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Physical Medicine

ASSESSMENT OF CLINICAL AND FUNCTIONAL IMPROVEMENT AFTER POSTERIOR TIBIAL NERVE BLOCK IN HEMIPLEGIA DUE TO STROKE

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ABSTRACT

Introduction: Ankle spasticity in post stroke patients often causes severe problems like abnormal posture and joint contracture and difficulty in standing and walking. These affect the activities of daily living (ADL).

Aims And Objective: To evaluated the effectiveness of phenol neurolysis of the tibial nerve for the treatment of ankle plantar flexor spasticity and functional improvement.

Materials And Methods: Before after study by using consecutive sample with a sample size of 20 over a period of 1 year.

Results: Statistically significant outcomes were observed for the various parameters like spasticity, walking time, heel contact.

Conclusion: Posterior tibial nerve block is an effective procedure for ankle spasticity in post stroke patients

KEYWORDS : Phenol, Spasticity, Tibial nerve

INTRODUCTION:

Spasticity is a motor disorder characterized by a velocity dependent increase in tonic stretch reflexes with exaggerated tendon jerks, resulting from hyperexcitibility of stretch reflex, as a component of upper motor neuron syndrome[1]. Ankle spasticity in post stroke patients often causes severe problems like abnormal posture and joint contracture and difficulty in standing and walking. These affect the activities of daily living (ADL). Local management procedures for relieving spasticity include chemical neurolysis withalcohol or phenol, motor point injection with botulinum toxin and surgical procedures like tibial neurectomy, selective tibial neurotomy, tenotomy and tendon lengthening procedures.We evaluated the effectiveness of phenol neurolysis of the tibial nerve for the treatment of ankle plantar flexor spasticity and functional improvement.

The MAS is most commonly used instrument because of its simplicity and good reproducibility. Ashworth Scale was initially developed to measure spasticity in multiple sclerosis patients.[2]The Modified Ashworth Scale was developed later by Bohannon and Smith.[3]

Table 1. Modified Ashworth Scale

Grade	Description
0	No increase in muscle tone
1	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end of the range of motion when the affected part/s is/are moved in flexion or extension.
1+	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the ROM.
2	More marked increase in muscle tone through most of the ROM, but affected part(s) easily moved.
3	Considerable increase in muscle tone, passive movement difficult.
4	Affected part(s) rigid in flexion or extension.

ROM, range of motion.

By 1959 phenol was established as a neurolytic agent for the relief of chronic pain.[4]Then Kelley and Gautier Smith and Nathan simultaneously reported intrathecal injection of phenol in hyperbaric solution with positioning to fix it on anterior nerve roots, thus relieving spasticity caused by UMN lesions.[5]Khalili& collaborators then performed perineural injection and following him, Helpern&Meelhuyen and De Lateur used it as intramuscular injection.[6,7] Since then phenol has been widely used for neurolysis in the treatment of both pain and spasticity.Applied directly to tissue in concentration of 5% or more in water, it causes protein coagulation and necrosis. Adverse effect includes pain and paresthesia, swelling, cellulitis & deep venous thrombosis. Intravascular injection of 10% phenol causes "severe tinnitus and flushing within a few seconds but recovery is rapid and complete" [8]. Awad made a major contribution to this topic.[9] The procedure has been performed on hemiplegic patients. [13-16] Khalili [11] pointed out that the average beneficial effect lasted 308 days and ranged from 2 days to 743 days. Awad[12] reported that the duration of the effects of a block ranged from 3 to 14 months. Garland[15] obtained almost the same results in hemiplegic patients.

AIMS AND OBJECTIVE:

To evaluated the effectiveness of phenol neurolysis of the tibial nerve for the treatment of ankle plantar flexor spasticity and functional improvement in various parameters like

- Barthel Index
- Spasticity grading
- 50 feet walking time
- Heel strike

MATERIALS AND METHODS:

Before after study by using consecutive sample with a sample size of 20 over a period of 1 year.

Inclusion Criteria

- Hemiplegia with duration greater than 6 months
- Plantar flexor spasticity MAS grade >1

Exclusion Criteria

- Patients with fixed deformities
- Altered mental status
- Patients with bleeding disorders
- Patients refusing phenol block.
- Sensitivity to phenol.

Institutional ethical committee clearance and written informed consent was taken from the subjects and clinical assessments were done before the block and at 1 week, 4 weeks and 2 months. Selective blocking of Tibial nerves were done, by using peripheral nerve stimulators for accurate localization, with 5% aqueous phenol. A small percutaneous direct current stimulator was used to localize the nerves. It had the following specifications:

1. current impulse of 0 – 10mA
2. Stimulation time from 1-100 msecs
3. Selection of current between surge faradic and intermittent galvanic types
4. Visual indications during stimulation.

The stimulator had a cathode port that could be connected to a Teflon Coated Regional Analgesia Needle (bipolar electrode). The anode was

connected to the dispersive electrode.

Tibial Nerve Block

It is the larger of the two terminal branches of the sciatic. It descends along the back of the thigh and through the middle of the popliteal fossa, to the lower part of the Popliteus muscle, where it passes with the popliteal artery beneath the arch of the Soleus. In the thigh it is overlapped by the hamstring muscles above, and then becomes more superficial, and laterally lies to popliteal vessels. The popliteal artery is related to the medial side of the nerve in the upper part, lateral side of the nerve in the lower part and behind the knee in the middle part making it an important landmark for identification of the nerve. The patient was positioned prone with the extremity to be injected resting on the pillow to maintain the knee in approximately 30 degrees to 45 degrees of flexion. The knee was flexed to allow palpation of the superior popliteal fossa borders and identification of the skin crease behind the knee joint. The patient was prepared in a standard aseptic fashion over an area large enough to allow palpation of landmarks, and sterile technique was used throughout the procedure. The Teflon coated needle was attached to an out syringe which contained 5% aqueous Phenol. A 25mm Teflon coated needle was used in case of Tibial nerve block. The needle was inserted just above the crease line in the middle of the popliteal fossa, taking precautions to avoid popliteal vessels. The stimulating needle was advanced towards femur perpendicularly till contraction of gastrosoleus was visible. Then the needle was manipulated to a point where maximum contraction was visible with minimum current. After negative aspiration, phenol solution was injected.

