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ORIGINAL ARTICLE

# Comparison of kinesio taping, trigger point injection, and neural therapy in the treatment of acute myofascial pain syndrome: A randomized controlled study

## *Akut miyofasiyal ağrı sendromunda kinezyoteypleme, tetik nokta enjeksiyonu ve nöral terapinin karşılaştırılması: Randomize kontrollü çalışma*

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**Summary**

**Objectives:** Myofascial pain syndrome (MPS) is a regional painful soft-tissue disorder, characterized by trigger points (TrPs) and taut bands in the muscles. In this study, we aimed to compare the effectiveness of kinesio taping (KT), TrPs injection, and neural therapy (NT) on pain and disability in acute MPS.

**Methods:** 104 patients with MPS in the cervical region were allocated into three groups. Group 1 (n=35) were treated with KT, Group 2 (n=35) received local anesthetic (LA) (lidocaine of 0.5%) TrPs injection, and Group 3 (n=34) received NT with the same LA solution. Patients were assessed by means of pain, pressure pain threshold (PPT), and disability. Pain severity was measured by Visual Analog Scale. The neck pain disability scale was used for assessing disability. PPT was measured by using an algometer. Measurements were taken before and after treatment of 3rd and 7th days.

**Results:** There were improvements on pain and disability in all groups at the end of treatments at 3rd day and during follow-up period ($p<0.001$) and no differences were found between the groups. There was significant difference in PPT values in TrPs injection and NT groups in comparisons between all time periods, however, the change, depending on time in the KT group, was not statistically significant.

**Conclusion:** The results of this study show that all these three treatment methods found to be effective on pain relief and disability in acute MPS. In terms of PPT, injection treatments seem to be superior than KT.

Keywords: Acute pain; disability; injection; kinesio taping; myofascial pain; neck pain; neural therapy; trigger point.

**Özet**

**Amaç:** Miyofasiyal ağrı sendromu tetik noktalar ve kasta gergin bantlarla karakterize bölgesel ağrılı bir yumuşak doku hastalığıdır. Bu çalışmada, akut miyofasiyal ağrı sendromu olgularında ağrı ve özürlülük üzerine kinezyoteypleme, tetik nokta enjeksiyonları ve nöral terapi etkinliğinin karşılaştırılması amaçlandı.

**Gereç ve Yöntem:** Çalışmaya alınan 104 hasta üç gruba ayrıldı. Grup 1 (n=35) kinezyoteypleme, grup 2 (n=35) tetik nokta üzerine lokal anestezik (%0,5'lik lidokain) enjeksiyonu, grup 3 (n=34) aynı lokal anestezik solüsyonu kullanılan nöral terapi uygulamasından oluşmaktadır. Hastalar ağrı, basınç ağrı eşiği ve özürlülük açısından değerlendirildi. Ağrı şiddeti görsel analog skala ile ölçüldü. Boyun ağrı özürlülük skalası ile özürlülük düzeyi belirlendi. Basınç ağrı eşiği ise algometre ile ölçüldü. Ölçümler tedavi öncesi ve sonrasında üçüncü ve yedinci günlerde yapıldı.

**Bulgular:** Tedavinin üçüncü günü ve takip ölçümlerinde ağrı ve özürlülük değerlerinde bütün gruplarda iyileşme mevcuttu ($p<0,001$) ve gruplar arasında fark yoktu. Tüm zamansal süreçte basınç ağrı eşiği değerlerinde tetik nokta enjeksiyon ve nöral terapi gruplarında istatistiksel anlamlı farklılık varken zamana bağlı bu değişim kinezyoteypleme grubunda istatistiksel olarak anlamlı bulunmadı.

**Sonuç:** Bu çalışmanın sonuçları her üç tedavi yönteminin de akut miyofasiyal ağrı sendromu tedavisinde ağrı ve özürlülük üzerine etkili olduğunu göstermektedir. Basınç ağrı eşiği üzerinde ise enjeksiyon tedavilerinin kinezyoteyplemeden üstün olduğu gözlemlendi.

Anahtar sözcükler: Akut miyofasiyal ağrı; enjeksiyon; nöral terapi; kinezyoteyp.

