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Application of laser therapy in the treatment of nipple traumas: a literature review

A aplicação da laserterapia no tratamento de traumas mamilares: revisão de literatura

Aplicación de laserterapia en el tratamiento del traumatismo del pezón: revisión de literatura

Brenda Kelly Pontes Soares[1]
ORCID: 0000-0001-7873-1653
Ravana Amália Ribeiro Barreto[1]
ORCID: 0000-0003-2677-8198
Ilana Bruna de Lima Feitoza[1]
ORCID: 0000-0003-1195-8890
André Dianna Lopes[2]
ORCID: 0000-0003-4146-9502
Ilisdayne Thallita Soares da Silva[1]
ORCID: 0000-0003-2421-8090
Francisca Marta de Lima Costa Souza[1]
ORCID: 0000-0002-2442-9499

1 Federal University of Rio Grande do Norte, RN, Brazil
2 IN LASER Clinic, RJ, Brazil

Editor: Ana Carla Dantas Cavalcanti
ORCID: 0000-0003-3531-4694

Corresponding author:
Brenda Kelly Pontes Soares
E-mail: brendaa.pontes@gmail.com

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ABSTRACT
Objective: To identify in the scientific literature the application of low-level laser therapy in the treatment of nipple traumas in puerperal women. **Method:** This is an integrative literature review. The survey of publications took place from September to November 2020, using the descriptors "low-level light therapy" and "laser therapy", in addition to the keyword "nipple trauma", in the PubMed, EMBASE, CINAHL, Scopus and Web of Science databases. After reading and analyzing the articles, 3 were selected for the final sample. **Results:** The analyzed data composed two thematic axes, namely: "The use of laser therapy for nipple pain relief" and "The use of laser therapy in the healing of nipple fissures". **Conclusion:** The application of laser therapy resulted in pain reduction and in good nipple tissue regeneration, contributing to the maintenance of breastfeeding.
Descriptors: Low-Level Light Therapy; Healing; Breastfeeding.

RESUMO
Objetivo: Identificar na literatura científica a aplicação da laserterapia de baixa intensidade no tratamento de traumas mamilares em puérperas. **Método:** Trata-se de uma revisão integrativa da literatura. O levantamento das publicações ocorreu no período de setembro a novembro de 2020, utilizando os descritores *"low-level light therapy"* e *"laser therapy"*, além da palavra-chave: "*nipple trauma*", nas bases de dados da PubMed, EMBASE, CINAHL, Scopus e *Web of Science.* Após a leitura e análise dos artigos, 3 artigos foram selecionados para a amostra final. **Resultados:** Os dados analisados compuseram dois eixos temáticos denominados: "Uso da laserterapia no alívio da dor mamilar" e "Uso da laserterapia na cicatrização de fissuras mamilares". **Conclusão:** A aplicação da laserterapia resultou na diminuição da dor e boa regeneração tecidual mamilar, contribuindo para manutenção do aleitamento materno.
Descritores: Terapia com Luz de Baixa Intensidade; Cicatrização; Aleitamento Materno.

RESUMEN
Objetivo: Identificar en la literatura científica la aplicación de laserterapia de baja intensidad en el tratamiento del traumatismo del pezón en mujeres posparto. **Método:** Se trata de una revisión integradora de la literatura. El levantamiento de publicaciones se realizó de septiembre a noviembre de 2020, utilizando los descriptores *"low-level light therapy"* y *"laser therapy"*, además de la palabra clave: "*nipple trauma*", en las bases de datos de PubMed, EMBASE, CINAHL, Scopus y *Web of Science*. Después de leer y analizar los artículos, se seleccionaron 3 artículos para la muestra final. **Resultados:** Los datos analizados comprendieron dos ejes temáticos denominados: "Uso de laserterapia para aliviar el dolor del pezón" y "Uso de laserterapia para la cicatrización de las grietas del pezón". **Conclusión:** La aplicación de laserterapia dio como resultado una disminución del dolor y una buena regeneración del tejido del pezón, contribuyendo al mantenimiento de la lactancia.
Descriptores: Terapia de Luz de Baja Intensidad; Cicatrización; Amamantamiento Materno.

