

Effect of Magnetic Therapy on Pressure Ulcer in complete spinal Cord injury (SCI) patient.

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Case report

Background: Pressure sores are an important source of complications in patients who are immobilized and bedridden. The prevalence of Pressure ulcers stage two or greater is between 8.1% and 12.9%. We aimed to investigate the efficiency of magnetic field treatment in pressure sores. **Methods:** This was a case control study, Female of 40 years complains from ischial pressure ulcer with history of spinal cord injury, in the study magneto-therapy, once a day for 30 minutes and with 90G, magneto-therapy device's program. The surface areas of the pressure sores were evaluated at the onset of the treatment (1st day), and on the 4th and 30th days. **Results:** a significant difference was observed between the 1st and 4th day. In addition, there was a significant difference in the scar area. **Conclusion:** The healing process of the tissue can be accelerated. With the use of magneto therapy in the treatment of pressure sores of stage IV.

Key Words: Magnetic field treatment, pressure sore, spinal cord injury

Introduction

Pressure ulcers occur in up to 23% of patients in long term and rehabilitation facilities and at incidence of 10-41% in ICU patients. More than 60000 patients in US die each year as a results of pressure ulcers (1)

The prevalence of Pressure ulcers in two long term care facilities was 36.2%. The prevalence of Pressure ulcers stage two or greater is between 8.1% and 12.9% (2).

Pressure sores are an important source of complications in patients who are immobilized and bedridden. The care of these sores is difficult and expensive and they play a role in the increase of morbidity and mortality rates (3).

It is well known that some physical treatment agents have an impact in reducing healing time and improving the quality of scar tissue (4).

The magnetic field, which is one of these agents, is an electrical current passing through a conductive framework (5).

In the application of pulse electro-magnetic field, it has been observed that there is lysosome, ribosome and mitochondrial stimulation, and a positive change in the enzymatic activities and synthesis (5,6).

Furthermore, it has also been established that the autonomous nervous system is affected and, due to this impact, vasodilatation and healing of tissue perfusion takes place as a result of increased flexibility of erythrocytes (7, 8,9).

There are studies showing that pulse electro-magnetic field application to large body areas increases the respiratory volume and pulse, changes the pH value of the blood, stimulates the macrophage, and causes anti-inflammatory, analgesic and even antiseptic and antimicrobial changes through the increase of the enzyme amounts and activities (9,10,11,12).

Magnetic stimulation is relatively painless, has positive effects on the deep rooted neural structures, and there is no need for direct stimulator-skin contact during its application. However, the target tissue needs to be positioned within the magnetic field, and the current flow on the tissue is in the opposite direction to the current flow from the coil (2-4). The amplitude of this flow is intense under the sides of the coil.(13)

Wound Etiology: Ulcer Types

1-Pressure Ulcers: Usually located over bony prominences. Areas of necrosis and ulceration where soft tissue structures are compressed between osseous prominences or hard external surfaces.

2-Malignant Ulcers: Tumors can present similar to chronic wounds.

3-Hypertension Ulcers: These are uncommon. Often associated with arterial hypertension in patients with palpable pulses.

4-Ischemic Ulcers: Result of inadequate perfusion due to arterial obstruction.

5-Diabetic/Neuropathic Ulcers: Chronic ulceration in patients with diabetes is multifactorial, due to a combination of diabetic neuropathy, autonomic dysfunction, and vascular insufficiency. They happen at locations of the body with repeated trauma such as plantar metatarsal heads. Areas of the foot are often exposed to repetitive trauma (toes and sides of feet)

6-Venous Ulcer: Commonly located between the knee and ankle. Commonly from deep vein thrombosis and venous valvular incompetence.

