PULSED ELECTROMAGNETIC FIELDS "PEMF"
CTU – MEDICAL DEVICE *PERISO sa,*
for the
TREATMENT OF THE CHRONIC LOW BACK PAIN

Abstract

Background:
Lower back pain is one of the most frequent causes of patients seeking medical treatment and has a tendency to become chronic. The use of PEMF has been studied in different pathological conditions of the Osteoarticular apparatus but not in the lower back pain with or without root involvement.

Study Objective:
the purpose of this study was to evaluate the efficacy of PEMF (Pulsed Electromagnetic Field, CTU Medical Device - Periso sa) for the treatment of patients with **CHRONIC LOW BACK PAIN**

Methods:
patients with chronic low back pain with or without radicular pain, were assigned randomly to receive PEMF or placebo (sham) treatment. PEMF was administered using the CTU Medical Device - Periso SA. Independent outcome variables included PAIN and Oswestry disability score

Results:
patients who received active PEMF consistently showed significant pain reduction ($P < 0.05$ compared with baseline) and the mean revised Oswestry disability percentage in the PEMF group was significantly improved from the baseline value 4 weeks after completing therapy ($P < 0.05$).

Conclusions:
in the present study it's clearly demonstrated that PEMF reduced pain and disability in patients with chronic lower back pain.

Search strategy:
databases used to identify studies for this clinical study include Medline, Embase and Cochrane.

Keywords:
Low back pain, chronic low back pain, treatment, PEMF, revised Oswestry disability score. No language limit was applied.

MD. Pietro Romeo (Annex 1)

INTRODUCTION

Since obtaining approval from the United States Food and Drug Administration in 1979, Pulsed Electromagnetic Field (PEMF) has been widely used to counteract pain resulting from various conditions such as arthritis of the knee joint,[1-3] ligament and muscle injuries [1,4,5] delayed union fracture,[6] whiplash injury,[7] chronic pelvic pain,[8] headache,[9] complex regional pain syndrome type I[10] and multiple sclerosis.[11] In addition, PEMF has also been used to prevent osteoporosis[12,13] and enhance scar healing.[14,15] However, its efficacy and the optimal modes of magnetic field administration remain intensely controversial. A small number of randomized, double- blind clinical studies[1-3] have suggested that PEMF is a promising therapy for knee osteoarthritis, but double-blind, placebo- controlled studies have not been conducted on its efficacy in patients with lower back pain. Back pain is one of the most common reasons for seeking medical treatment and the development of effective symptomatic treatment is vital. If PEMF can be shown in placebo-controlled studies to have a positive effect on lower back pain, it offers a useful treatment modality. We therefore studied the efficacy of PEMF in a randomized, double- blind, placebo-controlled clinical trial in patients with chronic lower back pain.

DEVICE DESCRIPTION

PULSED LOW-FREQUENCY ELECTROMAGNETIC FIELDS: The pulsed low-frequency (< 50Hz; ~7Hz) electromagnetic fields (1b) belong to the class of non ionizing radiations, that is, they are characterized by an associated energy below 12 eV (electron-Volt). Such an energy is insufficient both to turn on ionization phenomena in molecules and to break even very weak chemical bonds. For this reason in the last decades these radiations have not been considered able to interact with biological systems and, as a consequence, the studies on this subject were scarce and information poor, especially when compared with the great amount of knowledge concerning the interactions among ionizing radiations and biological systems (2b). Only recently, due to the more and more common use of electromagnetic fields of different intensity and frequencies (3b), a vast research activity (4b-5b-6b-7b-8b-9b-10b-11b) has started, addresses to the definition of their main biological and therapeutic effects, on which are based the exposition thresholds currently recommended.

DIAMAGNETISM: The diamagnetism works on hydrogen atoms. Indeed, when a hydrogen atom is covalently bound to a strongly electronegative atom, as for example the oxygen, the bond electrons tend to move toward the latter. As a consequence, the H atom assumes a partial but consistent positive charge. This charge, distributed in a small volume, lead to a high electric charge density. At this point, the hydrogen atom tends to bind with a partially negatively charged atom (the oxygen atom of a different water molecule) in this way acquiring a greater stability neutralizing its electric charge.
A single water molecule does not feel any net force, since it is subject to the action of the surrounding molecules that are uniformly distributed in any direction of the three-dimensional space. The liquid water consists in a disordered network of molecules, bound together by relatively weak chemical bonds. Such a network is continuously subject to fluctuations that randomly break and create new bonds among the molecules. Due to these characteristics the water does not have a proper dipole magnetic moment and it is repelled by an external magnetic field (diamagnetism). The PEMF - CTU PERISO sa (Fig. 1), is a device of molecular diamagnetic acceleration. It uses an energy of up to 200 Joule, generating high power (2 Tesla), pulsating fields and developing a water-repulsive force with the following main therapeutic aims:

- liquids transport;
- tissue biostimulation.

