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Response of Male Pudendal Neuralgia to Two Different Pulsed Electromagnetic Field Therapy Programs

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Abstract:Purpose: to evaluate the efficacy of two different pulsed electromagnetic field therapy programmes on male pudendal neuralgia. **Methods of evaluation:** Measurement of the serum cortisol level (SCL), naproxen medicament intake (NMI) and the visual analogue scale (VAS). **Methods:-** Sixty male patients who had chronic pudendal neuralgia were participated in the study, their ages ranged from 30 to 50 years, they were randomly divided into 3 equal groups in number; 2 experimental groups (A) and (B) and a control one (C). Group (A) received a programme of strong impulses, stimulating South polarity of the magnetic pulses with frequency Fluently changing from 12.5-50 Hz, with buttons 1, 3 and 6 up while buttons 2, 4 and 5 down in addition to the traditional physical therapy and medical care. Group (B) received a programme of mild impulses, soothing North polarity of the magnetic pulses with frequency of 12.5Hz with buttons 1,2,4 and 5 down while buttons 3 and 6 up, in addition to the traditional physical therapy and medical care. Group (C) received the traditional physical therapy and medical care only for 4 months. The pulsed electromagnetic field therapy (PEMF) was applied once daily, three times per week for 4 months as a total period of treatment, each session was conducted for 20 minutes in the form 10 minutes over the perineal area between anus and scrotum on the centrum tendineum with the patient in comfortable supine hook-lying position with abducted hips, while the other 10 minutes were applied over the buttocks medially at the level of the ischial spines (medial to the ischial spines bilaterally) (5 minutes for each side), with the patient in comfortable prone-lying position. **Results and conclusion:-** Results showed a highly significant reduction in SCL, NMI and VAS at the end of the treatment program in groups (A) and (B). So both programmes of strong impulses and mild impulses in groups (A) and (B) were effective in improving the male pudendal neuralgia as manifested by the highly significant decrease in SCL, NMI and VAS. But programme of mild impulses was more fruitful and beneficial than the strong impulses programme.
Key words (Pulsed electromagnetic field therapy, Pudendal neuralgia,Serum cortisol level, Naproxen medicament intake and the Visual analogue scale).

Introduction

The pudendal nerve arises from the ventral primary rami of S2, S3, and S4 of the sacral plexus. The pudendal nerve exits the pelvic cavity under the piriformis muscle through the greater sciatic foramen and descends ventral to the sacrotuberous ligament. The nerve then passes under the sacrospinous ligament medial to the ischial spine and re-enters the pelvic cavity through the lesser sciatic foramen. While under the levatorani

muscle, the pudendal nerve courses ventrally through the pudendal canal of Alcock, a thickening of the obturatorinternus fascia. Within the ischioanal fossa, the pudendal nerve gives off two branches: the inferior rectal branch and perineal branch. The dorsal sensory nerve of the penis or clitoris forms the terminal branch. The inferior rectal branch of the pudendal nerve passes medially through the ischioanal fossa, providing motor supply to the external anal sphincter and sensory supply to perianal skin[1,2 3].

Persistent pain (neuralgia) and burning sensations (paraesthesia) in the perineal region caused by pudendal nerve entrapment due to solitary neurofibroma, postherpeticpudendal neuralgia and with patients who underwent pudendal nerve decompression surgery and still complained form intractable and persistent perineal pain that may result in severe morbidity [8,9].

Although idiopathic urogenital and anorectal pain syndromes are not uncommon, effective treatments remain elusive for this patient group. Pain in these areas of the body can be embarrassing for the patient, limiting the desire to discuss the symptoms with the physician; physicians also may not be familiar enough with these pain syndromes, leading to misdiagnosis. Poorly understood pain syndromes, including idiopathic vulvodynia, prostatodynia, orchialgia, idiopathic proctalgia, coccydynia, levatorani syndrome, and urethral syndrome, share many common features, including pain in the distribution of one or both pudendal nerves[9,10,11,12].

The two documented sites of pudendal nerve entrapment (PNE) are between the sacrotuberous / sacrospinous ligaments and in the pudendal canal. Pudendal neuropathy as a source of fecal incontinence and occasional constipation and temporary loss of penile sensation, and even impotence has been described. There is also limited literature identifying pudendal neuropathy as a possible source of perineal pain [12,13,14].

