

EVALUATION THE EFFICACY OF PULSED RADIOFREQUENCY (PULSED DOSE MODE) FOR THORACIC POST HERPETIC NEURALGIA TREATMENT

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ABSTRACT

Neuralgia is a sharp, shocking pain that follows the pathway of a nerve and is due to irritation or damage to the nerve. Post-herpetic neuralgia (PHN) is one of the most common forms of neuralgia. It is characterized by persisting pain in the affected dermatome after rash healing which last for years. PHN is often resistant to the traditional methods of treatment. Pulsed Radiofrequency (PRF) is known as an effective treatment for neuropathic pain. The aim of this study was to evaluate the efficacy of PRF (pulsed dose response second generation of pulsed radiofrequency) for the management of PHN.

This study included 20 patients who have post herpetic neuralgia in thoracic dermatomes, the patients were selected according to inclusion and exclusion criteria, A 10 cm length cannula with 10 mm active tip was introduced in the thoracic transforaminal opening of the affected dermatomes under fluoroscopic guidance to become adjacent to dorsal root ganglia (DRG), this position was confirmed by sensory and motor stimulation, after obtaining the appropriate stimulation, PRF was applied to the corresponding level (temperature 42 degree, pulse number 900, voltage 65), after finishing the procedure the patients were evaluated at one, three and six months using McGill questionnaire.

The result of this study demonstrated that there are highly statistically significant decreases in Pain Rating Index (PRI) and Pain Persistent Intensity (PPI) in all patients of McGill pain questionnaire at one, three or six months after radiofrequency application, when compared with before radiofrequency application. In conclusion, the use of PRF for treatment of PHN is a safe therapeutic alternative method. Benefits include that the procedure is minimally invasive, provides short-term pain relief and improves quality of life.

Keywords: Postherpetic neuralgia; Pulsed radiofrequency

How effective & do study to evaluate efficacy...change 1st sentence.

INTRODUCTION

Herpes Zoster (HZ) or shingles is considered one of the common diseases its incidence varying from 2.2 to 3.4 per 1000 person/year(1). In high percentage of the patients, in the most cases healing of the skin and disappearance of the pain occur within 3-4 weeks. However, after rash was healed the pain may go on and this situation known as post herpetic neuralgia (PHN) (2).

PHN affects 50% of patients over 60 years of age and 15% of anti herpetic patients. The pain of PHN spreadthrough the single nerve root from the central dorsal line in a ventral direction, harmonious with the dermatomal rash (3).

This chronic neuropathic pain is associated with a decline in quality of life and daily fluctuations in stress and negative mood that can worsen the experience of neuropathic pain.(4)

The treatment methods are intricate and largely depend on the type and particularity of pain described by the patient.(5)

As there is no standard treatment accessible for PHN, accordingly there are multiple therapies recommended (3). Most of the treatment depends on the use of psychotropic and anticonvulsant medications (6). Pharmacological therapies were influential in reducing pain intensity and improved quality of life in managing PHN. It include tramadol, opioid analgesics, anticonvulsant drugs, tricyclic antidepressant drugs, and topical agents. (7). There

are many different techniques that were used in treatment of pain like nerve blocks, subarachnoid injection of local anesthetics, removal of the affected skin and neuromodulation techniques (8) Pulsed radiofrequency (PRF) is a different therapeutic strategy that has been used by pain practitioners as a non- or minimally neurodestructive technique where short burst of high frequency current are applied to nervous tissue (9). The basic principles of radiofrequency (RF) involve transferring an alternating electrical current, in the same frequency range as radio waves by a generator to a nerve via an active electrode (10). The most common site of PHN is the thoracic nerve (T1-12) with an incidence of up to 50% (11). As the dorsal root ganglion (DRG) neurons are responsible for pain so it is the most common targets of PRF treatment. PRF is used to treat these painful neuralgia conditions by interrupting sensory nerves which carry pain signals, a process known as lesioning with results lasting an average of 6-9 months (12). This study hypothesized that the use of PRF for the treatment of PHN may cause pain relief for longer periods than the other traditional methods. A previous study found that the use of PRF is safe and highly effective treatment for neuropathic pain of different causes (13). However, other study showed that the use of PRF in treatment of PHN is limited (14).

The aim of this study was to evaluate the efficacy of PRF (pulsed dose response second generation of pulsed radiofrequency) for the management of PHN in one group clinical trial at one, three and six months .

PATIENTS AND METHODS

This prospective cohort study was performed at pain unit of Zagazig University Hospitals. After approval from local Ethics Committee and obtaining a written informed consent from twenty patients who have postherpetic neuralgia in the thoracic dermatomes .

