EFFICACY OF NERVE FLOSSING TECHNIQUE IN THE MANAGEMENT OF ACUTE SCIATICA

EFICIENȚA TEHNICII DE NERVE FLOSSING ÎN MANAGEMENTUL SCIATICII ACUTE

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Keywords: nerve flossing, sciatica, Siatica Bothersome Index

Abstract

Introduction: Sciatica is one of the most common painful and disabling conditions accounting for about 40% of low back pain cases hence the need for effective means to alleviate symptoms. Nerve Flossing Technique has been successfully used to manage neuropathic pain like carpal tunnel syndrome.

Aim: This study investigated the efficacy of nerve flossing technique (NFT) in the relief of symptoms of acute sciatica and the attendant functional disabilities.

Method: In this randomized control trial, 32 participants between the ages of 18 – 64 years with acute sciatica were randomly assigned into two groups; Group A (Study Group) received Nerve Flossing Technique (NFT) in addition to Conventional Physiotherapy and group B (Control Group) received only Conventional Physiotherapy. The outcome was assessed in terms of Numeric Pain Rating Scale (NPRS), Passive Straight Leg Raise (PSLR) and Sciatica Bothersomeness Index (SBI).

Result: Both groups had significant improvement in NPRS score ($p<0.01$), PSLR value ($p<0.01$) and SBI score ($p<0.01$). However, comparing the mean changes in the outcome measures between the two groups showed that the study group had significant ($p<0.01$) changes in all outcome measures when compared to the control group.

Conclusion: NFT combined with conventional physiotherapy has a better effect on the management of acute sciatica and should be an

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Abstract

Introducere: Sciatica este una dintre cele mai dureroase şi debilitante condiţii, fiind responsabilă de 40% din cazurile de dureri de spate, de unde şi necesitatea unor mijloace eficiente de ameliorare a simptomelor. Tehnica Nerve Flossing a fost folosită cu success pentru managementul durerii neuropatice, precum sindromul de tunel carpian.

Scop: Acest studiu doreşte să evidenţieze eficienţa aplicării tehnicii nerve flossing (NFT), în ameliorarea simptomelor de sciatică acută, precum şi ameliorarea disabilităţilor funcţionale aferente.

Metodă: La acest studiu randomizat, au participat 32 subiecţi, vârse între 18 – 64 ani, suferind de sciatica severă, care au fost distribuiţi aleatoriu în două grupuri; la grupul A (de studiu) s-a folosit tehnica Nerve Flossing (NFT) şi kinetoterapie convenţională şi la grupul B (de control) s-a folosit doar kinetoterapie convenţională. Rezultatele s-au evaluat cu ajutrul Scalei Numerice a Durerii (NPRS), Straight Leg Raise Pasiv (PSLR) şi Indexul Sciatica Bothersomeness (SBI).

Rezultate: Ambele grupuri au prezentat îmbunătăţiri semnificative ale scorurilor NPRS ($p<0.01$), PSLR ($p<0.01$) şi SBI ($p<0.01$). Dar, la compararea valorilor medii dintre cele două grupuri s-a observant că grupul de studiu a prezentat modificări semnificative ($p<0.01$) ale paramerilor evaluaţi, faţă de grupul de control.

Concluzii: NFT combinat cu kinetoterapia convenţională are un effect mai bun în tratamentul sciaticii acute şi de aceea ar trebui să fie o componentă integrată în mangementul kinetoterapeutic al acestei afecţiuni.