The syndrome was characterized by pain in the distribution of the pudendal nerves, particularly in the seated position, in absence of sexual disturbances, in men; the pain can affect the perineum, scrotum, anus, and penis. The pain can be unilateral or bilateral; pain intensifies during sitting and is diminished when standing, recumbent, or sitting on a lavatory seat. A relationship is recognized between burning pain and prolonged mechanical compression of the pudendal nerve within the pudendal canal shortly before symptoms begin. The pudendal nerve exiting the pelvis via the greater sciatic foramen and re-entering immediately adjacent to the inferior border of the sacrospinous ligament. Pudendal nerve entrapment can occur between the sacrospinous and sacrotuberous ligaments or in Alcock's canal [15, 16].

The ancient people discovered magnetic phenomenon about 2000 years ago. Certain lead colored stones notably at Magnesia "a province in Asia Minor" were found to possess the property of attracting iron filling or small pieces of steel. Since it was found in Magnesia it was given the name of magnetite. During the past few decades, the biological effects of electric currents and electromagnetic fields (EMF) have become a topic of increasing attention. Endogenous electrical and electrochemical interactions are associated with many basic physiological processes, ranging from ion binding and molecular conformation in the cell membrane to the macroscopic mechanical properties of tissues [19].

Pulsed electromagnetic field therapy (PEMFT) is a physical therapy modality that has been widely used for increasing permeability of the cell membrane and blood circulation, increasing oxygen supply, increasing ATP production, stimulating healing process and epithelialization of the injured tissues, accelerating bone healing, improving fibroblastic as well as osteoblastic activities, plus its anti-inflammatory and analgesic effect, [20,21,22,23].

Material and Methods

Subjects:

Sixty male patients who had chronic pudendal neuralgia were participated in the study, their ages ranged from 30 to 50 years, they were randomly divided into 3 equal groups in number; 2 experimental groups (A) and (B) and a control one (C). Group (A) received a programme of strong impulses, stimulating South polarity of the magnetic pulses with frequency Fluently changing from 12.5-50 Hz, with buttons 1, 3 and 6 up while buttons 2, 4 and 5 down in addition to the traditional physical therapy and medical care. Group (B) received a programme of mild impulses, soothing North polarity of the magnetic pulses with frequency of

12.5Hz with buttons 1,2,4 and 5 down while buttons 3 and 6 up, in addition to the traditional physical therapy and medical care. Group (C) received the traditional physical therapy and medical care only for 4 months. The pulsed electromagnetic field therapy (PEMF) was applied once daily, three times per week for 4 months as a total period of treatment, each session was conducted for 20 minutes in the form 10 minutes over the perineal area between anus and scrotum on the centrum tendineum with the patient in comfortable supine hook-lying position with abducted hips, while the other 10 minutes were applied over the buttocks medially at the level of the ischial spines (medial to the ischial spines bilaterally) (5 minutes for each side), with the patient in comfortable prone-lying position [1,3,8,12,16,25].

Instrumentation:

Pulsed electromagnetic field therapy unit: (JAMAVA® S Magneto therapeutic apparatus), with the following characteristics and specifications: Maximum induction of magnetic field: 70 mT, diameter: 55 mm, length: 160 mm, active surface: or functional area 30 cm^2, weight: 500 g, operational frequency:1.6-50Hz, minimum treatment Period: 20 minutes, maximum treatment Period: 40 minutes, 10 therapeutic different programmes (10 optional frequency modes): Programmes (1) & (9): intermediate frequency programmes, programmes (2) & (10): Mild frequency programmes, programme (3): weak frequency programme, programme (4): the weakest frequency programme, programmes (5), (6) & (7): Strong frequency programmes, programme (8): the strongest frequency programme. As previously mentioned and according to the induction of the magnetic field, polarity and frequency of the pulsed electromagnetic JAMAVA apparatus, the apparatus emit six levels of magnetic field induction through 10 programmes, namely the weakest, weak, mild, intermediate, strong and the strongest programmes[20,21,22,23].

Procedures

Evaluation:

1- Elexcess twenty ten device: Normal cortisol level ranged from 9-25 µg/dL at morning and patients with painful conditions tended to have higher than normal SCL, estimation of serum cortisol level was carried out before and after 4 months of treatment program . A venous blood sample of 8 CC was taken at the morning, centrifuged and stored at 20ºC till analyzed for blood serum analysis that was used for the measurement of serum cortisol level**.**

2- Calculation of the naproxen medicament intake in mg (NMI): Was done before and after the treatment program.

