

Immediate Effects of Dry Needling vs. Functional Dry Needling in Patients with Shortened Calf Muscles

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ABSTRACT

Background: Shortened muscle is a condition of physical shortening of the length of the muscle and is also accompanied by other soft tissues surrounding the muscle. In shortened calf muscles the muscles (gastrocnemius and soleus) of lower leg have reduction in their length resulting in pain, reduced range of motion of joint and somehow limiting the functional ability and capability of and individual. The use of dry needling as well as functional dry needling is thought to reduce pain and increase range of motion.

Objective: This study was aimed at finding the immediate effects of dry needling versus functional dry needling on pain and range of motion.

Methods: It was a quasi-experimental study conducted at Buch International Hospital, Multan & Ali Rehabilitation & pain relief center, Multan from February 01, 2023, to April 31, 2023. There were two groups in total. One group was provided with functional dry needling and the other with dry needling. Only single session was taken and measurements of Numeric Pain Rating Scale and range of motion with goniometry were recorded before and after the treatment. SPSS-27 was used to analyze the data.

Results: There were a total of 40 patients. 20 patients were assigned to functional dry needling group and 20 patients to dry needling group. The mean age of patients was 27.65 + 2.368 and 27.80 + 1.852 in functional dry needling and dry needling groups respectively. Pain severity in functional dry needling group reduced significantly compared to dry needling group at the end of the session (p-value=<0.01). Active range of motion and passive range of motion were found non-significant at the end of session (p-value=.089 and p-value=.146) respectively.

Conclusion: Both functional dry needling and dry needling reduces pain severity but functional dry needling resulted in reduction in pain severity more than dry needling whereas, both showed non-significant effects on range of motion.

Keywords: FDN; functional dry needling, DN; dry needling, AROM; active range of motion, PROM; passive range of motion.

INTRODUCTION

Shortened muscle is a condition of physical shortening of the length of the muscle and is also accompanied by other soft tissues surrounding the muscle. Shortened calf muscles is a condition in which the muscles (gastrocnemius and soleus) of lower leg have reduction in their length resulting in pain, reduced range of motion of joint and somehow limiting the functional ability and capability of and individual. Risk factors include muscles strain, certain injury/health condition

Huawn (2018) said that calf muscles in human are known as gastrocnemius. These muscles have two main heads i.e. medial and lateral. The gastrocnemius lies above the Soleus muscle. By working of both muscles together, they made the calf pump (Rogery, 2019, p.23).

Many sports like tennis, rugby, athletics, and football along with certain dancing practices are influenced by calf muscles injuries or strain. Considering football game, the muscular injuries are approximately 92%. Out of these 92% injuries, muscular injuries are 13% (Hawn & Opal, 2014, p.76).

The major causes of shortened calf muscles are;

- An Overuse: a sudden increase in activity or start an activity.
- An Underuse: In sufficient moving or walking less.
- Atrophy (Muscle wasting): Less movement but most common in older people.
- Muscle Tears: Would be muscle tight, acute, and painful.
- Sciatica/Nerve-tension: Nerve pain travels down to leg and thighs.
- Foot Wear: The regular change of footwear is a challenge for calf muscles. A common change of footwear like high heels and sandals causes muscle problems.

The dry needling is an appropriate treatment technique to cure the trigger-points present in the injured tissues and tight calf muscles. It comprises an inserting of dry needles into the tight

points of calf muscles as this is opposed to a body part or a whole region just like acupuncture. Such dry needles used for muscle treatment must be very thin and sterile (Hook, 2017, p.530).

Dry needling used for the acupuncture practice without injective. Typically, dry needling treatment technique is used to cure subcutaneous fascia, tendons, muscles, scar tissues, neurovascular bundles, and peripheral nerves for maintain the different kind of neuromusculoskeletal pain syndromes (Han, 2017, p.213).

The broad base related to international literature available on technique that essentially concerned with State-Boards Physical Therapy, primary US based, and National Physical-Therapy Association have narrowed this definition. According to them, dry needling is an intramuscular procedure. Therefore, it involves the needling insertion into nodules present in muscle taut bands commonly known as the 'Myofascial Trigger-Points' (MTrPs) or simple 'Trigger-Points' (TrPs). These professional organizations provide dry needling procedure with respect to 'Trigger-Points dry needling' (TDN) or referred as 'Intra-muscular Manual Therapy' (IMT) in physical therapy (Shawn, 2018, p.49).