Inclusion criteria

- 1 - Duration of pain more than 6 months and failure to respond to medical treatment
- 2 -Patients has positive diagnostic block by 1% xylocaine (thoracic transforaminal injection of the affected root) in the operating room and under fluoroscopic guidance.

Exclusion criteria

- 1 – Patients with polynuropathy and other neurological problem.
- 2- Bleeding tendency
- 3-Severe systemic disorder and severe immunocompromised patients
- 4- Major psychopathology.

Firstly, the therapeutic area was detected by the thoracic segment which affected by HZ and accompanied with specific neuropathic pain . Patients were placed in prone in the surgical bed with suitable pillow under the chest .

A 10 –cm electrode with 10 mm active tip (20G cosman cannula RFK TM ; Cosman INC. Burlington, MA), we insert needle under fluoroscopic guidance, the aim is to enter the intervertebral foramen adjacent to DRG , this position was confirmed by sensory stimulation to produce tingling , numbness of the affected nerve using the following parameters (frequency ;50HZ , pulse width;1 ms, voltage; 0.4v-0.6v). after gaining the convenient stimulation , PRF (pulsed dose mode) was applied 900 pulse at corresponding level to 42 degree , voltage 65 .

After one month of the procedure ,we started to decrease the dose of medical therapy to avoid the phase of post procedure discomfort (the phase in which the patient may feel neuritis like effect which may last for up to three weeks) after using the machine.

Pain was evaluated 1,3 ,6 months after the procedure using McGill pain Questionnaire Reference . The used drugs were maintained or reduced according to pain relief and any complication occurred during the procedure were recorded. We use radiofrequency machine (neurotherm NT 1100 {RDG medical, croydon,UK}) and we use pulsed dose response second generation of pulsed RF

Sample size: According to percentage of improvement and at 80% power and 95% confidence interval the estimated sample size was 20 patients

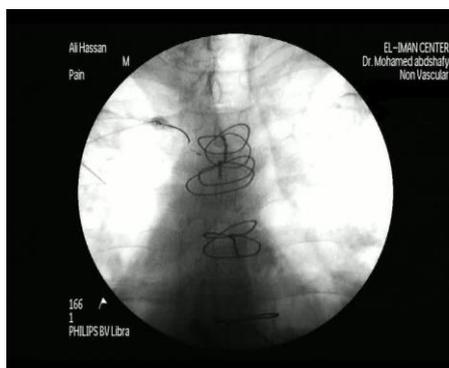


Fig 2 :oplique view show the RF cannula inside T2foramen

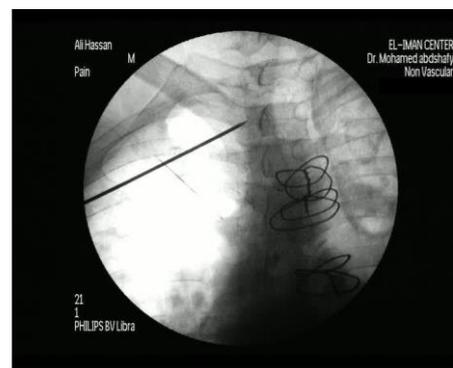


Fig1:oplique view detection of T2 foramen before introducing of RF cannula

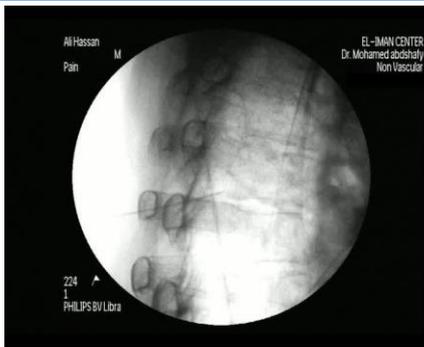
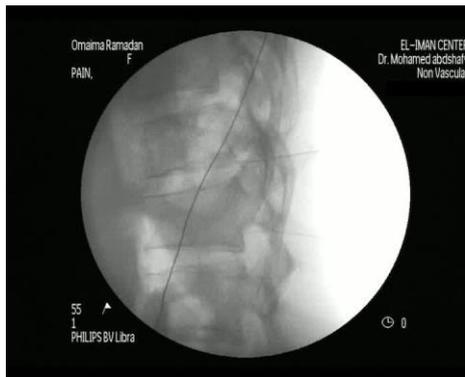