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Introduction

Sciatica is a set of symptoms which includes radiating pain, tingling sensation, numbness and weakness along the distribution of the sciatic nerve, that may be caused by compression and/or irritation of one or more of the five sciatic spinal nerve roots in one or both lower limbs.[1,2,3] The prevalence of sciatica varies from 1.6% in the general population to 43% in a selected working population.[4,5,6] Although the prognosis is good in most patients, a substantial proportion continues to have pain for 1 year or longer.[7,8]

Physiotherapy treatment of acute sciatica includes cold therapy, rest, manual therapy (spinal manipulation and soft tissue mobilization) and electrotherapy,[9] core muscle strengthening, stretching of tight structures, mechanical traction. [10] However, there are still contentions on the Physiotherapy treatment protocols which produce a rapid improvement in patients with sciatica [9,11] though a systematic review [12] reported that exercises seemed not to produce therapeutic benefits. However, it is yet to be ascertained if Nerve Flossing Technique (NFT), can improve sciatic nerve function thereby decreasing pain, sensory symptoms, functional disability and prevent the need for surgery, since it has been shown to be a cost effective option in the management of other conditions.[12, 13,14,15]

Nerve flossing involves movement of peripheral nerves from a mean position along its bed [16] and can be initiated from either one or both ends of the nerve bed. It has been shown that significantly less nerve excursion occurs during nerve flossing exercise initiated from one end of the nerve bed using a single joint movement, compared with nerve flossing initiated from both ends of the nerve and with multiple joints [16]. However, the underlying mechanisms associated with clinical improvements following nerve flossing technique remain unclear [17].

There are many theories that have been postulated, including physiological effects (removal of intraneural oedema), central effects (reduction of dorsal horn and supraspinal sensitization) and mechanical effects (enhanced nerve excursion).[16,17,18]

It is anticipated that nerve flossing technique (sliders) might be effective in the management of NFT and sciatica and acute sciatica, since it has been shown to be effective in the management of neuropathic conditions like carpal tunnel syndrome, [19] low back pain [15] and other radiculopathies.[20,21] A couple of recent studies [11,22] recommend investigations also into the therapeutic efficacy of NFT in lower limb radiculopathies such as sciatica, to enhance the wide application of the technique.

