

LASER THERAPY IN PRESSURE ULCERS: LIMITATIONS FOR EVALUATION OF RESPONSE IN PERSONS WITH SPINAL CORD INJURY

Gisela Maria Assis¹, Auristela Duarte de Lima Moser²

¹ Master's degree student on the Post-Graduate Program in Health Technologies at the Pontifical Catholic University of Paraná (PUCPR). Paraná Association of the Physically Disabled. Curitiba, Paraná, Brazil. E-mail: giassis83@gmail.com

² Ph.D. in Production Engineering Professor on the Post-Graduate Program in Health Technologies at PUCPR. Curitiba, Paraná, Brazil. E-mail: auristela.lima@pucpr.br

ABSTRACT: Laser therapy is effective in accelerating the scarring of wounds, but there is a shortage of evidence in relation to its use with pressure ulcers and to studies on treatment in people with spinal cord injuries (SCI) undergoing outpatient treatment. The study aimed to report the limitations found in the implementation of a laser therapy program for treating pressure ulcers, supporting a reflection on approaches of this nature. This is exploratory-descriptive research. Six subjects with spinal cord injuries from two rehabilitation centers were followed up at twice-weekly attendances over an eight-week period, receiving laser irradiation on one lesion, the other lesion being the control. The main limitations observed were difficulty in following the guidance on push-up and appearing for the consultations. It is believed that such limitations are related to flaws in the guidance relating to the prevention of these lesions and to changes in sensitivity in the areas affected.

DESCRIPTORS: Laser therapy. Spinal cord. Pressure ulcer.

LASERTERAPIA EM ÚLCERAS POR PRESSÃO: LIMITAÇÕES PARA AVALIAÇÃO DE RESPOSTA EM PESSOAS COM LESÃO MEDULAR

RESUMO: A laserterapia é efetiva na aceleração da cicatrização de feridas, porém faltam evidências quanto sua utilização em úlceras por pressão e estudos de tratamento em pessoas com lesão medular em atendimento ambulatorial. O estudo teve como objetivo relatar as limitações encontradas na implementação de um programa de laserterapia no tratamento de úlceras por pressão, subsidiando uma reflexão sobre abordagens desta natureza. Trata-se de pesquisa exploratório-descritiva. Seis sujeitos com lesão medular, de dois centros de reabilitação, foram acompanhados em dois atendimentos semanais por oito semanas, recebendo irradiação laser em uma lesão, tendo outra como experimental. As principais limitações observadas foram dificuldade no seguimento da orientação de *push-up* e comparecimento às consultas. Acredita-se que tais limitações estejam relacionadas a falhas no processo de orientação quanto à prevenção destas lesões e à alteração na sensibilidade local.

DESCRIPTORIOS: Terapia a laser. Medula espinal. Úlcera por pressão.

LASERTERAPIA EN ÚLCERAS POR PRESIÓN: LIMITACIONES PARA LA EVALUACIÓN DE LA RESPUESTA EN LAS PERSONAS CON LESIÓN MEDULAR

RESUMEN: La terapia con láser es efectiva para acelerar la recuperación de las heridas, pero carece de pruebas para su uso en úlceras por presión y para el tratamiento en personas con lesiones de la médula espinal en la atención ambulatoria. El objetivo del estudio fue describir las limitaciones de la aplicación de un programa de terapia con láser en el tratamiento de úlceras por presión, subsidiando una reflexión sobre los abordajes de esta. Es una investigación exploratoria y descriptiva. Seis sujetos con lesión medular de dos centros de rehabilitación, fueron acompañados por dos visitas semanales durante ocho semanas, recibiendo la irradiación láser en una lesión. Las principales limitaciones se relacionaron con las dificultades para seguir la guía de *push-up* y la asistencia a las consultas. Se cree que estas limitaciones están relacionadas con defectos en el proceso de orientación respecto a la prevención de estas lesiones y el cambio en la sensibilidad local.