Liquids transport: as a result of diamagnetic repulsion, the free water in the extracellular compartments is fiercely pushed away from the field application site. The transport of extracellular liquids helps the oedema and post-traumatic effusions reabsorption and the

scoriae removal, and stimulate the lymphatic circulation and related phenomena also thanks to the vasodilatation draining action produced by the diathermia coupled with PEMF (CTU – PERISO sa). In addition, the magnetic field works on the intracellular liquids, increasing their mobility. The increase of the thermal molecular excitation supports the cells biochemical activity as well as the mitochondrial and phagic-lysosomal metabolic mechanisms. The result is a beneficial acceleration of all energetic, metabolic and cellular activities like ionic transport, scoriae removal and cellular breathing.
Tissue biostimulation: a variable magnetic field crossing a conductor induces an electric current. The human body is a conductor, that when it is crossed by a magnetic field the phenomenon of biostimulation occurs. The action of magnetic fields is well described in terms of bioelectric parallelisms existing among cells (12b), since it acts on the difference of electric potential on the membrane sides as well as on the orientation af the circulating atoms that behave as elementary magnetic dipoles (13b, 14b).

Fig. 1

SEARCH STRATEGY

Medline, Embase, and the Cochrane Central Register of Controlled Trials (CENTRAL) were searched from the inception of each database from February 2014 to February 2015. The Medline and Embase databases were searched together via www.embase.com
The search was conducted using the keywords low back pain, chronic low back pain, PEMF, revised Oswestry disability score. No language limit was applied.
List 1 Search Strategy used in www.embase.com (step by step):
1 ‘low back pain’ OR ‘low back pain’/exp
2 ‘radiculopathy’ OR ‘sprain’/exp
3 ‘leg pain’ OR ‘injuries’/exp
4 ‘diagnostic imaging’
5 ‘chronic LBP’
6‘ functional improvement’
7 #1 OR #2 OR #3 OR #4 OR# 5 OR #6

8 random: ab,ti OR factorial: ab,ti OR crossver: ab,ti OR placebo :ab,ti OR control :ab,ti OR trial:ab,ti OR group: ab,ti OR 'crossover procedure'/exp OR 'single blind procedure'/exp OR 'double blind procedure'/exp OR 'randomized controlled trial'/exp
#1 #2 #3 #4 AND #5.

Materials and Methods

This randomized, double-blind, placebo controlled clinical trial studied the effectiveness of Pulsed Electromagnetic Field (PEMF) in patients with chronic low back pain.

Study Selection Criteria

Types of Studies, Participants and Interventions Included

Patients with chronic lower back pain with or without radicular pain, with a score of > 4 on an 11point numerical rating scale (NRS) for pain assessment, who had not received pain treatment (e.g. physiotherapy, nerve blocks, analgesics) during the 3-month period prior to the study, and who had a pain duration of> 3 months were recruited. Patients with any unstable medical disorder not controlled by standard treatment and those with a cardiac pacemaker or using any other electrical devices were excluded from the study. All patients provided written informed consent. Institutional review board approval was obtained for the study.
The treatment commenced immediately after enrolment:
Once included in the study, the patient was blindly assigned into the PEMF treatment group (Group 1) or the control group (Group 2) according to randomly generated numbers. The treatment commenced immediately after enrollment.

- In Group 1, PEMF using a real (Magnetic Field=2 Tesla; Intensity=90 J; frequency of impulses=7Hz; duration=30minutes/day). The handpiece of CTU Medical Device – PERISO sa, was placed 3 cm over the Lumbar region
- In Group 2, the coil was applied for 30min/day with a sham signal generator from the same manufacturer.

All patients were requested to record their potential discomfort and the duration of the treatment. They were also asked to refrain from smoking, alcohol abuse, or additional forms of therapy during the study period. Biweekly contact through phone calls was performed by two research assistants to exclude patients with poor compliance.