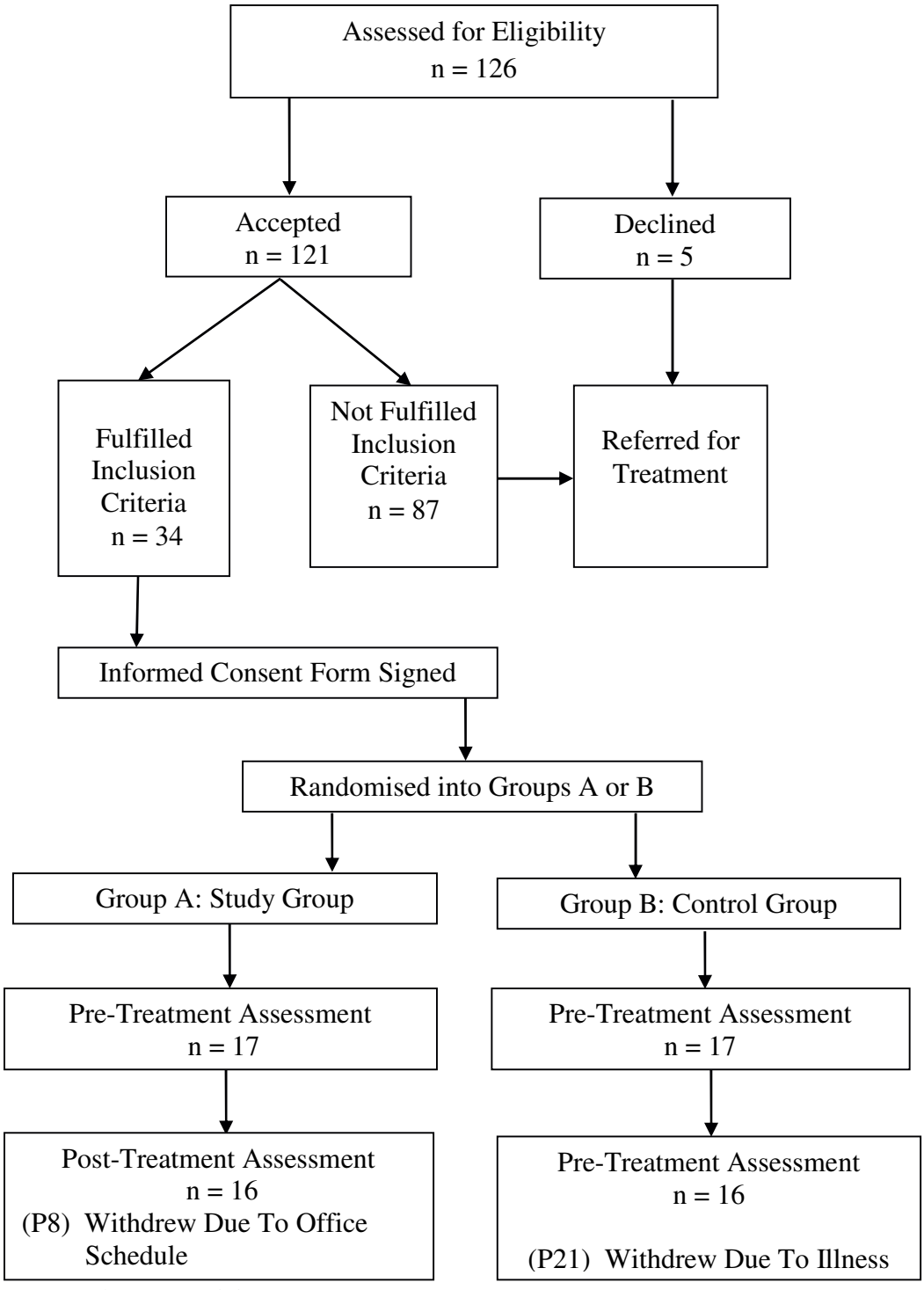
Purpose

Nerve Flossing Technique has also been shown to be a safer and cost effective conservative treatment option [13, 14, 15]. However, there is dearth of evidence on its use in the management of acute sciatica. This study is therefore aimed at investigating the therapeutic efficacy of nerve flossing technique in the management of acute sciatica.

Materials and Methods

Subjects

A total of 76 patients presenting with sciatica were invited to participate in the study. 71 patients accepted to participate, while 5 declined to participate in the study. Thirty-seven patients were found ineligible for the study after screening and were therefore excluded. Each group had 17 participants from the 34 eligible patients. However, only 16 participants from each of the groups completed the study. Reasons for withdrawal by the 2 participants who did not complete the study were as given in figure 1.



n = Sample; P = Participant

Figure 1: Flow diagram for participant recruitment and randomization

Participants included in the study were those presenting with Sciatica (acute stage), due to intervertebral disc pathology as seen in the Radiologist report, participants with positive Passive Straight Leg Raise (PSLR) Test (30^0-70^0). [23] Those with positive Flip Sign - trunk extension from sitting in an attempt to fully extend the target knee [24] and those with only sensory symptoms of sciatica like radiating pain, tingling and numbness. The Participants included only those who suspended pain relieving drugs for the period of the study. Excluded were participants who have had lumbar spine surgery within the last 12 months and anyone who had sciatica along with muscular weakness, vascular disorders, diabetic neuropathy, tumour and fractures. Also excluded were those with underlying spinal pathology and acute ligament injury and participants with clinical situations where Cryotherapy, TENS and back extension exercise are contraindicated.

The outcome measures were the Numeric Rating Scale (NRS), the Sciatica Bothersomeness Index [25] and the range of movement (ROM) of hip flexion as determined by the passive straight leg raise (PSLR).

Sciatica Bothersomeness Index (SBI): This is a composite score of four questions about back and leg symptoms: (1) Leg pain; (2) Numbness or tingling in the leg, foot or groin; (3) Weakness in the leg or foot and (4) Back or leg pain while sitting.[25] Scores are in the range of 0 to 6 for each question (0 = not bothersome to 6 = extreme bothersome). The total score ranges from 0 to 24, and a higher score indicate worse pain. Test-retest reliability has been reported for a Norwegian translation of the SBI with intra-class correlation coefficient = 0.88, 95% confidence interval = 0.82–0.92. [26]

A simple random sampling technique was used to assign participants into 2 groups (groups A and B). This was done in phases, through balloting, with each participant picking a slip of paper in a ballot box containing equal numbers of paper slips marked either 'A' or 'B'. The sample size for this study was determined using the mathematical relationship as described by Cohen (1988) [27], in which the minimum sample size for each of the groups was determined to be 13 participants.