DESCRIPTORIOS: Terapia por láser. Médula espinal. Úlcera por presión.

INTRODUCTION

The incidence and prevalence of spinal cord injuries (SCI) in Brazil are unknown, as these are not health problems which must be mandatorily notified. Regional studies show that men aged between 21 and 40 years of age are affected most. Among these individuals, a spinal cord injury has the effect of interrupting their professional activity, changing their routine and leading to a high cost for society.¹

Pressure ulcers (PU) are among the frequent complications of SCI, resulting from the reduction in mobility and sensitivity below the injury. PU are lesions characterized by localized areas of cell death, caused by the compression of soft tissue between a bony prominence and a surface for a period of time.²

It is estimated that 70% of individuals with SCI get a PU and that 7% to 8% of these die from the complications of these lesions. A PU has a negative impact on these patients' quality of life, as it affects them physically, psychologically and socially, as well as resulting in delays or interruptions in the rehabilitation, and a consequent delay in their social re-integration.¹

Among the ways of treating PU, the National Pressure Ulcer Advisory Panel (NPUAP)³ mentions low-intensity laser therapy, although it mentions the shortage of evidence proving its effectiveness.

The therapeutic effects of laser (Light Amplification by Stimulated Emission of Radiation) radiation on tissue lesions are biochemical, bio-electric, and bio-energetic, resulting in stimulation of the microcirculation, cell nutrition, and analgesic, anti-inflammatory, anti-edematous and scarring action.⁴

Studies on rats, evaluating different parameters for laser therapy in experimental wounds, have shown an acceleration in the scarring process,⁵ an increase in the synthesis of collagen,⁶ reduction in inflammatory intensity,⁷ prevention of tissue necrosis,⁸ and a more organized process of tissue repair.⁹

In humans, some case studies present as results: complete scarring of necrotic incisions from abdominoplasty,¹⁰ complete scarring of diabetic ulcer, and of dehiscence of saphenectomy in the ninth session,¹¹⁻¹² reduction in pain¹¹ and significant reduction of the diameter of the PU in persons with SCI.¹³

It may be observed that the lack of evidence cited by the NPUAP refers to the scarcity of experimental studies in humans, as well as to the lack of standardization of a protocol covering the characteristics of different wounds, permitting comparisons between studies.

Studies show a high prevalence of pressure ulcers in persons with SCI undergoing outpatient treatment;¹⁴⁻¹⁵ one may observe a shortage of studies evaluating the response of this population's pressure ulcers to specific treatments. Studies on pressure ulcers essentially address the surveying of risk factors,¹⁶ characterization,¹⁷ incidence,¹⁸ and the team's perceptions,¹⁹ among other issues which do not include outpatient treatment.

It is suggested that the previously-mentioned shortage is due to the difficulty of controlling important variables such as relief of pressure, nutrition and changing dressings, items which are more easily-observable in people being treated as in-patients. The present article is part of a project entitled "Effects of low-intensity laser therapy in the scarring of pressure ulcers in persons with spinal cord injuries", which aimed to evaluate the response of pressure ulcers in persons with spinal cord injuries, attended with laser therapy on an outpatient basis.

Some of the limits for researching this population were observed; hence, this article's objective is to report the difficulties found for the implementation of the proposed therapy on an outpatient basis.

METHOD

This is a report of an experience of exploratory-descriptive research, taken from an experimental study undertaken in the period May-July 2010, approved by the PUCPR Research Ethics Committee, under Decision n. 4414/10. The study was carried out in a Philanthropic Rehabilitation Association in a city in the state of Paraná.

The sample was made up of six persons with spinal cord injuries, totalling 12 pressure ulcers. The subjects were selected based on the nursing records from the Association where the study took place, and from a rehabilitation center in the same city, this last being a public entity of the State Health Department. Following telephone contact, the potential research subjects participated in a meeting, during which they were selected based on the following inclusion criteria: being over 18

years of age, having a spinal cord injury and at least two pressure ulcers. People who presented systemic manifestations of infection, or neoplasms, were excluded. The research's technical or ethical aspects were explained.