Exclusion Criteria

Before performing the treatments with PEMF CTU Medical Device – PERISO sa, all the patients received a clinical evaluation to detect:

- Unsuitable physiological states
- Presence of ferromagnetic material within the areas of the body to be treated.

In addition were excluded as were those patients with Open Physis, terminal illnesses/malignancies, pregnancy or lack of contraception use in women of childbearing age, and use of pacemaker or any implanted electrical device were excluded, and ferromagnetic parts.

Benefit/Risk

No Risks, Dangers, Adverse Reactions have been associated with the use of the CTU Medical Device – PERISO sa, even outside the protocols used. The CTU Medical Device PERISO sa, respects all CLINICAL SAFETY Standards

Types of Outcome Measure

Any treatments, including pain medications, topical analgesics and physiotherapy, were prohibited throughout the study period (3 weeks of therapy and 4 weeks of post- therapy evaluation). Outcome was measured using pain assessment on a numerical rating scale (NRS) and revised Oswestry disability scores. NRS scores were evaluated at baseline, immediately

after the last therapy session, and 1 and 4 weeks after completing therapy. Revised Oswestry disability scores were evaluated at baseline and again at 1 and 4 weeks after completing therapy; the total score for all the items in the questionnaire was multiplied by two to give the revised Oswestry disability percentage. The examining physician, the patients and the clinician administering the therapy and collecting data were all blinded to the study details

METHODS

Patients were assigned randomly to receive PEMF or placebo (sham) treatment. PEMF was administered using the CTU Medical Device - Periso SA (fig. 1). In the patient group, the handpiece was placed about 3 cm away from the skin of the lower back for 30 min. For the placebo group, an identical procedure was followed, except the device didn't work, but patients are unable to detect any difference between the active or shame device. The 30-min treatment/placebo sessions were repeated three times a week for 3 weeks, and subjects were followed up for 4 weeks post-therapy.

STATISTIC ANALYSIS

STATISTICAL METHODS

Patients who did not receive therapy in more than three of the nine sessions of PEMF or who did not attend both the follow-up assessments were excluded from the data analysis. Patient characteristics were compared using the t-test, χ test or Fisher's exact test. The percentage changes from baseline in the NRS score and revised Oswestry disability percentage within the groups were compared using Friedman repeated measures analysis of variance on ranks test followed by Dunn's method. Intergroup comparisons were performed using the Mann–Whitney rank sum test. A P-value < 0.05 was considered to be statistically significant.

RESULTS

To provide a statistical power of 80% to detect a 30% difference in the percentage change in the NRS score of the two groups, 14 patients were needed to complete the therapy in each group. With the expectation of a 30% dropout rate, a total of 40 patients (20 in each group) were recruited to ensure the study had sufficient statistical power. Of the 40 patients enrolled, four were excluded from the data analysis: one patient in the placebo group received only three therapy sessions, two patients in the PEMF group did not attend both of the follow-up assessments, and one patient in the PEMF group was excluded due to violation of the protocol. Baseline patient characteristics for both the PEMF group and the placebo group are given in Table 1. There were no significant differences between the groups in any of the parameters measured except for height. The results of pain assessment in the two groups using an 11-point NRS are shown in Table 2. Patients who received active PEMF consistently showed significant pain reduction throughout the whole observation period ($P < 0.05$ compared with baseline). Pain reduction was also seen in the placebo group; this reduction was statistically significant compared with the baseline value 1 and 4 weeks post-therapy. The percentage change in the NRS score from baseline was significantly greater in the active treatment group than in the placebo group at all three time-points after therapy (Fig. 2). At 4 weeks after therapy, the mean ± SD percentage change from baseline was 38 ± 11% and 22 ± 24% in the PEMF and placebo groups, respectively ($P < 0.05$). Approximately 20% of the patients in the placebo group and 47% in the PEMF group showed a > 40% pain reduction from baseline at 4 weeks after therapy. The mean revised Oswestry disability percentage in the PEMF group was significantly improved from the baseline value 4 weeks after completing therapy ($P < 0.05$) (Fig. 3); there were no significant differences in the placebo group. In addition, no statistically significant differences were observed between the two groups. At 4 weeks after therapy, the change in disability percentage (mean ± SD) was 28 ± 30% in the PEMF group and 8 ± 32% in the placebo group. However, no statistically significant differences in disability percentage were observed between the two groups at the time-points studied.

