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Original Article

Comparison of Conventional Physiotherapy with Pulsed Electromagnetic Field Therapy in Breast Cancer Patients with Lymph-Edema

Anuja Pasari

Division of Physiotherapy, Department of Orthopaedics, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005

ABSTRACT

Background: *Lymphedema in addition to arm pain and movement restriction following breast cancer surgery is common challenge to physiotherapy. PEMF therapy is proving good adjunct for enhancing fracture healing, reducing inflammation and symptom relief. The same is exempt for benefit in stated problems of post-breast cancer surgery patients.*
Methods: *60 patients each were sequentially enrolled following informed consent, administering either conventional physiotherapy or combined PEMF therapy with conventional physiotherapy for 3 weeks. The parameters examined were pain score, range of movement and arm circumference for edema.*
Results: *Physiotherapy benefited pain and range of movement but not lymphedema. PEMF combined therapy significantly reduced lymphedema in addition to other benefits.*
Conclusions: *PEMF therapy with reported bioenergetic effects appears to effect reduction of lymphedema as well as pain relief and betterment of joint movements. The study emphasizes need for establishing PEMF as adjunct root in therapy for the kind of patients. This would need larger and wider evaluation.*

Keywords: *Lymphedema, PEMF Therapy, Breast cancer.*

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***Corresponding Author**

Anuja Pasari
Physiotherapist
34, Gurudham Colony, Varanasi (U.P.), India, Pin-221010
Email – anuja_pasari@yahoo.com

INTRODUCTION

Women who have undergone surgical or radiation treatment for breast cancer (BC) are at a lifelong risk of developing lymphedema, which can cause swelling in the arm, hand, shoulder, breast or chest wall.[1] The condition has physical and psychological impact and affects women's quality of life (QOL). Lymphedema is an accumulation of fluid in the interstitial tissue due to the inability of the lymphatic system to transport lymph fluid out of the affected area.[1] Lymphedema can physically impair arm function by limiting range of motion, as well as causing feeling of pain, heaviness and numbness in the upper extremity.[2,3] Arm lymphedema that occurs following mastectomy and related cancer treatment often develops gradually and if untreated tends to worsen.[4] Recent meta-analysis indicates incidence of lymphedema of around 20% after breast cancer surgery.[5] A few reports[6] have described good adjunctive results using microwave treatments. Because previous work[7,8] showed that low energy pulsed radio frequency therapy increased skin blood flow, likely via enlargement of vascular channels. It was speculated that the therapy may similarly affect lymphatic channels. It was therefore sought to determine any positive impact of PEMF on lymphedema reduction.

METHODS

This study was conducted in patients referred to the physiotherapy department of S.S. Hospital, Banaras Hindu University during the period September 2017 to April 2018. Sequential allocation design was used for randomization.

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The control group was given conventional physiotherapy and the intervention group was treated with PEMF therapy in addition to physiotherapy.

Selection Criteria

Patients of BC were referred from Radiotherapy (RT) outpatient department following modified radical mastectomy (MRM) or breast conservative surgery (BCS). Pain, numbness, heaviness, range of motion and arm circumference were noted initially and at the end of treatment, employing specific scoring scales i.e. Visual Analogue Scale (VAS), goniometer and measuring tape.

PEMF therapy was given during the entire period of RT. It has a single treatment head mounted on an adjustable bracket. It was placed in close contact with the arm to be treated. Since it does not cause any inconvenience to the patient, no special instruction given at 26Hz frequency, 65 us pulse duration and 200w pulse power. It was given at arm, forearm and hand of affected side for two minutes per area. The device directs radiofrequency waves to the area through cylindrical treatment head. It was applied for 30 minutes (10 minutes each area) 6 sittings were given per week and it was applied for 3 weeks.

Patients were allocated alternately to either group 1(control group) i.e. only exercise or group 2 (intervention group) i.e. exercise with pulsed electromagnetic field therapy. The age group of patients included was between 24 to 66 years of female.

