

Effectiveness of ultrasound therapy and short wave diathermy over therapeutic exercise and NSAIDs in the treatment of frozen shoulder in a tertiary level hospital - A comparative study

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Abstract:

Background: Frozen shoulder or adhesive capsulitis is a painful and disabling condition that often causes great frustration for patients as well as care givers due to slow recovery. In this condition, movement of the shoulder is severely restricted and pain is usually constant, worse at night. It may cause sudden onset of tremendous pain and cramping on certain movements, usually abduction & external rotation. Traditionally, frozen shoulder was treated with NSAIDs, therapeutic exercise and physical therapy such as ultrasound therapy and short wave diathermy. We compared efficacy, safety and tolerability of physical therapy with that of NSAIDs and therapeutic exercise. **Methods:** A prospective, observational, comparative study was done in Physical Medicine Department of Rajshahi Medical College Hospital (RMCH), Rajshahi from January 2007 to December 2007. Among 292 of painful shoulder patients, 60 frozen shoulder patients were selected. For therapeutic trial, patients were divided into three groups: group-I (short wave diathermy with NSAID & therapeutic exercise), group-II (ultrasound therapy with NSAID & therapeutic exercise) and group-III placebo group (NSAID & therapeutic exercise). Treatment continued for 8 weeks period in all three groups. **Result:** After 8 weeks of treatment, evaluation revealed that the gain in the range of motion (ROM) significantly greater with ultrasound therapy than short wave diathermy & placebo group. The ROM for abduction at pre treatment stage in three groups were 61.25 (\pm SD 16.61), 51.25 (\pm SD 19.86) and 47.75 (\pm SD 14.09) for group-I, II & III respectively. After 8 weeks of treatment ROM for abduction improved to 92.75 (\pm SD 18.81), 86.00 (\pm SD 25.83) and 70.75 (\pm SD 18.16) for group-I, II & III respectively. Improvement with ultrasound therapy was highly significant ($P < .001$) in comparison to short wave diathermy & placebo therapy. **Conclusion:** The study indicates that ultrasound therapy is superior to short wave diathermy as a physical therapy for frozen shoulder. Inference can also be drawn that, heating modalities may be necessary for subjective improvement of frozen shoulder.

Key words: Frozen shoulder, ultra sound therapy, short wave diathermy.

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Introduction

Frozen shoulder, medically referred to as adhesive capsulitis, is a disorder in which the shoulder capsule, connective tissue surrounding the gleno humeral joint of the shoulder becomes inflamed and stiff and grows together with abnormal band of tissue called adhesion which causes greatly

restricted motion and chronic pain¹. It has incidence of 2.4 per 1000 per year². Exact cause of frozen shoulder is unknown. It can last from 5 months to 3 years or more in some cases. It may be caused by injury or trauma to the area³. It is also believed that it may have an auto immune component⁴. Chronic inflammation leads to adhesion between the joint & tissues causing greatly restricted motion and sleeping problem for extended period, resulting in chronic fatigue, depression, problems in back & neck as well as damage to tissues surrounding the joint⁵. There are a number of risk factors for frozen shoulder, including diabetes, stroke, accident, lung diseases, connective tissue disease & heart conditions⁶. Treatment of frozen shoulder is painful and progress is slow. Assist of physical therapy such as ultrasound therapy, shortwave diathermy & therapeutic exercise, massage⁷, hydro dilatation and lastly manipulation under anaesthesia which breaks up the adhesion and scar tissue in the joint to help restore some range of motion⁸.

Materials & methods

A prospective, comparative observational study

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was conducted in Rajshahi Medical college Hospital (RMCH) in January 2007 to December 2007. 60 clinically diagnosed patients of frozen shoulder, with shoulder pain more the 4 weeks, restricted range of motion of shoulder, pain on both active and passive movement of shoulder, were selected for the study.

Procedures

For therapeutic trial, patients were divided into three groups.

Group I: physical treatment with short wave therapy machine applied with frequency of 27.33 MHz and dosimetry of 60-70 waths, placing the non contact applicator over the shoulder for 15 minutes each time, 3 days in a week for 8 weeks period.

Group II: Physical treatment with ultrasound therapy machine with the frequency of 1MHZ and desimetry of 0.8watt / cm² by moving the sound head (transducer) in a back and forth stroking motion over the shoulder region after applying coupling media for 15 minutes each time 3 days in a week for 8 weeks period.

Group III (Placebo group): Here the Short wave diathermy machine was switched on so that the display light gives the impression that the physical treatment was going on. The procedure was maintained for 15 minutes each day, 3 days in a week for 08 weeks perod.

