54    |
| 60 min                    | 2.7 (2.5)        | 2.6 (2.3)        | 0.67    |

Table 3. Average PTM differences between groups.

| Pressure threshold meter (PTM) | Group A (n = 18) | Group B (n = 18) | p value |
|--------------------------------|------------------|------------------|---------|
| Pre                            | 1.9 (2.0)        | 1.9 (2.0)        | 0.31    |
| 0 min                          | 2.9 (2.9)        | 3.0 (2.7)        | 0.80    |
| 30 min                         | 3.1 (0.6)        | 3.1 (0.8)        | 0.88    |
| 60 min                         | 3.3 (0.8)        | 3.3 (0.9)        | 0.88    |
Table 3 shows the pain thresholds measured using PTM in both groups, before treatment and 0, 30, and 60 min after treatment. There were no statistically significant differences in the PTM values between the groups in terms of each measurement ($P > 0.05$).

4. Discussion

The present study involved 36 patients with MPS who fulfilled the inclusion criteria. The subjects were recruited by distributing brochures about the study to workers in the Cipto Mangunkusumo Hospital (RSCM) area. The selected subjects were then randomly divided into two groups: a control group ($n = 18$) and a treatment group ($n = 18$). The treatment group underwent sparrow pecking acupuncture treatment; needles were inserted 1 cm into the skin at a 45° angle, and a plugging–unplugging motion was performed at a tempo of 100 beats/min. The procedure was carried out for 15 min, every 5 min. The control group underwent superficial dry needling; needles were inserted 1 cm into the skin at a 45° angle. Pain score and pain threshold values were assessed before therapy and 0, 30, and 60 min after therapy. There were no dropouts among the respondents. A statistical analysis was carried out to compare patients’ characteristics, pain scores, and pain thresholds between the control and treatment groups. Statistical tests were carried out to observe differences in average VAS and PTM scores between the control and treatment groups using unpaired $t$-test for normally distributed data. Data with skewed distribution were analyzed using Mann–Whitney $U$ test with a threshold $p$ value of 0.05 and a confidence interval of 95%.

Acupuncture therapy was performed in regions representing the most complaints, including the upper trapezius area and areas of tenderness due to palpation, in addition to trigger points which are hypersensitive nodules on strained muscles (taut bands) [10]. Trigger points with such characteristics are also known as latent trigger points, at which the patients did not report spontaneous pain but reported pain due to pressure [4]. Trigger points are formed because of sarcomere shortening in the muscle. This is due to abnormal depolarization at the motor end plates caused by excessive acetylcholine release [11]. In contrast, taut bands represent localized stiffness in muscle fibers without any activation from the motor end plate.

In the present study, we did not choose any particular acupuncture sites because the aim was to compare two similar acupuncture techniques. Sparrow pecking is also known as the leopard spot technique. Manual acupuncture using this technique has been shown to quickly improve the walking ability of geriatric patients [12], relieving pain and stiffness in the shoulder areas [13].

The causes of MPS include macro- and microtrauma and other factors that weaken the muscles and lead to spinal abnormalities, chronic infections, and joint inflammation. Macrotraumas injure muscles, bones, and joints directly, forming a trigger area. Microtraumas cause injuries slowly and accumulatively, showing signs and symptoms of MPS. In the present study, there was no assessment of other MPS causative factors; however, more than 50% of the subjects did not have any history of trauma or injury in the upper trapezius area, and microtraumas due to work-related activities were the main causes of MPS. The occupations of the subjects included administrative employee roles, cleaning service roles, and nurse roles. Work-related movement or physical activity, if done continuously and repeatedly, without rest, particularly with incorrect posture and ergonomy, could cause strain and stiffness in the muscles. Static low-level muscle contraction activities, such as bowing or working on computers, can induce spasms, collagen contraction, adhesion, actin–myosin crosslink abnormalities, and low blood pressure in the neck’s extensor muscle groups, one of them being the upper trapezius muscle. These can then become trigger points in the taut band that causes MPS [14]. Patients experience pain, stiffness around the neck and shoulder, and migraine, or even pain in the lower arm.

Using the direct needling technique on the TP can affect the length of the sarcomere and fascia in muscle myofibrils that have TPs, lowering the impending pain in the trapezius muscle and causing relaxation and improvement in circulation [3]. Acupuncture can improve the circulation, because of the vasodilation mediated by CGRP and NO. It can also stimulate mast cell activation to produce histamines (vasodilators). In addition, it increases capillary and venous permeability, increasing fluid
diffusion. Blood circulation increases oxygen flow to tissues and accelerates metabolism to eliminate excess and nociceptive substances. Needling can stimulate the afferent nerve fiber A delta to block pain impulses from afferent nerve fiber C, lowering pain sensation at the spinal level. Moreover, acupuncture can stimulate endogenous analgesic release, enabling pain modulation at the supraspinal level. Needling can also stimulate fibroblasts in myofascial tissues, leading to flexing and triggering collagen production. There have been no studies explaining the differences between mechanisms involved in different manual-stimulation acupuncture techniques.

There were no significant differences between superficial dry needling and sparrow pecking in terms of lowering pain and increasing the pain threshold. Therefore, both of these acupuncture techniques could be used to manage MPS. A comparison of pain relief at 0, 30, and 60 min showed that, at 0 min, the pain relief in the sparrow pecking group was lower than that in the superficial dry needling group, in contrast to that at 30 and 60 min. More pain relief was obtained with superficial dry needling because the pain effect after needle insertion and manipulation was less than that in the sparrow pecking group. In the sparrow pecking group, the patients did not immediately experience pain relief after the needle was removed. However, pain relief lasted longer than in the superficial dry needling group. Needle pecking, which was done every five minutes, caused a pain effect, but several minutes later, the patients experienced pain relief that lasted 60 min. As seen on the graph, the sparrow pecking group had a declining VAS score and the superficial dry needling group stayed at relatively the same level. In the present study, measurement was only done until 60 min, and therefore further analgesic effects could not be observed.

Sparrow pecking causes stronger stimulation than superficial dry needling. The stronger the mechanical stimulation, the greater the polarization effect of electrical conduction on nerve fibers and the greater the microtrauma effects created; therefore, greater acupuncture effects are produced. Mechanical effects after needle insertion could stimulate postsynaptic nerve receptors, reinnervation, and muscle regeneration. A previous study by Domingo et al. showed that there were signs of inflammation at three hours after needling, which increased 24 h after the procedure and then decreased and stopped in seven days with completion of muscle regeneration [15]. One day after the procedure, there were postsynaptic receptor changes, with reinnervation likely on the third day.

No side effects occurred in this study, including bleeding, intense pain, or syncope, although the management of such events had been planned. Both sparrow pecking and superficial dry needling acupuncture procedures were found to be safe without any significant side effects. There were no significant disruptions during the study, because each patient underwent the procedure only once. Due to the fact that this study took place in a polyclinic acupuncture room that was also handling regular patients, researchers and subjects had to wait for the room to become available.

The limitation of this study was that only immediate effects of the acupuncture techniques were assessed without any further observation of how long the effects could last. In addition, the range of motion of the joints and the effect of the acupuncture therapies on ROM were not assessed.

5. Conclusion
There were no significant differences between pain relief due to superficial dry needling and pain relief due to sparrow pecking acupuncture until 0, 30, or 60 min after therapy. However, the VAS score trends in the sparrow pecking group lasted until 60 min after the treatment. There was no significant rise in the pain threshold using either of the techniques until 0, 30, or 60 min after treatment.

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