



**To assess accuracy of USG guided v/s peripheral nerve stimulator (PNS) guided, neurolytic block method for localization of obturator nerve, in bilateral hip adductors spasticity of spine cord injured patients.**

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**Abstract**

**Background:** To assess accuracy of USG guided v/s peripheral nerve stimulator (PNS) guided, neurolytic block method for localization of obturator nerve, in bilateral hip adductors spasticity of spine cord injured

**Methods:** A hospital based randomized comparative interventional study conduct on Spine cord injury patients with bilateral hip adductor spasticity of grade 3 as measured on Modified Ashworth Scale (MAS)

attended in the department of Physical Medicine and Rehabilitation, SMS Hospital, Jaipur.

**Results:** Out of 60 sites of obturator nerve of 30 patients, included in this study, 31 (51.67%) obturator nerve were blocked by 2 pricks, while 12 (20%) obturator nerve were blocked by 3 pricks, followed by 9 (15%) were blocked by 1 prick, 5 (8.33%) by 4 pricks, 2 (3.33%) by 5 pricks than only 1 (1.67%) obturator nerve was blocked by 6 pricks. No significant difference was observed between number of pricks and

type of method use to block obturator nerve either by PNS or USG guided.

**Conclusion:** Obturator nerve block with phenol by blind anatomical landmark performed in the treatment of spasticity with peripheral nerve stimulator is good one where ultrasound guidance facility is not available, rather than regional nerve blocks should performed by ultrasound guidance because we can see the real-time picture of needle advancement, prevent vascular puncture resulting in lower complications rate.

**Keywords:** Obturator Nerve, Spasticity, Blocks.

### Introduction

Spasticity is derived from the Greek word *spasticus*, which means “to pull.” It is a component of upper motor neuron syndrome (UMN), which occurred in many neurological conditions including spinal cord injury (SCI), multiple sclerosis, stroke, traumatic brain injury, cerebral palsy, hypoxic brain injury and tumors etc.

Phenol is a nonselective neurolytic and neurolysis is proportional to the concentration and total volume of fluid used<sup>1</sup>. Phenol exerts local anesthetic and neurolytic effect. Local effect is immediate and transient and short-term which is directly proportional to thickness of nerve fibers.<sup>2</sup>

Neurolytic properties of phenol is long-term and due to protein coagulation, which result in Wallerian degeneration of nerve.<sup>3</sup>

Because of low cost and long lasting effect of peripheral nerve block with phenol where the targeted nerves are either pure or highly motor, thus it seems to be a best modality to treat spasticity in developing country like India where low economic condition and less awareness about spasticity.

In 1993, Wassef et al<sup>4</sup> performed obturator nerve blocks by inter-adductor approach to treat spasticity.

Obturator nerve block with phenol is generally performed by using anatomical landmarks with the help of a peripheral nerve stimulator (PNS), because obturator nerve is mostly motor nerve most commonly intervene nerve for the management of spasticity and sensory innervations of the medial aspect of the thigh that may lead to complication due to phenol block like dysaesthesia, numbness, hematoma, local pain and treatment failure. To combat these complication<sup>15,16</sup> Ultrasound has been shown to facilitate identification of nerves and allows real time monitoring of needle position and spread of therapeutic solution<sup>5-7</sup>.

### Material and Method

**Study Area:** Spine cord injury patients with bilateral hip adductor spasticity of grade 3 as measured on Modified Ashworth Scale (MAS) attended in the department of Physical Medicine and Rehabilitation, SMS Hospital, Jaipur.

**Study Design:** A hospital based randomized comparative interventional study.

**Study Duration:** From the approval of the Research Review Board till the desired sample size was obtained and their follow up completed (May 2018 to September 2019).

### Inclusion Criteria

- Aged >18 years and any gender
- Those who were willing to accept and sign for a valid and informed written consent
- Grade 3 spasticity on Modified Ashworth Scale of the bilateral hip adductors from an upper motor neuron lesion (spine cord injury)

### Exclusion Criteria

- Prior chemo-neurolysis or chemo-denervation to the hip adductors in the past 1 year
- Evidence of fixed joint contracture

- Patient with coagulation disorders
- Patient with allergy to phenol
- Non cooperative patients
- Patient on blood thinner drugs
- Severely ill patients
- Infection at proposed site of block

**Statistical Analysis**

- Statistical analysis was performed with the SPSS, version 21 for Windows statistical software package (SPSS inc., Chicago, IL, USA)
- Continuous data were summarized as mean and standard deviation. Difference in two means were analyzed using student’s ‘t’-test.
- Qualitative data were expressed in form of proportion, difference in proportions were analyzed using “Chi -Square” test.
- The level of significance was kept 95% for all statistical analysis.
- P value <0.05 was taken as significant.