TABLE 1:
Baseline characteristics in patients with lower back pain receiving either pulsed electromagnetic therapy (PEMF) CTU Medical Device or placebo

	PEMF group (n = 17)	Placebo group (n = 19)
Age (mean ± SD, years)	75 ± 5	74 ± 4
Gender		
Male	5	14
Female	12	5
Height (mean ± SD, cm)	156 ± 9[a]	164 ± 6
Weight (mean ± SD, kg)	58 ± 11	60 ± 8
Duration of pain (mean ± SD, months)	120 ± 147	91 ± 111
History of		
Diabetes mellitus	2	–
Hypertension	8	7
Other	1	–
Radicular pain	9	10
Neurogenic intermittent claudication	8	7
Neurological examination		
Decreased sensory function	1	1
Decreased motor power	1	1
Physical examination		
Facet joint tenderness	6	13
Iliolumbar tenderness	8	8
Sacroiliac tenderness	4	4
Positive Patrick test	3	4
Positive Gaenslen test	1	2

[a]$P < 0.05$ versus placebo group.

TABLE 2:
Pain assessments using an 11-point numerical rating scale in patients with lower back pain receiving either pulsed electromagnetic therapy (PEMF) CTU Medical Device or placebo

	PEMF group (n = 17)	Placebo group (n = 19)
Baseline	6.7 ± 1.7	6.5 ± 1.7
Immediately post-therapy	4.8 ± 1.2[a]	5.5 ± 1.5
1 week post-therapy	4.4 ± 1.1[a]	5.5 ± 2.1[a]
4 weeks post-therapy	4.5 ± 1.2[a]	5.4 ± 2.3[a]

Values are mean ± SD.
[a]$P < 0.05$ versus baseline.

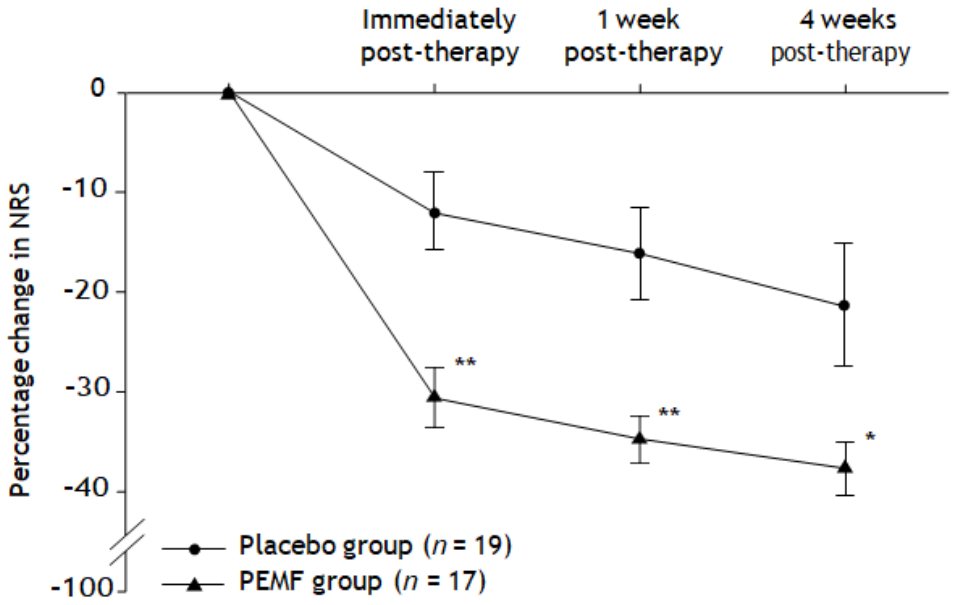

FIGURE 2: Percentage change from the baseline in pain assessed using an 11-point numerical rating scale (NRS) in patients with lower back pain receiving either pulsed electromagnetic therapy (PEMF) or placebo. Values are mean ± SE. $^{*}P < 0.05$ and $^{**}P < 0.01$ versus placebo group