Pressure Ulcer Stages :

Recently in 2014, the National Pressure Ulcer Advisory Panel updated the definitions of the pressure ulcer staging. In order to prevent and treat pressure ulcers, it is important to understand the definitions of the following stages:

- Category/Stage 1
- Category/Stage 2
- Category/Stage 3
- Category/Stage 4

Stage 1

- Non-blanchable erythema
- Intact skin with non-blanchable redness of a localized area usually over a bony prominence.
- Darkly pigmented skin may not have visible blanching; it's color may differ from the surrounding area.
- The area may be painful, firm, soft, warmer or cooler than adjacent tissue.



Stage 2:

- Partial thickness skin loss
- Loss of dermis presenting as a shallow open ulcer with a red pink wound bed, *without slough*
- Intact or open/ruptured serum-filled blister

- Presents as a shiny or dry shallow ulcer without slough or bruising. (*Bruising indicates suspected deep tissue injury*)
- *This Category/Stage should not be used to describe skin tears, tape burns, perineal dermatitis, maceration or excoriation. (15)*



Stage 3:

Full thickness skin loss

- Subcutaneous fat may be visible but bone, tendon or muscle are not exposed
- Slough may be present but does not obscure the depth of the tissue loss
- Undermining and tunneling *may* be present
- Depth of Stage 3 varies by anatomical location
- Shallow Stage 3 pressure ulcers can include
 - Occiput, malleolus, bridge of nose, ears

The occiput, malleolus, bridge of nose, and ears do not have subcutaneous tissue and therefore Category/Stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep Category/Stage III pressure ulcers. Bone/tendon is not visible or directly palpable.

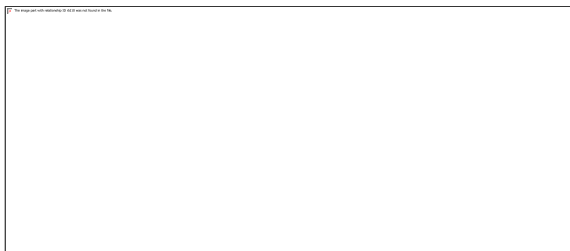
(NPUAP, 2014)



Stage 4

- Full thickness tissue loss with exposed bone, tendon, or muscle.
- Slough or eschar may be present on some parts of the wound bed
- Tunneling and undermining are often present.
- May be extending into muscle and/or supporting structures making osteomyelitis possible

(15))



Assess any wounds or reddened areas of the skin. This assessment involves:

- Identification of the etiology of the wound
- Location, size, and depth of the wound
- Type of tissue present
- Quality and quantity of exudates
- Presence of infection

- Condition of the wound margins

In addition, it is important to obtain a thorough evaluation of any past and current treatments that may impact the presentation.

Determining the etiology of the patient's wound is important so that systemic conditions can be enhanced to assist in healing. (16).

Wound Measurements :

Always use a single-use, metric tape measure. Never measure using "coins" (dime-sized, quarter-sized, etc.).

-Length of a wound is measured by placing a ruler at the point of greatest length (head-to-toe).

-Width of a wound is measured by placing the ruler at the point of greatest width (side-to-side; right to left).

-Depth is commonly obtained by placing a cotton-tipped applicator into the wound bed at the deepest point and placing a mark on the applicator at skin level (or simply using the examiners thumb and index finger) and using a ruler to determine the depth of the wound at the skin level mark.

(16)



Tissue Type & Thickness :

The wound bed tissue reveals the phase and progress of wound healing.

There are tissue colors that can be seen in pressure ulcers such as pink, red, black, and yellow/beige:

- Epithelial tissue is "pearly pink" in color.
- Granulation tissue is beefy red.
- Necrotic tissue is usually black, brown, or tan and known as eschar.
- Yellow necrotic tissue is known as slough (it can also be tan, gray, green, or brown) (15).

Photography has proven to be reliable and successful in capturing the pressure ulcer condition over time.

Documentation of Pressure Ulcers:

The following slides will review how to document for pressure ulcers.