Parameter studied

The following prameters were studied in all patients of each group.

- i) Measurement of pain by visual analogue scale (VAS)
- ii) Measurement of range of motion (ROM) by goniometer : a) Abductin, b) External rotation
- iii) shoulder pain & disability index.

Analysis of Data

The results obtained were subjected to standard statistical procedure. Statistical analysis of the results were obtained by using windows based computer software device with statistical packages for social sceince (SPSS-14). The results were presented in tables, figures and diagrams. Statistical test for signficance of difference were done using t test and chi-square test. AP value <0.05 was considered as significant.

Result

Out of 4378 patients registered in the Department of Physical Medicine of RMCH in the study period, 292 (6.67%) were diagnosed as Frozen shoulder. Out of 60 patients selected, 25 (41%) were male and 35 (58.3%) were female with male-female ratio of 1:1.4.

In our study, 20 (33.33%) patients were manual workers, 14 (23.3%) were house wives, 07 (11.7%) were service holder, 08 (13.3%) were teacher 05 (8.34%) were business man and 06 (10%) were retired persons. Majority were of non-manual occupation (Table-I).

Table-I: Distribution of occupation

Occupation	Frequent s	Percentage (%)
Manual Worker	20	33.3%
House wife	14	23.3
Teacher	08	13.3
Service holder	07	11.7
Retired	06	10.0
Businss	05	8.34

Range of motion (ROM) for abduction at pre-treatment stage was 61.25±SD16.61, 51.25±SD19.86 and 47.75±SD14.09 during shortwave, ultrasound and placebo therapy respectively. After 8 weeks of treatment, ROM for abduction were 92.75±SD18.81, 86.00±SD25.83 and 70.75±SD18.16 during shortwave, ultrasound and placebo therapy respectively. Improvement with ultrasound therapy was highly significant (P<.001) in comparison to shortwave and placebo therapy. The ROM for external rotation at pre-treatment stage was 24.50±SD8.72, 36.75±SD12.38 and 34.25±SD7.30 during shortwave, ultrasound and placebo therapy respectively. After 8 weeks of treatment, it was 38.75±SD11.11, 69.00±SD12.31 and 52.75±SD9.10 during shortwave, ultrasound and placebo therapy respectively. Improvement with ultrasound therapy was highly significant (P<.001) in comparison to shortwave and placebo therapy

Table-II: Range of motion (ROM) for abduction (in degree) in baseline and post therapy states.

Study groups	N	mean ± sd		median		range	
		Baseline	Post-therapy	Baseline	Post-therapy	Baseline	Post-therapy
Group I	20	61.25 ± 16.61	92.75 ± 18.81	65.00	90.00	25-85	45-120
Group II	20	51.25 ± 19.86	86.00 ± 25.83	50.00	90.00	20-80	40-120
Group III	20	47.75 ± 14.09	70.75 ± 18.16	45.00	72.50	25-70	40-100
Total	60	53.42 ± 17.69	83.17 ± 22.83	50.00	90.00	20-85	40-120

Independent Sample t Test : t = 1.727; P> 0.05. NS

Table-III: Range of motion (ROM) for external rotation (in degree) in baseline and post therapy states.

Study groups	N	mean \pm sd		median		range	
		Baseline	Post-therapy	Baseline	Post-therapy	Baseline	Post-therapy
Group I	20	24.50 \pm 8.72	38.75 \pm 11.11	25.00	37.50	10-40	15-60
Group II	20	36.75 \pm 12.38	69.00 \pm 12.31	30.00	67.50	20-60	45-90
Group III	20	34.25 \pm 7.30	52.75 \pm 09.10	32.50	50.00	20-45	40-70
Total	60	31.83 \pm 10.93	53.50 \pm 16.45	30.00	52.50	10.60	15-90

Independent Sample t Test (baseline) : t = 3.617; P < 0.01. HS; Independent Sample t Test (post-therapy) : t = 8.159; P < 0.01. HS

Shoulder pain and disability index (SPADI) was also evaluated at pre and post treatment stage. At pretreatment stage (Table-IV), pain score is 77.55 \pm 5.96 75.60 \pm 7.64 and 75.60 \pm 6.20 in shortwave, ultrasound and placebo therapy group respectively. At post treatment stage it was 61.85 \pm 6.32, 4.10 \pm 434 and 57.30 \pm 7.73 respectively.

Table-IV: Shoulder pain score (%) in baseline and post therapy states.

