



Research Article

IMMEDIATE EFFECT OF DRY NEEDLING IN GASTROCNEMIUS-SOLEUS MUSCLE ON PAIN AND FLEXIBILITY: PRE-POST EXPERIMENTAL STUDY

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ABSTRACT

Police constables are more prone to musculoskeletal problems which lead to reduced work efficiency because of their work demands. Lower limb pain, tightness and fatigue are major issues of physical health for police constables who require long standing period. Therefore, immediate effect of dry needling was done in police constables with gastrocnemius-soleus muscle pain. 58 subjects were included based on inclusion and exclusion criteria. Visual analogue scale, pressure pain threshold and calf stretch test was used as an outcome measures. Analysis was done by dependent t test and Wilcoxon matched pair test. VAS, pressure pain threshold and calf stretch test showed significant effect post-treatment. Pain was reduced significantly on VAS than pain pressure threshold and flexibility of gastrocnemius-soleus muscle. Study concluded that dry needling is effective in police constables with gastrocnemius-soleus muscle to reduce pain and increase flexibility.

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INTRODUCTION

Police officers belong to a category of workers who are exposed to physically challenging stressful conditions with a heavy workload. Depression, stress and musculoskeletal disorders are common causes of their workplace conditions. Lower limbs and back are the common regions for musculoskeletal disorders in police constables¹. Long period of standing position may lead to discomfort and muscle fatigue causing decrease work performance and efficiency. Static contraction occurs particularly in back and legs in prolonged standing, thus resulting in diminished function of calf muscles². Prevalence of gastrocnemius-soleus muscle pain was about 26.1% and 72.8% for more than 1 year in Korean police constables³.

According to Janda's approach muscle tightness causes functional imbalance. Muscle tightness leads dominating movement pattern and inhibits the action of antagonists which causes poor posture, overuse of shortened muscles and weakness. Overactivity of shortened muscles leads to formation of myofascial trigger points⁴. Trigger points have detrimental effects on people's social and work related activities with a significant impact on quality of life, causing pain and functional disability⁵.

Simons *et al* proposed that the presence of myofascial trigger points (MTrPs) might be the cause of soft tissue muscular pain⁵.

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A myofascial trigger point is defined as a "hyperirritable" spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band which has characteristic referred pain, tenderness at spot, motor dysfunction, and autonomic phenomena⁶. Previous studies indicated that 30-85% musculoskeletal pain is occurred due to trigger points⁷.

Numerous non-invasive methods like stretching, ischemic compression, laser therapy, acupuncture, ultrasound and pharmacological treatments have been used to reduce the decrease musculoskeletal pain. But no treatment was found to be solely effective in management of pain. Another way to treat the muscular pain can be minimally invasive acupuncture technique 'Dry needling' which can be defined as "skilled intervention using a thin needle to penetrate the skin that stimulates trigger points, muscle and connective tissue for the management of musculoskeletal pain disorders⁷. Dry needling provides a mechanical localized stretch to the shortened sarcomeres and contracted cytoskeletal structures within the trigger points which allows sarcomeres to resume its resting length by reducing the degree of overlap between actin and myosin filaments⁸.

Muscle tightness and pain are common symptoms in lower leg in police constables because of their working conditions⁴. Visual Analogue Scale is the most reliable and valid method used to check the pain intensity, in which 10cm horizontal line is drawn indicating 0 means 'no pain and 10 means 'maximum pain'⁹.

Pressure pain threshold (PPT) is defined as the minimal amount of pressure that produces pain. A simple handheld pressure algometer (PA) with a spring is commonly used,

although more sophisticated electrical devices with a strain or pneumatic pressure gauge have been developed. Pressure of 10N/s id used to check the pain threshold at myofascial trigger points¹⁰.

Calf stretch test is also called as ‘knee to wall test’ which uses measurement tape as a tool. Subject is asked to stand near the wall and touch the knee of leg front without raising heel of behind leg from the ground and measurement is taken.