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## Introduction

Myofascial pain syndrome (MPS) is a regional painful soft-tissue disorder, characterized by trigger points (TrPs), taut bands tenderness, autonomic dysfunctions, and local twitch response in the muscles. It is known that during the lifetime, approximately 85% of the population have MPS at least once.[1] Although there are various theories, the exact mechanism of TrPs is unclear. In upper back, one of the most effected muscles is trapezius. The activation of TrPs on this muscle expresses itself as painful and limited range of motion (ROM) in the neck, radiating pain, and muscle weakness.[2] The main treatment goal is to provide pain relief by inhibiting painful TrPs and improve ROM. There are pharmacological and non-pharmacological therapies including systemic or local treatment options. Physical therapy applications, manual therapy, exercise, kinesio taping, dry needling, and TrPs injections are mostly preferred.[3–5]

Kinesio taping (KT) has been developed by Dr. Kenzo Kase and widely used for the treatment of musculoskeletal problems including MPS and neck pain. It is water resistant, lightweight, elastic and has a capacity of stretching. Some of the major effects of KT are decreasing pain, reducing edema by providing drainage of local blood and lymph fluid, relaxing the muscles, and improving proprioception. Elevating the skin provides space which enhances the fascial movement and removes inflammatory products.[5,6] Although the exact mechanism of KT is unclear, regarding these effects KT has been preferred widely in the treatment of MPS patients.

In previous studies, local anesthetic (LA) injections of TrPs have been found effective in MPS. Studies mostly included the lidocaine injection directly in TrPs which provided pain relief in short time by inactivating them regarding both needling and the action of active drug.[7–9] Furthermore, lidocaine is one of the LAs, used in neural therapy (NT) which is based on the healing process of the neurovegetative system. NT not only focuses on pain relief in acute and chronic musculoskeletal pain disorders but also regulation of the dysfunction of autonomic nervous system. Local and segmental application of lidocaine injection is the first step of NT to provide a proper pain response.[10,11] Although studies are mostly included the efficacy of NT in chronic musculoskeletal pain conditions, its effect on acute pain is still unclear. The relationship between nociceptive impulse and sympathetic dysregulation seems to be the starting point of using NT in acute MPS treatment.

As acute MPS is a very painful clinical condition, an effective treatment should be implemented to stop the vicious cycle of pain and muscle spasm and also avoid chronicity and disability. It is well known that KT is a non-invasive and well-tolerated technique whereas TrPs injections and NT are invasive methods. However, in literature search, we could not find any randomized research which showed any advantage over one another treatment methods. Thus, in this study, we aimed to assess the efficacy of KT, TrPs injection, and NT on pain relief and disability in the treatment of acute MPS.

## Material and Methods

A total of 136 patients who admitted to Physical Medicine and Rehabilitation Outpatient Clinics and diagnosed as MPS based on the criteria of Travell and Simons were enrolled this multicenter study.[12] The inclusion criteria were the acute (<7 days) complaints of regional pain, presence of at least one active TrP located in upper trapezius muscle, and ages >18 years. The exclusion criteria included the existence of fibromyalgia syndrome, neurologic disorders, cervical disc problems including radiculopathy, myelopathy and having previous neck and shoulder surgery, recent TrPs injection, and a physical therapy program applied during last 6 months, history of drug allergy, pregnancy, and inflammatory diseases. The flow diagram of the participants was shown in Figure 1.

### Study Design

This study was prospective, randomized controlled trial. Before treatment, all participants were informed about the study and signed written informed consent. The study was carried out in accordance with the Declaration of Helsinki and was approved by the University of Ufuk, Human Research Ethics Committee.