Study groups	N	mean \pm sd		median		range	
		Baseline	Post-therapy	Baseline	Post-therapy	Baseline	Post-therapy
Group I	20	77.55 \pm 5.96	61.85 \pm 6.32	77.00	61.00	64-89	64-89
Group II	20	75.60 \pm 7.64	54.15 \pm 4.34	77.00	54.50	63-85	63-85
Group III	20	75.60 \pm 6.20	57.30 \pm 7.73	78.50	59.50	65-84	65-84
Total	60	76.25 \pm 6.59	57.77 \pm 6.95	77.50	58.50	63-89	29-70

Independent Sample t Test : t = 3.617; P < 0.01. HS

Better improvement of pain occurred in ultrasound and shortwave group rather than placebo group.

The disability score (Table-V) at pretreatment stage was 74.75 \pm 6.41, 75.80 \pm 5.94 and 73.72 \pm 6.51 in shortwave, ultrasound and placebo therapy groups respectively. At post treatment stage it was 58.25 \pm 6.36, 53.20 \pm 4.65 and 58.60 \pm 4.44 respectively. Better improvement of disability occurs in ultrasound and shortwave groups rather than placebo group. SPADI score at pretreatment stage was 76.20 \pm 4.54, 76.27 \pm 6.57 and 75.09 \pm 5.34 in shortwave, ultrasound and placebo therapy groups respectively. At post treatment stage it was 60.17 \pm 5.67, 53.99 \pm 4.26 and 75.09 \pm 5.34 respectively³⁴.

Table-V: Shoulder disability score (%) in baseline and post therapy states.

Study groups	N	mean \pm sd		median		range	
		Baseline	Post-therapy	Baseline	Post-therapy	Baseline	Post-therapy
Group I	20	74.75 \pm 6.41	58.25 \pm 6.36	75.50	59.00	65-89	46-70
Group II	20	75.80 \pm 5.94	53.20 \pm 4.65	75.00	52.50	64-85	45-64
Group III	20	73.72 \pm 6.51	58.60 \pm 4.44	73.25	59.50	65-845	48-65
Total	60	74.76 \pm 6.24	58.68 \pm 5.71	75.00	58.70	64-89	45-70

Independent Sample t Test : t = 3.617; P < 0.01. HS

Discussion

Frozen shoulder or adhesive capsulitis is a group of disorder affecting Joint, bones, muscles, connective tissues & bursae of shoulder girdle⁹. In a study by Rizk et al¹⁰, shoulder related complaints were 6.82%, which in our study was 6.67%. Study by Hsu and chan¹¹ also found the incidence of frozen shoulder was 6.7%. Both are in agreement with the current study in our department.

The male : female ratio seen in a study by Hsu and Chan was¹¹ 1:1.71, which is nearly similar (1:1.4) to our study. Study by Cyriax¹² found that among the frozen shoulder patients, 72% were non manual and 28% were manual workers, which is more or less in agreement with our study (patients with non manual occupation were 80 or 66.67%, while patients with manual occupation were 20 or 33.33%).

Hedtman & Fett¹³ compared ultrasound and shortwave diathermy in the physical treatment of periarthritis of the shoulder. Evaluation after 8 weeks of treatment revealed that the gain in the range of motion was significantly greater when the patients were treated with ultrasound therapy than when they were treated with shortwave diathermy. They found gain in forward flexion was 27.4 $^{\circ}$ \pm 2.3 after treatment with ultrasound, where it was 16 $^{\circ}$ \pm 1.5 only with shortwave diathermy. In abduction, the gain was 32.6 $^{\circ}$ \pm 2.5 versus 21.2 $^{\circ}$ \pm 2.1 and in rotation the gain was 45.40 \pm 28 versus 17.3 \pm 4 with ultrasound therapy and shortwave diathermy respectively.

Nelson¹⁴ found better improvement of SPADI score with ultrasound therapy in comparison to shortwave diathermy, which is more or less in agreement with our study. Effects of shortwave diathermy, ultrasound therapy and placebo therapy on range of motion (abduction, external rotation) and SPADI score were evaluated after 8 weeks of treatment. He found that improvement in range of motion (abduction) with ultrasound was highly significant, (P < .001) in comparison with both shortwave diathermy (P < .01) and placebo.

Conclusion

Result of this study demonstrate that ultrasound therapy is superior to short wave diathermy as the physical therapy for frozen shoulder. Inferences can also be drawn from this study that heating modality is necessary for subjective improvement of frozen shoulder. It can be concluded that frozen shoulder is common disability among our people, especially in the non manual (sedentary) persons. Further studies with large number of patients with long assessment period may be needed for

verification of various informations collected from the present study.

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