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INTRODUCTION

Exclusive breastfeeding (EB) is considered the best food for the newborn (NB) up to six months of life, contributing to growth, development and strengthening of the maternal-child bond, reducing the number of neonatal deaths, pathologies and comorbidities. In addition to that, EBF reduces the risk of postpartum hemorrhage, breast cancer, etc[1].

Despite the countless advantages that EBF offers the binomial (mother and baby), breastfeeding is a difficult process, which requires learning and constancy to carry out the practice of offering milk. It is common for lactating women to experience difficulty in breastfeeding, reporting pain and with the possibility of presenting fissures, thus opting for early weaning and complementary or supplemental breastfeeding[1].

One of the most prevalent factors for the interruption of EBF are nipple traumas and lesions, characterized by fissures, edema, cracks, abrasions, blisters, erythema, ecchymosis, etc. These traumas are associated with the positioning and inadequate latch of the NB to the mother's breast, being caused by the pressure exerted on the nipple and by friction during suction. Nipple lesions reach the layers of the connective tissue, dermis and epidermis, located at the base of the nipple, reaching mainly at its tip[2].

One of the ways to treat nipple traumas is the use of low-level laser therapy (LLLT), which has analgesic, anti-inflammatory and healing action on wounds, not causing damage to the biological system tissues, and having therapeutic effect during the patient's rehabilitation[3].

LLLT has a non-ionizing action on the tissues, which means that it cannot affect the electron mobility of the molecules that are being stimulated in a given location, only activating the electrons due to their low power. The wavelengths used in the application of LLLT are red and infrared; the lower the light energy, the greater the absorption[3].

It is believed that the use of LLLT for nipple trauma healing, by health professionals, contributes to the maintenance of EBF, reducing the number of neonatal deaths resulting from lack of the nutrients and protective factors provided by breast milk. Thus, the objective of the study is to identify in the scientific literature the application of LLLT in the treatment of nipple traumas in puerperal women.

METHOD

This is an integrative literature review, carried out in six stages: elaboration of the guiding question, literature search, data collection, critical analysis of the studies included, discussion of the results, and presentation of the integrative review[4].

The study aims at answering the following research question: "What does the scientific literature reveal about the application of laser therapy in the treatment of nipple traumas in puerperal women?". In the construction of the appropriate research question, the PICO strategy was used:[5] "P" (Population) puerperal women diagnosed with nipple traumas; "I" (Intervention) laser therapy; "C" (Comparison) does not apply, as this is not

a comparative study; and "O" (Outcome) nipple trauma treatment.

Data collection took place between September and November 2020. The databases searched were the following: SciVerse Scopus (Scopus), PubMed Central: PMC, EMBASE (Elsevier), Web of Science and Cumulative Index to Nursing and Allied Health Literature (CINAHL).

Inclusion criteria were established for selection of the studies, namely: original research articles, in which the theme answered the guiding question, open access, the year limit was not defined for being a scarce topic in the scientific literature. The following exclusion criteria were adopted: studies such as case reports, reflections, recommendations, reviews and gray literature (course conclusion papers, theses, dissertations and abstracts published in annals).

The following were used as descriptors, identified in the Health Science Descriptors (*Descritores em Ciência da Saúde*, DECs) and their equivalents in the Medical Subject Headings (MESH) and Embase Subject Headings (Emtree): "*low-level light therapy*" and "*laser therapy*", in addition to the keyword: "*nipple trauma*". The search strategy was conducted by crossing these descriptors using the Boolean operators AND and OR: ("*low-level light therapy*" *OR* "*laser therapy*") *AND* ("*nipple trauma*").

In order to systematize sample collection, the advanced search form was used, according to each peculiarity of each database. The search strategy in the databases followed the protocol presented in Chart 1.

As it refers to a study with data from secondary sources, it was not submitted to the Research Ethics Committee. However, the recommendations set forth in Resolution No. 510/2016 were followed.

