

## **Trigger Point Dry Needling under Ultrasound Guidance. A New and Unreported Technique.**

*Case report and literature review.*

### **Technical innovation**

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#### **Abstract**

The aim of the study was to examine the use of trigger point dry needling under ultrasound guidance and myofascial release for the treatment of myofascial pain, to increase the provability of the puncture treatment by visual verification. A review of modern and traditional approaches to the myofascial pain treatment was presented. For the first time the trigger point was visualized by ultrasound (US) in this study and needling therapy of muscles of the head and neck by ultrasound examination was performed as well. The study results were presented at the Symposium on orthopedic dentistry at the 3 rd Dental Pan-European Congress (Kyiv) in December 9-11, 2009. The primary experience is embedded in clinical practice.

The ultrasound imaging technique significantly improve the detection accuracy and specificity of verification the trigger points, as the causes of myofascial pain, as well as it is usefull for the dynamic control of the effectiveness of their treatment.

Inactivation of MTrPs by dry needling appears to be the result of the mechanical action of needle, since it can be successfully accomplished without the use of local anesthetics or other materials. The use of ultrasound can significantly improve the effectiveness and safety of the deep dry needling as an optimal method of inactivation of trigger points. We believe that use of deep dry needling is inadequate without ultrasound guidance, as the precise puncture of certain muscles can not be performed accurately without ultrasound visual navigation.

**Key words:** ultrasound diagnosis, pain therapy, dysfunction of the temporomandibular joint, acupuncture, the puncture under ultrasound guidance.

#### **Introduction**

Most of the pain syndromes in clinical practice have myofascial nature, caused by the formation of myofascial trigger points (MTrP) [1].

The aim of the study was to examine the use of "dry" needling trigger points under ultrasound guidance in the treatment of myofascial pain, improve provability puncture treatment with visual verification. A review of modern and traditional approaches to treatment of myofascial pain. For the first time the trigger point was visualized by ultrasound (US) in this study and needling therapy of muscles of the head and neck by ultrasound examination was performed as well. The study results were presented at the Symposium on orthopedic dentistry at the 3 rd Dental Pan-European Congress (Kyiv) in December 9-11, 2009. The primary experience is embedded in clinical practice.

The trigger point (TT, myofascial trigger point, MTrP, MTrPs) are hypersensitive areas in skeletal muscle, fascia, tendons and ligaments, painful when pressed and can irradiate a pain in other parts of the body and lead to abnormal sensitivity, autonomic phenomena, such as dizziness, numbness, dysesthesia (Gatterman, 1990). Local anesthetics, the introduction of saline or acupuncture reduces the activity of the trigger point.

The trigger point can be in state:

- «active" trigger points that cause pain irradiation during palpation;
- «latent" trigger points –palpation cause only a local hypersensitivity.

Frequency of active MTrP reaches a maximum in middle age. In elderly people revealed a lot of latent trigger points. Women are more likely than men to visit a doctor because of the myofascial pain origin. J. Travell and D. Simons [2] argue that in normal muscle contains MTrP, they are not compacted strands, they were not painful on palpation, do not give the convulsive reactions and do not reflect the pain of compression. At the same time, according to T. Bates [3], myofascial MTrP is the main source of pain in skeletal muscles in children.

### **Study History**

The term "trigger", was introduced by Steindler in 1940 [4]. Already in 1816, a British physician, Balfour described as MTrPs as pain inflamed nodules in the muscles. . different terms were used to determine the trigger point: fibrosis miofasciit, muscular rheumatism, rheumatic myositis, miogeloz, myalgia, myofascial pain, fibromyalgia [5]. In 1983, Travell and Simons issued a classic two-volume work "myofascial pain and dysfunction", after its second reissue in 1999, treatment of myofascial pain by acting on the trigger point was put to a modern level of expertise. In 1938, a British rheumatologist Kellgren published a description of specific patterns of reflected pain in the different groups of muscles and ligaments of the spine after injection of hypertonic saline solution.