**Observation**

Table 1: Distribution of the cases according to age group

| Age group | Group-PNS |        | Group-USG |        | Grand Total |        | p-value     |
|-----------|-----------|--------|-----------|--------|-------------|--------|-------------|
|           | No        | %      | No        | %      | No          | %      |             |
| ≤20       | 2         | 6.67   | 4         | 13.33  | 6           | 10.00  | 0.902<br>NS |
| 21 to 30  | 11        | 36.67  | 11        | 36.67  | 22          | 36.67  |             |
| 31 to 40  | 3         | 10.00  | 7         | 23.33  | 10          | 16.67  |             |
| 41 to 50  | 10        | 33.33  | 4         | 13.33  | 14          | 23.33  |             |
| 51 to 60  | 1         | 3.33   | 1         | 3.33   | 2           | 3.33   |             |
| >60       | 3         | 10.00  | 3         | 10     | 6           | 10.00  |             |
| Total     | 30        | 100.00 | 30        | 100.00 | 60          | 100.00 |             |

Chi-square = 4.838 with 10 degrees of freedom; P = 0.902

Table No.1 depicts total 30 patients with bilateral hip adductor spasticity of spine cord injury were included.

A total 60 obturator nerve block with 6% aqueous phenol was performed either by peripheral nerve stimulator or ultrasound guided. Maximum numbers of block were performed in age group of 21 to 30 years 22 (36.67%), followed by 41 to 50 years 14 (23.33%) and only 2 (3.33%) blocks were performed in age group 51 to 60 years. The mean age of study group were 36.4±14.06 years ranging from 18 to 76 years. No significant difference was observed in distribution of cases according to age and obturator nerve block performed by either group/method in hip adductors spasticity patients.

Table 2: Distribution of the cases according to gender

| Gender | GROUP -PNS |       | GROUP-USG |        | Grand Total |       | p-value |
|--------|------------|-------|-----------|--------|-------------|-------|---------|
|        | No         | %     | No        | %      | No          | %     |         |
| Female | 5          | 16.67 | 5         | 16.67  | 10          | 16.67 | 1.000NS |
| Male   | 25         | 83.33 | 25        | 83.33  | 50          | 83.33 |         |
| Total  | 30         | 100   | 30        | 100.00 | 60          | 100   |         |

Chi-square = 0.000 with 2 degrees of freedom; P = 1.000

Table 2: shows maximum numbers of obturator nerve block were performed in males 50 (83.33%) and 10 (16.67%) blocks were performed in females. No significant difference was observed in distribution of cases according to gender and obturator nerve block performed by either peripheral nerve stimulator or ultrasound guided in hip adductors spasticity patients.

Table 3: Distribution of the cases according to vertebral injury

| Vertebral Injury | GROUP - PNS |        | GROUP-USG |        | Grand Total |        | p-value |
|------------------|-------------|--------|-----------|--------|-------------|--------|---------|
|                  | No          | %      | No        | %      | No          | %      |         |
| Cervical         | 6           | 20     | 4         | 13.333 | 10          | 16.667 | 0.713NS |
| Dorsal           | 14          | 46.667 | 16        | 53.333 | 30          | 50.000 |         |
| Lumbar           | 0           | 0.000  | 0         | 0.000  | 0           | 0.000  |         |

|                 |    |         |    |         |    |         |
|-----------------|----|---------|----|---------|----|---------|
| Multiple region | 7  | 23.333  | 3  | 10.000  | 10 | 16.667  |
| No bony injury  | 3  | 10.000  | 7  | 23.333  | 10 | 16.667  |
| Total           | 30 | 100.000 | 30 | 100.000 | 60 | 100.000 |

Chi-square = 3.733 with 6 degrees of freedom; P = 0.713

Table No.3 depicts that total 60 obturator nerve blocks with 6% aqueous phenol were performed either by peripheral nerve stimulator or ultrasound guided in patients with bilateral hip adductor spasticity of spine cord injury. Maximum numbers of block were performed in dorsal region 30 (50%) of vertebral injury patients followed by cervical, multiple vertebral region and no bony injury patients 10 (16.67%), 10 (16.67%) and 10 (16.67%) respectively there was no significant difference was observed in distribution of cases according to vertebral injury and obturator nerve blocks performed by either group in hip adductors spasticity patients.