1. Pressure ulcer stage
2. Anatomical location
3. Wound measurements
4. Appearance of wound bed
5. Assessment of drainage
6. Condition of periwound skin
7. Wound care performed
8. Patients tolerance to wound care
9. Wound progress towards goal

Assessment of Drainage

The amount, type, and odor of wound drainage should always be assessed and documented.

Amount: Assessed as none, light, moderate, or heavy.

Type: Assessed as being clear, serous sanguineous, sanguineous, purulent, tan, or bloody.

Odor: Assessed as being absent, faint, moderate, or strong.

It is important to know that most wounds do have an odor and the type of dressing can affect the wound odor, as well as the presence of devitalized tissue.

(16).

Material and Methods:

This study was conducted in private clinic of physical therapy in Monfia, from 13/9/2018 to 11/11/2018, 48 sessions, one sessions/ day.

Study design: Case control study.

Patient history:

Female Patient aged 40 years old, with no history of diabetes nor hypertension. There was history of complete spinal cord transection because of car accident 19 years ago. The pressure ulcer (four stage) was not responded to other medical treatment interventions, for five years of complaint.

Location of the pressure ulcer: it was located at left side underischial tuberosity.

Measurement procedure:

Patient Assessment: (linear measurement method)

Prior to assessing the ulcer, it was debrided so that the actual size can be determined.

The most common type of measurement is linear measurement (clock method) (17)

Application:

1. Using centimeter ruler to measure the greatest length (head to toe) direction; and the greatest width (side to side). Multiply these two measurements (length *width) to calculate the size of ulcer.the size was $12\text{ cm} \times 4\text{ cm} = 48\text{cm}^2$
2. Digital camera was also used to capture photos to follow the improvement of the pressure ulcer.

Before treatment:



13/9/2018

Before treatment

Materials:

Electromagnetic therapy:

QF magnetotherapy,

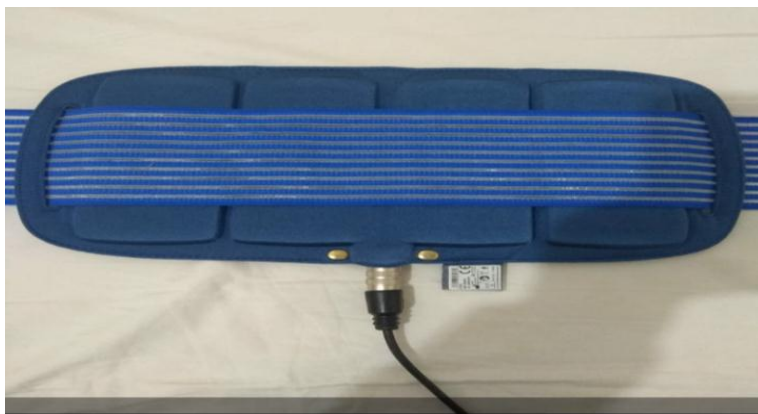
Frequency: 50 Hz

(ASA) made in Italy

Duty cycle: intermittent 90%



Qs Magnetotherapy



Flexapad 30cm*20cm

Methods:

Treatment procedure:

Patient preparation:

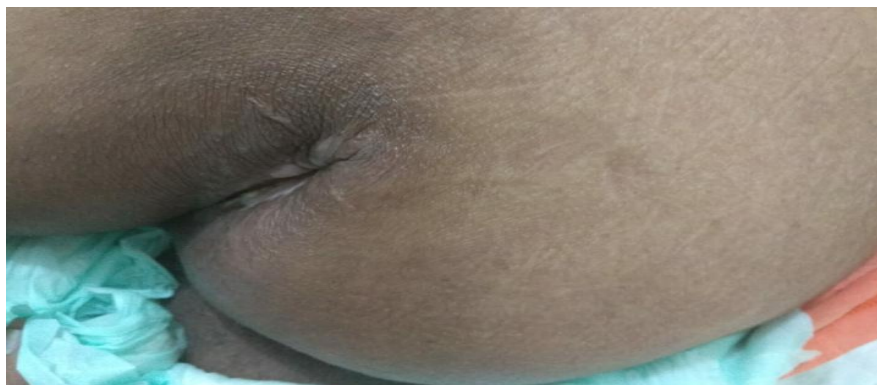
Patient was in supine lying, Electromagnetic therapy was used (ASA electromagnetic therapy, made in Italy). A computerized program (tissue repair) was used for 30 minutes/ session for thirty sessions, using two electrodes of flexapad, one electrode on suprapubic area and other electrode on the left gluteal area. The application was on clothes. There was significant improvement after first four sessions.