Visual analogue scale (VAS): The pain level was assessed by visual analogue scale (VAS) before starting treatment (first record) then after 4 months (as second final record). The visual analogue scale (VAS) consisted of a line, usually 10 cm long, whose ends are labeled as the extremes of pain (e.g., no pain to unbearable pain).Patient was asked to place a mark at the point on the line which best represent his experience of pain between two "no pain" to "worst pain", then the operator measured the distance from the zero "no pain" in centimeters. All the aforementioned parameters (VAS and the CMI) were measured 2 times; the baseline record that was taken before starting of the study, the second record was taken after 2 months from the starting of the study [23,24].

Treatment:

All patients in the 3 groups will receive the same traditional physical therapy and medical care. Procedures of the pulsed electromagnetic field therapy for the study groups (A) and (B): The pulsed electromagnetic field therapy (PEMF) was applied once daily, three times per week for 4 months. Each session was conducted for 20 minutes in the form 10 minutes over the perineal area between anus and scrotum on the centrum tendineum with the patient in comfortable supine hook-lying position with abducted hips, while the other 10 minutes were applied over the buttocks medially at the level of the ischial spines (medial to the ischial spines bilaterally) (5 minutes for each side), with the patient in comfortable prone-lying position. First programme of PEMF for the first study group (A) has the following characteristics: A programme of strong impulses, stimulating South polarity of the magnetic pulses with frequency Fluently changing from 12.5-50 Hz, with buttons 1,3 and 6 up while buttons 2,4 and 5 down. Second programme of PEMF for the second study group (B) has the following characteristics: A programme of mild impulses, soothing North polarity of the

magnetic pulses with frequency of 12.5Hz with buttons 1,2,4 and 5 down while buttons 3 and 6 up, 20,21,22,23.

Data analysis:

SCL, NMI and VAS were measured before and after the treatment program and the collected data were fed into computer for the statistical analysis; descriptive statistics as mean, standard deviation, minimum and maximum were calculated for each group. The ANOVA test was done to compare the mean difference of the three groups before and after treatment application and within each group. Alpha point of 0.05 was used as a level of significance [25,26].

Results

In the present study, effects of two different pulsed electromagnetic field therapy programmes on SCL, NMI and VAS in cases of malepudendal neuralgia in the first study group, second study group and the third control group were investigated. As shown in table (1) and figure (1), the mean values of SCL before treatment was (26.4554 ± 0.3986) µg/dL in the first study group, while after treatment was (26.6630 ± 0.5672) µg/dL. These results revealed significant reduction in SCL (P<0.0001). While the mean values of SCL before treatment was (36.4456 ± 0.3865) µg/dL in the second study group, while after treatment was (25.4500 ± 0.4464) µg/dL. Also these results revealed significant reduction in SCL (P<0.0001).But in the control group, the mean values of SCL before treatment was (36.3628 ± 0.4221) µg/dL in the control group, while after treatment was (36.3632 ± 0.4325) µg/dL. These results revealed non-significant difference in SCL (P>0.05).ANOVA test showed that, there was significant difference between the three groups after treatment with better improvement in the Second study group.

Table (1): Comparison of the mean values of SCL before and after treatment in the three groups.

		Before treatment		After treatment		P –value
		Mean	± SD	Mean	± SD	
Within group	First study group (Strong PEMFT)	36.4554	0.3986	26.6630	0.5672	<0.0001
	Second study group (Mild PEMFT)	36.4456	0.3865	25.4500	0.4464	<0.0001
	Control group	36.3628	0.4221	36.3632	0.4325	> 0.05
Between groups (ANOVA)		Before treatment				0.874
		After treatment				<0.0001