Fig 3;lateral view show the RFcannula inside T2 foramen



Fig 4 :oblique view show the RF cannula inside T12foramen



F5; lateral view show the RFcannula inside T12 foramen

McGILL PAIN QUESTIONNAIRE
RONALD MELZACK

Patient's Name _____ Date _____ Time _____ am/pm

PRI: S _____ A _____ E _____ M _____ PRI(T) _____ PPI _____
(1-10) (11-15) (16) (17-20) (1-20)

1 FLICKERING	11 TIRING	BRIEF
2 QUIVERING	12 EXHAUSTING	MOMENTARY
3 PULSING	13 SICKENING	PERIODIC
4 THROBBING	14 SUFFOCATING	STEADY
5 BEATING	15 FEARFUL	TRANSIENT
6 POUNDING	16 FRIGHTFUL	INTERMITTENT
7 JUMPING	17 TERRIFYING	CONSTANT
8 FLASHING	18 PUNISHING	
9 SHOOTING	19 GRUELLING	
10 PRICKING	20 CRUEL	
11 BORING	21 VICIOUS	
12 DRILLING	22 KILLING	
13 STABBING	23 WRETCHED	
14 LANCINATING	24 BLINDING	
15 SHARP	25 ANNOYING	
16 CUTTING	26 TROUBLESOME	
17 LACERATING	27 MISERABLE	
18 PINCHING	28 INTENSE	
19 PRESSING	29 UNBEARABLE	
20 GNAWING	30 CRUSHING	
21 CRAMPING	31 SPREADING	
22 CRUSHING	32 RADIATING	
23 TUGGING	33 PENETRATING	
24 PULLING	34 PIERCING	
25 WRENCHING	35 TIGHT	
26 HOT	36 NUMB	
27 BURNING	37 DRAWING	
28 SCALDING	38 SQUEEZING	
29 SEARING	39 TEARING	
30 TINGLING	40 COOL	
31 ITCHY	41 COLD	
32 SMARTING	42 FREEZING	
33 STINGING	43 NAGGING	
34 DULL	44 NAUSEATING	
35 SORE	45 AGONIZING	
36 HURTING	46 DREADFUL	
37 ACING	47 TORTURING	
38 HEAVY	48 PPI	
39 TENDER	49 NO PAIN	
40 TAUT	50 MILD	
41 RASPING	51 DISCOMFORTING	
42 SPLITTING	52 DISTRESSING	
	53 HORRIBLE	
	54 EXCRUCIATING	

E = EXTERNAL
I = INTERNAL

COMMENTS:

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Statistical analysis:

The data were collected, presented and analyzed using SPSS-PC (version 20) software. Comparisons between several measures of PRI (Mean \pm SD) were done using one way ANOVA test and paired t-test to measure change from baseline. Also, changes in categorical variables were done by Mc Nemar's chi-squared test.

Correlation coefficient was calculated to determine correlation of age and sex to pain Rating Index scores before and after radiofrequency. The test results were considered significant when P.value <0.05.

RESULTS

Twenty patients were initially enrolled in this study, although only nineteen patients successfully completed the entire study. One patient was withdrawn because of failure to complete all the postoperative evaluations.

Table (1): Relevant Characteristics of the Studied Cases (19 cases)

AGE year	Studied Group N(19)
mean \pm (SD)	57.95(9.59)
Median	57
Range	42-72
SEX	
Male Number (%)	7(36.8)
Female Number (%)	12(63.2)
M/F Ratio	1/1.7

Table (2): Difference in the Mean (SD) scores of Pain Rating Index (PRI) of postherpetic neuralgia before radiofrequency and (one, three, six) Months after radiofrequency

Characteristics Pain Rating Index	Radiofrequency application				P-value
	Before	1 month after	3 month after	6 month after	
n	19	19	19	19	
mean \pm (SD)	41.6 (7.2)**	32.1(8.1)	23.7(9.3)	18.1(9.9)	<0.001
Median	44**	33	23	15	
Min-max	24-52**	17-47	8-47	4-41	

**There is a highly statistical significant differences between Mean scores of Pain Rating Index (PRI) of post herpetic neuralgia before radiofrequency and (one, three, six) months after radiofrequency using paired t-test

**p <0.001 when compared with baseline

Table (3): Difference in the Mean scores(SD) of Pain Rating Index (PRI) of postherpetic neuralgia before radiofrequency and (one, three, six)