Ethical approval was sought and obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital, Idi-Araba and the National Orthopaedic Hospital Igbobi, Lagos. All participants gave written informed consent

Assessment

Participants were assessed with detailed history taken and physical examination carried out to confirm Sciatica. The confirmation of sciatica was done with a positive Passive Straight Leg Raise between 30° to 70°,[23] positive Flip Sign (trunk extension from sitting in an attempt to fully extend the knee),[24] pain at the back (L_4 to S_3) during digital pressure and radiologist report. They were further screened based on the inclusion/exclusion criteria. Information relating to age, gender, occupation, height, weight and target/affected lower extremity – the more symptomatic or sciatic lower extremity (for participants with bilateral lower sciatic extremity) were obtained. Adopting the protocol of Akinbo *et al.* (2011),[28] the dominant lower extremity was chosen as the target/affected extremity for participants with similar severity of bilateral symptoms. Lower limb dominance was resolved following the protocol of Fabunmi and Gbiri (2008),[29] by asking the participants to detect the limb with which they: (a) kick a ball with, (b) lead with while climbing stairs (c) lead with from a standing still position. Participants were later asked to demonstrate (b) and (c) above.

Participants were briefed about the nature of the study, effect and benefit of participation. They were encouraged to clarify issues regarding the study if any. Written Informed Consent was then obtained.

Means

Participants were then randomly assigned into two groups; Study (Group A) and Control (group B) respectively. Nerve Flossing Technique was thereafter demonstrated to the study

group alone. Passive Straight Leg Raise (hip flexion range) value, numeric pain rating scale and Sciatica Bothersomeness scores of the participants were measured /recorded prior to intervention.

Reassessment was done after 2 weeks of six treatment sessions, with all treatment starting on a Monday.

Study group (Group A) received Cryotherapy for 10 minutes on the back, Soft Tissue Manipulation at the painful areas for 5 minutes, Back extension exercises in prone lying (affected lower extremity raised with ipsilateral full knee extension) for 10 repetitions by 5 seconds hold and 5 seconds relax, Transcutaneous Electrical Nerve Stimulation (TENS) for 15 minutes and Nerve Flossing Technique.

The Nerve Flossing Technique was performed actively with the participant sitting on a chair. Adopting the protocol of Pallipamula and Singaravelan (2012) [11], the participant flexed the knee of the target lower extremity backwards beside the chair, as far back as possible and flexed the neck at the same time, holding both the flexed knee and neck in this position for 5 seconds. The participant in turn extended the neck and the knee of the target lower extremity, abducted and flexed the hip until pain was felt and did not push beyond that point. This extended position was equally maintained for 5 seconds. The procedure (Nerve Flossing Technique) was repeated 15 times, for 3 sets with an interval of 5 minutes between each set. However, as the nerve became less sensitive, the participant increased the stretching effect by dorsiflexing the ankle and extending the toes of the foot upward towards the shin.

The Control (Group B) Group received all the procedures above except the Nerve Flossing Technique. Participants in both groups received the above treatment plan 3 times weekly for 2 weeks. All the participants were advised to remain as active as possible.

The post treatment protocol used by Akinbo *et al.,* (2007) [28] was adopted, in which post-test evaluation was performed three days after completion of the last final treatment session. This was to avoid the immediate effect of treatment on results. The data, thus obtained was considered for statistical analysis.

Statistical Package for Social Science (SPSS) 20 for windows package program was used to analyse data. All demographic and quantitative data were expressed as mean ± standard deviation (SD). Descriptive statistics of bar chart and percentage was used to present gender, body weights, heights, occupation and target extremity distribution in the two groups.

Paired sample t-test was used to compare the pre-intervention and post-intervention changes in outcome measure variables in each group (group A and B) while independent t-test was used to compare the mean changes between the two groups. All statistical tests were performed at the 0.05 level of significance ($p \leq 0.05$).