No medications was used during the periods of treatment from 13/9-11/11.

Results:

1-There was significant reduction in size of ulcer =

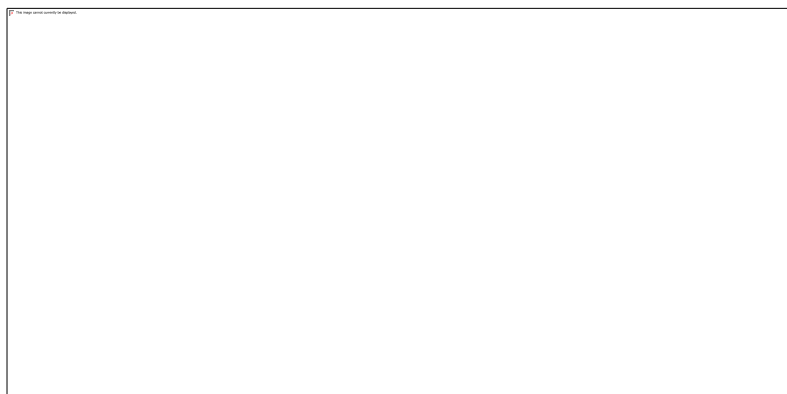
2-There was significant improvement in morphology of the ulcer as the following:



20/9 (after 6 sessions)



17/10/2018 (after 28 sessions)



11/11/2018 (after 48 sessions)

Complete recovery of pressure ulcer

Discussion:

Keast et al. (2006)(18) in updating best practices recommendations for the prevention and treatment of pressure ulcers, recommends considering electromagnetic fields as one adjunctive modality for stimulating closure of chronic non-healing pressure ulcers. Electromagnetic energy is believed to act at the proliferative stage of wound healing to promote production of granulation tissue formation (19).

These results were supported by another study conducted by, Salzburg et al. (1995)(20), who evaluated the effects of non-thermal pulsed. Electromagnetic energy (PEE) for healing of stage II and III ulcers in patients with Spinal cord injury. In the stage II treatment group (n=10), a greater proportion of ulcers healed (84%) after 1 week versus control (40%), $p=0.01$. For complete healing, the treatment group healed in a median 13 days versus 31.5 days for controls ($p<0.001$). In the stage III group, healing was also associated with PEE treatment. 3/5 ulcers healed on average within 43 days; while 0/5 healed in control group. Ulcer area decreased 70.6% versus 20.7% in control group.

On the other side, Smith et al. (2013)(21) summarized the evidence comparing the effectiveness and safety of treatment strategies for adults with pressure ulcers. Randomized trials and comparative observational studies of treatments for pressure ulcers in adults and non-comparative intervention series ($n > 50$) for surgical interventions and evaluation of harms were included in the review. The authors found

that electromagnetic therapy was no different from sham treatment or standard care in wound-healing outcomes.

