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Effects of 6 session on dry needling and conventional physiotherapy in hemiplegic individuals: A pilot study

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Abstract---Myofacial trigger points and other pain syndromes can be treated with dry needling (DN), a therapeutic technique. There is still a dearth of evidence supporting the use of DN with functional assessment in neurological diseases. This pilot study investigated the effects of DN on hemiplegic patients' spasticity and static balance. 10 chronic stroke survivors (>3 months onset) were included in a single group pilot study. The Modified Tardieu scale and the Modified Ashworth scale (MAS) were used to measure spasticity. The Berg balance scale was used to evaluate balance (BBS). These stroke patients underwent conventional physiotherapy along with 6 DN sessions for spastic soleus muscle over the course of two weeks on alternate days. Results were evaluated before and after the six sessions. Pre- and post-analysis of the MAS, Modified Tardieu scale, and BBS are conducted using the Unpair t Test. All 3 outcome indicators experienced a substantial improvement (p 0.05). The resistance to passive movements from the plantar flexor muscles decreased, and MAS showed progress from Grade 3 to 1+. The Tardieu scale revealed a 12 degree improvement in ankle ranges. The Berg balance scale score climbed by 7 and stroke patients' balance dramatically improved. In light of the foregoing, it can be said that dry needling was successful in lowering spasticity, improve the range of motion, and accuracy of maintaining stability in stroke patients. Although the preliminary results are encouraging, additional research must be done to substantiate the results.

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Keywords---Berg balance scale, dry needling, modified ashworth scale, spasticity, stroke, modified tardieu scale.

Introduction

Stroke is a worldwide disease[1] and it is one of the most common causes of disability with respect to its impact on functional limitations[2]. Although spasticity continues to be a poorly understood concept,[3] recent studies have shown significant differences between stroke survivors with and without spasticity. Stroke survivors with spasticity often experience secondary limb deformities, physical disability, and pain that limits their ability to perform basic activities of daily living, such as self-care, and ambulation. Stroke survivors with spasticity also often suffer from psychological and emotional issues, such as depression and poor self-image. As a result, spasticity has been hypothesized to have a significant negative impact on the health-related quality of life (HRQoL) of stroke survivors.[4] One third of stroke patients eventually end up with lower limb spasticity.[5] Consequently, numerous stroke survivors with spasticity in the lower limbs complain of standing and difficulty in maintaining balance.[1] Gastrocnemius and soleus are the prime muscles in the lower limb with main role in standing.[6] The ankle plantar flexor muscles which play an important role in the gait cycle, demonstrate decreased force-generating ability in individuals with hemiparesis after stroke.[7] Due to spasticity, stroke patients tend to develop spasticity in ankle plantar flexors (i.e in the direction of gravity force). [1]

Different pharmacological and physical therapy treatments have been recommended in order to manage the spasticity in post stroke patients.[1] In recent years, therapeutic approaches aimed at reducing spasticity includes muscle stretching procedures, muscle strengthening exercises, physical agents treatment (shockwaves, ultrasound, functional electrical stimulation) and pain management could be combined with classical pharmacological interventions.[8] Current pharmacological treatment for patients with spasticity include botulinum toxin type A which acts by blocking the release of acetylcholine in the neuromuscular junction. However, this treatment is costly and can have negative long term effects on the muscle.[9] Non pharmacological treatments for spasticity include dry needling.[2, 9] Dry needling (DN) has been used by physical therapists for the management of spasticity. In this technique, there is no injection of substances into the body.[1]Dry needling has been defined by the American Physical Therapy Association as "a skilled intervention that uses a thin filliform needle to penetrate the skin for the management of neuromuscular impairements."[10] The dry needling for hypertonia and spasticity (DNHS) technique is a novel dry needling technique for decreasing hypertonia and spasticity and for the improvement of function in patients with damage to the central nervous system.