Table 4: Distribution of the cases according to ASIA level

| ASIA LEVEL | GROUP - PNS |         | GROUP- USG |         | Grand Total |         | p-value    |
|------------|-------------|---------|------------|---------|-------------|---------|------------|
|            | No          | %       | No         | %       | No          | %       |            |
| A          | 20          | 66.667  | 20         | 66.667  | 40          | 66.667  | 1.00N<br>S |
| B          | 6           | 20.000  | 6          | 20.000  | 12          | 20.000  |            |
| C          | 4           | 13.333  | 4          | 13.333  | 8           | 13.333  |            |
| D          | 0           | 0.000   | 0          | 0.000   | 0           | 0.000   |            |
| Total      | 30          | 100.000 | 30         | 100.000 | 60          | 100.000 |            |

Chi-square = 0.000 with 4 degrees of freedom; P = 1.000

Table No.4 depicts total 60 obturator nerve blocks with 6% aqueous phenol were performed either by peripheral nerve stimulator or ultrasound guided in patients with bilateral hip adductor spasticity of spine cord injury. Maximum numbers of blocks 40 (66.67%)

were performed in patients belonged to ASIA level A, followed by ASIA B 12 (20%) than only 8 (13.33%) blocks were performed in patients belonged to ASIA C. There was no significant difference was observed in distribution of cases according to ASIA level and obturator nerve block performed by either group in hip adductors spasticity patients.

Table 5: Distribution of the cases according to No. of prick

| No of Prick | GROUP - PNS |       | GROUP- USG |        | Grand Total |        | p-value     |
|-------------|-------------|-------|------------|--------|-------------|--------|-------------|
|             | No          | %     | No         | %      | No          | %      |             |
| 1           | 7           | 23.33 | 2          | 6.67   | 9           | 15.00  | 0.642N<br>S |
| 2           | 14          | 46.67 | 17         | 56.67  | 31          | 51.67  |             |
| 3           | 6           | 20.00 | 6          | 20.00  | 12          | 20.00  |             |
| 4           | 1           | 3.33  | 4          | 13.33  | 5           | 8.33   |             |
| 5           | 2           | 6.67  | 0          | 0.00   | 2           | 3.33   |             |
| 6           | 0           | 0.00  | 1          | 3.33   | 1           | 1.67   |             |
| Total       | 30          | 100   | 30         | 100.00 | 60          | 100.00 |             |

Chi-square = 7.868 with 10 degrees of freedom; P = 0.642

Table no.5 depicts that out of 60 sites of obturator nerve of 30 patients, included in this study, 31 (51.67%) obturator nerve were blocked by 2 pricks, while 12 (20%) obturator nerve were blocked by 3 pricks, followed by 9 (15%) were blocked by 1 prick, 5 (8.33%) by 4 pricks, 2 (3.33%) by 5 pricks than only 1 (1.67%) obturator nerve was blocked by 6 pricks. No significant difference was observed between number of pricks and type of method use to block obturetor nerve either by PNS or USG guided.

Table 6: Distribution of the cases according to decrease in spasticity score (MAS Score) at one month

| MAS Score at one month | GROUP - PNS |       | GROUP- USG |       | Grand Total |       | p-value |
|------------------------|-------------|-------|------------|-------|-------------|-------|---------|
|                        | No          | %     | No         | %     | No          | %     |         |
| 1                      | 10          | 33.33 | 14         | 46.67 | 24          | 40.00 | 0.888   |

|       |    |        |    |        |    |        |    |
|-------|----|--------|----|--------|----|--------|----|
| 1+    | 19 | 63.33  | 15 | 50.00  | 34 | 56.67  | NS |
| 2     | 1  | 3.33   | 1  | 3.33   | 2  | 3.33   |    |
| 3     | 0  | 0      | 0  | 0      | 0  | 0      |    |
| 4     | 0  | 0      | 0  | 0      | 0  | 0      |    |
| Total | 30 | 100.00 | 30 | 100.00 | 60 | 100.00 |    |

Chi-square = 1.137 with 4 degrees of freedom; P = 0.888

All 60 sites were in grade 3 hip adductors spasticity at baseline but after one month score was decrease out of 60 site, most of the cases were observed in grade 1+ hip adductors spasticity 34 (56.7%) followed by grade 1 hip adductors spasticity 24 (40%) than only 2 (3.33%) sites were in grade 2 hip adductors spasticity as measured on MAS score in our study. No significant difference was observed between the two groups in terms of decrease in spasticity score.

Table 7: No. of pricks among the groups

| No. of Punctures |    |      |                |         |         |           |
|------------------|----|------|----------------|---------|---------|-----------|
|                  | N  | Mean | Std. Deviation | Minimum | Maximum | Sig.      |
| Group-PNS        | 30 | 2.23 | 1.073          | 1       | 5       | .276 (Ns) |
| Group-USG        | 30 | 2.53 | 1.042          | 1       | 6       |           |
| Total            | 60 | 2.38 | 1.059          | 1       | 6       |           |

Table No. 7 depicts that the average number of pricks to block obturator nerve in terms of skin prick to reach up to obturator nerve which observed as adductor motor response at lowest stimulator current in Group PNS was 2.23 (1.0 to 5.0) and in Group USG was 2.53 (1.0 to 6.0); there was no statistically significant difference between the two groups. (P=0.276NS)