Functional Dry Needling or also known as FDN is a treatment technique used by physical therapists. This technique is used to cure and manage of pain in neuro-musculoskeletal, movement impairments, and trigger points. Zuberan (2012) discussed that FDN treatment technique involves a thin filiform needle, a person without injection or medication has inserted into the skin or affected muscle areas. FDNs used for deactivating or releasing of trigger points to improve motion or reduce pain (Kuhan, 2017, p.570).

The trigger point is a 'taut-band' derived from the skeletal muscles that are located in an area of large muscle group. These trigger points tend to cause pain on local points; however, they also produce pain within surrounding tissues. Drex (2018) found that TrPs associated with each surrounding musculoskeletal in

every pain condition. They involve but not limited to joint dysfunctions, craniomandibular dysfunction, radiculopathies, tendonitis, pelvic pain, regional pain syndrome, disc pathologies, spinal dysfunction, post herpetic neuralgia, and urologic disorders (Rohew, 2019, p.711).

METHODS

It was a quasi-experimental study conducted at Buch International Hospital, Multan & Ali Rehabilitation & pain relief center, Multan after approval. 44 patients were enrolled in this study. 40 of which participated in the study. Each group was assigned 20 patients. All patients were informed about the treatment protocol and informed consent was received. Consent form was signed by the patients. Screening if individual was done by gross physical examination and inclusion and exclusion criteria was followed. Age group from 18 years to 30 years was followed (Druke & Shelly, 2015). Patients showing positive for the special tests (Silverskoid test) and tools (NPRS) numeric pain rating scale of score 3 or more, having shortened calf muscles symptoms for more than 3 months and having active trigger points in calf muscles were included. Patients refusing to participate in study, showing negative for the special tests, tools and with co-morbidities/other pathologies were excluded. Explanation of whole procedure was given to patient/client as it is an invasive procedure.

The study duration was from February 01, 2023, to April 31, 2023. Initial session included thermotherapy in the form of moist heat via heating pad was applied first for the preparation of muscles for specific procedure for both groups. Sterile dry needles of size 25mm-30mm were used for the procedure.

Trigger points were targeted for shortened calf muscles for dry needling (DN), while frequencies of 5.0Hz with wave length of 300µS width for 20 minutes were used for functional dry needling (FDN). After the intervention effects were noted with tools and questionnaires, as immediate effects are being noted so no follow up required. Group A (n=20) of 20 patients were given treatment by using functional dry needling, while Group B (n=20) were given treatment by dry needling.

Only one session was given to note the immediate effects of both techniques. Patients were evaluated before session and after session. The outcome measures used were Numeric Pain Rating Scale (NPRS), Active Range of Motion (AROM) by goniometry and Passive Range of Motion (PROM) by goniometry before and after the session. SPSS-27 was used to analyze the data. The treatment effects of both techniques were compared using independent sample t-test. A p-value of less than 0.05 was considered significant.

RESULTS

Forty-four patients were assessed for eligibility. 4 patients declined to participate in the study. 20 patients were assigned to group receiving functional dry needling and (FDN) 20 patients were assigned to group receiving dry needling (DN). In total, data 40 patients were analyzed (20 patients in group receiving FDN and 20 patients in group receiving DN).

The baseline characteristics of patients taking part in this study are provided in Table 1.