Having accepted to participate in the research by signing the Terms of Free and Informed Consent, the subjects included in the study were expected to appear in the place where data collection would take place twice a week, over a period of eight weeks, at a time arranged in line with the researcher's and the participant's availability.

First of all in the consultations, the subjects, with their caregivers, were given guidance. The guidance was given verbally and by demonstrating the procedures. Following the giving of the guidance, the patient or their caregiver was requested to repeat what they had understood in their own words, so as to assess whether the content had been learnt. The consultations' mean length was 30 minutes, the guidance being given concomitantly with the care. The content of the guidance was:

- Changing of dressings: this should be carried out twice a day or more, if the dressing was saturated with exudate or coming away from the area, which should be irrigated with heated saline isotonic solution. The wound should be covered with sterile gauze, moistened with essential fatty acid (EFA) and fixed in place with microporous tape. It is stressed that the study did not guarantee the provision of material for this procedure, due to the provision being linked to the Municipal Prefecture Health Centers.

- Relief of pressure: the research subjects were to relieve the pressure, which involved lifting the hips from the chair, using the strength of the arms, to relieve the compression of the ischiatic region, every 15 minutes, whenever they were sitting down.

- Change in supine position: the changing of position, or repositioning, should be carried out with non-stipulated frequency, so as to spend as little time as possible on the PU when lying down.

- Assiduity in attending consultations: participation in all 16 consultations was essential for evaluation of the response to the therapy applied, as the periodicity and number of sessions were determined based on the literature,²⁰ with a view to the best response possible in the scarring.

The evaluation of the response to the guidance given was undertaken through a semi-structured interview in which the individual was asked how following the guidance had gone, in relation to changing dressings, relieving pressure and changing supine position, between one consultation and the next. In the case of non-attendance at consultations, the reasons mentioned by the subjects were written in this same space.

The questions referring to following guidance constitute one item, in one of the data collection instruments. This instrument contained questions for characterizing the sample, such as age, sex, duration, cause and level of the lesion and data on the PU, as well as a table with space for length, width and depth of the lesion and the questions previously cited, for each of the 16 consultations.

Another instrument used in the study was the PUSH (Pressure Ulcer Scale for Healing),²¹ which considers three parameters for evaluation: area of the wound, quantity of exudate, and appearance of the wound bed, defined by the tissue prevalent - which can be necrotic, slough, granulation or epithelial tissue, resulting in a situation of scarring.

The object of the evaluation was to compare the progression of a PU treated with laser therapy with one that had not been, both kept with the same topical therapy. In this regard, it should be noted that all the participants had more than one PU and that one of these, chosen by the researcher and the patient, was irradiated in the consultations after cleaning, and the other was not irradiated, although it was clean and was evaluated in the same way.

The laser therapy was applied in the following parameters: diode laser, 830nm wavelength, with 10 mW of output, of 4J/cm², continuous mode of emission, point technique, 45 seconds per point, with a distance of 1 cm between the points.²²

RESULTS

The study sample was characterized predominantly by young men, whose lesions were at the level of the tenth thoracic vertebra, with a PU in the ischiatic region. Among the causes of the lesion were fall from a height and car accidents. The situation presented below explains this information.

Table 1 - Distribution of the participants regarding epidemiological data, the spinal cord injury, and pressure ulcers. Curitiba-PR, 2010

Sex	Age	Cause of injury	Level of injury	Place of the experimental ulcer	Place of the control ulcer
Fem	22	Fall from a height	T10-T11	Right sciatic	Left sciatic
Male	61	Car accident	T10	Right sciatic	Left sciatic
Male	31	Car accident	T10	Sacral	None
Male	27	Wound from fire-arm	T10	Right trochanteric	Sacral
Male	29	Dive into shallow water	C4-C5	Left sciatic	Right sciatic
Male	29	Fall from a height	T10	Right sciatic	Right hallux

The difficulty in evaluating the therapy were presented in two axes, so as to facilitate the discussion: difficulty in participating in the consultations and difficulty in following the guidance for caring for the PUs.