The patients were informed about the nature of two treatments and explained that they shall receive either of the treatment.

After this, patients were told that the details of their case will be used in research. Their identity will never be revealed without their consent. Patients were also given the option to withdraw from the study at any time. After this they were required to give written consent.

Inclusion criteria

- Post mastectomy/Breast conservative patients requiring radiotherapy.
- Age group of patients selected between 22 to 65 years.

Exclusion criteria

- Bacterial Infection of arm.
- Arterial and venous circulation disorder.
- History of lymphedema of the concerned arm before surgery.
- History of filariasis.

Measurements

Pain intensity- it was measured on visual Analogue scale [VAS] of 10 points to evaluate intensity of pain where '0' represents no pain and '10' represents unbearable pain.[9]

Joint movement – It was measured with the help of universal goniometer. The axis of goniometer was placed at 2.5 cm inferior to the lateral aspect of the acromion process for shoulder flexion, at 1.3 cm inferior and lateral to the coracoid process for shoulder abduction and at the olecranon process of the ulna for shoulder internal and external rotation.[10]

Difference of arm circumference

4 points of measurement were determined from olecranon process. first point was 5 cm above and second was 15 cm above the olecranon process and same below the olecranon process. Arm circumference of bilateral upper limb was noted with the help of measuring tape. It was measured initially and at the end of treatment.[11]

Treatment

Group 1 (Exercise control group)

In order to restore muscular deficits in strength, mobility and coordination of rotator cuff and shoulder girdle muscle, standard exercise protocol was given. At the beginning of the treatment all the participants were explained anatomy and biomechanics of shoulder complex and pathology of the disease.

Stretching exercise for Levator scapulae, upper trapezius, pectoralis major and medial and lateral rotators muscles of the shoulder and progressive active and active assisted shoulder exercise started in conjunction with functional activities and exercises without resistance during three weeks of treatment period.

Group 2 (Pulsed electromagnetic field therapy with shoulder exercise)

Participants in the intervention group (group 2) received pulsed electromagnetic field therapy at 26 HZ frequency, 65 microsecond pulse duration and 200w pulse power. It was given at arm, forearm and dorsum of hand of affected side for 10 minutes per area. 6 sittings were given per week. Total treatment was given for 3 weeks. This was given in addition to standard exercise therapy as given in exercise control group (group 1).

RESULTS

During the study, 130 post breast cancer cases referred from radiotherapy department were enrolled. However, 10 cases failed to continue therapy for entire period of study; among these, 5 were from exercise control group and 5 from intervention group. The result showed that exercise therapy gave modest reduction in pain and quite significant improvement in range of motion while arm circumference was not significantly affected. In Intervention group all parameters viz. pain, range of various movements, difference in arm circumference showed highly significant improvement. Heaviness was present in 40 patients while numbness in 41 patients. Objective assessment was not done for heaviness and numbness but marked improvement was seen in both the groups.

A) Observations in Group I (Only exercise control group)

Table-1A Distribution of cases (n=40) by median (median pain score=7)

	Number of cases above median	Number of cases below median and at median	P. value
Pre test	14	26	
Post test	6	34	P=0.03

Table-2A Distribution of cases (n=20 for flexion, abduction and internal rotation and n=22 for external rotation) by median (median score for flexion is 130^0, for abduction is 120^0, for internal rotation is 40^0 and for external rotation is 80^0)

		Number of cases at median or below median	Number of cases above median	P. value
Flexion	Pre test	18	2	
	Post test	2	18	P=0.0001
Abduction	Pre test	19	1	
	Post test	3	17	P=0.0001
Internal rotation	Pre test	19	1	
	Post test	5	15	P=0.0001
External rotation	Pre test	22	0	
	Post test	5	17	P=0.0001

Table-3A Distribution of cases (n=30) by median (median score=3) for difference in arm circumference at 1 week.