Chart 1 – Search strategy in the databases. Santa Cruz, Rio Grande do Norte, Brazil, 2020.

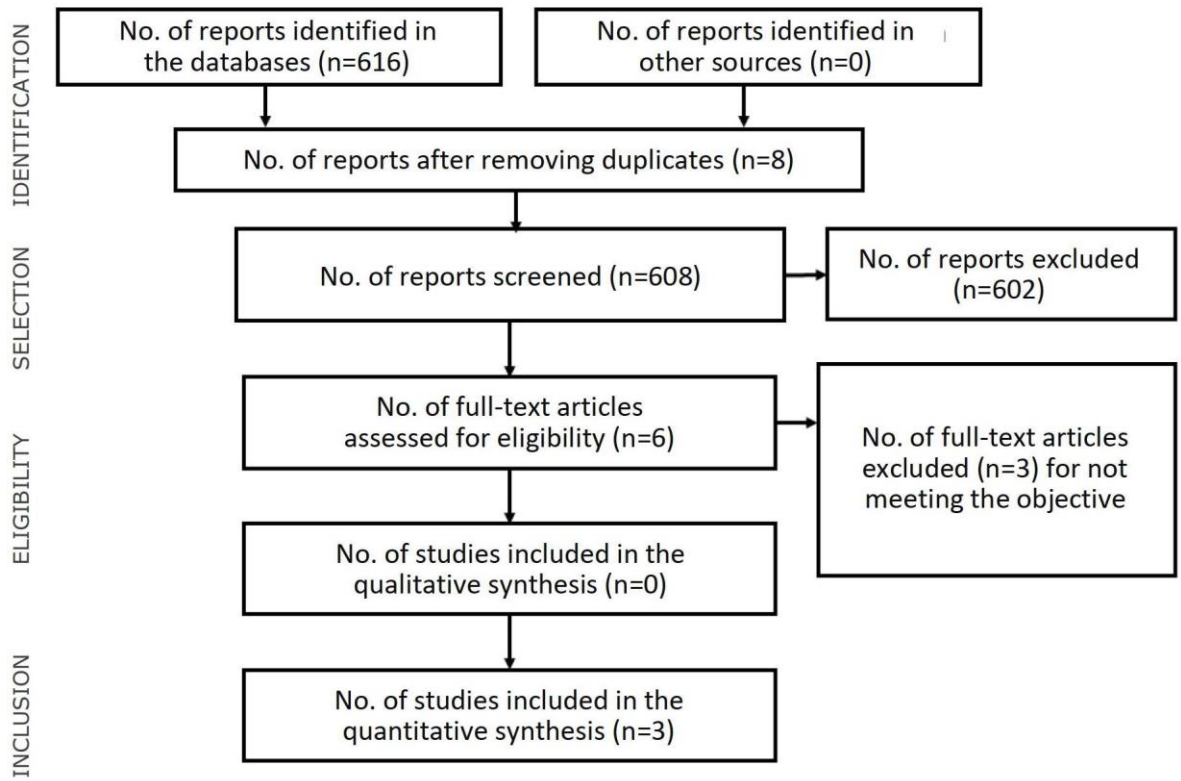
Database	Search strategy	Results	Publication period
PubMed Central	"*Nipple trauma*"[*All Fields*] *AND* ("*Low-Level Light Therapy*"[*All Fields*] *OR* "*laser therapy*"[*All Fields*])	5	2004-2018
CINAHL	"*Nipple trauma*" *AND* ("*Low-Level Light Therapy*" *OR* "*laser therapy*")	593	1985-2020
SCOPUS	"*Nipple trauma*" *AND* ("*Low-Level Light Therapy*" *OR* "*laser therapy*")	14	2012-2020
EMBASE	'*nipple trauma*' *AND* ('*low-level light therapy*'/*exp OR* '*low-level light therapy*' *OR* '*laser therapy*'/*exp OR* '*laser therapy*')	1	2012
WEB OF SCIENCE	*TS=*(*Nipple trauma*) *AND TS=*(*Low-Level Light Therapy OR laser therapy*)	3	2016-2020
TOTAL		**616**	**1985-2020**

Source: Elaborated by the author, 2020.