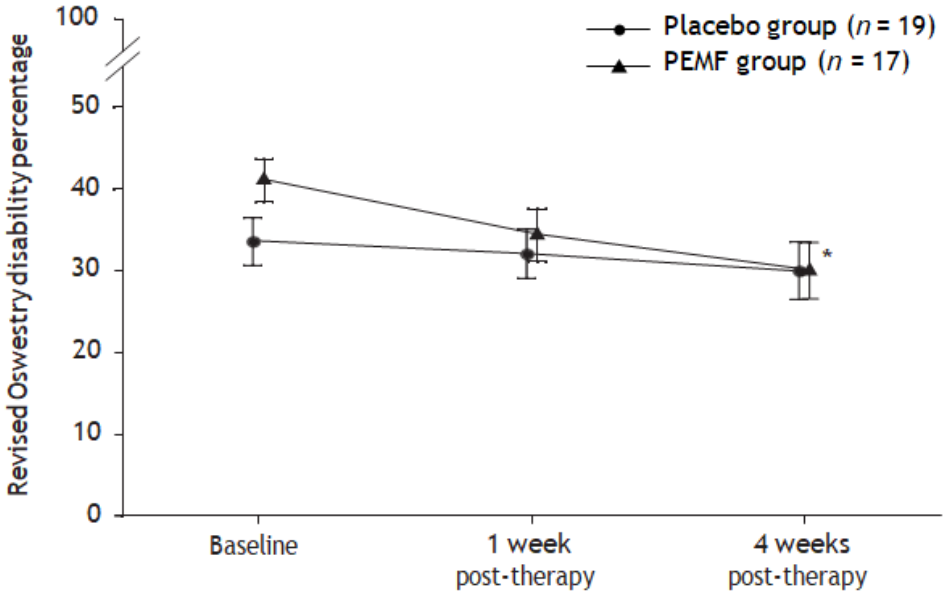

FIGURE 3: Percentage change from the baseline in the revised Oswestry disability percentage in patients with lower back pain receiving either pulsed electromagnetic therapy (PEMF) or placebo. Values are mean ± SE. $^{*}P < 0.05$ versus baseline

DISCUSSION

In the present study, PEMF was found to reduce pain and disability in patients with chronic lower back pain. The use of a randomized, double-blind trial design strengthens the validity of this data. Although a strong placebo effect was observed, as is usual for new forms of therapy for back pain, and considerable variability in the therapeutic effect was evident between patients, a greater degree of improvement was consistently found in the PEMF group compared with placebo by the end of the study period. A 31% reduction in the mean NRS score at the end of treatment and a 38% reduction 4 weeks after treatment were observed in those treated with PEMF. This compared with a 12% reduction at the end of treatment and a 22% reduction 4 weeks after treatment in the placebo group. These results are consistent with the findings of Trock et al. who reported a 30 – 35% reduction in pain at the end of treatment and a 20 – 39% reduction 1 month after treatment in the active PEMF group versus a 17 – 27% reduction at the end of treatment and a 0 – 18% reduction 1 month after treatment in the placebo group in patients with cervical facetal osteoarthritis. They also reported that a 29 – 36% reduction in pain was observed at the end of PEMF in patients with knee osteoarthritis, whereas the placebo group showed only an 11 – 19% reduction. In these patients, pain reductions of 21% to 31% and -0.3% to +16% were observed 1 month after therapy in the PEMF and placebo groups, respectively. Reports on the effects of non-steroidal anti-inflammatory drugs (NSAIDs) in patients with lower back pain can be usefully compared with PEMF results. Coats et al. studied the effectiveness of valdecoxib on chronic lower back pain using a 4-week, randomized, placebo-controlled trial. After 1 week of treatment, there was a 40% reduction in pain in the valdecoxib group compared with a 24% reduction in the placebo group. At the end of 4 weeks' treatment, pain reduction was 57% in the valdecoxib group and 43% in the placebo group. Patients were not followed up after discontinuation of the medication. Pallay et al. studied the effectiveness of two doses of etoricoxib on lower back pain using a randomized, double-blind, placebo-controlled trial. After 4 weeks of treatment, 60 and 90 mg/day of etoricoxib produced 34% and 32% pain reductions versus baseline, respectively, and this therapeutic effect was maintained for 12 weeks after discontinuing medication. Thus, the therapeutic effectiveness of PEMF seen in the present study is comparable with that of NSAIDs. Recently, Giles and Muller conducted an interesting randomized, non-placebo-controlled clinical trial to compare medication (an NSAID), acupuncture and chiropractic manipulation. Chiropractic manipulation achieved a 50% reduction in lower back pain (final score of 3 on a 10-point visual analogue scale compared with a baseline score of 6). However, medication and acupuncture were not found to reduce lower back pain. Transcutaneous electrical nerve stimulation for chronic lower back pain and therapeutic ultrasound for knee osteoarthritis have been shown to have efficacies similar to placebo therapy. In the present study, PEMF had a therapeutic efficacy that was comparable or better than that obtained with NSAIDs, chiropractic manipulation or acupuncture, and therefore appears to have the potential to be an important therapeutic tool for the conservative therapy of chronic lower back pain. In this study, an 11% mean improvement in the revised Oswestry disability percentage (41% disability at baseline and 30% disability 4 weeks after completing therapy) was observed in the PEMF group. In the study of Giles and Muller, improvements in Oswestry low back disability percentages achieved by chiropractic manipulation were similar to the results obtained in the present study, whereas acupuncture produced only a 4% improvement and an NSAID produced no improvement. Although the mechanism by which PEMF reduces pain is unclear, several explanations have been put forward to explain its analgesic effect, including the stimulation of descending inhibition and a subsequent increase in central b-endorphin production, hyper- polarization at the motor end plate and subsequent muscle relaxation and the stimulation of chondrogenesis. Lednev proposed that nociceptive C-fibres have a lower threshold potential and that a magnetic field may selectively attenuate neuronal depolarization by shifting the membrane resting potential. The promotion of increased blood flow to tissues and the modulation of the release of cytokines or other factors have also been suggested. Any of these proposed mechanisms could be responsible for the results of the present study since lower back pain has a complex nature