Regarding the axis of difficulty in participating in the consultations, the most frequently found are presented below:

In relation to the changing of dressings, one participant went to the great majority of the consultations with no covering on the lesion, as he used little adhesive tape, causing the dressing to come off with any movement. Another participant used pieces of fabric as a substitute cover for the gauze in some of the evaluations during the period of the study.

Relief of the pressure was not undertaken adequately by any participant. One participant was tetraplegic and depended on somebody to carry out an appropriate relief; two reported being ashamed to carry out the relief when they were near other people, as both participated in sporting and educational activities which kept them seated for hours without a break; and three reported forgetting to carry out the activity, one of these passing two periods a day sat down working.

A lack of guidance during the initial hospitalization regarding the necessity of relieving pressure was reported by all the participants and only two referred to having received this guidance during the period of rehabilitation.

The change in supine position had greater adherence by the participants, as all spent time lain down for a short period of time, normally at night, when they woke up a number of times to change position. Problems with this guidance were observed only in one subject, who decided to go back to sleeping on the lesion when it showed improvement. This step caused a new increase in diameter and worsening of other characteristics of the lesion such as exudate and tissue.

Moving on to the second axis of difficulties, all missed some consultations, for various reasons. Two attended only three consultations; one attended five consultations; one, 10; one, 11; and one, 14 consultations.

Of those who went to three consultations, one was suspended from the study after the third, as he presented systemic manifestations of local infection of the wound, which contra-indicates laser therapy. The other ceased attending the consultations without any explanation, also ceasing to answer telephone calls made.

The participant who went to five consultations missed several consultations at the beginning, as he was suffering from depression because of personal problems, stopped leaving the house for several days, and mentioned eating badly and having smoked heavily in this period. One of the non-attendances in this period was due to the absence of somebody to accompany him to the consultation, and to the poor travelling conditions for wheelchair users between his house and the bus stop. When he returned to participate in the consultations, he presented a considerable worsening in the lesions, and signs of local infection; over the next three applications this progressed to systemic manifestations, and the therapy was suspended.

The one who went to 10 consultations missed two because of bad weather; two, because he needed to resolve personal problems at the time the consultation was taking place; and two because of end-of-the-month stock-taking etc where he worked, requiring him to be there full time.

The person who went to eleven consultations missed five: three because of problems with transport from his town to the place of the study, and two because although he was in the city where the study was taking place, he had nobody to take him to the bus stop, which was difficult to access for wheelchair users.

The most assiduous participant, who attended 14 consultations, missed two non-consecutive days, for personal reasons, which were not declared.

Table 2 summarizes the main difficulties presented in the two sections. It should be emphasized that the same subject may be included in more than one item.

Table 2 - Difficulties for the implementation of outpatient therapy for treatment of PU in persons with spinal cord injury. Curitiba-PR, 2010

Not following guidance for care with the PU	Frequency
Dependence on caregiver to undertake it	1
Inadequate dressing (too little adhesive tape, occluded with non-sterile material)	2
Failure to relieve pressure (from forgetting or shame)	6
At night, remaining on the PU	1
Non-attendance at consultations (reasons reported or observed)	n
Systemic manifestations of infection	2
Reason not given	2
Depression	1
Need to resolve problems with personal documents	1
Impossibility of leaving during work hours	1
Transport difficulties	2

DISCUSSION

The profile of the study participants was similar to that of studies characterizing spinal cord trauma in public hospitals, reaffirming that young males are most affected by this type of injury and that falls and car accidents are among the most frequent causes.^{23,15}

Regarding the predominant place for pressure ulcers, the data differs from that presented by some studies presenting data referent to the incidence, prevalence and characterization of the injuries of hospitalized persons, for various reasons,¹⁷⁻¹⁸ or because of spinal cord injury;¹⁵ in these cases, the most prevalent places are the sacral, calcaneal and trochanteric regions, as the patients spend most of their time in bed.