Table 1: Baseline Demographic features of study participants

Characteristics	Group A* (n=20)	Group B* (n=20)
Age (Mean + SD)	27.65+2.368	27.80+1.852
Gender		
Male	13 (65)	14(70.0)
Female	7 (35)	6(30.0)
Leg involved		
Right	7(35.0)	7(35.0)
Left	6(30.0)	8(40.0)
Both	7(35.0)	5(25.0)

*Group A: Treated with Functional Dry Needling
*Group B: Treated with Dry Needling

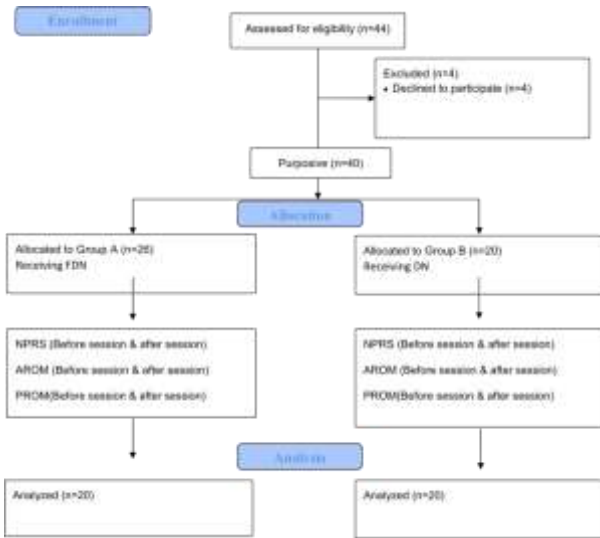


Figure 1: CONSORT flow diagram

Comparison between pain score by numeric pain rating scale data before and after sessions between two groups has been provided in the Table 2. There was a statistically significant difference between two groups at the end of session. (P-value=<0.001). Pain was reduced more in group treated with functional dry needling (2.45 + .686) as compared to group treated with dry needling (3.30 + .733).

Table 2: Comparison of Numeric Pain Rating Scale (NPRS) score between two group

	Group A* (n=20) (Mean + SD)	Group B* (n=20) (Mean + SD)	p-value
Before Session	6.55 + .887	6.60 + .883	<0.01
After Session	2.45 + .686	3.30 + .733	

*Group A: Treated with Functional Dry Needling
*Group B: Treated with Dry Needling

Comparison between pain score by active range of motion data before and after session between two groups has been provided in the Table 3. There was a statistically non-significant difference between two groups at the end of session. (P-value = .089).

Table 3: Comparison of Active Range of Motion (AROM) score between two group

	Group A* (n=20) (Mean + SD)	Group B* (n=20) (Mean + SD)	p-value
Before Session	17.10 + 1.651	17.60 + 1.231	.089
After Session	18.95 + .887	18.40 + 1.095	

*Group A: Treated with Functional Dry Needling
*Group B: Treated with Dry Needling

Comparison between pain score by passive range of motion data before and after session between two groups has been provided in the Table 4. There was a statistically non-significant difference between two groups at the end of session. (P-value = .146).

Table 4: Comparison of Passive Range of Motion (PROM) score between two group

	Group A* (n=20) (Mean + SD)	Group B* (n=20) (Mean + SD)	p-value
Before Session	17.60 + 1.353	17.65 + 1.226	.146
After Session	19.25 + .716	18.80 + 1.152	

*Group A: Treated with Functional Dry Needling
*Group B: Treated with Dry Needling

DISCUSSION

Our study found that functional dry needling and dry needling technique on shortened calf muscle resulted in significant decrease in pain whereas functional dry needling reduced severity

of pain more than dry needling. Both techniques showed non-significant effects on range of motion.

Studies (Cothem, 2020, p.290) showed that dry needling reduces the muscle pain and increases the threshold pressure pain as compare to other treatments. In our study pain was reduced and it was found pain severity reduced more in group treated with functional dry needling as compared to dry needling. In our study we tried to show a comparison between these two dry needling techniques. Our study did not have long follow-up sessions and showed immediate effects of techniques in as single session by measuring before and after treatment results.

Our study was reported according to the guidelines mentioned in CONSORT statement.(45) The study duration of immediate effects in a single session which is shorter than the previous studies published is strength of this study. However, this study also had few limitations. First, it did not include the random sampling of patients which may have some impact on the results. Second, the sample size was small and it would be difficult to generalize the results on a larger population. This study also had less number of females (32.5%) and majority was males. Future researches should focus on large sample size, with randomization of patients and inclusion of equal or nearly equal number of male and female patients.

CONCLUSION

Both functional dry needling and dry needling reduces pain severity but functional dry needling resulted in reduction in pain severity more than dry needling whereas, both showed non-significant effects on range of motion.

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