and originates from multiple sources, including musculoskeletal structures and spinal nerves. The most effective PEMF frequency and exposure mode remain controversial. Low frequency pulses such as those in the present study are most often used.[1,27] In an animal study, Lee et al.[4] reported that lower frequency PEMF had a greater effect on inflammation reduction and promoted tendon return to histological normality. In addition, frequencies < 60 Hz were found to affect cell behaviour by increasing transcription[28] and DNA synthesis.[29] Sakai et al.[29] reported that intermittent exposure to PEMF stimulation was superior to continuous exposure in an in vitro study. Further studies using different modes, intervals and durations of PEMF as well as different follow- up periods may help to determine the optimal protocol for this treatment.

Conclusion

In conclusion, PEMF is a non-invasive method that, if correctly applied, is not associated with any side-effects. It is extremely well tolerated by patients and therefore has a high degree of compliance. In the present study, PEMF reduced pain and disability in patients with chronic lower back pain and appears to be a potentially useful therapeutic tool for the conservative management of such patients. Further studies are required to confirm these findings and to determine the optimal treatment protocol.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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ANNEX 1

FORMATO EUROPEO PER IL CURRICULUM VITAE

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Aprile 2010 – oggi
Istituto Ortopedico Galeazzi – IRCCS – Via Riccardo Galeazzi 4, Milano.
Dipartimento di Clinica Ortopedica Università degli Studi Milano
(Direttore Prof. V. Sansone)
Dirigente Medico (Rapporto LP)

Ottobre 2004 - oggi
Eurocentro Polispecialistico – V.le Milano 18 - Varese
Convenzionato Servizio Sanitario Regione Lombardia
Specialista Ortopedico – Terapia con Onde d'Urto (Rapporto LP)

Da Aprile 2000 - Marzo 2015
INAIL – Istituto Nazionale Assicurazione Infortuni sul Lavoro
V.le Aguggiari, 6 . 21100 Varese
Specialista Ortopedico Convenzionato

Dal 1993 al 2000
Azienda Sanitaria Locale della Provincia di Varese- Via O. Rossi 9- Varese
Dirigente Medico - Organizzazione Servizi Sanitari di Base – Incarico in Ambulatorio Infortuni Traumatologia

Dal 1993 al 2000
Ministero di Grazia e Giustizia – Dipartimento dell'Amministrazione Penitenziaria- Casa Circondariale di Busto Arsizio (VA)
Specialista Ortopedico Convenzionato

1990
Azienda Sanitaria Locale della Provincia di Varese- Via O. Rossi 9- Varese
Ospedale Filippo Del Ponte
Assistente Medico Supplente – Chirurgia Generale (Incarico a Termine)

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1990
Azienda Sanitaria Locale della Provincia di Varese- Via O. Rossi 9- Varese
Igiene Pubblica
Assistente Medico Supplente (Incarico a Termine)

• Nome e indirizzo del datore di lavoro

Dal 1988 al 1993
Ministero di Grazia e Giustizia – Dipartimento dell'Amministrazione Penitenziaria- Casa Circondariale di Busto Arsizio (VA)
Medico del Servizio di Assistenza Sanitaria Integrativa