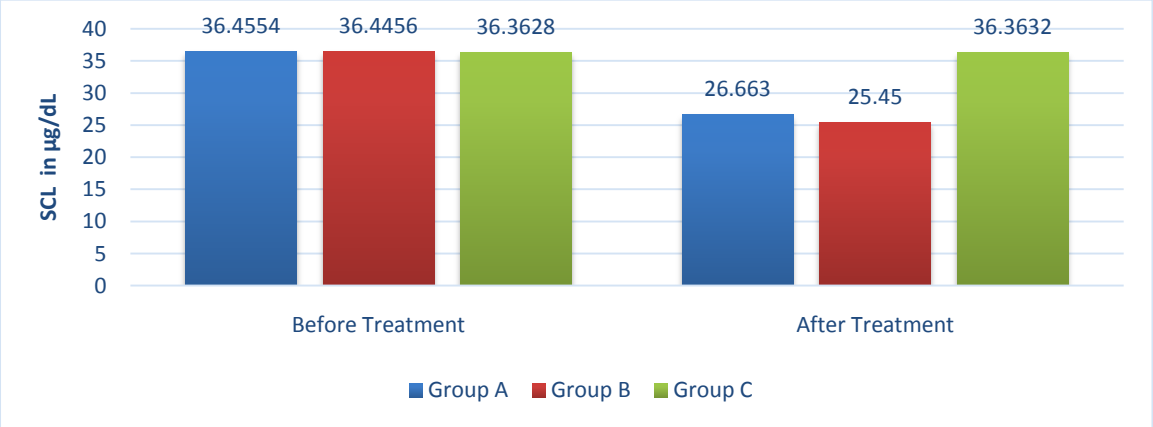

Fig (1): Mean values of the SCL before and after treatment in the three groups.

Also as shown in table (2) and figure (2), the mean value of NMI before treatment was (1284.6 ± 206.1) mg in the first study group (PEMFT), while after treatment was (525.0 ±199.2) mg. These results revealed significant reduction in NMI (P<0.0001). The mean value of NMI before treatment was (1287.5 ± 203.2) mg in the second study group (MENS), while after treatment was (475.0 ± 197.0) mg. Also these results revealed

significant reduction in NMI (P<0.0001). But in the control group, the mean values of NMI before treatment was (1285.3 ± 206.9) mg in the control group, while after treatment was (1282.2 ± 205.8) mg. These results revealed non-significant difference in NMI (P>0.05). ANOVA test showed that, there was significant difference between the three groups after treatment with better improvement in the Second study group.

Table (2): Comparison of the mean values of NMI in mg before and after treatment in the three groups.

		Before treatment		After treatment		P –value
		Mean	± SD	Mean	± SD	
Within group	First study group (Strong PEMFT)	1284.6	206.1	525.0	199.2	< 0.0001
	Second study group (Mild PEMFT)	1287.5	203.2	475.0	197.0	< 0.0001
	Control group	1285.3	206.9	1282.2	205.8	> 0.05
Between groups (ANOVA)		Before treatment				0.811
		After treatment				<0.0001

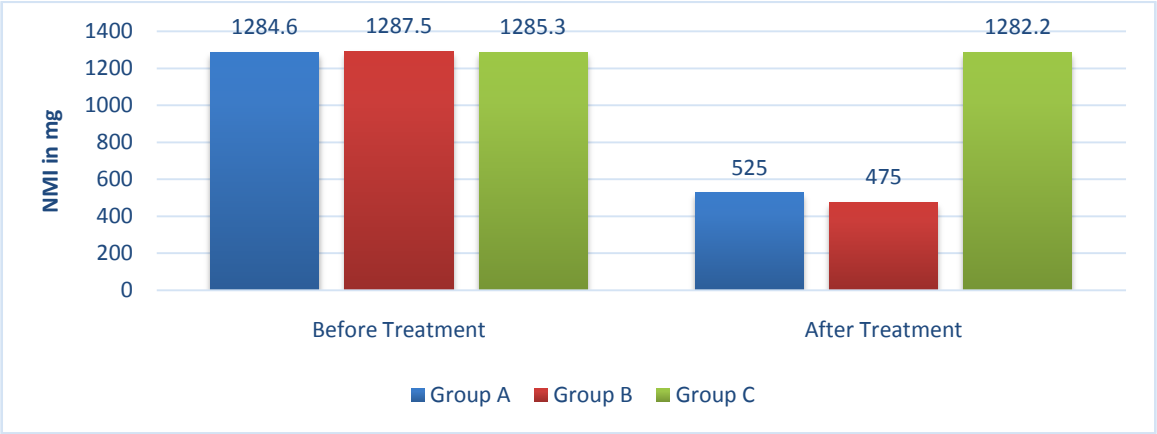

Fig (2): Mean values of the NMI in mg before and after treatment in the three groups.

Also as shown in table (3) and figure (3), the mean value of VAS before treatment was (9.531 ± 0.162) degrees in the first study group (PEMFT), while after treatment was (3.402 ± 0.232) degrees. These results revealed significant reduction in VAS (P<0.0001). The mean value of VAS before treatment was (9.552 ± 0.166) degrees in the second study group (MENS), while after treatment was (2.221 ± 0.231) degrees. Also these results revealed significant reduction in VAS (P<0.0001). But in the control group, the mean values of VAS before treatment was (9.549 ± 0.154) degrees in the control group, while after treatment was (9.525 ± 0.149) degrees. These results revealed non-significant difference in VAS (P>0.05).ANOVA test showed that, there was significant difference between the three groups after treatment with better improvement in the Second study group.