### Randomization

To give all patients, the same chance of receiving any treatment, triple block randomization method was used to distribute patients to groups and to researchers (Random Allocation Software AS).[13]

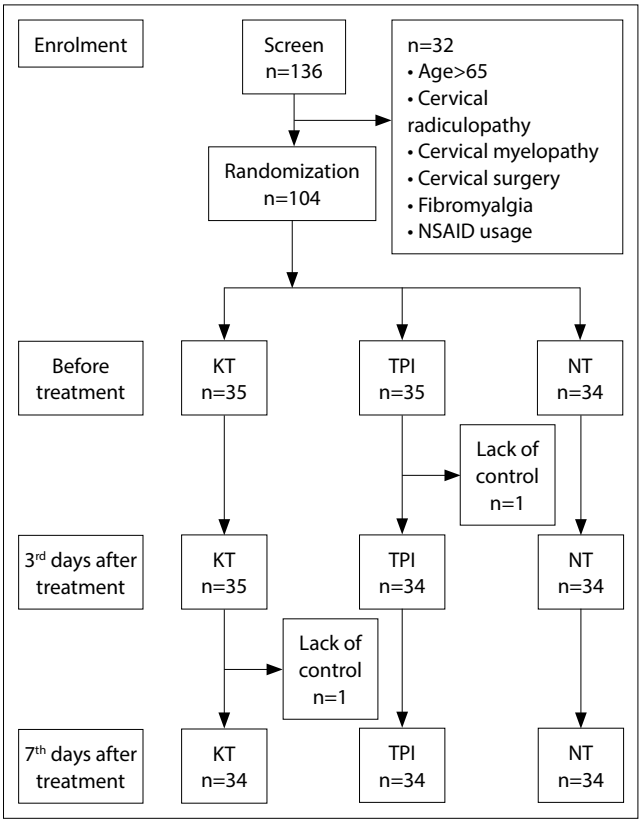


**Figure 1.** The flow diagram of the patients included in this study.
KT: Kinesio taping; TPI: Trigger point injection; NT: Neural therapy; NSAID: Non-steroidal anti-inflammatory drugs.

## Treatment

Group 1 (n=35) was treated with kinesiotape (Kinesio Tex Gold, 5 cm×5 m, USA). The muscle inhibition technique which was described by Kase was applied. A 15–20 cm long "Y" strip and 10 cm "I" strip were used. In the sitting position, a "Y-"shaped strip was placed on the dorsal region (T3-T4) through the upper cervical region (C1-C2) while patient's neck was in flexion with paper off tension. Then "I" strip was applied over the neck with moderate-to-severe tension. There after another "I" strip was placed along upper trapezius muscle starting from acromion through the hairline while neck was in lateral flexion to the opposite side and rotation to the same side without stretching (Fig. 2). The kinesiotape remained for 3 days and then removed by the patients.

Group 2 (n=35) consisted of a single injection of TrPs on the trapezius muscle. Before injection, the skin was cleaned with an antiseptic solution. While the patient was lying supine position, painful trigger point was fixed between thumb and index finger. A 26-gauge 13-mm disposable needle was used. The physician moved forward within the TrP until the needle receives the local twitch response or contraction of the band with pain. LA solution of 0.5% lidocaine was prepared by diluting 1:3 mixture of 2% (20 mg/mL) lidocaine without vasoconstrictor with saline (0.9% sodium chloride solution). After negative aspiration, 2–3 mL LA solution was injected into the trigger point and then repeated in each direction such as laterally and medially.

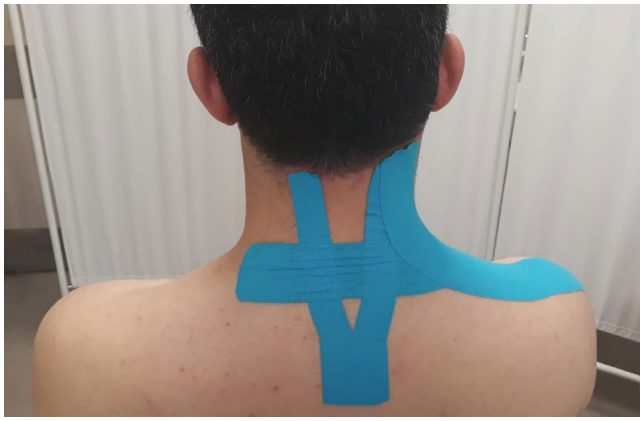

**Figure 2.** The application of kinesio taping on cervical region and upper trapezius muscle.

Group 3 (n=34) received NT injections with the same LA mixture (lidocaine of 0.5% without vasoconstrictor). After the skin was cleaned with antiseptic solution, injections were applied while the patient was lying in prone position. Intradermal injections were performed using a 5-mL syringe with a 26-gauge and 13-mm needle. The NT included a local treatment into the TrPs on trapezius muscle, a segmental treatment on the thoracic region, and a periosteal injection into the sternum. Locally, on trapezius muscle, the Quaddel injection was performed on the painful TrPs and for segmental treatment the Quaddel injections were applied into T1-T10 interspinous area and 2 cm apart laterally from the spinous process on both sides.