These results were not far from another study conducted by Gupta et al. (2009)(22) who assessed the effectiveness of pulsed electromagnetic field therapy (PEMF) in the healing of pressure ulcers in patients with neurological disorders in a randomized double blind control trial. The study included 12 patients (M:F, 9:3) with pressure ulcers who were 12-50 years of age. Six patients with 13 ulcers received PEMF therapy and the remaining 6 patients with 11 ulcers received sham treatment, for 30 sessions (45 minutes each) using the equipment 'Pulsatron'. The frequency of PEMF was set at 1 Hz with sine waves and current intensity of 30 milli ampere. Whole body exposure was given in both the groups. Bates-Jensen wound assessment tool (BJWAT) score National Pressure Ulcer Advisory Panel (NPUAP) scores were used as outcome measures. Thirteen ulcers were in stage IV and 11 were in stage III at the start of the study. Significant healing of ulcers was noted, BJWAT scores, in both the treatment and sham groups at the completion of the study. However, when comparing between the groups, healing was not significant. A similar trend was noted with NPUAP scores with no significant difference between the treatment and sham groups at the completion of study. The investigators concluded that no significant difference in pressure ulcer healing was observed between PEMF treatment and sham group in this study (22).

Also In a Cochrane review, Aziz et al. (2011) (23) assessed the effects of electromagnetic therapy (EMT) on the healing of venous leg ulcers. Three randomized controlled trials (RCTs) of variable quality involving 94 people were

included in the review. All the trials compared the use of EMT with sham-EMT. In the two trials that reported healing rates; one small trial (44 participants) reported that significantly, more ulcers healed in the EMT group than the sham-EMT group however, this result was not robust to different assumptions about the outcomes of participants who were lost to follow-up. The second trial that reported numbers of ulcers healed found no significant difference in healing. The third trial was also small (31 participants) and reported significantly greater reductions in ulcer size in the EMT group however this result may have been influenced by differences in the prognostic profiles of the treatment groups. The authors concluded that there is no high quality evidence that electromagnetic therapy increases the rate of healing of

Conclusion:

Magnetic therapy is very effective in management of pressure ulcer, with significant differences.

Recommendations:

- 1. Using magnetic therapy as an effective method of treatment to pressure ulcer.**
- 2. Conducting more experimental studies with magnetic therapy.**

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تأثير العلاج المغناطيسي في قرحة الضغط

الخلفية: تعتبر تقرحات الضغط مصدرا مهما للمضاعفات في المرضى الذين يعانون من عدم القدرة على الحركة او طريح الفراش. يبلغ معدل انتشار قرحة الضغط في المرحلة الثانية او اكبر بين ٨,١% و ١٢,٩% الهدف من الدراسة التحقق في كفاءة العلاج المغناطيسي في تقرحات الضغط. الطريقة: تمت هذه الدراسة على على مريضة عمرها ٤٠ سنة تعاني من قرحة ضغط منذ اكثر من خمس سنوات من الدرجة الرابعة كما انها لديها تاريخ اصابة بالحبل الشوكي. تم عمل ٤٨ جلسة علاج مغناطيسي مدة الجلسة ٣٠ دقيقة مع استخدام برنامج علاج الجروح بالجهاز. تم تقييم المناطق السطحية لقروح الضغط قبل بداية العلاج وعد فترات من بدء الجلسات. النتائج: لوحظ اختلاف كبير بعد الجلسة الرابعة وتم تمام الشفاء بعد الجلسة ٤٨ . الخلاصة: يمكن تسريع عملية الشفاء من قرح الضغط باستخدام العلاج المغناطيسي.

المجال المغناطيسي، قرح الضغط اصابة ،الحبل الشوكي

Informed consent form

I am freely voluntarily consenting to participate in this research study under the supervision of researcher: **Dr, HanyRezk** description of the study procedure has been explained to me and understands that I may withdraw my consent and discontinue participation in this research study at any time without prejudice to me.

Participant:

Date: 10/9/2018

إقرار

أوافق أنا علي المشاركة في الدراسة البحثية الخاصة
بالباحث/هاني رزق حنا وقد تم شرح خطوات البحث لي بالتفصيل وأنه من حقي أن
أنسحب من الدراسة في أي وقت و دون أي أضرار لي.

و هذا إقرار منى بذلك.

التوقيع التاريخ

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