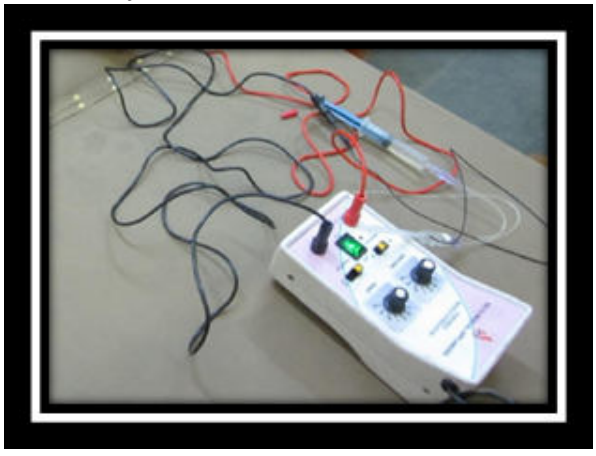

Figure 1. Electrical Stimulator

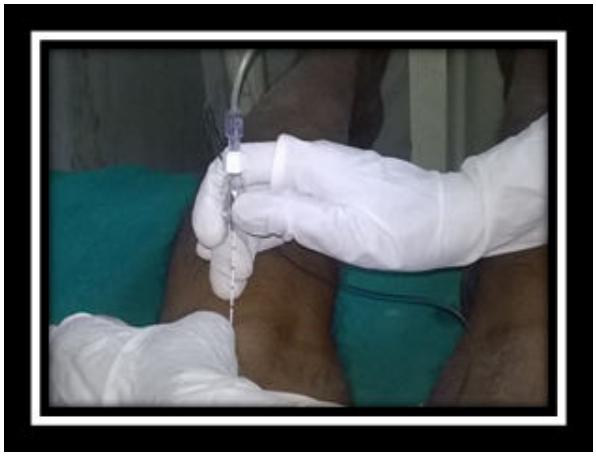

Figure 2.- 25mm Teflon Needle With Positioning

RESULTS:

Demography- In our study there were 14 males and 6 females. 11 of them suffered from haemorrhagic stroke and 9 from ischaemic stroke. 12 patients had right hemiparesis and 8 had left hemiparesis.

Comparison of MAS(Modified Ashworth Scale) over time was done by Friedman's ANOVA followed by Dunn's test for post hoc comparisons and statistically significant results were obtained throughout the 2 month period.

Table 1. Comparison Of MAS With Baseline Following Intervention

Dunn's Multiple Comparison Test	Difference in rank sum	Significant P < 0.05
MAS0 vs MAS1	35.000	Yes
MAS0 vs MAS4	45.500	Yes
MAS0 vs MAS8	37.500	Yes

Heel Contact distribution change – 1 week vs. 8 week was done by McNemar's chi-square test

Table 2. Heel Contact Distribution

	HeelCont1		
HeelCont8	No	Yes	
No	6	0	6 (30.0%)
Yes	4	10	14 (70.0%)
	10 (50.0%)	10 (50.0%)	20
Significance	P = 0.1250		

Initially none of the patients had heel contact while walking, at 1 week post intervention 16 patients had heel contact which was maintained till 4 weeks. At 8 weeks, 2 patients lost heel contact while walking. The improvement was still statistically significant at 8 weeks.

Comparison of 50 ft Walking Time over time was done by Repeated measures ANOVA followed by Tukey's test for post hoc comparisons and statistically significant outcomes were observed at 1 week, 4 weeks and 8 weeks.

Table 3. 50 Feet Walking Time Compared To Base Line

Tukey's Multiple Comparison Test	Mean Diff.	P value
50FtTime0 vs 50FtTime1	2.4	< 0.001
50FtTime0 vs 50FtTime4	3.2	< 0.001
50FtTime0 vs 50FtTime8	3.0	< 0.001

Comparison of Barthel Index over time was done by Friedman's ANOVA followed by Dunn's test for post hoc comparisons.

Table 4. Barthel Index As Compared To Baseline

Dunn's Multiple Comparison Test	Difference in rank sum	Significant P < 0.05	Summary
BI_0 vs BI_4	-13.500	No	ns
BI_0 vs BI_8	-13.500	No	ns
BI_4 vs BI_8	0.00000	No	ns

The results were not statistically significant when compared to base line.

DISCUSSION:

Phenol neurolysis has been well established for last 40 years. Previous studies have shown the effects lasting for a period of 3 – 14 months and the peak effect taking 1-2 week time but in our study we observed the maximum effect in the 2nd week. As per our knowledge there is no data regarding the effect of phenol block on heel contact in hemiplegic stroke and on 50 feet walking time.

LIMITATION:

Sample size was small and there was no control group. Patients could not be assessed at closer intervals and long term follow-up was not possible.

CONCLUSION:

In conclusion we can say that the control of spasticity was good and statistically significant outcome sustained over the period of 8 weeks for Heel contact, Ankle spasticity and 50 feet walking time but there was no significant improvement in the Barthel index.

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