In 1952, Janet Travell published one of the first of the first articles that recognize the specificity of pain as reflected in the models with more than 30 muscles [6]. Travell (1901 - 1997) on the right is a pioneer in the treatment of musculoskeletal pain by opredoleniya MTrPs. She introduced the term "myofascial pain syndrome" to describe the pain as a result vznikonoveniya trigger points in muscles, tendons, skin, fascia and ligaments. Several subsequent works of Janet Travell devoted to craniomandibular pain [7,8].

### **Hypotheses of pathogenesis**

- The Travell theory of the initial injury
- Integrated trigger hypothesis
- Cycle pain-spasm-pain
- Spindle Muscular hypothesis
- Neuropathy hypothesis
- The hypothesis of fibrous (scar) tissue
- Integrated hypothesis Shah (2008) [9]
- Active trigger point depends on the emotional condition [10].

### **Causes**

- trauma muscle;
- muscle ischemia;
- visceral-somatic reflexes;
- radiculopathy, nerve root compression;
- anxiety;
- other causes.

### **Trigger points and fibromyalgia**

Until now, evidence-based medicine is widely uses the term fibromyalgia, often also in myofascial pain syndromes [11]. We should distinguish fibromyalgia syndrome (FMS) and Myofascial pain syndrome (MPS), which belong to the group of chronic non-inflammatory pain syndromes affecting the muscles and tendons. Important criteria in the diagnosis of both diseases is the presence of "sensitive points" and "trigger points". According to the criteria of the American College of Rheumatology, FMS is characterized by the presence of sensitive points and trigger points are usually defined in the MPS.

The term **tender points** is also used. They serve as diagnostic markers for the diagnosis fibromyalgia. Tender Points - extremely sensitive points on the body, painful with compression

weighing four kilograms (enough to pale nail). According to the American College of Rheumatology (N. Smyth, M. Yunus, 1990), the FMS is based on two main criteria:

1. The presence of a symmetric generalized pain (extending to the right and left, upper and lower half of the trunk or axial), which lasts for at least the last 3 months.

2. Prevalence by palpation of at least 11 out of 18 (9 pairs) specific sensitive points.

These tender places occur symmetrically on both sides of the body:

- at the base of the skull beside the spinal column;
- at the base of the neck in the back;
- on the top of the shoulder toward the back;
- on the breastbone;
- on the outer edge of the forearm about 2 cm below the elbow;
- over the shoulder blade;
- at the top of the hip;
- on the outside of the hip; and
- on the fat pad over the knee.

The main difference is that the tender points are localized, and trigger points can be found by palpation, which cause reflected pain. Fibromyalgia tender point pain may vary depending on time of day, weather, physical activity, presence of stressful situations and often proves to be more intense after disturbed sleep [12].

In palpation of tender points the node is not determined by, as the trigger point palpation, and no signs of inflammation (redness, swelling, local rise in temperature). The tender points are painful, but when pressed, the pain increased without irradiation.

Recently conducted research on the specific correlation between the sensitive and active trigger points [15,16].

**Table № 1**

**Differential Diagnosis of myofascial pain syndrome (IBS) and fibromyalgia syndrome (FMS), [13,14]**

<b>Fibromyalgia Syndrome (FMS),</b>	<b>Myofascial pain syndrome (IBS)</b>
Sensitive points	trigger points
Have a specific pain	may be insensitive
Do not cause reflected pain	Cause reflected pain.
Do not cause reflected pain	Cause the reflected pain.
Always multiple	May be single
Have symmetric localization	May occur in any group of muscles

### **Trigger Point Inactivation**

Trigger point is inactivated only later effect of local twitch response (LTR, LTRs, the local response of spasm), which is caused by either injection or needling strong palpation finger tense muscles or MTrP, which leads to a brief rupture of motor action potentials, which are available only on constricted fibers. Clinically, there is a slight increase of muscle spasm, after which it decreases [17].