The difference is due to the fact that the research subjects are rehabilitated or undergoing rehabilitation, spending much of their time seated, causing the ischiatic region to be most exposed to pressure.

In relation to topical care for the wound, the keeping of the occlusive dressing moist and undertaken with sterile gauze has the objective of the absorption of the exudate and the application of topical agents,²⁴ which in this study was EFA.

One subject's dressings were coming off because he used the minimum quantity of adhesive tape, which inviabilized the objective of the same. The reason for this practice was the price charged by the industry for this type of product and shortcomings in the programming of distribution of

materials in the public network, which does not include adhesive tape as a material made available for changing dressings at home.

Another patient used - on some days - pieces of fabric instead of gauze. The reason for adopting this practice was that the quantity of gauze provided by the public service was insufficient for all the changes necessary up until more would be supplied, which shows flaws in the assessment of the real need and the planning for appropriate provision.

The failure to relieve pressure, also known as the push-up or ischiatic decompression, was the most prevalent problem, being observed in all the subjects. Considering that the ischiatic region was the region most affected by the PU, and that this is caused by prolonged compression of the soft tissues between bony prominences and an external surface,²⁴ the non-undertaking of relief of pressure makes the scarring of the lesion impossible, as the causal factor has not been removed.

A similar problem was observed in a study carried out in a rehabilitation center in São Paulo¹⁴, where more than 57% of the paraplegics interviewed did not carry out any preventive steps for PU, and of those who did, less than 50% undertook the relief of pressure.

Guidance regarding care for skin integrity and PU prevention, and training for sciatic decompression, were judged necessary by 100% of the specialists, in a study undertaken to determine interventions for people with spinal cord injuries who had diagnoses of potential for impairment of skin integrity.¹⁶

In the face of this, some conjectures are raised for explaining the problem: either the people with spinal cord injuries are not being guided regarding the physiopathology of PUs, their consequences and forms of prevention, or this guidance is not being provided in a way that is accessible enough to be reversed to satisfactory adherence to forms of prevention.

Authors cite that professional knowledge is instituted as correct and insurmountable, but that this does not always take account of the individuality of the subject. The professional knowledge is elaborated for a specific group, based on scientific proof, with the same physical or psychological situations, which do not correspond in practice to the expectations which each subject brings in his or her socio-political-cultural context.²⁵

Nursing professionals recognize the priority of guidance in relation to preventive care,¹⁹ thus it is necessary to undertake research assessing the reasons why this is not provided or observed.

The change in supine position seems not to have been a relevant problem in this study. This fact may be related, once again, to the location of the lesions, which were not harmed to a significant degree in the lying position, making it difficult to assess the effectiveness of these self-care guidelines.

The recommendation in relation to changing of supine position is that the same should be undertaken irrespective of the type of surface used, and that its frequency depends on the individual's characteristics.³ Professionals evaluate the non-undertaking of this step as the first in the ranking of risk factors for developing PU.¹⁹

The lesions' infection was a problem prevalent in two subjects. The risk factors for this are the same factors which constitute risk for the development of PU in individuals with spinal cord injury; among them one can cite excessive humidity in the place of the wound - because of sudoresis, incontinence or exudation - immobility, which impairs adequate local tissue perfusion and migration of defence cells, and change in sensitivity, which impairs the perception and correction of the items described.²⁴

The excessive number of missed consultations can be explained by a variety of factors. In addition to the reasons presented by the participants, the failure to prioritize the treatment of the PU can be related to the absence of local sensitivity, as already mentioned, which means that the individual does not present pain related to the lesion, and to the chronic nature of the lesions, which determines the exposure to the various types of treatment, without achieving the desired result.