There can be paucity in literature of gastrocnemius-soleus muscle pain and flexibility in police constables which is one of the most common musculoskeletal disorders in police constables. Studies on Korean and Iran police constables states the gastrocnemius-soleus muscle pain is common musculoskeletal disorder in police constables. There is paucity of less literature on Indian population. Therefore, this study is intended to evaluate immediate effect of dry needling on gastrocnemius-soleus muscle pain and flexibility in police constables.

MATERIALS AND METHOD

Pre-post experimental study design was conducted on 58 police constables through non-probability design for a period of 6 months. Both male and female police constables willing to take part in study of age 30-45 years from various police stations and training centers, belgavi were included for the study. Subjects with needle phobia, diagnosed with peripheral vascular diseases, having acute infection, ulcers and fever and allergic to metals were excluded from the study.

Outcome Measures

Visual Analogue Scale

It is the horizontal 10 cm line with word anchors at the extremes, such as ‘no pain’ on one end and ‘worst pain’ that patient can imagine on the other end. According to the pain intensity subject mark on the line. Reliability of this scale is: ICC= 0.71-0.94.

Pain Pressure Threshold

Pressure pain threshold (PPT) is defined as the minimal amount of pressure that produces pain. A simple handheld pressure algometer (PA) with a spring is commonly used. The PA is placed perpendicular to the tissue surface and pressure applied steadily at a constant rate. Ideally compression should be performed slowly enough to allow the subject time to react when pain is felt. The most commonly used surface area of probes is 0.5 or 1 cm². Reliability: ICC= 0.43 to 0.94.

Calf Stretch Test

Subjects are asked to stand near wall with distance. Tested leg should be behind and another leg in front. Ask the subject to touch the wall with front knee and measure the distance between behind leg and wall. After the intervention same procedure will be performed and distance will be measured.

Procedure

Ethical clearance was obtained from the institutional Ethical Committee (IEC). The study protocol was explained to the subjects in their vernacular language. Participants were included according to inclusion and exclusion criteria. Subjects were recruited from various police stations and training centres in belgavi. Demographic details of each subject were recorded.

Pre and post treatment measurements were obtained for pain using visual analogue scale, pressure pain threshold using pressure algometer and flexibility by calf stretch test in gastrocnemius-soleus muscle.

Dry needling as a treatment was given on gastrocnemius-soleus muscle trigger points. Subject was in prone lying position with area treated exposed and cleaned. Then identification of trigger point was done by palpation and needle size of 25mm were inserted in the direction of gripping fingers on trigger point by holding the gastrocnemius-soleus muscle. After 5-10 minutes needle were removed as it was inserted and immediately after treatment outcome measures for pain and flexibility were obtained.

RESULT

The present study was carried out to evaluate the immediate effect of dry needling on gastrocnemius-soleus muscle pain and flexibility in police constables. Total 58 police constables were included in study where more number of males was present than females with homogeneity of mean age in baseline (figure 1)(Table1). Statistical analysis was done using SPSS 21 software. Table 2 shows the significant difference between pre-treatment and post-treatment values of VAS. Table 3 shows no significant difference between pre-treatment and post-treatment values of PPT. Table 4 shows the significant difference in pre-treatment and post-treatment values of calf stretch test.

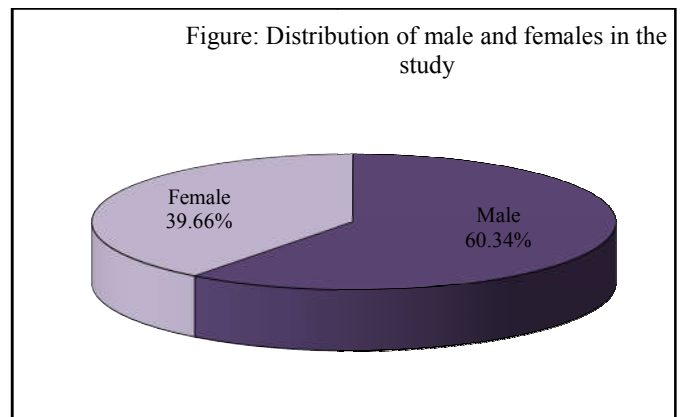


Figure 1 Distribution of male and females in the study.