All treatments were applied once. During the treatment process, none of the patients were allowed using any analgesic drugs or non-steroidal anti-inflammatory drugs.

## Outcome Parameters

### Pain

Pain was assessed using a visual analog scale (VAS), 0–10 cm; 0 means no pain, 10 means severe pain, 0–10 is marked in cm on a 10-cm ruler. The pain of the patients was assessed by VAS at rest, at night, and at motion.

**Table 1.** Sociodemographic features and clinical characteristics of patients

| | Group 1 (KT) n=34 | Group 2 (TPI) n=34 | Group 3 (NT) n=34 | p |
|---|---|---|---|---|
| Age (year) | | | | 0.413 |
| Mean±SD | 36.9±15.9 | 37.0±14.9 | 41.2±14.7 | |
| Min–Max | 20–64 | 20–65 | 20–65 | |
| Gender (female) n (%) | 29 (85) | 26 (77) | 26 (77) | 0.583 |
| Education, n (%) | | | | 0.001 |
| Primary school | 9 (27) | 15 (44) | 5 (15) | |
| Secondary school | 9 (27) | 10 (29) | 3 (9) | |
| High school | 16 (46) | 9 (27) | 26 (76) | |
| Work status employee, n (%) | 11 (32) | 15 (44) | 18 (53) | 0.228 |
| Disease duration, day | | | | 0.566 |
| Mean±SD | 3.4±1.3 | 3.5±1.1 | 3.9±1.6 | |
| Min–Max | 2–5 | 2–5 | 2–7 | |

KT: Kinesio taping; TPI: Trigger point injection; NT: Neural therapy; SD: Standard deviation; Min: Minimum; Max: Maximum. p values from Chi-square test and one-way analysis of variance (ANOVA).

### Pressure Pain Threshold (PPT)

PPT on the TrPs was measured using an algometer (kg/cm$^2$) (Algometer Commander, JTECH Medical, Utah).

### Disability

Disability was assessed by Turkish version of Neck Pain Disability Scale (NPDS) which was found valid and reliable.[14] The NPDS is a self-administered questionnaire consisting of 20 items and measures neck movements, pain intensity, effect of neck pain on emotional factors, and interference with daily life activities. Each section is scored on a 0 to 5 rating scale and total score ranges between 0 and 100.

The assessment parameters were measured before treatment, at the end of 3$^{rd}$ days and 7$^{th}$ days after the treatment.

### Statistical Analysis

For calculating the sample size, power analysis was performed using the G*Power version 3.1.9.2 software program. The calculation was based on the pre and post-treatment VAS values of the study which was reported by Atalay et al.[15] before. To obtain 80% study power at an alpha level of 0.05, at least 29 patients in each group was estimated (Group 1: 5 and Group 2: 3.5), and considering a dropout rate as a 15%, 34 patients for each group were recruited in the study.

Mean±standard deviation for metric variables and frequency (percent) for categorical variables were given as descriptive statistics. To compare groups in terms of gender and age, Chi-squared test and one-way analysis of variance (ANOVA) were used, respectively. For the evaluation of trend in time and group comparisons, repeated measures of ANOVA were performed and $p<0.05$ was considered as statistically significant.

## Results

Sociodemographic features and disease characteristics of patients were shown in Table 1. All groups were similar with respect to age, sex, education level, and disease duration. None of the patients reported adverse reactions. Two patients (1 patient from KT, and 1 patient from TrPs injection group) dropped out from the study due to the lack of control. Finally, 102 patients (81 female/21 male) completed the study and 34 patients for each group statistically analyzed.