### **Puncture treatment of the trigger points**

Dry needling (MTrP, TRP-DN) of trigger points, also called intramuscular stimulation (IMS), is an invasive procedure in which a needle (often acupuncture) is introduced in the skin or muscles

[18]. TRP-DN - a relatively new technique used in combination with other methods of physical therapy. Local injections are used in different ways for decades. The publications are known from early 1940's [19-21]. Today in the United States Dry Needling the trigger points in the protocols approved by the physiotherapy [22]. There are many parallels between the TRP-DN and acupuncture.

### **Superficial and Deep Dry Needling**

*Superficial dry needling (SDN)* - the introduction of a needle into the surface tissue to a depth of 5-10 mm directly above the palpable MTrP.

In the early 1980 Baldry [23], concerned about the risk of pneumothorax in patients with MTrP in the anterior scalenus muscle.

Instead of using TRP-DDN, he introduced the needle into the superficial tissue, just above the MTrP. After the withdrawal of the needle in a short time, the pain quickly and easily passed. Based on this experience, Baldry popularized the practice of SDN and to inactivate MTrPs in different parts of the body with good empirical results, even in the treatment MTrPs of deeper muscles. He recommended the introduction of an acupuncture needle into the tissue covering every MTrP to a depth of 5-10 mm for 30 seconds.

*Deep dry Needling (DDN)* - is the introduction of a needle directly into deep MTrP, called Local Twitch Response (LTR) and soreness in the course of irradiation, requires manipulation of a needle, a painful procedure, occur after the puncture modest pain. Used in cases of compression of nerve roots by deep muscle spasm.

DDN has been used for centuries, but the first researcher, who became a strong supporter of its use in modern times was a Czech doctor Karel Lewit. In his classic work, published in 1979 [24], he described the results of treatment of myofascial pain in 241 patients by introducing a needle into the zone of maximum sensitivity, trigger zone, and the pain point (as he termed it), or that of its description, will now called MTrPs. He acknowledged a deep, dry iglokualyvanie this kind leads to considerable pain, but said that its effectiveness depends on the intensity of pain when the needle to a point, and this in turn depends on the accuracy of verification of the trigger point for the puncture.

Chan Gunn [25] thoroughly investigated and popularized the analgesic effect of this type of treatment for myofascial pain syndromes. He called this technique intramuscular stimulation. Deep dry needling is the best way to inactivate the trigger points. The action of the needle with DDN - induction effect of local twitch response. The disadvantages are its low provability and possible complications of the inaccuracy of.

### **Injecting treatment**

Injections of local anesthetics is not achieved a better effect than the introduction of normal saline [26].

In a comparative study, dry iglokualyvanie was just as effective as injections of local anesthetics like procaine (Novocain), or lidocaine (Xylocaine). Dry needling and the introduction of 0.5% lidocaine were equally effective in relieving myofascial pain. Posleineksionnaya pain develops more often after using the technique of dry needling.

When comparing injection therapy with MTrP TrPDN, many authors believe that the dry iglokualyvanie MTrP provides greater pain relief than injection of lidocaine, but a matter of great posleineksionnyu pain. "Typically, these authors refer to the study of Hong [27], who compared the effectiveness of injections lidocaine with TrP-DN, but this author injection of lidocaine and TrP-DN performed using conventional needles from a syringe, rather than acupuncture needles.