• Tipo di azienda o settore
• Tipo di impiego
• Principali mansioni e responsabilità

ISTRUZIONE E FORMAZIONE

• Date (da – a)

2008
Bologna – Scuola di Ecografia Muscolo Scheletrica
Corso Avanzato
2006 e 2007
Bologna – Scuola di Ecografia Muscolo Scheletrica
Corso Base
1992
Diploma di Specializzazione in Ortopedia e Traumatologia
Università degli Studi di Milano
1984
Abilitazione Professionale
Università degli Studi di Pavia
1984
Diploma di Laurea in Medicina e Chirurgia
Università degli Studi di Pavia
1977
Diploma di Maturità Scientifica
Liceo "F.lli Vianeo" Tropea (CZ)

• Nome e tipo di istituto di istruzione o formazione
• Principali materie / abilità professionali oggetto dello studio
• Qualifica conseguita
• Livello nella classificazione nazionale (se pertinente)

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CAPACITÀ E COMPETENZE ORGANIZZATIVE

ULTERIORI INFORMAZIONI

Affiliazione a società scientifiche
SIOT (Società Italiana Ortopedia e Traumatologia)
ASON (Associazione Specialisti Osteoarticolari Nazionale) – Referente regionale per la Lombardia biennio 2015-2017
SITOD (Società Italiana di Terapia con Onde d'Urto).
Componente del Consiglio Direttivo biennio 2008-2010, biennio 2010-2012 biennio 2012-2014 , biennio 2014-2016 , biennio 2016-2018
ISMST (International Society for Medical Shock Wave Treatment)

Il sottoscritto è a conoscenza che, ai sensi dell'art. 76 del DPR 445/2000, le dichiarazioni mendaci, la falsità negli atti e l'uso di atti falsi sono puniti ai sensi del codice penale e delle leggi speciali. Inoltre, il sottoscritto autorizza al trattamento dei dati personali, secondo quanto previsto dalla Legge 196/03.

CITTA' __Varese_____

DATA___07/08/2017 _____

NOME E COGNOME (FIRMA)

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CAPACITÀ E COMPETENZE PERSONALI

Acquisite nel corso della vita e della carriera ma non necessariamente riconosciute da certificati e diplomi ufficiali.

Italiano

Dal 1995 al 2016 interesse e competenze specifiche nel campo dell' Ortopedia applicata alla Medicina Legale quale consulente di compagnie assicurative (1995 – 2008) dell' Istituto Nazionale Assicurazione Infortuni sul Lavoro (INAIL) , consulente tecnico per la branca di Ortopedia presso il Tribunale di Varese sino al mese di ottobre 2015.

Dal 2004 interesse nella Terapia con Onde d'urto Extracorporee utilizzando apparecchiature focalizzate piezoelettrica ,elettromagnetica ed elettroidraulica . Esperto in trattamenti ecoguidati ed eco-assistiti *manu medica*, per il trattamento delle principali patologie muscolo scheletriche, inclusi i ritardi di consolidazione delle fratture , la patologia vascolare e metabolica dell'osso le osteocondropatie e il trattamento delle ulcere cutanee . Dal 2010 attività di ricerca clinica e sperimentale presso il Dipartimento di Ortopedia e Traumatologia dell'Università degli Studi di Milano dell' Istituto Ortopedico Galeazzi (Direttore prof V. Sansone) che riguardano l'impiego delle energie fisiche nella patologia metabolica , degenerativa e vascolare dell'osso , gli effetti su colture di cellulari (Centro di Ricerca Applicata sulla Stimolazione Biofisica dei Tessuti Muscolo-Scheletrici)

Coautore di pubblicazioni in materia su riveste nazionali e internazionali indicizzate . Relatore – moderatore in congressi e corsi di formazione

PRIMA LINGUA	Italiano
ALTRE LINGUE	
	Inglese
• Capacità di lettura	Buona
• Capacità di scrittura	Buona
• Capacità di espressione orale	Discreta

Ha maturato negli anni capacità di lavoro individuale e in equipe

CAPACITÀ E COMPETENZE RELAZIONALI

Vivere e lavorare con altre persone, in ambiente multiculturale, occupando posti in cui la comunicazione è importante e in situazioni in cui è essenziale lavorare in squadra (ad es. cultura e sport), ecc.