Table (3): Comparison of the mean values of VAS in degrees before and after treatment in the three groups.

		Before treatment		After treatment		P –value
		Mean	± SD	Mean	± SD	
Within group	First study group (Strong PEMFT)	9.531	0.162	3.402	0.232	< 0.0001
	Second study group (Mild PEMFT)	9.552	0.166	2.221	0.231	< 0.0001
	Control group	9.549	0.154	9.525	0.149	> 0.05
Between groups (ANOVA)		Before treatment				0.634
		After treatment				<0.0001

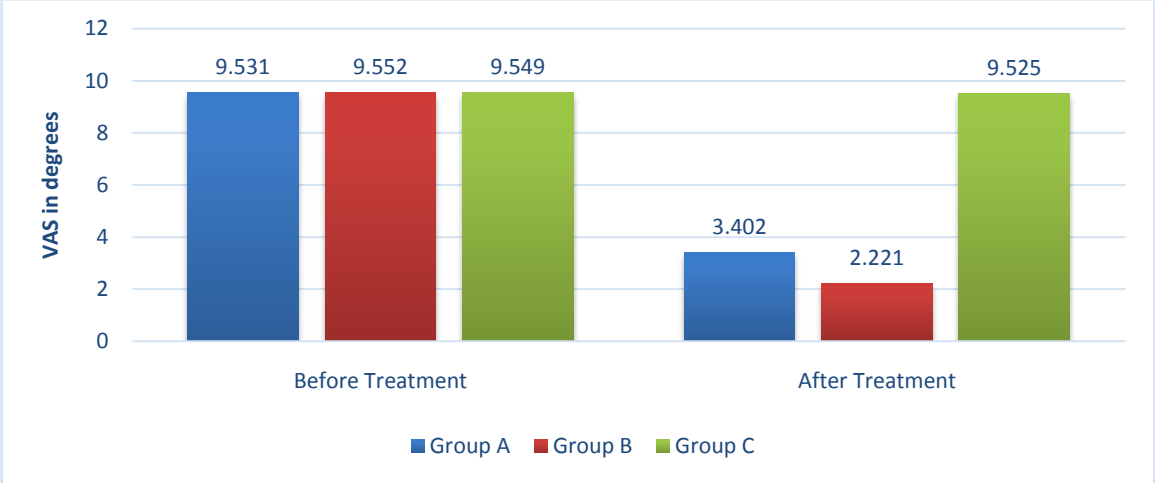

Fig (3): Mean values of the VAS in degrees before and after treatment in the three groups.

Discussion

Pudendal nerve originates from the second, third and fourth sacral nerves, its branches are the inferior rectal and the perineal. Distributions of the pudendal nerve are the urogenital diaphragm, skin around the anus, skin of the scrotum or labium major and external sphincter of the anus. But the pudendal plexus originate also from the second, third and fourth sacral nerves, its branches are visceral, muscular, pudendal and dorsal nerve of penis or clitoris. Distribution of the pudendal plexus are the bladder, prostate, seminal vesicles, external genitalia, rectum, urogenital diaphragm, skin and muscles of anus, scrotum and labium major [1,2,3,4,5,6].

In neuralgia, pain can occasionally be reproduced by gently tapping over an area of point tenderness (Tinel sign) or by extending the thigh or hip, if a local entrapment or neuroma is responsible for the pain; a local block of the pudendal nerve alleviates the symptoms. If the pain is not relieved, the S-2, S-3 and S4 nerve plexus can be blocked through a paravertebral route with 0.5% bupivacaine and 0.75% lidocaine with epinephrine 1:200,000.by performing separate blocks and observing for pain relief [9,10,11].

PNE can cause pain in the rectum, scrotum (labia), or penis (clitoris). At onset, pain is exacerbated in the seated position, except on a lavatory seat, and relieved by standing or lying down. Diagnostic techniques, including CT-guided nerve blocks and nerve conduction studies, can confirm the diagnosis. Once diagnosed, guided corticosteroid injections and surgical intervention can provide relief and even cures for this formerly refractive population. At present, it is unknown what fraction of cases of idiopathic urogenital and anorectal pain syndromes are related to PNE. However, because accurate diagnostic methods and effective treatment options for PNE do exist, these diagnostic methods may be appropriate before concluding a patient has an idiopathic perineal pain syndrome [6,7,8,9,10].

