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A STUDY TO COMPARE THE EFFECTS ON PAIN AND SWELLING USING CONVENTIONAL TREATMENT VERSUS THE CENTURION MAGNETIC THERAPY SYSTEM.

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INTRODUCTION

This study was done in the Physiotherapy Department, at York Central Hospital from January to July 1989. The equipment under study was the Centurion Magnetotherapy System, which is manurfactured by Centurion Medical Corporation of Calgary, Canada. The therapy works on a range form 1 - 60 Hz. and 5 - 100 gauss.

For this study, a concentric portable coil was used which produced alternating polarities. There are two types of magnetic energy, - a negative or north pole which has a calming or relaxing effect, and a positive or south pole, which has a stimulating or strengthening effect. The concentric coil on the machine creates an alternating, pulsating field between the north and south poles.

All cells have a basic or resting potential that is necessary for normal cellular metabolism. If there is no electrical potential left in the cell, it is no longer viable. The normal cell potential is 90 m.v. (millivolts), while an inflamed cell is approximately 120 m.v. and a degenerative cell is 30 m.v.

The rest potential of the cell is proportional to the ion exchange occurring at the cell membrane. The ion exchange is responsible for the oxygen utilization of the cell. The pulsating magnetic field influences this ion exchange therefore improving oxygen utilization.

Invisible magnetic field lines permeate all cells in the body simultaneously down to the last molecular level.
If diseased or damaged cells move into a pulsating magnetic field they will be influenced by the rhythm of the pulsating field.

DEPENDING ON (INTENSITY / FREQUENCY) SETTINGS, effects on this treatment are:

1. relief of pain and inflammation
2. stimulation of tissue
3. increased circulation
4. rehabilitation
   (ie. treatment of fractures/non union)

The contraindications to the use of this therapy are:

1. late stages of pregnancy
2. pacemakers
3. haemorrhage
4. viral infections (at high settings)
5. juvenile diabetes
6. menstruation (at high settings)

OTHER EFFECTS OF THIS THERAPY INCLUDE:

1. Increased relaxation.
2. Increased voiding.

RATIONALE

The current literature describes the effects of electro magnetic therapy on specific conditions including Multiple Sclerosis[1],peripheral blood circulation disorders[2], ununited fractures[3] failed arthrodesis and skin ulcers of venous origin[4].

In this study we will compare the recovery rate of magnetic therapy versus conventional therapy on 1. post cast removal and edema

2. chronic pain

We are also addressing the issue of cost effectiveness in the treatment of the above conditions in a clinical setting.

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[1]Guseo, A. "Pulsating Electromagnetic Field Therapy of Multiple Sclerosis by th Gyuling-Bordacs Device: Double-Blind, Cross-Over and Open Studies" Journal of Bioelectricity 6(1), 23-35, 1987.

[2]Lay, Benjamin "Effects of Low Frequency Electromagnetic Field on Blood Circulation", Department of Microbiology, School of Medicine, Loma Linda University, Loma Linda, California

[3] Bassett, C.A., Mitchell, S., Gaston, S. "Pulsating Electromagnetic Field Treatment in Ununited Fractures and Failed Arthrodesis

[4] Jeran, M., Zaffuto, S., Moratti, A., Bagnacani, M., Cadossi, R., "PEMF Stimulation of Skin Ulcers of Venous Origin in Humans: Preliminary Report of a Double Blind Study", Journal of Bioelectricity 6(2) 181-188, 1987

AIM

The objective of the study is to obtain details of patients' progress and response to conventional physical therapy treatment compared to the Centurion Magnetotherapy System in a clinically oriented setting, in order to provide strategies for patient care which would be valuable in the practice of physiotherapy.

METHODOLOGY

Twenty patients were randomly chosen from our waiting list to be treated in our outpatient deparment. These patients presented with post cast oedema, or chronic pain lasting longer than three months. There are enough patients referred to our department with the above mentioned conditions to warrant the study of the Centurion Magnetotherapy System on these conditions and in this setting. Patients progress was assessed by changes in swelling as evidenced by measurement and changes in pain, measured subjectively on a scale of 1 to 10, "0" being no pain - "10" being severe.

Patients were assessed using our standard assessment forms (see Appendix 1 and 2> which inclued both subjective and objective findings.

METHODOLOGY

Conventional Group

Ten patients were treated using conventional treatments. Seven patients suffered foot and ankle injuries followed by casting and/or surgery; two sustained colles fractures treated by casts and one patient presented with chronic hip bursitis.