The mechanism of action of dry needling is based on a mechanical disruption of the associated dysfunctional endplate zone. Furthermore, dry needling has also shown to enhance the blood flow and oxygen saturation in the stimulated region.[2] Different dry needling techniques have been used for treating the patients with spasticity.[11] However, the changes of spasticity in the soleus muscle after DN have not been mentioned[1] and the published studies regarding the evidences for

application of dry needling in neurological conditions with functional assessment have not elaborated the possible effects of dry needling technique. This case series was conducted to explore the effects of DN on spastic soleus muscle in chronic stroke patients. Therefore, the main objectives of this study were to assess the effect of Dry Needling on spasticity and static balance by using Modified Ashworth scale (MAS), Modified Tardieu scale on spastic soleus muscle and Berg Balance scale (BBS) in stroke individuals. Therefore, the main objectives of this study were to assess the effect of Dry Needling on spasticity by using Modified Ashworth scale (MAS), Modified Tardieu scale and Balance By using Berg Balance scale (BBS) in stroke individuals.

Subjects and Methods

A case series research based on a single group was conducted (pre-post experimental design). Prior to the study, all subjects signed an informed consent form that was authorised by the institute's ethical committee. Chronic stroke patients who matched the inclusion requirements were enrolled. The following were the inclusion requirements: 1. First-ever unilateral stroke (at least 3–4 months after stroke onset), 2. Stroke-related hemiplegia, 3. Between the ages of 40 and 75, 5. Preserved cognitive function (MMSE grade > 24), presence of ankle plantar flexor spasticity (grades 1 to 3 on the Modified Ashworth Scale). 6. A Berg Balance Scale score between 21 and 56, which indicates a medium to low risk of falling; 7. Ambulatory, with or without an aid. Recurrent stroke, Botox treatment within the last six months, Aversion to needles, any categorical prohibition against dry needling, such as anticoagulants, infections, bleeding, or psychotic behaviour and any other neurological condition were the exclusion criteria.

Intervention

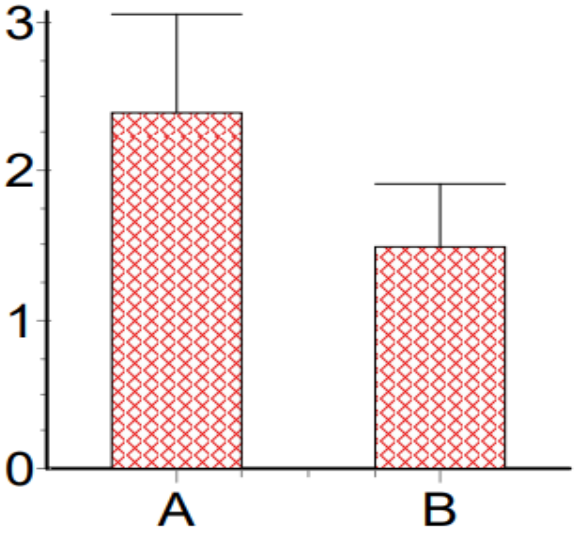
Before any intervention, approval from respective Neurologist, Research and Recognition committee and Head of Institution was taken. Study consisted of 10 chronic stroke patients. After screening for inclusion and exclusion criteria, informed consent of the patients were taken. Procedure was explained to the patients prior to the protocol. Each patient was pre and post assessed by using Modified Ashworth Scale, Modified Tardieu scale and Berg Balance Scale. After the pre assessment, the taut band of spastic soleus muscle was palpated by using a pincer grip. Once the site of insertion was determined, the overlying skin was cleaned with an antiseptic solution and a single session of DN for soleus muscle with 0.25x40 mm disposable needles were applied. To begin with, the handle of the needle and guide tube were held together, lock of the needle was opened, the guide tube-needle was placed on the area in desired angle to drive the needle via skin, using a pincer grip a single tap on top of needle handle, the guide tube was removed, only the needle handle was held and inserted into the desired depth (piston and rotation) for 30 seconds with respect to the patient’s tolerance level, after which the needle was then removed swiftly. After the application of dry needling, conventional exercises were taught to the patient in order to provide additional effects. Accordingly, 6 alternate sessions of DN to soleus muscle in addition to conventional treatment for a period of 2 weeks were given to each and every patient. After every session, post assessment was carried out by using MAS, MTS and BBS scale.