Recently Kamanli et al. [28] updated Hong study in 1994, comparing the results of lidocaine injections, injections of botulinum toxin and TRP-DN. In this study, the researchers also used syringe needles, and they did not take into account the effect of LTRs. In clinical practice, TRP-DN, as a rule, performed acupuncture needle. There is no scientific studies that

compare TRP-DN with the use of acupuncture needles with injection treatment MTrP. Based on published scientific studies, the assumption that TrP-DN would cause great pain postleinektionu compared with injections of lidocaine can not be objective, since the latter would not have arisen if acupuncture (fine) needles are used. Studies were conducted to determine the optimum diameter of the needle. It is believed that the use of needle-thick 21-23-gauge - the most effective for preserving the quality of life [29]. Itoh et al. came to the conclusion that the DDN can be more effective in the treatment of low back pain in elderly patients than standard acupuncture (acupuncture) or SDN [30]. Cummings and White concluded: "the nature of the injectable substance is irrelevant to the outcome of treatment, and injections (wet needling) has no therapeutic advantages over dry needling [18].

### **Visualization of the trigger point**

In 2007, with the help of magnetic resonance elastografi were recorded zone of reduced flexibility in the location of the trigger points. This is the only publication of the evidence sample visualization of trigger points. [31]. Minimally invasive manipulation of ultrasound become lately in the conservative orthopedics different parts of the body more important [32]. Ultrasound navigation in minimally invasive interventional orthopedics gives significantly better effects than blind needle insertion based on anatomical landmarks only [33]. There is a pioneer study of attempts to render the trigger points with ultrasound and with the subsequent precise needle insertion under ultrasound navigation [34]. This would avoid complications (damage to blood vessels, nerves, esophagus, etc.) and improve the effectiveness of manipulation. However, before that it **was not published sonograms of trigger points.**

### **Comparison with acupuncture**

**Dry Needling is not acupuncture.** Acupuncture is based on restoring the flow of energy ("chi") along the meridians in the body. During TrPDN no direct intent to influence the energy meridians. TrPDN based on modern Western scientific principles and knowledge of anatomy and physiology. Although R. Melzack et al. [35,36] found that 71% of cases the localization of trigger and acupuncture points (AT) is the same. Most recently, Dorsher [37] compared the anatomic and clinical relationship between the 255 MTrPs described by Travell and Simons, and 386 acupuncture points described in the Shanghai College of Traditional Medicine and other publications on acupuncture. He believes that 92% of the 255 trigger point correspond acupuncture points and are equal in 79.5% due to the clinical indications in pain syndromes [38] [38]. Dorsher came to the conclusion that there is considerable overlap between MTrPs and acupuncture points, and claimed that "a high degree of consistency between the treatment of trigger points and acupuncture should contribute to strengthening the integration of acupuncture into contemporary clinical management of pain." Although these studies prove the feasibility of treatment of TrP-DN as a form of acupuncture, both studies suggest that there are different anatomical localization MTrPs at a time when acupuncture points are anatomical specificity.

### **Clinical case.**

Complaints of pain in the right half of the lower jaw, right ear, numbness of the upper teeth. According to the three-dimensional computer reconstruction of CT TMJ head is shifted forward. Dentition shifted posteriorly.

The deep dry needling performed under ultrasound guidance:

### **The main trigger points**

- m. pterygoideus lateralis (upper portion) on the right
- m. pterygoideus medialis left