Pudendal Neuralgia is a painful neuropathic condition that is caused by inflammation of the pudendal nerve. Triggers for the sensitivity include trauma secondary to childbirth, surgery, cycling, squatting exercises, bio-mechanical abnormalities (e.g., sacroiliac joint dysfunction, pelvic floor dysfunction), chronic constipation, repetitive vaginal infections and direct falls on the tailbone. Pudendal neuralgia is known in some circles as (cyclist's syndrome), (pudendal canal syndrome) or (Alcock's syndrome). Primary symptoms of pudendal neuralgia include: pelvic pain with sitting that may be less intense in the morning and increase throughout the day. Symptoms may decrease when standing or lying down. The pain can be perineal, rectal or in the clitoral / penile area; it can be unilateral or bilateral, sexual dysfunction in women manifested as pain or decreased sensation in the genitals, perineum or rectum. Pain may occur with or without touch. It may be difficult or impossible for the woman to achieve orgasm [1,2,7,9,12,14,16].

Pulsed magnetic field therapy have shown decreased pain and improved functional performance in patients with osteoarthritis of the knee. Magnetotherapy is very effective in drawing pain and relieving stiffness as when the body comes into contact with magnet. The magnetic pass through the tissues and induce secondary

currents, which produce impacting heats thus reducing pain and swelling. It also revives and promoted the growth of cells and increases the number of healthy red blood corpuscles. The red corpuscles contain hemoglobin, which in turn contains iron, the magnets influence the iron in the blood through which it reaches every part of the body, and removes calcium, cholesterol and other deposits. It cleans, purifies and ionizes the blood. The ionized blood flows easily thus there is no clotting, resulting in the ease of activity of the heart and normalization of blood pressure. The secretion of hormones is also regulated and this improves the circulation of the skin [1, 9,10,13].

Electromagnetic fields were applied to promote bone healing, treat osteoarthritis and inflammatory diseases of the musculoskeletal system, alleviate pain and enhance healing of ulcers. This demonstrates how much EMF is beneficial for the field of physical therapy**.** Many clinical and basic research studies have shown that PEMF was effective not only on healing long bone nonunion, but also on cancellous bone graft incorporation, soft tissue injuries and peripheral nerve injuries**.** Pulsed magnetic field therapy have shown decreased pain and improved functional performance in patients with osteoarthritis of the knee. Pulsed electromagnetic field exposure has been applied to a variety of orthopedic pathologies, mostly with positive, successful indications. PEMF therapy was a successful modality of treatment of congenital pseudoarthrosis, pseudoarthrosis, delayed union, fracture at risk, recent fracture, bone grafts, vertebral arthrosis, and avascular necrosis. Limb lengthening, however, was not successfully achieved through the use of PEMF stimulation[1,10, 13,18,21.]

Findings of the present study showed non-significant difference in the pre-treatment records of the SCL, NMI and VAS, between the mean values of the first study and the control groups, also between the mean values of the second study and the control groups, as well as between the mean values of the first study and the second study groups.

Results of this study revealed a highly significant reduction in the mean values of SCL, NMI and VAS in the first study group after the application of the strong PEMFT, also in the second study group after the application of the mild PEMFT, but showed non-significant difference after application of the traditional physical therapy in the control group, where SCL (2) compared with the mean value of SCL (1), NMI (2) compared with the mean value of NMI (1), and VAS (2) compared with the mean value of VAS (1) in the three groups.

Significant differences showed in this study were consistent with those observed and recorded by Aaron el al., 2004;Amarenco et al., 2007; Cesaro and Ollat, 2008; De Mattei et al., 2005; Deitz et al., 2002; Gaston, 2006; Hokinson, 2004;Leisner et al., 2002; Prochazka, 2002 and Schaeffer, 2000.

Results of this study supports the expectation that both programmes of strong impulses and mild impulses of PEMFT in groups (A) and (B) were effective in improving the male pudendal neuralgia as manifested by the highly significant decrease in SCL, NMI and VAS. But programme of mild impulses was more fruitful and beneficial than the strong impulses programme.

Conclusion

Both programmes of strong impulses and mild impulses of PEMFT in groups (A) and (B) were effective in improving the male pudendal neuralgia as manifested by the highly significant decrease in SCL, NMI and VAS. But programme of mild impulses was more fruitful and beneficial than the strong impulses programme.

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