The trend of VAS (rest, night, and movement) values and NPDS value were similar within the groups. Statistically significant effect of time on VAS (at rest, night, motion) and NPDS (p=0.0001) was found and there was no difference between the groups. There were significant improvements in comparisons between all time periods in all groups (Table 2 and Fig. 3).

**Table 2.** The results of pain, pressure pain threshold, and disability in all groups after treatment of 3rd and 7th days

| Parameters | KT (n=34) Mean±SD | TPI (n=34) Mean±SD | NT (n=34) Mean±SD | p1, p2, p3 |
|---|---|---|---|---|
| VAS at rest | | | | 0.930, <0.001, 0.126 |
| Before treatment | 7.3±1.6 | 7.6±1.9 | 7.3±1.7 | |
| 3rd days AT | 4.6±1.8 | 4.8±1.8 | 5.2±1.5 | |
| 7th days AT | 3.8±2.1 | 3.6±1.9 | 3.5±1.3 | |
| VAS at night | | | | 0.996,<0.001, 0.287 |
| Before treatment | 7.0±2.1 | 6.6±2.4 | 7.0±2.1 | |
| 3rd days AT | 4.2±2.3 | 4.6±2.3 | 4.6±2.0 | |
| 7th days AT | 3.6±2.8 | 3.5±2.5 | 3.2±1.9 | |
| VAS at motion | | | | 0.595, <0.001, 0.126 |
| Before treatment | 7.4±2.0 | 7.5±2.1 | 7.9±2.0 | |
| 3rd days AT | 4.6±2.2 | 4.7±2.1 | 5.4±1.9 | |
| 7th days AT | 3.9±2.3 | 3.2±2.5 | 3.4±1.8 | |
| PPT (kg/cm$^2$) | | | | 0.773, <0.001, 0.036 |
| Before treatment | 5.7±0.9 | 5.4±1.1 | 5.5±1.0 | |
| 3rd days AT | 6.8±1.2 | 6.8±1.2 | 6.6±1.3 | |
| 7th days AT | 7.0±1.3 | 8.3±1.6 | 7.7±1.3 | |
| Pain neck disability index | | | | 0.054, <0.001, 0.946 |
| Before Treatment | 66.6±14.9 | 67.7±15.9 | 59.2±14.2 | |
| 3rd days AT | 50.1±16.6 | 49.1±22.9 | 41.3±12.2 | |
| 7th days AT | 38.6±19.4 | 39.0±23.5 | 31.9±23.5 | |

KT: Kinesio taping; TPI: Trigger point injection; NT: Neural therapy; SD: Standard deviation; VAS: Visual Analog Scale; PPT: Pressure pain threshold; AT: After treatment; p1 refers group comparison; p2 refers to time comparisons; p3 refers to group time interaction.