	Number of cases above median	Number of cases at or below median	P. value
Pre test	13	17	
Post test	19	21	P=0.2

Table-4A Distribution of cases (n=30) by median (median score=3) for difference in arm circumference at the end of treatment.

	Number of cases above median	Number of cases at or below median	P. value
Pre test	9	21	
Post test	7	23	P=0.055

(B) Observations in group II (PEMF with exercise) -

Table-1B Distribution of cases (n=48) by median (median pain score=5)

	Number of cases above median	Number of cases at median and below median	P. value
Pre test	34	4	
Post test	3	35	P=0.0001

Table-2B Distribution of cases (n=27 for flexion, n=25 for abduction, n=19 for internal rotation and n=20 for external rotation) by median (median score for flexion and abduction is 160^0, for internal rotation is 60^0 and for external rotation is 80^0)

	Number of cases at median or below median	Number of cases above median	P. value
Flexion Pre test	25	2	
Post test	7	20	P=0.001
Abduction Pre test	22	3	
Post test	11	14	P=0.002
Internal rotation Pre test	19	0	
Post test	1	18	P=0.0001
External rotation Pre test	20	0	
Post test	4	16	P=0.001

Table-3B Distribution of cases (n=35) by median (median score=2) for difference in arm circumference at 1 first week.

	Number of cases above median	Number of cases at median and below median	P. value
Pre test	18	17	
Post test	7	28	P=0.006

Table-4B Distribution of cases (n=35) by median (median score=1) for difference in arm circumference at the end of treatment.

	Number of cases above median	Number of cases median and below median	P. value
Pre test	15	20	
Post test	5	30	P=0.008

DISCUSSION

Arm problems including pain, restriction of movement and lymphedema following breast cancer surgery are well recognized. Nonspecific physiotherapy remains the palliative therapy with limited number of studies examining the level of benefits in Indian patients. The present study compares effects of conventional exercise physiotherapy versus effects of combined PEMF therapy. As the results display exercise control group gains significant improvement in range of motion, modest improvement in pain but no significant reduction in arm edema. In contrast the intervention group employing PEMF therapy in combination to exercise therapy gave much more prominent pain relief and improved range of motions as well as significant reduction in arm edema. There is a well-known understanding on mechanism of benefit by exercise physiotherapy in traumatic and post inflammatory pain and movement restrictions. Not much has emerged as local therapy for reduction of stagnant lymphedema. The fact that Intervention group combining PEMF therapy benefited all the three parameters including lymphedema is important. Attention is drawn to reported physiological effects of PEMF that are of therapeutic interest.[12]

Thus, PEMF is unique energy therapeutics. This boosts ATP formation and ATP driven cell functions like proper transmembrane ion kinetics, neurotransmitter kinetics and dynamics and repair processes of injured cells. In addition, there is inhibitory effect of PEMF on inflammation. It also improves microcirculation, opening of capillaries and stimulating contractive element. This may explain removal of pain causing chemical disturbances from site of inflammation and trauma. In action of PEMF on lymphatics, akin to that in blood capillaries involving improved endothelial function on nitric oxide biology would explain its beneficial effect in reducing lymphedema.

This study therefore clearly indicates combination of PEMF with standard exercise therapy as apparently rational and effective advance in treating post breast cancer surgery, arm problems and lymphedema.

Present study however is not controlled in many other respects like patient's nutrition, occupation and other health parameters. Similarly, the direct relation of PEMF benefits to the reported biological action of PEMF may need focused study in larger and wider patient population.

CONCLUSION

This was the study in total 120 patients suffering arm pain, restriction of movements and lymphedema following breast cancer surgery and put on radiotherapy. Comparative evaluation of benefits on the stated parameters was done on even number of patients given either physiotherapy alone or in combination with PEMF therapy for 3 weeks. Results indicate superior outcome including reduction of lymphedema in patients receiving PEMF additive therapy. The study was not controlled. Multicentric larger studies would establish the role for PEMF in regular management of arm trouble and lymph edema following Breast cancer surgery.

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