The nine post fracture patients received ROM and strengthening exercises,stretches, joint mobilizations, gait re-education if appropriate, ice/heat, and home exercises. These patients were treated two to three times per week for an average of ten treatments. Patients spent approximately one hour in therapy.

METHODOLOGY

Experimental (Magnetic Therapy Group)

Ten patients were treated using Magnetotherapy.

-Six patients presented with chronic pain. Five of these six patients previously attended therapy and were treated using our conventional methods which were ineffective- there was minimal relief of pain.

-Four patients presented with edema; three of these patients were seen after cast removal and a fourth patient was seen following knee surgery.

The patients were treated three to four times a week and spent thirty minutes each session on the Centurion Magnetotherapy System. Each patient also received thirty minutes of exercise. The average number of treatments was seventeen. It is important to note that 60% of these patients had chronic problems.

CONVENTIONAL GROUP - RESULTS

EDEMA

PATIENT #	DIAGNOSIS	BEFORE	AFTER	CHANGE	# TREATMENTS
1	fractured tibia/ fibula - ORIF	severe	minimum	improved	18
2	trimalleolar fracture - ORIF	moderate	moderate	unchanged	12
3	fractured tibia/ fibula - CREF	moderate	minimum	improved	7
4	fractured tibia/ fibula	moderate	minimum	improved	8
5	fractured fibula CREF	moderate	minimum	improved	7
6	bunionectomy, excision lat. sesamoid, excision base of proximal phalanx second digit	moderate	minimum	improved	13
7	fractured tibia/ fibula - ORIF	moderate	minimum	improved	6
8	colles fracture	moderate	minimum	improved	8
9	colles fracture	minimum	resolved	resolved	10
10	trochanteric bursitis	not a problem	----------	----------	---------

ORIF - open reduction/internal fixation
CREF - closed reduction/external fixation

SUMMARY STATEMENT

Conventional Group - Edema

#1 $\frac{\text{number improved}}{\text{number treated}} = \frac{8}{9} = 89\%$

#2 $\frac{\text{total resolution}}{\text{number treated}} = \frac{1}{9} = 11\%$

#3 Average number treatments for entire group

$= \frac{\text{number of total treatments}}{\text{number treated}} = \frac{89}{9} = 9.9\%$

#4 Average number treatments to complete resolution

$= \frac{\text{total number of treatments in resolved group}}{\text{number of patients resolved}}$

$= \frac{10}{1} = 10$

#5 $\frac{\text{unchanged}}{\text{\# treated}} = \frac{1}{9} = 11\%$

CONVENTIONAL GROUP - RESULTS

PAIN

Scale: 0(none)----5(moderate)-10(severe)

PATIENT #	DIAGNOSIS	BEFORE	AFTER	CHANGE	# TREATMENTS
1	fractured tibia/ fibula - ORIF	3	2	improvement	18
2	trimalleolar fracture - ORIF	5	3	improvement	12
3	fractured tibia/ fibula - CREF	3	0	resolved	7
4	fractured tibia/ fibula	10	5	improvement	8
5	fractured fibula CREF	5	0	resolved	7
6	bunionectomy, excision lat. sesamoid, excision base of proximal phalanx second digit	3	1	improvement	13
7	fractured tibia/ fibula - ORIF	3	3	no change	6
8	colles fracture	4	2	improvement	8
9	colles fracture	5	3	improvement	10
10	trochanteric bursitis	8	8	no change	12

ORIF - open reduction/internal fixation
CREF - closed reduction/external fixation

SUMMARY STATEMENT

Conventional Group - Pain

#1 $\frac{\text{number improved}}{\text{number treated}} = \frac{8}{10} = 80\%$

#2 $\frac{\text{total resolution}}{\text{number treated}} = \frac{2}{10} = 20\%$

#3 Average number of treatments for entire group

$\frac{\text{total treatments}}{\text{number of patients}} = \frac{101}{10} = 10.1$

#4 Average number of treatments to complete resolution

$\frac{\text{total number of treatments in resolved group only}}{\text{number of patients with total resolution}}$

$= \frac{20}{2} = 10$

#5 $\frac{\text{number unchanged}}{\text{number treated}} = \frac{2}{10} = 20\%$

EXPERIMENTAL GROUP - RESULTS

PAIN

Subjective Evaluation

Scale: 0----------5----------10 (no pain) (moderate) (severe)