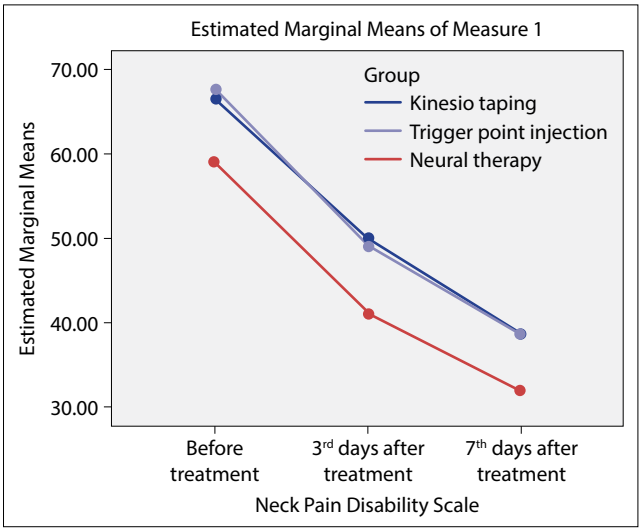


**Figure 3.** The results of Neck Pain Disability Scale before, 3rd days and 1 week after treatment in groups.

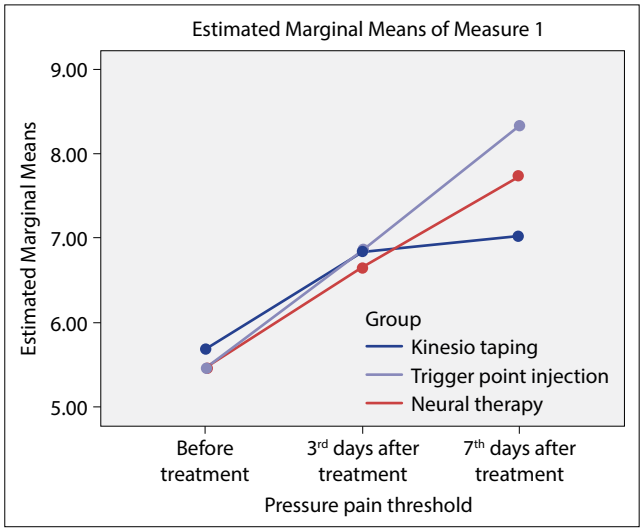


**Figure 4.** Baseline, after 3rd and 7th day results of pressure pain threshold in treatment groups.

The change of PPT values over time was different between groups. There was statistically significant increase in PPT values in TrPs injection and NT groups in comparisons between all time periods; however, the change, depending on time in the KT group, was not statistically significant (Table 2 and Fig. 4).

## Discussion

The main therapeutic goal in acute MPS is to provide pain relief quickly and return to daily functions as soon as possible. Preventing prolonged pain and disability also inhibits turning a chronic form of MPS. In this study, we compared the effectiveness of KT,

TrPs injection, and NT in the treatment of acute MPS. We found that all of the three methods were effective in VAS and disability. These statistically significant improvements continued and found better at the end of the week. In addition, there was significant increase in PPT values in both TrPs injection and NT groups in all time periods, however, this time depending increase was not observed in KT group.

There are several studies investigated the efficacy of KT in MPS.[5,6,15–18] Öztürk et al.[17] investigated both short and mid-term effects of KT on trapezius in MPS. They compared KT with sham application on trapezius muscle and both groups received additional home-based exercise program. They evaluated VAS, algometry scores, and muscle strength immediately after therapy and at the end of 1 month. Although they found improvements in the VAS and algometry scores in both groups, only KT group had prolonged effect during 1-month follow-up period. Furthermore, improvement in muscle strength was observed only KT group. They concluded that the positive effects in sham group were due to both psychological and sensory feedback effects of taping. Similarly, a double-blind placebo controlled study compared KT and sham taping in MPS for a duration of 2 weeks. KT was applied on levator scapula muscle and sham applied on the same muscle in neutral position without tension. At the end of the therapy, pain, PPT, cervical ROM, and disability were improved in both groups.[18] Furthermore, we found improvement in VAS and disability results in all of the three groups except PPT, which showed no improvement only in KT group. Although PPT values could not reach a statistically meaningful value in KT group, we noticed an increase at 3rd day, this was not observed at the end of the week (Fig. 4). This time-dependent change of KT was observed in another study which investigated the immediate and short-term effects of KT on balance of healthy individuals. KT provided an immediate effect on balance but did not continue after 24 h.[19] In our study, KT was removed after 3 days and was not repeated again. The majority of the studies applied KT more than once and this time-dependent change in this study may be due to short stay on the skin. A systematic review and meta-analysis was reported that KT application had a powerful evidence on providing pain relief than the other non-invasive treatment methods. However, no superiority was found on muscle strength and disability.[20] Unlike this result, we found an improvement in disability scores in all groups including KT application. A recent published article by Ata et al.[21] compared the effects of KT with lidocaine injection in neck and shoulder pain with MPS. They concluded that combined therapy with lidocaine injection plus KT provided additional beneficial effects due to increased intramuscular blood flow, decreased algogenic substances, and stimulated mechanoreceptors which inhibited pain transmission.

Many studies have shown the success of TrPs injections in MPS.[3,8,9,21–24] Some of the studies designed on the comparison of the injections such as lidocaine, botulinum toxin, and dry needling TrPs.[8,23] Kamanlı et al.[23] found that all injections were effective but the most effective on pain was the lidocaine group. However, Cummings et al.[7] suggested that there was no clear evidence that dry or wet needling with placebo or pharmacologic substance had superiority to each other. A recent systematic review with meta-analysis evaluated the short-term effects LA injection comparing with placebo, dry needling/acupuncture, lidocaine plus hyaluronidase, and the others in head, neck, and shoulder MPS. The assessment parameters were VAS, PPT, ROM, and depression and improvement of these parameters was significant in LA injections, but the evidence was low due to low quality of the studies.[25] In our study, we found that lidocaine injection in TrPs was effective as the others. It was also practical and provided pain relief rapidly in acute cases.

