

## Dry Needling and Osteoarthritis Knee

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**Received:** May 01, 2019; **Published:** May 24, 2019

**DOI:** 10.31080/ASOR.2019.02.0058

### Abstract

Osteoarthritis is the most common form of joint disease and its most common location is in knee [1]. Symptomatic knee OA occurs in 10% men and 13% in women aged 60 years or older [2]. Osteoarthritis is the leading cause of disability globally [3] and ranked among ten noncommunicable diseases for disability adjusted life years across world [4].

**Keywords:** Dry Needling; Knee; Osteoarthritis

### Introduction

Dry needling is a skilled intervention that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points, muscular, and connective tissues for the management of neuromusculoskeletal pain and movement impairments [5]. Physiotherapists use dry needling to stimulate neural, muscular and connective tissues [6]. Dry needling in various forms has been used in the physiotherapeutic treatment of osteoarthritis.

### Clinical features of osteoarthritis knee

The primary clinical feature of osteoarthritis is pain [7] Persistent knee pain, limited morning stiffness, and reduced function are the three symptoms that are recommended for the diagnosis of knee OA by the EULAR [8].

Tibiofemoral joint OA is characterised by joint effusion, osteophytes, diminished flexion range, mediolateral instability and varus deformity. On the other hand in patellofemoral osteoarthritis, valgus deformity, grossly reduced quadriceps strength, pain on patellofemoral joint compression difficulty descending stairs and coarse crepitus is seen with a history of marked swelling [9]. Malalignment, like genu valgus or varus can be seen in advanced cases [10].

Muscle impairment is another well known clinical feature of knee osteoarthritis. Quadriceps, hamstrings and hip musculatures are most commonly involved [11]. This inability to completely activate a muscle secondary to joint dysfunction is known as arthrogenic muscle inhibition [12].

There has also been findings of altered hamstring quadriceps muscle balance in OA knee, with increased activation of hamstrings compared to the normal population [13].

Myofascial trigger point is prevalent in knee osteoarthritis especially in quadriceps, vastus medialis and lateralis are the usual areas [14].

Together all these factors contribute to reduction in the functional capacity and impaired activities of daily living.

### Dry needling in osteoarthritis

The effects of trigger point dry needling in the treatment of knee osteoarthritis has been well documented [15,16].

Dry needling has been found to be superior to acupuncture and sham acupuncture [17]. Needling by physiotherapists have been found as a cost effective use of health care resources [18].

Percutaneous electrical nerve stimulation is a more recent form of dry needling used by the physiotherapists. PENS has been associated with no morbidity, good pain relief, and increased function in patients with knee osteoarthritis [19]. A randomised sham controlled trial found PENS to be significantly better in reducing pain and stiffness and in improving function [20].

### Dry needling: Schools and types

Dry needling has been developed in various geographical locations and therefore there are various schools of needling [21].

Initial use of dry needling almost exclusively targeted myofascial trigger point (Trigger point dry needling). One of the pioneer of deep dry needling (needling into the trigger point) was Czech physician Karel Lewit in 1979. Peter Baldry started another type of dry needling called superficial dry needling. In the early 1980 [22]. Dr Yun Tao Ma, in his book biomedical acupuncture talks about primary and secondary reflex points [23]. The spinal segment sensitization technique of Chan Gunn stresses on needling the small spinal musculatures for peripheral conditions. Percutaneous electrical nerve stimulation is yet another variation of needling which incorporates TENS with needling.

**Proposed mechanism of action of dry needling in osteoarthritis knee**

**Neurophysiological Effects: Effects on central sensitization**

The most likely mechanism of pain relief through needle stimulation is hyper stimulation analgesia [24]. Needling around knee is purported to release a number of neurotransmitters including endorphins, serotonin and cortisol.

**Segmental inhibition/Gate control**

When a needle is rapidly thrust into the soft tissue around knee, the sensory response evoked leads to a large diameter sensory afferent proprioceptive input into the spinal cord. This could have a “gate-controlling” effect of blocking the intra-dorsal horn passage of noxious information generated in the nociceptors [25].

**Release of endogenous opioids**

Pain following the insertion of the needle around knee releases opioids which is mediated through the PAG in the brainstem [26].

**Effect on the release of neurotransmitters: Serotonin and noradrenaline**

Stimulation of A $\delta$  nerve fibers may also activate the serotonergic and noradrenergic descending inhibitory system [26].

**Conditioned pain modulation (CPM)**

Patients with chronic knee pain have impaired CPM. Depressed CPM will lead to a reduction of endogenous pain inhibition and can contribute to a chronic pain state [27]. Several reviews have hypothesized that needling may affect CPM positively and can produce a reduction in chronic pain.

**Effects on peripheral sensitization**

The concentrations of SP and CGRP are found to be higher in the vicinity of active myofascial trigger points compared to latent

ones or normal muscle tissue. After Dry Needling of trigger points such as those present in quadriceps in osteoarthritis knee, SP and CGRP concentrations reduce significantly compared to their pre-DN values [27].

**Effects on the taut band**

DN to a trigger point region could effectively suppress spontaneous electrical activity which is a hallmark of trigger point. The process also produces a local twitch response, which normalizes the chemical environment [28].

**Percutaneous electrical nerve stimulation (PENS)**

PENS is a relatively newer modality used almost exclusively for pain relief and it has shown a lot of potential in reducing osteoarthritis pain. Studies have shown PENS provide significantly better and lasting analgesia with minimal side effects [29].

It is a combination of Dry needling and TENS. There are two primary pain relief mechanisms which can be stimulated: the Pain gate mechanism and the Endogenous Opioid System. Pain relief by means of the pain gate mechanism involves activation (excitation) of the A beta (A $\beta$ ) sensory fibers, and, reduces the transmission of the noxious stimulus from the ‘C’ fibers, through the spinal cord and hence on to the higher centers. The A $\beta$  fibers appear to appreciate being stimulated at a relatively high rate (in the order of 90 - 130 Hz or pps). Clinically it is important to enable the patient to find their optimal treatment frequency – which will almost certainly vary between individuals [30].

An alternative approach is to stimulate the A delta (A $\delta$ ) fibers which respond preferentially to much lower rate of stimulation (in the order of 2 - 5 Hz), which will activate the opioid mechanisms, and provide pain relief by causing the release of an endogenous opiate (enkephalin) in the spinal cord which will reduce the activation of the noxious sensory pathways [5].

The released opioids may generate their analgesic action at peripheral, spinal and supraspinal sites. However, other neurochemicals like GABA have been implicated in TENS analgesia [31].

**Conclusion**

Osteoarthritis is a widely prevalent degenerative condition which produces considerable morbidity. Dry needling in various forms has been administered in the management of osteoarthritis. While the exact mechanism of action is hard to predict it appears dry needling has reasonable usefulness in the treatment of osteoarthritis knee.

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**Volume 2 Issue 6 June 2019**

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