Results

A total of 34 participants were eligible for the study after screening, with each group having 17 participants. However, only 16 participants from each of the groups completed the study and their findings were analysed. This gives an attrition rate of 0.06%. Seven (43.8%) out of 16 participants in the study group (Group A) were males while 9 (56.3%) were females. In the control group (Group B), 6 (37.5%) were males and 10 (62.5%) were females. The analysis showed that 9 (62.5%) out of the 16 participants in the study group had their right lower limb as the affected/target (sciatic) limb and 7 (43.8%) had their left lower limb as the affected/ target (sciatic) limb. Six (37.5%) out of 16 participants in the control group had their right lower limb as the affected/ target (sciatic) limb while 10 (62.5%) participants had their left lower limb as the affected/ target (sciatic) limb.

Table 1 describes the baseline characteristics of the participants in both groups and it is seen that there was no significant differences in the parameters.

Table 1: Physical and Baseline Characteristics of Participants in both Groups

Characteristics	Parameters	Study Group x± SD	Control Group x± SD	t-value	p-value
Physical Characteristics					
	Age (years)	53.50 ± 8.65	51.87 ± 10.29	0.483	0.632
	Height (m)	1.66 ± 0.07	1.63 ± 0.09	1.005	0.323
	Weight (kg)	71.88 ± 9.86	72.44 ± 8.32	-0.174	0.863
	BMI (kg/m^2)	26.21 ± 4.46	27.39 ± 4.11	-0.780	0.441
Baseline Characteristics					
	Pre- NPRS	8.56 ± 1.09	8.00 ± 1.55	1.187	0.245
	Pre- PSLR(°)	45.00 ± 5.54	45.38 ± 9.32	0.138	0.891
	Pre- SBI	13.75 ± 2.96	12.44 ± 3.27	1.192	0.243

Key
BMI = Body Mass Index
Pre- NPRS = Pre Numeric Pain Rating Scale
Pre- PSLR = Pre Passive Straight Leg Raise
Pre- SBI = Pre Sciatica Bothersomeness Index

In table 2, the intra group comparison of outcome measures pre and post intervention in the study and control groups showed significant differences between the pre and post treatment scores of numeric pain rating scale, hip flexion range of motion and Sciatica Bothersomeness Index of participants in the both groups.

Table 2: Comparison of Outcome Variables Pre- and Post- Intervention within the Groups

Groups	Outcome Variables	Pre-Intervention X±SD	Post-Intervention X±SD	t-value	p-value
Study Group	NPRS	8.56±1.09	1.81±1.60	13.851	<0.001*
	PSLR(°)	45.00±5.54	71.13±3.67	-16.554	<0.001*
	SBI	13.75±2.96	2.81±2.32	10.256	<0.001*
Control Group	NPRS	8.00±1.55	4.19±1.42	9.527	<0.001*
	PSLR(°)	45.38±9.32	61.50±6.76	-8.641	<0.001*
	SBI	12.44±3.27	7.31±3.40	14.556	<0.001*

*Significance at p≤0.05
Key
NPRS = Numeric Pain Rating Scale
PSLR = Passive Straight Leg Raise
SBI = Sciatica Bothersomeness Index

Table 3 compares the differences in the pre and post-intervention outcome measures between the study group and control group. There was a highly significant difference between the study group and control group in the numeric pain rating scale, hip flexion range of motion and sciatica Bothersomeness index scores.