### **Additional trigger points**

- m. digastricus right
- m. deltoideus right
- m. levator scapulae right, left

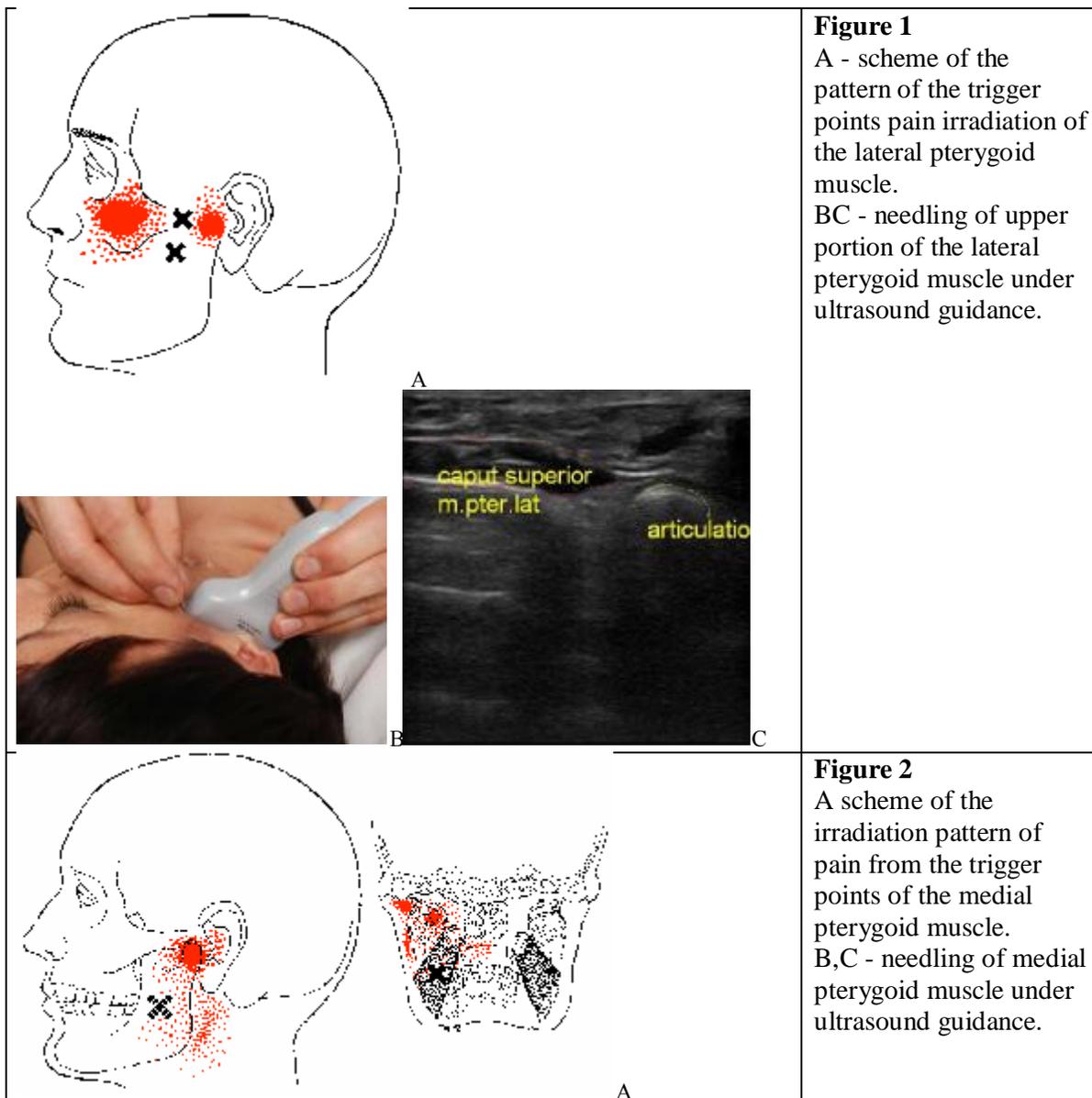
- m. temporalis right, left

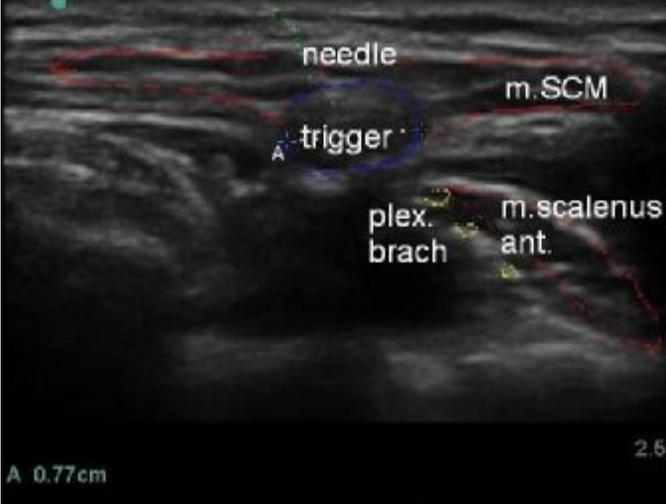
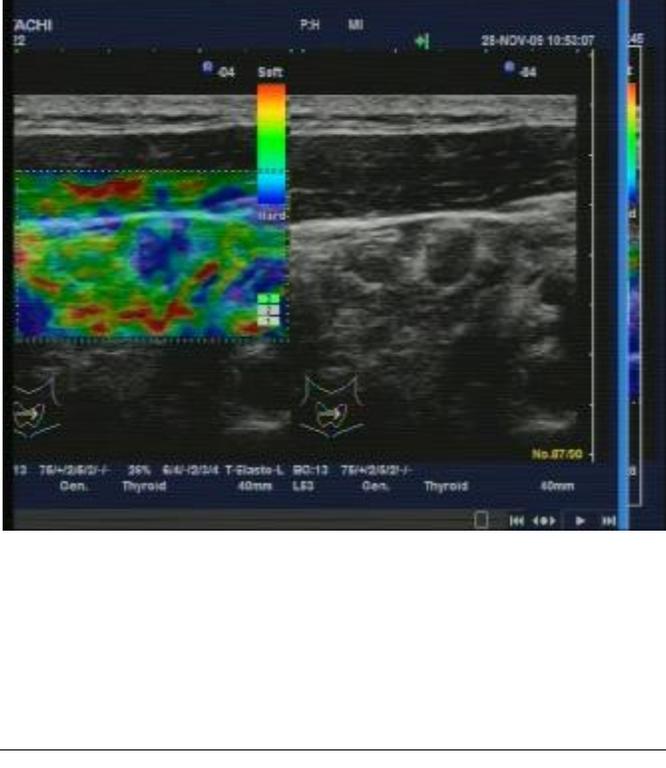
trigger point visualized and needled under ultrasound guidance:

- right m. masseter
- right m. sternocleidomastoideus
- right m. scalenus anterior

After treatment sessions myofascial release, manual manipulation (level C2-C3) were performed followed by orthopedic correction of occlusion when the muscles were relaxed.

The pain was eliminated, conducted an effective correction of occlusion, which had previously been impossible due to the spastic phenomena in muscles.



		
		<p><b>Figure 3</b>          Ultrasound visualization of the trigger points and the introduction of a needle under ultrasound guidance.</p>
		<p><b>Figure 4</b>          The trigger point in anterior scalene muscle. Sonoelastography application.</p> <p>During brachial plexus sonography</p> <p>In the projection of the lower third of m. scalenus ant. on the front surface is visualized hypoechoic area with a thin layer of fibrosis at the periphery size 7x6 mm, tightly surrounding tissue according sonoelastografy (corresponds to the trigger zone).</p>

## Conclusions

In study we first visualized trigger points, using ultrasonic testing to puncture therapy of head and neck muscles. For the first time used the additional ultrasonic methods for assessing the point – sonoelastography which application lets to identify areas of decreased elasticity in the muscle - the trigger point.

Using of the ultrasound imaging technique will significantly improve the accuracy of identification and specificity of verification of trigger points, as the causes of myofascial pain, as well as to the dynamic control of treatment effectiveness.

Inactivation of trigger points by the "dry" needling is a result of needles mechanical impact, so it can be successfully implemented without the use of local anesthetics and other materials.

The use of ultrasound examination can significantly improve the effectiveness and safety of the deep dry needling as an optimal method of inactivation of the trigger points. We believe the use of deep dry needling inadequate without ultrasound monitoring.

Puncture of some groups of muscles is impossible without ultrasound visual navigation.

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