FINAL CONSIDERATIONS

In spite of the impossibility of presenting the response of the PU to laser therapy, the study made it possible to explore the possible limitations for evaluating therapies applied to persons with spinal cord injuries, undergoing outpatient treatment for their PU.

As the predominant limitations, difficulty in adhering to the frequent practice of relieving pressure, and the non-prioritization of the treatment of PU were observed, the latter leading to frequent missing of consultations for a variety of reasons. Less frequent limitations, but not less important, were the establishment of infectious situations and difficulty in independent locomotion.

The study indicates the urgent need for early guidance of people with spinal cord injuries regarding care for preventing PU, leading to an awareness of the seriousness of the problem and their active involvement in the care. Another need observed was for adequate planning in the public services, in the provision of materials for care at home, favoring effective self-care, responding to the user's real needs.

Despite advances on the issue of the accessibility and independence of the person with a disability, be observed that there are still steps to be taken to achieve these objectives and the social reintegration of the physically-disabled person in all of Brazil's municipalities. There is a need to broaden the concept of accessibility, going beyond the architectural barriers, incorporating the confrontation of cognitive and attitudinal barriers as a way of making the subject co-responsible in health practices.

The issue of laser therapy for treating PU in persons with spinal cord injury remains a gap in the knowledge, further research being necessary so as to produce evidence for practice. It is hoped that this study may contribute to future research, which may have tools making it possible to face the limitations, including those presented in this study.

REFERENCES

1. Pereira CU, Jesus RM. Epidemiologia do traumatismo raquimedular. *J Bras Neurocirurg.* 2011; 22(2):26-31.
2. Paranhos WY. Ulceras de pressão. In: Jorge AS, Dantas SRPE. *Abordagem multiprofissional do tratamento de feridas.* São Paulo (SP): Atheneu; 2005. p. 287-98.
3. European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel. *Prevention and treatment of pressure ulcers: quick reference guide.* Washington DC (US): National Pressure Ulcer Advisory Panel; 2009.

