Effect of dry needling on submaximal strength and pain in patients with active myofascial trigger points in the rectus femoris: A case series

María Pilar López Royo1, Carolina Jiménez Sánchez1

1 Grupo de Investigación iPhysio, Facultad de Ciencias de la Salud, Universidad San Jorge, Villanueva de Gállego, Zaragoza, Spain

Address for correspondence María Pilar López Royo, MSc, Facultad de Ciencias de la Salud, Universidad San Jorge, Autovía A23, km 299, 50830, Villanueva de Gállego, Zaragoza, España (e-mail: mlopez@usj.es).

Introduction

A myofascial trigger point (MTrP) is a hyperirritable area of a skeletal muscle, of nodular appearance on palpation and located in a taut band. One of the techniques for the treatment of MTrP is dry needling (DN). The aim of the present work was to determine whether treatment with DN is effective in terms of pain relief and improvement of muscle weakness. For this purpose, differences in the Visual Analog Scale (VAS) and the Brzycki Test were observed before and after treatment of an active MTrP of the rectus femoris. In total, 5 patients received the treatment, of which 80% showed an improvement in pain and an increase in submaximal strength. Although it is not possible to establish a causal relationship, the results appear consistent with our hypothesis that DN is able to generally improve the symptoms of pain and weakness that appeared in patients.

Abstract

A myofascial trigger point (MTrP) is a hyperirritable area of a skeletal muscle, of nodular appearance on palpation and located in a taut band. One of the techniques for the treatment of MTrP is dry needling (DN). The aim of the present work was to determine whether treatment with DN is effective in terms of pain relief and improvement of muscle weakness. For this purpose, differences in the Visual Analog Scale (VAS) and the Brzycki Test were observed before and after treatment of an active MTrP of the rectus femoris. In total, 5 patients received the treatment, of which 80% showed an improvement in pain and an increase in submaximal strength. Although it is not possible to establish a causal relationship, the results appear consistent with our hypothesis that DN is able to generally improve the symptoms of pain and weakness that appeared in patients.

Keywords

► myofascial trigger point
► dry needling
► femoral rectus

Received
November 7, 2019

Accepted
November 22, 2019

ISSN 2386-4591.

Copyright © by Thieme Revinter Publicações Ltda, Rio de Janeiro, Brazil

License terms
the aim of the present study was to evaluate the effect of DDN regarding pain and submaximal muscle strength of the rectus femoris in people with one or more active MTrPs in this muscle.

**Material and Methods**

**Design**

A prospective case series study was performed, in which the submaximal strength of the rectus femoris was quantified together with the subjective perception of pain before and after the performance of the DDN technique. The present study was performed following the Case Report (CARE) clinical practice guidelines.\(^8\)

**Population**

The sample was recruited from a sports center in Zaragoza, Spain. The subjects had to fulfil the following inclusion criteria: presenting an active MTrP in the rectus femoris with referred pain to the area of the patella, being physically active, and having signed the informed consent form. The present study excluded subjects who had previously visited a previous lesion in the muscle assessed, those who had undergone invasive physical therapy treatment during the three months prior to the study and/or regular pharmacological treatment during the previous month, and individuals with needle phobia.

**Procedure**

Initially, participants were explained the purpose of the study, and they were given a brief introduction on the physiology of MTrPs and the DDN technique. Two physical therapists were involved in the study. One physical therapist assessed the pain and submaximal strength values both pre- and post-treatment, whereas a second physical therapist was in charge of performing the intervention.

Prior to the assessment and intervention, a muscle warm-up was performed on a static bicycle during 10 minutes, with a minimum resistance of 1.

**Assessment**

To evaluate the submaximal strength of the rectus femoris, the Brzycki test was used, which is based on the number of repetitions lifting submaximal weight that one can perform before fatigue. Based on this information, the submaximal weight that a person can correctly move in one repetition is calculated using the following formula: 1 Repetition Maximum (1 RM) = total displaced load (Kg) / Brzycki index.

This test was performed on the quadriceps bench (Selection Quadriceps Extension, Technogym, Cesena, Forlì-Cesena, Italy) due to the associated ease to maintain the correct posture, avoiding compensations, as well as the possibility of performing a unilateral evaluation. The participants were asked to perform the test (maximum of 15 repetitions) with an estimated weight for each person until the resistance offered was impossible to bear. The total displaced weight was recorded, as well as the number of repetitions, to calculate the Brzycki index and the 1RM.