Months after radiofrequency

	Pain Index Mean	Rating SD	Paired test	t	P-value
Before Radiofrequency	41.6	7.2	6.6		<0.001*
Vs					
1 Month after Radiofrequency	32.1	8.1			
1 Month after Radiofrequency	32.1	8.1	6.1		<0.001*
Vs					
3 Months after Radiofrequency	23.7	9.3			
3 Months after Radiofrequency	23.7	9.3	6.7		<0.001*
Vs					
6 Months after Radiofrequency	18.1	9.9			

** There is a highly statistical significant difference between Mean scores

of Pain Rating Index (PRI) of postherpetic neuralgia (before radiofrequency and one month), (one and three months after radiofrequency) and (three and six months after radiofrequency)

Table (4): Difference in the Persistent Pain Intensity (PPI) of postherpetic neuralgia before radiofrequency and (one, three, six) months after radiofrequency

Characteristics	Radiofrequency application on 19 studied cases								Mc Nemar's chi-Square	P-value
	Before		1 month after		3 month after		6 month after			
PPI	N	%	N	%	N	%	N	%		
0	0	0	0	0	0	0	2	10.5	42.21**	<0.001
1	0	0	0	0	5	26.3	7	36.8		
2	1	5.3	7	36.8	8	42.1	6	31.6		
3	7	36.8	8	42.1	5	26.3	3	15.8		
4	11	57.9	4	21.1	1	5.3	1	5.3		

There is a highly statistical significant difference between Persistent Pain Intensity (PPI) of postherpetic neuralgia before radiofrequency and (one, three, six) months after radiofrequency.

Table (5) : Correlation between (Age, Sex) and Pain Rating Index score (PRI) of postherpetic neuralgia before radiofrequency and six months after radiofrequency.

Characteristics	Correlation Coefficient (r)	P-value
<u>Pearson correlation between age and PRI</u>		
PRI before radiofrequency with Age	0.625	0.004**
PRI 6 months after radiofrequency with Age	0.646	0.003**
Improvement in PRI after radiofrequency with Age	- 0.327	0.171
<u>Spearman s correlation between sex and PRI</u>		
PRI before radiofrequency with Sex	-0.182	0.456
PRI 6 months after radiofrequency with Sex	- 0.21	0.388
Improvement in PRI after radiofrequency with Sex	0.09	0.714

** There is a highly statistical significant positive correlation between Age and (PRI) score of postherpetic neuralgia before radiofrequency and six months after radiofrequency. While improvement in PRI score does not show significant correlation with age. Also sex show no significant correlation either with (PRI) of postherpetic neuralgia before and after radiofrequency nor with Improvement in PRI.

. There was excellent pain reduction in three patients who did not need additional pharmacological or interventional treatment, ten cases responded to PRF and needed only minimal dose of tricyclic antidepressant(25mg of

amitryptaline once daily), six cases showed mild respond to PRF (half of the original treatment was reduced. There is no complications were detected during the procedure.

DISCUSSION

When the intricate kind of the disease is considered , it is normal that no definitive treatment of PHN is available (3).

PRF is nondestructive procedure where current is delivered in a pulse of 20 milliseconds followed by a silent period of 480 milliseconds to avoid radiofrequency heat lesions (9).

The analgesic action of PRF is including the increase of noradrenergic and serotonergic

descending inhibitory pathways . The long term analgesia of PRF is related to change in gene expression in the neurons (15).

This study examined the intermediate- term effect of procedure after one month, three and six months. It demonstrated that the pain severity gradually improved in most of the patients.

This result is in agreement with the study of Jenneifer et al (4) who reported that pulsed RF ablation of the DRG provided significant pain relief compared with conventional pain treatment in patients with intractable PHN.

Also, Cohen et al (12) when compared treatment outcome between pharmacotherapy, PRF of the intercostals nerves and PRF of DRG in neuralgia after surgery, they reported that PRF of the DRG was highly effective than pharmacotherapy . Multiple clinical trials and animal experiments have demonstrated the superiority of PRF for management of neuropathic pain over other available clinical methods (16-17-18)

In this study there is highly statistical positive correlation between age and PRI before application of PRF. This is in accordance with David et al (3) who found that PHN affected 50% of patients over 60 years of age and 15% of anti herpetic patients.

In this study , there are several limitations

First limitation :after obtaining appropriate stimulation (proper position of the needle), PRF was preformed (900 pulses for every DRG) and there is no strict data to support this number of pulsation.

Second limitation : this mode is new and there is no adequate number of studies was done using this mode of pulsations.

Third limitation: we only observed the intermediate effect .So, long term follow up observation is needed.

In conclusion : the use of PRF for treatment PHN is a safe therapeutic alternative method. The advantage of this procedure is minimally invasive, provides short-term pain relief and improves quality of life.

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