

The use of phototherapy for healing treatments: study of new techniques for tissue neoformation

Abstract

According to the Brazilian Association of Endocrinology and Metabolism, diabetes, or Diabetes Mellitus, is a chronic, autoimmune disease, characterized by the deficiency of insulin production by the body. The problem involves the metabolism of glucose in the blood and can be presented in several ways. The best known types of diabetes are 1 and 2. Beta-cell failure in the pancreas characterizes the first, which affects children and adolescents more often. Type 2 diabetes, whose genetic load is much higher, occurs due to resistance to insulin action, with obesity as one of the main triggering factors. The other forms of diabetes can be manifested by anatomical lesions in the pancreas, due to several toxic aggressions, by infections, chemical compounds, among others. A very common consequence of diabetes is a formation of skin wounds due to metabolic disorders, these wounds can be very aggressive and diminish the quality of life of the patients. An equipment based on phototherapy associated with a latex blade was developed as an alternative treatment for skin wounds, the equipment works directly on the neoformation of the wounded tissue, accelerating the scarring process at a low cost.

Keywords: tissue neo formation, new technique, low cost, LED

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Abbreviation: LED, light emitting diode

Introduction

Diabetes is a disease that encompasses various metabolic disorders in which the blood glucose index gets high. This disease can cause wounds in the feet caused by a set of alterations in the lower limbs, being injuries in the nerves, alterations in the arteries, the reduction of immunity and, sometimes, alterations in the bony anatomy of the feet. This consequence is called diabetic foot.¹

A skin lesion triggers a series of biochemical events aimed at restoring vascular and cellular integrity. During the healing process, the tissue is vulnerable to several factors that may disrupt it. The failure of any phase of the repair process sequence may prevent healing and lead to significant morbidity, resulting in costs.² The tissue neoformation induction system aims to treat patients who present ulcers from various diseases and do not respond well to conventional treatments, it's seen as a new form of phototherapy, but with reduced costs due to the use of high brightness LED in place of LASER

The number of people who have chronic wounds in Brazil has increased in recent years. Minimizing the suffering of these people is what motivated the development of an equipment capable of replacing the conventional method of treatment, since it can substantially accelerate scarring processes at a low cost. This equipment is called RAPHA, a mobile tissue neoformation system based on the principles of phototherapy which aims to aid in the healing of wounds, along with a blade made of latex.

Discussion

The treatment of 4 participants of the research using silver foam and 6 other participants treated using the latex blade associated to the use of LED for 30 minutes were compared. The clinical findings were analyzed qualitatively and quantitatively, demonstrating that the

results obtained by the group treated with the LEDs were higher than those obtained by the foam treated group.³ This fact suggests that the tissue neoformation induction system presented here, is characterized by an effective treatment option for diabetic foot ulcer due to the high potential in inducing healing.

After the ulcer closes, remodeling and maturation of the formed scar occurs. This phase takes months or years, and involves reducing the number of cells and blood flow in scar tissue, reformulating and improving the components of collagen, and reabsorption of water. Maturation is responsible for increased tensile strength (maximum 80% of normal skin force) and decreased scar size.⁴

In this way, it can be seen that wound healing has been studied with several covering techniques to Hevea brasiliensis is better treat the wound and demonstrate healing effectiveness. The use of new coatings, among them the use of latex of in animals⁵⁻⁷ and humans.^{3,8-13}

Conclusion

Therefore, the method of treatment of ulcers through LEDs associated with a latex blade is shown as a positively differentiated approach to those already presented in the literature and currently used in research participants with ulcers in the lower limbs. The RAPHA equipment is intended to treat ulcers presented in external regions of the body which may interact with the light provenient from LEDs, such as diabetic ulcers, which is a chronic wound that occurs in people who, for various reasons, have had a complication of diabetes, pressure ulcers which are very common in bedridden or mobility impaired patients as it is caused by too much pressure in a region of the body that ultimately damages the skin.

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Conflict of interest

The author declares no conflict of interest.

References

1. Saulde M. Manual do Pel Diabético- Estratégias para o cuidado da Pessoa com Doença Crônica. Brazil: Ministério da Saúde; 2016.
2. Ricardo José de Mendonça, Joaquim Coutinho-Netto Cellular aspects of wound healing. *Anais brasileiros de dermatologia*. 2009;84(3):257–262.
3. Reis Maria do Carmo dos. Sistema indutor de neoformação tecidual para pel diabético com circuito emissor de luz de LEDs e utilização do látex natural. Brasília Universidade de Brasília, Faculdade de Tecnologia, Brasília: Springer; 2013. 167 p.
4. Samuel Henrique Mandelbaum, Érico Pampado Di Santis, Maria Helena Sant'Ana Mandelbaum Cicatrization: current concepts and auxiliary resources-Part I. *An Bras Dermatol*. 2003;78(4):393–410.
5. Agostini DLS. Estudo dos componentes não isoprenos do látex de *Hevea brasiliensis* indutores de angiogênese. Tese de Doutorado. Tese (Doutorado em Ciência e tecnologia de materiais)-Universidade Estadual Paulista (UNESP)-Faculdade de Ciências e Tecnologia (FCT), programa de pós-graduação em Ciência e Tecnologia de Materiais (POSMAT), Presidente Prudente. Brazil: Springer; 2013.
6. Andrade, Thiago Antonio Moretti de Modificações teciduais e mecanismos de ação da fração F1 do látex da seringueira *Hevea brasiliensis* na cicatrização de úlceras cutâneas em ratos diabéticos. *Tese de Doutorado*. Universidad de Sao Paulo, Brazil; Springer; 2012.
7. Pimenta JR, Massabki PS. Carcinoma hepatocelular: um panorama clínico. *Rev Bras Clin Med*. 2010;8:59–67.
8. Marcos Miranda Araujo, Eduardo Tanaka Massuda, Miguel Angelo Hyppolito. Anatomical and functional evaluation of tympanoplasty using a transitory natural latex biomembrane implant from the rubber tree *Hevea brasiliensis*. *Acta cirurgica brasileira*. 2012;27(8):566–571.
9. Frade, Marco Andrey Cipriani. Úlcera de perna: caracterização clínica e perfil imunohistopatológico da cicatrização na presença da biomembrana de látex natural da seringueira *Hevea brasiliensis*. *Tese de Doutorado*. Universidade de Sao Paulo, Brazil: Springer; 2003.
10. Liveira, Mariele Gobo de. Estudo comparativo de gel de palquetas home made versus hidrocólido no processo de cicatrização de úlceras crônicas de etiologia venosa; 2011.
11. Pinho ECCMO. uso da biomembrana de látex natural comparado ao transplante conjuntival autólogo na superfície ocular. *Ribeirão Preto*. Universidade de Sao Paulo, Brazil: Springer; 2011.
12. Cláudia Patrícia Cardoso Martins Siqueira, Dari de Oliveira Togninho Filho, Franciele Mendes de Lima, Henrique Durante, et al. Efeitos biológicos da luz: aplicação de terapia de baixa potência empregando LEDs (Light Emitting Diode) na cicatrização da úlcera venosa: relato de caso. *Seminário: Ciências Biológicas e da Saúde*. 2009;30(1):37–46.
13. Caetano, Kelly Steinkopf. Avaliação do tratamento de úlceras venosas crônicas com fototerapia (LEDs) e sulfadiazina de prata a 1%. Tese de Doutorado, Universidade de Sao Paulo, Brazil. Springer; 2008.