It is known that LA affects both mechanical and pharmacologic effect on TrPs. Besides irritating the TrPs, LA is an active drug that blocks nervous conduction by propagation of action potential due to inhibition of Na+channel.[25,26] LA regulates membrane depolarization, prevents irreversible changes, and may effect as a neuroprotector for the membrane. It is known that membrane disturbance leads inflammation which is thought to be the underlying cause of the neurovegetative system dysfunction. Keeping cells healthy by regulating autonomic nerve system are the basic fundamental principles of NT.[25–27] Lower membrane potential threshold fires painful action potential and by injecting lidocaine, resting membrane potential of nerve cells normalize to –90 mV which cause a break on vicious circle of muscle spasm and pain.[27–29] There are few studies about NT and most of them

investigated its effectiveness in chronic pain conditions.[15,30–33] Atalay et al.[15] compared the efficacy of NT with lidocaine and physical therapy in chronic low back pain patients. They applied NT on local area and interference fields. Although both groups showed improvements in pain, function, quality of life, anxiety, and depression, subgroup of energy and social isolation levels were significantly improved only in NT group. Similarly, a recently published study reported the effectiveness of five sessions NT injections in conservative treatment resistant chronic low back pain patients.[30] Another study evaluated the effectiveness of NT in the treatment of fibromyalgia. Patients randomized either exercise or exercise plus NT injection. Lidocaine injections were applied once a week during 6 weeks and both groups showed significant improvements in pain, functional capacity, quality of life, anxiety, and depression.[31] Egli et al.[32] reported the long-term results of NT in refractory chronic pain patients. A total of 280 patients included the study and procaine or lidocaine injections were applied in local, segmental, and interference field if needed. After 1-year follow-up, NT was found to be successful and cost effective as there was significant improvement in pain and reduction in using analgesics. Even though NT seemed to have better results with repeated injections in chronic conditions, in this study, we observed an improvement in acute respond as well. In neuropathic pain, the contribution of autonomic nerve system is well known.[34] However, in acute condition, this mechanism is unclear. It may be due to the activation of reflex pathways by noxious nociceptive inputs which seem to have connections with sympathetic nerves. Furthermore, increased muscle tone and hyperalgesia occur as a response of the sympathetic system activation.[28,32] McDonnell[35] reported that blocking stellate ganglion with lidocaine provided marked decrease in acute pain after orthopedic surgery. Referring to this study, Bantel and Trapp expressed that autonomic nerve system contributes in processing acute pain.[36] Regarding to these studies, we assume that inhibition of increased sympathetic system which is the main target of NT may provide pain relief in acute cases. Furthermore, NT was found to have high therapy response and high patient satisfaction on musculoskeletal disorders.[11] Furthermore, no significant adverse effects were reported at none of these studies. Similarly, in our study, no patient was dropped out due to adverse effect.

## Limitations

One of the limitations of this study is the short follow-up period. We focused on the immediate pain relief as patients had acute painful clinic. Especially to elucidate the efficacy of NT regarding the regulating effect, it would be better to involve chronic MPS patients. In addition, KT is non-invasive group, and we could not design a double blind, placebo/sham controlled study.

## Conclusion

Although a majority of the studies focused on the treatment of chronic MPS, this study shows that all these three treatment methods seem to be effective on acute MPS patients suffering from pain and disability. Even though publications studied mostly KT and TrPs injections, we found that NT is also as effective as the others and none of the treatments are superior to each other.

***Peer-rewiew: Externally peer-reviewed.***

***Ethics Committee Approval: The Ufuk University Non-Interventional Clinical Research Ethics Committee granted approval for this study (date: 29.03.2017, number: 8).***

***Conflict-of-interest issues regarding the authorship or article: None declared.***

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