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2012 TORINO XI CONGRESSO NAZIONALE SOCIETA' ITALIANA TERAPIA CON ONDE D'URTO EXTRACORPOREE (SITOD)
P. Romeo. La terapia con onde d'urto extracorporee. L'Operatore. Figure professionali coinvolte e specificità operative

2012 TORINO XI CONGRESSO NAZIONALE SOCIETA' ITALIANA TERAPIA CON ONDE D'URTO EXTRACORPOREE (SITOD) CONVEGNO SATELLITE: LE ONDE D'URTO IN PATOLOGIA ORTOPEDICA
P. Romeo. La Terapia con Onde d'Urto. Indicazioni Controindicazioni Aspetti Medico Legali.

2012 – ROMA 4° CONGRESSO NAZIONALE C.O.R.T.E
P. Romeo – MC D'Agostino, Onde d'Urto e Rigenerazione tissutale, il ruolo dell'Angiogenesi

2012- INNSBRUCK 2nd ISMST Basic Research Meeting
MC D'Agostino. P. Romeo. Early angiogenic response to shock waves in a three – dimensional model of microvascular endothelial cell culture (HMEC-1)

2011 - SANTA MERGHERITA LIGURE (GE) INDICAZIONI E LIMITI DELLA TERAPIA CON ONDE D'URTO: DAL MEDICO DI MEDICINA GENERALE ALLO SPECIALISTA.
- P. Romeo. Indicazioni Controindicazioni e modalità di somministrazione della terapia con onde d'urto. Linee guida

2011 VARESE AGGIORNAMENTO DEL MEDICO DI MEDICINA GENERALE
- L'Edema Osseo Midollare nelle patologie Osteoarticolare. Aspetti prognostici e Terapeutici

2011 BERGAMO TERAPIA CON ONDE D'URTO: DALLA RICERCA ALLA PRATICA CLINICA. INDICAZIONI
- P. Romeo Effetti Biologici delle Onde d'Urto Extracorporee. I Meccanismi della risposta cellulare.

2010/2011 MILANO – I CORSO AVANZATO SULL'UTILIZZO DELLE ONDE D'URTO EXTRACORPOREE IN ORTOPEDIA-FISIATRIA E MEDICINA RIGENERATIVA

-P. Romeo, V. Sansone Effetti Biologici della Stimolazione con Onde d'Urto. I meccanismi dell'azione terapeutica.
-P. Buselli, P. Romeo. Aspetti Medico Legali delle Terapia e raccolta del consenso informato.
- P. Romeo, V. Sansone. Onde d'Urto extracorporee e patologie vascolari dell'osso. Il razionale terapeutico
-P. Romeo, V. Sansone Le Onde d'Urto nella patologa dell'Achilleo. Dalla biologia alla pratica clinica.

2010 BARI. X CONGRESSO NAZIONALE SOCIETA' ITALIANA TERAPIA CON ONDE D'URTO EXTRACORPOREE (SITOD)
- P. Romeo, Indicazioni Controindicazioni, Utilità, Inutilità nelle applicazioni cliniche (o routinarie) delle onde d'urto focalizzate.

2010 SANTA MARGHERITA LIGURE (GE) NUOVE FRONTIERE NEL TRATTAMENTO DELLE PATOLOGIE ORTOPEDICHE CON ONDE D'URTO ED INGEGNERIA TISSUTALE ON LINE
- P. Romeo. V. Sansone. M.C. D'Agostino Onde d'Urto e Angiogenesi, Considerazioni clinico sperimentali.

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2010 VIENNA 1 th ISMST (International Society for Medical Shock Waves Treatments) BASIC RESEARCH MEETING
M.C. D'Agostino – P. Romeo. Osteogenesis and Bone Turnover

2009 CAMPOBASSO XXXVII SIMFER. SOCIETA' ITALIANA MEDICINA FISICA E RIABILITAZIONE
M. C. D'Agostino, P. Romeo. V. Sansone
Onde d'Urto Extracorporee dalla litotripsia alla rigenerazione tissutale. Sessione Poster

2007 VII CONGRESSO NAZIONALE SOCIETA' ITALIANA TERAPIA CON ONDE D'URTO EXTRACORPOREE (SITOD)
L. Polo – P. Romeo
Effetti secondari e applicazioni "off label "delle Onde d'urto. Sperimentazione e aspetti Medico Legali

Varese 07/08/2017

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