Table 8: Duration of procedure (minute) among the groups

| Duration of Procedure(Minute) |    |        |                |         |         |            |
|-------------------------------|----|--------|----------------|---------|---------|------------|
|                               | N  | Mean   | Std. Deviation | Minimum | Maximum | Sig.       |
| GROUP-PNS                     | 30 | 1.3307 | .75792         | .30     | 3.24    |            |
| GROUP-USG                     | 30 | 1.6630 | .74215         | 1.00    | 4.41    | 0.092 (NS) |
| Total                         | 60 | 1.4968 | .76234         | .30     | 4.41    |            |

Average time of the obturator nerve block in terms of disappearance of adductors motor response after phenol injection was 1.66 min (1.0 to 4.41min).

**Discussion**

One of the most important consequences of upper motor neuron syndrome is spasticity which is “involuntary muscle hyperactivity in the presence of central paresis”.<sup>2</sup> Adductor muscle spasticity may occur in many neurological conditions like multiple sclerosis, spinal cord injury, traumatic brain injury and cerebral palsy. Spasticity increases in these patients due to various inadequate trigger like pain, tight clothing and during perineum hygiene and interfere in activity of daily living and ambulation.

Primary aim of medical intervention is to decrease spasticity either by oral drugs (baclofen, tizanidine, clonidine, etc.), intrathecal baclofen pump neurolytic applications or by surgical interventions like rhizotomy and myelotomy.

When relation between number of needle adjustment (pricks) while performing obturator nerve block by either method was evaluated, no statistically significant difference was observed between the two groups the average number of needle redirection (pricks) in Group PNS was 2.23 (1.0 to 5.0) and in Group USG was 2.53 (1.0 to 6.0). (P=0.276NS)

Our results were similar to studies done by Nazan Has Selmi et al<sup>8</sup> and Alberto Manassero et al<sup>9</sup> when average

number of puncture in two groups was compared. Both of these studies performed statistical analysis and found that there was no difference in the number of needle pricks, similar to our study.

When relation between the average times needed to complete the block by either method was evaluated, no significant differences were detected between the two groups the average time needed to the obturator nerve block was 1.33min in Group PNS (0.30min to 3.24) and 1.66 min (1.0 to 4.41min) in Group USG, and no significant differences was observed. (P=0.092NS)

We also observed no significant differences in average time to complete the block by either method.

Studies conducted by Nazan Has Selmi et al<sup>9</sup> they found significant differences in average time to complete the block by either method, but in our study the average time to complete the block by either method the difference was statically non significant.

Nazan Has Selmi<sup>9</sup> explained that the difference in average time in both groups was due to lack of experience in regional block in ultrasound where as in our study ultrasound blocks were performed under the guidance of a consultant with more than ten years of musculoskeletal USG.

Spasticity was evaluated by Modified Ashworth Scale (MAS), all 60 injection sites had grade 3 hip adductors spasticity at baseline but after one month score was decrease and 34 injection sites (56.7%) had grade 1+ hip adductor spasticity, 24 (40%) injection sites had grade 1 hip adductor spasticity only 2 (3.33%) sites had grade 2 hip adductor spasticity in our study. No significant difference was observed between the two groups in terms of lowering the spasticity score.

Our results are similar to the studies by Yasin demir et al<sup>10</sup> and Jay KARRI et al<sup>11</sup>. When decrease in spasticity after obturator nerve block, compare to baseline was

evaluated and all reported significant decrease in spasticity post neurolytic block.

Dysaesthesia is the most common complication of phenol neurolytic block. Other complications are pain at injection site, muscle necrosis, local skin chemical burn and interstitial fibrosis.

Dysaesthesia was not reported in any of our study patients as most of the patients had spinal cord injury together with significant sensory deficit. No other complications were observed in the study groups.

Jay Karri et al<sup>11</sup> conducted a retrospective review with phenol neurolysis and they reported that pain (4.0%), swelling and inflammation (2.7%), dysaesthesia (0.7%) and hypotension (0.7%) as post-procedure adverse events, contrary to our study.

Phenol is economical alternative while regional not focal reduction in spasticity is required, but its nonselectivity, only motor or nearly motor nerves are targeted only.

### **Conclusion**

Obturator nerve block with phenol by blind anatomical landmark performed in the treatment of spasticity with peripheral nerve stimulator is good one where ultrasound guidance facility is not available, rather than regional nerve blocks should performed by ultrasound guidance because we can see the real-time picture of needle advancement, prevent vascular puncture resulting in lower complications rate. As a simple needle can be used while performing a USG guided block while reducing cost of a stimulating needle (stimuplex), which cost more than 1000 Rs in India. Thus may be economic for the patient while lowering the price of procedure without compromising quality and accuracy of care/procedure.

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