



Effectiveness of Electrical Stimulation in the Treatment of Pressure Ulcers in Spinal Cord Injuries

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Abstract

Patients with spinal cord injuries manifest unique characteristics that imply particular therapeutic indications and management. In the present work, the use of electrical stimulation is shown, by means of the STIMUL W[®] electrical stimulator, using the prophylactic and therapeutic options offered by the stimulator, which allowed establishing a conservative behavior with favorable results in the treatment of pressure ulcers.

Keywords: Spinal Cord Injury; Pressure Ulcers; Electrical Stimulation

Introduction

Millions of people in the world suffer from some type of disability such as those caused by spinal cord injuries, which cause the appearance of hemiplegia, paraplegia and quadriplegia. Above all, in the latter, the immobility of the patient causes, in most cases, the appearance of pressure ulcers (PU).

In patients with spinal cord injuries, a disease of epidemic magnitudes (900-1000/million inhabitants), the prevalence of ulcers reaches 60% of people with complete cervical injuries and 40% of those with incomplete injuries and more than 50% of those with thoracic and lumbar injuries developed ulcers [1]. A five-year study reported that between 40% and 45% of quadriplegics (both motor and sensory) developed this type of injury [2]. It should be noted that between 7% and 8% of deaths in patients suffering from spinal cord injury are due to the complications of PUs.

In complete thoracic-lumbar injuries, PUs affect 50% of paraplegics, while if the injury is incomplete it reaches 30% of paraparetics. Conservative calculations of the cost of treating a patient with pressure ulcers estimate it to be between \$2,000.00 USD and \$30,000.00 USD, depending on the ulcer, and establish a cost of \$70,000.00 USD for a seriously complicated ulcer [3]. According

to statistics from the "National SCI Data Research Center", the cost per Hospitalization increases five times if the ulcer is large enough to require surgical treatment and the annual financial impact for the healing of a PU is estimated at \$3.5 billion USD to \$7 billion USD per institution, which can rise to \$66 billion USD for hospitalization and treatment if the patient has a spinal cord injury [3].

The prevention and healing of pressure ulcers constitutes a medical problem to be solved, since conventional treatments do not contribute to its solution. The development of new health technologies constitutes an ideal means and method to solve the problem posed.

Particularly, in Physical Medicine and Rehabilitation, adequate knowledge about PUs is of great importance, as well as the therapeutic approach for their prevention and treatment, since they constitute one of the causes that frequently slow down or hinder the execution of a program of rehabilitation, and therefore influence the fulfillment of the objectives outlined in the same.

The results of the application of electrical stimulation, using the STIMUL W[®] electrical stimulator, in the prevention and healing of pressure ulcers in spinal cord injured patients are presented.

Use or electrical stimulation in the prevention of pressure ulcer

15 spinal cord injured patients with high risk of generating a pressure ulcer were selected, who were treated with electrical stimulation once a day for 30 minutes.

The initial data and results of the treatment are shown in table 1. It should be noted that there is no known history of the application of this type of treatment as a prophylactic option.

Session Pcte. Results		
1		No Erythema
2	12	No Erythema
3	11	Erythema disappears
4	13	Erythema disappears
5	13	No Erythema
6	13	No Erythema
7	13	No Erythema
8	15	No Erythema
9	13	Erythema disappear
10	14	No Erythema
11	15	Erythema disappears
12	13	Erythema disappears
13	15	Erythema disappears
14	13	No Erythema
15	12	Erythema disappears

Table 1: General data of the patients and results of the application of the prophylactic treatment.

The criteria used to measure the effectiveness were based mainly on the knowledge of the areas of the human body with the highest prevalence of these lesions, in addition to the reddening of the skin and the appearance of the characteristic erythema that precedes the formation of the ulcer:

Use of electrical stimulation in the healing of pressure ulcer

15 cases of patients with grade III PUs were also selected, establishing the analysis of the results of the treatment after three months of initiation. The reduction in the surface area of the ulcers was observed weekly, using the ImageJ program for digital image processing [4] in the public domain, programmed in Java and developed at the National Institutes of Health.

The initial data and treatment results are shown in table 2. In all cases, 11 of the treated patients healed their lesions in less than three months and in the remaining four patients, the surface area decreased significantly. subsequently achieving total healing.

Pcte.	Time (days)	Results
1	77	Total Healing
2	42	Total Healing
3	-	62% Healing
4	-	80% Healing
5	35	Total Healing
6	56	70% Healing
7	49	Total Healing
8	77	Total Healing
9	63	Total Healing
10	-	81% Healing
11	35	Total Healing
12	56	Total Healing
13	63	Total Healing
14	49	Total Healing
15	21	Total Healing

Table 2: Results of the treatment application.

All patients received the treatment twice a day, for 30 minutes each time.

Graphic evidence of the effectiveness of the use of electrical stimulation in the healing of pressure ulcer

Figure 1 shows the graphic combination of the healing process (at the beginning and at the end of treatment) of a 23-year-old male patient with incomplete spastic tetraplegia, who presented multiple PUs, one of them chronic sacral, grade III, who was included in the group that received treatment with electrical stimulation, using the STIMUL W® electrical stimulator [5].



Figure 1: Patient with a grade III PU treated with electrical stimulation.

The sacral ulcer had developed for several months, and total healing was achieved 49 days after starting treatment.

Results

The application of the prophylactic option enabled by the STIMUL W® electrical stimulator made it possible to avoid the appearance of the PU before the initial symptoms appeared and in cases where there was erythema, its elimination was achieved, demonstrating the effectiveness of the method.

The evidence obtained from the application of electrical stimulation in the treatment of pressure ulcers allowed establishing a conservative approach with favorable results in the treatment of grade III ulcers.

Conclusions

The results of the application of electrical stimulation with the use of the STIMUL W® electrical stimulator were presented, demonstrating that this technique can be an effective alternative for the treatment of pressure ulcers in spinal cord injured patients, contributing to establish a conservative behavior, with favorable results.

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