Table 3: Comparison of the Mean Changes in Outcome Measures between the Groups

Outcome Measures	Study Group X± SD	Control Group X± SD	MD X± SD	t-value	p value
NPRS	-6.75±1.95	- 3.81±1.60	-2.94±0.63	4.658	<0.001*
PSLR	26.13±6.31	16.13±7.46	10.00±2.44	4.092	<0.001*
SBI	10.94±4.27	5.13±1.41	-5.81±1.12	5.176	<0.001*

*Significance at p≤0.05

Key

NPRS = Numeric Pain Rating Scale

PSLR = Passive Straight Leg Raise

SBI = Sciatica Bothersomeness Index

MD= Mean Difference

Discussion

The purpose of this study was to investigate the efficacy of nerve flossing technique (NFT) in the management of acute sciatica. There were no significant differences in the baseline and physical characteristics of the participants in the two groups (table 1). The results of this study show a significant improvement in the outcome parameters in both the study and control groups (table 2). This could be attributed to the effects of the modalities used for the conventional physiotherapy treatment protocol. In the control group, there was significant reduction in pain and subsequent increase in PSLR [10] which eventually resulted in lower SBI scores. These effects could be due to stimulation of mechanoreceptors within the joint capsule as well as the use of Transcutaneous Electrical Nerve Stimulation (TENS) in pain modulation [30]. This is because both movement and TENS may help control pain at the level of the central nervous system. In the gate control theory [11, 30] stimulation of mechanoreceptors within the joint capsule and surrounding tissues causes an inhibition of pain at the spinal cord.

The significant pain reduction could also be directly associated with the cryotherapy-induced reduction in the neurogenic inflammation. This indicates that participants in the control group that had only conventional physiotherapy equally improved in terms of the entire outcome parameters. This improvement might have been due to the therapeutic gains accompanying conventional Physiotherapy, since it is the currently acceptable, widely used treatment protocol in the management of sciatica. These findings agree with the study o; Pallipamula and Singaravelan (2012) [11] and Sarkari and Multani (2007) [20] which ascertain the efficacy of neural mobilisation in sciatica.

In table 3, a comparison of the differences between the pre-treatment and post-treatment values of the outcome measures between the control group and the study group that had nerve flossing in addition to conventional physiotherapy showed that NFT resulted in a better effect in the management of acute sciatica. This result agrees with the findings of some previous studies, [11, 31] though, none of them worked on acute sciatica. Similar results have equally been produced using NFT in the management of Carpal Tunnel Syndrome, [19, 31] Low Back Pain [15] and in Cervicobrachial neurogenic pain. [33] The pain and dysfunction associated with sciatica has been suggested to be a result of mechano-sensitivity which refers to the generation of impulses in response to mechanical stress by the neural tissue [34,35] which in turn trigger the activation of nociceptive ectopic signals in sensitized neural tissue. Mechano-sensitivity is a normal physiological response which is considered a defense mechanism of the nervous system. [34]

Since a peripheral nerve must move in order to function properly [36] many authors have suggested that one of the primary benefits of nerve flossing is to promote nerve excursion in order to break down neural fibrosis and tethering, and thus restore optimal nerve mobility.[17, 37]

These effects of NFT may therefore be due to restoration of neural physiology which causes a dynamic variation in neural pressure (by stretching at one end and relaxing at the other

end), hence leading to evacuation of intraneural edema which might be present in acute sciatica. [22, 34, 38]

This technique may also help to oxygenate the nerve, by causing neurovascular effleurage and increase in neural perfusion, thereby decreasing ischemic pain and promoting axonal transport.[11] In addition, it is hypothesized that the movement of nerve within pain-free variations can help reduce nerve compression, tension and friction therefore decreasing its mechanosensitivity.[39]

Our findings suggest that for effective reduction of sciatic pain and improvement in functional ability, NFT should be combined with conventional Physiotherapy as reported by previous studies [11, 21, 40] as the combination of NFT and conventional Physiotherapy protocol appears to produce a synergistic effect. The advantage of NFT is that it is cost-effective and can be given as home program for the patient in order to optimize therapeutic gains.

Conclusion

NTF combined with conveal physiotherapy has a better effect on the management of acute sciatica. Nerve Flossing Technique is efficacious in the management of acute sciatica and should be an integral component of Physiotherapy management. There is however the need to replicate this study with larger sample sizes in order to validate these results

Further studies could be done to determine the effect of Nerve Flossing Technique in the management of chronic sciatica.

Conflict of Interest

The authors report no conflicting interest; financial or otherwise

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