Table 1 Distribution of male and females with mean and SD

Gender	Number	%	Mean	SD
Male	35	60.34	38.03	5.12
Female	23	39.66	38.04	5.07
Total	58	100.00	38.03	5.05

Table 2 Comparison of VAS pre and post treatment.

	Mean	SD	% of change	P-value
Pre-test	5.97	2.01		
Post-test	2.93	1.77	50.81	0.0001*

*p < 0.05

Table 3 Comparison of Pain pressure threshold (Kg/cm²) pre and post treatment.

	Mean	SD	% of change	P-value
Pretest	2.07	0.72		
Posttest	2.09	0.72	-1.00	0.7927

*p < 0.05

Table 4 Comparison of Calf stretch test (cm) pre and post treatment.

	Mean	SD	% of change	P-value
Pretest	26.11	3.71		
Posttest	26.51	3.59	-1.52	0.0001*

*p < 0.05

DISCUSSION

The study was conducted on immediate effect of dry needling on a sample size of 58 police constables, from various police stations and training centers in Belgavi. Objective of the study is to evaluate immediate effects of dry needling on gastrocnemius-soleus muscle pain and flexibility in police constable. Study done by ana paula nassif tondato da trindade *et al* on musculoskeletal disorder symptoms in police officers in 2015. 198 subjects (75%) reported musculoskeletal disorder symptoms over the past 12 months and 135 (51.5%) of them reported the same symptoms over the last seven days suggests that the importance of periodic evaluation and there is need to implement strategies to promote health and to improve working conditions in order to minimize the prevalence of musculoskeletal disorder symptoms¹. Another study was done to evaluate the causes of musculoskeletal injuries in police constables in 2012 concluded the physical condition of officers has direct major influence on musculoskeletal injuries⁹.

Prolonged standing during working hours and inefficient rest period causes the fatigue and overload on the lower extremity muscles commonly gastrocnemius-soleus muscle. Overactivity of gastrocnemius-soleus muscle in police constables goes into tightness and thus pain, reduced flexibility, decreased efficiency of muscles to work and formation of trigger points. Back pain, heel pain can be the causes of chronic pain in calf.

Effectiveness of trigger point dry needling for plantar heel pain was studied using outcome measure VAS for pain intensity. Significant decrease in pain intensity was seen at baseline, 2 weeks, 4 weeks, 6 weeks and 3 months. Which suggest that dry needling has long term effect on pain. Follow up studies can be done in future to evaluate long term effects of dry needling after single session.

Maryam ziaefar *et al* studied clinical effectiveness of dry needling immediately after application on myofascial trigger point in upper trapezius muscle¹⁰. Pressure pain threshold were measured and in line with our study they also found no significant difference immediately after dry needling. Muscle soreness can be the reason of higher or no change in the pressure pain threshold.

L Huguenin *et al* studied effect of dry needling on gluteal muscles on straight leg raise¹¹. No significant difference was seen in straight leg raise but subjective improvement in activity related muscle pain and tightness were seen. Our study effect of dry needling on flexibility of gastrocnemius-soleus muscle showed significant effect.

Present study concluded that dry needling is effective in reducing pain intensity and increase flexibility of muscles. Immediate effect of dry needling was seen more to reduce pain intensity in gastrocnemius-soleus muscle. Flexibility was increased immediately after dry needling but long term studies can be done in future to see the effects.

Limitations of this study can be the small sample size, absence of control group. Follow up can be taken in further studies.

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