PATIENT #	DIAGNOSIS	BEFORE	AFTER	CHANGE	# TREATMENTS
1	chronic bursitis (M.S.)	5	5	no change	5
2	multiple fractures 6 mos., right L.E. post injury	8	4	improved	25
3	communited fracture proximal tibia & TT repair avulsion #	8	4	improved	25
4	chronic low back pain	7	2	improved	12
5	colles fracture with early Sudeck's	8	1	improved	11
6	colles fracture (diabetic)	8	2	improved	12
7	fibrositis chronic dsp.	7	stopped attending----------		3
8	total knee	N/A ----------	----------	----------	--------
9	osteo-arthritis right hip	8	5	improved	15
10	coiles fracture with O.A. hands	9	3	improved	18

SUMMARY STATEMENT

Experimental Group - Pain

#1 $\frac{\text{number improved}}{\text{number treated}} = \frac{8}{9} = 90\%$

#2 $\frac{\text{number total resolved}}{\text{number treated}} = \frac{0}{9} = 0\%$

#3 Average number of treatments in entire group = 15

#4 Average number of treatments to complete resolution - nobody experienced total resolution

#5 $\frac{\text{number unchanged}}{\text{number treated}} = 11\%$

EXPERIMENTAL GROUP - RESULTS

EDEMA

PATIENT #	DIAGNOSIS	BEFORE	AFTER	CHANGE	# TREATMENTS
1	chronic bursitis (M.S.)	N/A			
2	multiple fractures 6 mos., right L.E. post injury	moderate	minimum	improved	25
3	communited fracture proximal tibia & TT repair avulsion #	minimum	minimum	no change	25
4	chronic low back pain	N/A			
5	colles fracture with early Sudeck's	moderate	minimum	improved	10
6	colles fracture (diabetic)	gross	0	resolved	14
7	fibrositis chronic dsp.	N/A			
8	total knee	gross	minimum	improved	22
9	osteo-arthritis right hip	N/A			
10	colles fracture with O.A. hands	moderate	0	resolved	17

SUMMARY STATEMENT

Experimental Group - Edema

#1 $\frac{\text{number improved}}{\text{number treated}} = \frac{6}{6} = 100\%$ improvement

#2 $\frac{\text{total number resolved}}{\text{number treated}} = \frac{2}{6} = 33.3\%$

#3 Average number of treatments in entire group

= 18

#4 Average number of treatments to complete resolution

= 15

COMPARISON BETWEEN CONVENTIONAL AND EXPERIMENTAL GROUPS

		CONVENTIONAL		EXPERIMENTAL	
		Edema	Pain	Edema	Pain
1.	number improved / number treated	89%	80%	83.2%	89%
2.	number with total resolution / number treated	11%	20%	33%	0%
3.	number unchanged / number treated	11%	20%	17%	11% and one patient stopped attending
4.	Average number of treatments	9.9	10.1	18	15
5.	Average number of treatments for total resolution	10	7	15	no one experienced total resolution

RESULTS

There was no significant difference between the two groups with respect to resolution of edema. Both groups progressed satisfactorily.

Similar results were found when comparing reduction of pain. The conventional group showed an 80% improvement while the experimental group showed an 89% improvement.

One significant finding is that patients in the experimental group now showed significant improvement with Centurion Magnetotherapy treatment. Five out of the six demonstrated a ninety percent improvement as compared to none to minimal improvement when previously treated conventionally. The sixth patient did not respond at all.

In the conventional group there was one patient who presented with chronic pain. This patient showed no pain relief following treatment.

One major discrepancy found was the average number of treatments between the two groups. It is felt that the types of conditions (ie. chronic and acute with complicating factors) that were being treated in the experimental group had a direct influence on these results.

CONCLUSION

The Centurion Magnetotherapy System was effective in treating patients experiencing chronic pain and oedema, especially those who had been previously treated with conventional physiotherapy modalities.

It is also noteworthy that minimal time expenditure is required to set up equipment as compared to setting up modalities ie. interferential, short wave diathermy and ultrasound.

Time spent explaining the rationale contraindications etc. of treatment would be the same no matter what modality would be used for treating the patient for the first time.

Two to three patients can be treated at the same time utilizing one cubicle space only while freeing a half to an hour of the therapist's time to treat other patients simultaneously.

As a result of our findings, we will continue to treat and document results using magnetotherapy on the following orthopaedic problems seen frequently in our department, medial and lateral epicondylitis, chronic low back pain, chondromalacia and osteoarthritic knees.