In addition, before and after the DDN was performed, the Visual Analog Scale (VAS) was used, and the participants were asked to quantify their pain from 0 to 10, with 0 meaning absence of pain, and 10, the maximum bearable pain. A change of two points on this scale is considered clinically significant.\(^9\)

**Intervention**

The patients were placed in supine position on the treatment table with a wedge below the lower limb to enable 30° of hip flexion, 30° of knee flexion and a slight external hip rotation of ~ 15°. The intervention consisted of one session of DDN on the active MTrP of the rectus femoris. This MTrP is commonly found between 10 cm and 15 cm below the anteroinferior iliac spine, presenting a pattern of referred pain toward the knee, the patella and around this area.\(^10\) The MTrPs were identified by palpation of the rectus femoris muscle, which was performed perpendicular to the muscle fibers. A physical therapist trained in locating MTrPs performed the physical exam. The DDN technique was applied using needles (Agu-punt, Barcelona, Catalonia, Spain) with a guide tube measuring 0.30 × 6 cm. The area was previously cleaned and disinfected using an antiseptic solution (70% propan-2-ol, Skin-des, Antiseptica, Pulheim, North Rhine-Westphalia, Germany). The technique used for the DDN was the fast-in and fast-out technique with multiple insertions, as described by Chou et al.\(^11\) which consists of the insertion of the needle quickly up and down, without rotating it, in the area of the MTrP to achieve as many LTRs as possible within the tolerance level of each patient.

**Results**

The sample comprised 2 men and 3 women, whose ages ranged between 21 and 42 years.

Regarding the assessment of submaximal strength of the rectus femoris, the results obtained are shown in - Table 1, with a mean of 35.70 kg. The final mean weight was 39.32 kg, with an increase of 3.62 kg. Up to 80% of the patients increased their submaximal strength compared with the first assessment. Only 1 subject, participant 4, did not obtain any improvement in the submaximal knee extension strength (→ Table 1).

The participants underwent a pain assessment based on the VAS before (6.2 points) and after (4.2 points) the application of the DDN technique. Up to 80% of the participants showed a reduction of 2.5 points on the VAS regarding pain after the

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Results for submaximal strength (in kilos)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td><strong>Preintervention</strong></td>
</tr>
<tr>
<td>1</td>
<td>35.23</td>
</tr>
<tr>
<td>2</td>
<td>26.67</td>
</tr>
<tr>
<td>3</td>
<td>33.88</td>
</tr>
<tr>
<td>4</td>
<td>46.68</td>
</tr>
<tr>
<td>5</td>
<td>36.00</td>
</tr>
</tbody>
</table>
Discussion

The aim of the present case series was to describe changes in the level of submaximal muscle strength and pain immediately after a session of DDN on the rectus femoris. The findings suggest that DDN may increase the submaximal strength in the short term after a single session. These findings contrast with a recent meta-analysis\(^1\) that concluded that a large number of the studies performed in the region of the thigh and knee do not show changes in muscle strength immediately after the application of DN. Further studies are required to clarify the specific effect of DDN on the improvement in muscle strength in the short, mid and long terms.

Our results indicate a beneficial effect regarding pain quantified using the VAS scale in 80% of the participants, considering that a change of 2 points on this scale is considered clinically significant.\(^9\) According to the available literature, the best technique for the total and immediate inactivation of MTrPs is the technique of rapid needle insertions, which has obtained satisfactory results for the elimination of pain immediately after application.\(^11\) In a case series\(^13\) on cubital tunnel syndrome, improvements were observed regarding the reduction of pain in the second DDN session compared with our study; therefore, DN is thought to act according to the gate control theory, supporting the liberation of endogenous opioids.

The present study has several limitations worth noting. One of the limitations concerns the size of the sample, as only participants who fulfilled the selection criteria during the recruitment period were included. Furthermore, the study lacked a control group. Another limitation is the number of DDN sessions, considering that, although we sought to evaluate possible changes in strength and pain after a single session, this may be insufficient for the deactivation of the MTrPs of the rectus femoris; therefore, the results obtained regarding submaximal muscle strength and pain could be largely modified with further DDN sessions. Moreover, by performing further sessions, we could have assessed the extent to which adding more sessions may offer additional improvements. Lastly, it is necessary to perform assessments in the mid and long term, to enable follow-up, as well as the use of an isokinetic dynamometry device to ensure a more controlled assessment and intervention.

Conclusion

Although it is not possible to establish a causal relationship, the results of the present case study showed that 80% of the participants treated with DDN of active MTrPs in the rectus femoris improved their submaximal muscle strength and pain. Future research is required with larger samples to verify the effect of DDN in patients with active MTrPs in the rectus femoris.

Conflict of Interests

The authors have no conflict of interests to declare.

References


Table 2 Results for the perceived level of pain on the Visual Analog Scale

<table>
<thead>
<tr>
<th>Participants</th>
<th>Preintervention</th>
<th>Postintervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>