4. Veçoso MC. Laser em fisioterapia. Sao Paulo (SP): Lovise; 1993.
5. Maiya AG, Kumar P, Nayak BS. Photo-stimulatory effect of low energy helium-neon laser irradiation on excisional diabetic wound healing dynamics in wistar rats. *Indian J Dermatol.* 2009; 54(4):323-9.
6. Nascimento DG, Molena-Fernandes CA, Sartoretto JL, Bruschi LC, Cuman RKN, Silva FP. Efeitos da irradiação com o laser HeNe 632,8 nm sobre a cicatrização de feridas em ratos. *Ciência, Cuidado e Saúde:* 2006 Mai-Ago; 5(2):229-35.
7. Yasukawa A, Ohruji H, Koyama Y, Nagai M, Takakuda K. The effect of low reactive-level laser on operative wound healing in Rat Model. *J Vet Med Sci:* 2007; 69(8):799-806.
8. Prado RP, Liebanos RE, Hochman B, Pinfildi CE, Ferreira LM. Modelo experimental para laserterapia de baixa intensidade em retalho cutâneo randômico isquêmico em ratos. *Acta Cir Bras.* 2006 Jul-Ago; 21(4):258-62.
9. Júnior AMR, Oliveira RG, Farias RE, Andrade LCF, Aarestrup FM. Modulação da proliferação fibroblástica e da resposta inflamatória pela terapia a laser de baixa intensidade no processo de reparo tecidual. *An Bras Dermatologia.* 2006; 81(2):150-6.
10. Nogueira VC, Cunha MD, Castro JG, Serafim GL, Albertini R. Laser e ultra-som na cicatrização em pacientes submetidos a abdominoplastia. In: Anais do XI Encontro Latino Americano de Iniciação Científica e VII Encontro Latino Americano de Pós-Graduação [online], 2007 Out 18-19; São José dos Campos, Brasil. São José dos Campos (SP): Universidade do Vale do Paraíba; 2007 [acesso 2010 Mai 20]. p 1724-7.
11. Pinto MVM, Anjos CB, Lopes DV, Santos HR, Silva ALS, Barbosa LG, et al. Influência da laserterapia de 632,8 nm por 150 mw na cicatrização de úlcera diabética. Relato de caso. *Rev Dor:* 2009; 10(2):194-9.
12. Pinto NC, Pereira MHC, Stolf NAG, Chavantes MC. Laser de baixa intensidade em deiscência aguda de safenectomia: proposta terapêutica. *Rev Bras Cir Cardiovascular.* 2009; 24(1):88-91.
13. Felice TD, Pinheiro AR, Menchik EDS, Silva ACD, Souza LS, Caires CSA, et al. Utilização do laser de baixa potência na cicatrização de feridas. *Interbio.* 2009; 3(2):42-52.
14. Leite VBE, Faro ACM. Identificação de fatores associados às úlceras por pressão em indivíduos paraplégicos relacionados às atividades de lazer. *Acta Fisiatr.* 2006; 13(1):21-5.
15. Dias AO, Kameo SY, Moroóka M. Úlcera de pressão em pacientes com lesão medular: um problema constante? *Terra e Cultura.* 2005; 36: 117-26.
16. Faro ACM. Fatores de risco para úlceras por pressão: subsídios para a prevenção. *Rev Esc Enf USP.* 1999 Set; 33(3):279-83.
17. Blanes L, Duarte IS, Calil JA, Ferreira LM. Avaliação clínica e epidemiológica das úlceras por pressão em pacientes internados no Hospital São Paulo. *Rev Assoc Med Bras.* 2004; 50(2):182-7.
18. Rogenski NMB, Santos VLGG. Estudo sobre a incidência de úlceras por pressão em um hospital universitário. *Rev Latino-am Enfermagem.* 2005 Jul-Ago; 13(4):474-80.
19. Nogueira PC, Caliri MHL, Santos CB. Fatores de risco e medidas preventivas para úlcera de pressão no lesado medular. Experiência da equipe de enfermagem do HCFMRP-USP. *Medicina Ribeirão Preto.* 2002 Jan-Mar; 35: 14-23.
20. Gonçalves G, Golçalves A, Padovani CR, Parizzoto NA. Promovendo a cicatrização de úlceras hansênicas e não hansênicas com laserterapia: ensaio clínico em unidades ambulatoriais do Sistema Único de Saúde. *Hansen Int.* 2000; 25(2):133-42.
21. Santos VLGG, Azevedo MAJ, Silva TS, Carvalho VMJ, Carvalho VF. Adaptação transcultural do *Pressure Ulcer Scale for Healing (PUSH)*. *Rev Latino-Am Enfermagem.* 2005 Mai-Jun; 13(3):305-13.
22. Assis GM, Moser ADL. Proposta de um protocolo de laserterapia como adjuvante no tratamento de úlceras por pressão. In: Anais do IX Congresso Brasileiro de Estomaterapia [online], 2011 Out 23-27; Porto Alegre, Brasil. São Paulo (SP): Associação Brasileira de Estomaterapia; 2011 [acesso 2013 Mai 02]. Disponível em: http://www.sobest.org.br/index.php?option=com_jumi&fileid=14&Itemid=100&action=view_article&view_trab_id=200165
23. Siscão MP, Pereira C, Arnal RLC, Foss MHDA, Marino LHC. Trauma raquimedular: caracterização em um hospital público. *Arq Ciênc Saúde.* 2007 Jul-Set; 14(3):145-7.
24. Rocha JÁ, Miranda MJ, Andrade MJ. Abordagem terapêutica das úlceras de pressão: intervenções baseadas na evidência. *Acta Med Port.* 2006; 19(1): 29-38.
25. Martins PAF, Alvim NAT. Plano de cuidados compartilhado junto a clientes estomizados: a pedagogia freireana e as suas contribuições à prática educativa da enfermagem. *Texto Contexto Enferm.* 2012 Abr-Jun; 21(2):286-94.