Image

Image 1. Dry Needling on Spastic Soleus Muscle

Results

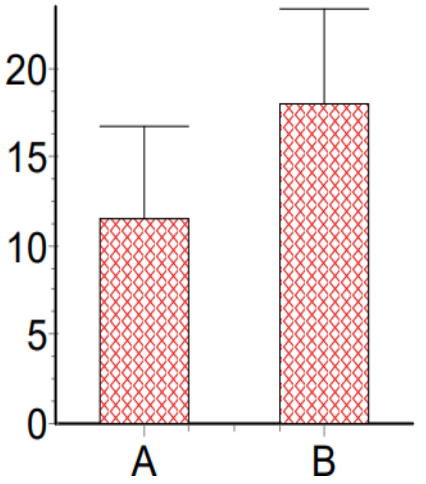
Effect of Dry Needling on spasticity by using Modified Ashworth Scale (MAS)



MAS	Pre	Post	P values
Mean +SD	2.4 + 0.7	1.5 + 0.4	P = 0.004

The measurement of resistance to passive movement for ankle plantar flexors showed a statistical decrease after the intervention.

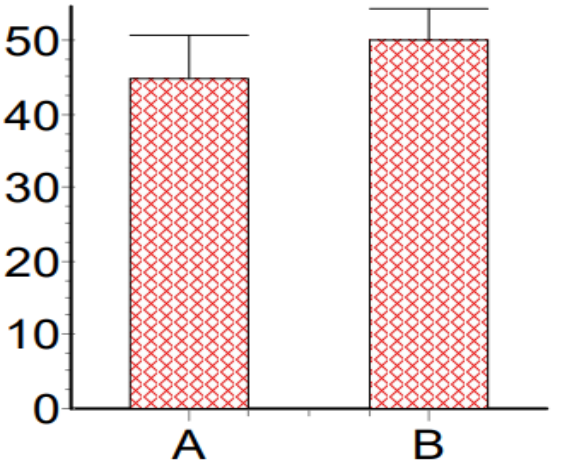
Effect of Dry Needling on spasticity Modified Tardieu Scale (MTS)



R2-R1	Pre	Post	P value
Mean +SD	11.50 +5.29	18 + 5.37	P = 0.01

The application of dry needling showed a significant effect on reducing spasticity of soleus muscle and also an increase in the degrees of range of motion of ankle.

Berg Balance Scale (BBS)



BBS	Pre	Post	P value
Mean +SD	44.80+5.69	49.90+ 4.33	P < 0.05

There was a significant improvement in static balance after the application DN by using Berg balance scale.

Discussion

Dry needling is largely known to be effective for the pain management, and only quite recently, it has been proposed for the management of spasticity.[1] This study is the first one to analyze the effect of dry needling on spasticity and static balance in stroke patients. The findings of this study showed that DN was effective in reducing the spasticity and also showed significant improvement in balance after the application of DN stroke survivors. Concerning spasticity, we found a statistically significant decrease in spasticity after application of dry needling in 6 sessions by using Modified Ashworth scale and Tardieu scale. Our findings were also in accordance with previous study[1] in which they showed a decrease in spasticity among stroke individuals. In our study, the MAS and Tardieu scale were used as a clinical tool for assessing spasticity in lower limb.[1] Mechanical insertion of needle disrupt the integrity of soft tissue contractures locally, DN reduced muscle stiffness and therefore decreases muscle resistance to passive movement.[11] We also observed significant improvement in balance after the application of DN by using Berge balance scale. The current results are similar to the finding of Cochrane review[19] reporting that DN was effective to improve balance by using posturography in stroke individuals.[20] Decrease in spasticity would lead to postural changes and improve the balance.[21]

Limitations

This was a case series study and hence, there were some limitations: 1.This study had a small sample size. 2. It also constituted short term outcome measurements without a control group. Further studies are needed to investigate the effects of application of dry needling looking at larger number of subjects, longer periods of intervention and a higher variability of intervention associated with dry needling in reducing spasticity in lower limb dysfunction. It is also necessary to compare the effects of dry needling with other therapeutic interventions aimed at reducing spasticity and thus improving balance in stroke populations.

Conclusion

According to the findings of the current study, dry needling for six sessions seems to reduce spasticity and enhance balance in stroke patients. According to the MAS and Tardieu scale, there is a decrease in soleus muscle tone following the administration of DN. Additionally, according to BBS, the static balance of the stroke population has significantly improved.

Clinical Implications

Dry needling appears to have a positive effect on reducing spastic muscle tone, increasing range of motion, and improving balance in stroke survivors. These preliminary findings are very promising; however, additional research with a larger sample size is required to validate the findings.

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