In order to ensure that the texts contemplated the review research question, the titles and abstracts were read exhaustively and independently by two authors, identifying

whether they met the established criteria. In cases of doubts about selecting the studies or not, it was decided to include them, deciding on their selection after reading them in full. There was no disagreement between the selected studies. Of the 6 articles selected for full reading, 3 made up the final sample. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[6] recommendation was followed, as shown in Figure 1.

Figure 1 - Flowchart corresponding to the selection of studies based on the PRISMA recommendation.



Source: Adaptation from Moher D, Liberati A, Tetzlaff, Altman DG TPG, 2020.

Classification of the articles' quality was by assigning the level of evidence. The following classification was obtained: Level I - Systematic Review or Meta-analysis of Controlled and Randomized Clinical Trials, Level II - Controlled and Randomized Clinical Trial with Narrow Confidence Interval, Level III - Therapeutic Outcomes and Non-Randomized Clinical Trials, Level IV - Case-Control Studies and Cohort Studies, Level V - Systematic Review of Qualitative, Descriptive and Philosophical Studies, Level VI - Individual Study of a Descriptive and Qualitative Nature, and Level VII - Opinions of Experts Committees and Authorities[7].

RESULTS

The 3 articles selected for analysis are retained in the period from 2014 to 2020. Regarding the sample, two studies included puerperal women with nipple lesions as their population while, in the other, the sample consisted of physiotherapy professionals from a maternity hospital.

Regarding the research design of the articles examined, it was verified that the three articles used a quantitative and descriptive approach, one with a cross-sectional design and two being clinical trials. Regarding the level of evidence, two studies are Level III and one article is Level V, as shown in Chart 2.

Chart 2 - Articles according to authorship/year, objective, type of study/level of evidence, main results and application mode. Santa Cruz, Rio Grande do Norte, Brazil, 2020.

AUTHOR/ YEAR	OBJECTIVE	JOURNAL/ COUNTRY	TYPE OF STUDY	LEVEL OF EVIDENCE	MAIN RESULTS	APPLICATION MODE
COCA, K. P. et al., 2016.	To investigate the efficacy of LLLT as treatment for breastfeeding-related nipple pain.	Pain Management Nursing/ Brazil	Triple-blind, randomized clinical trial	III	There was significant relief in nipple pain intensity. No side effects were recorded.	Three laser therapy sessions at three different points in time (0 hour, 24 hours and 48 hours).
BODENSTEIN, K.; JANSE VAN VUUREN, EC.; JOUBERT, G., 2014.	To determine the use of therapeutic laser in the treatment and prevention of sore and/or cracked nipples during breastfeeding.	Journal of Physiotherapy/ South Africa	Cross-sectional study	V	The preventive and therapeutic use of laser in nipple fissures has proven its usefulness to relieve pain caused by lesions in the nipples, alleviating the physiological problems associated with breast-feeding cessation.	It does not report application of LLLT.
CAMARGO, B. T. S. et al., 2020.	To evaluate the effect of a single application of PBM-LLLT (Photobio-modulation - Low-Level Laser Therapy) for lactating mothers with nipple pain and lesion.	Laser em Ciências Médicas/ Brazil	Randomized clinical trial	III	It was observed that a single application of LLLT irradiation does not provide immediate pain relief and that the use of lower energy levels in more than one session promotes better pain relief and greater healing than a single high-energy treatment.	Single, punctual and continuous irradiation directly applied.

Source: Elaborated by the author, 2020.

From data analysis by reading the articles, two thematic axes were obtained, namely: "The use of laser therapy for nipple pain relief" and "The use of laser therapy in the healing of nipple fissures".

DISCUSSION

The use of laser therapy for nipple pain relief

Pain is a sensory reaction triggered by a noxious stimulus in response to tissue damage. Nipple pain is one of the most common complaints of women in the first postpartum weeks[8]. According to a study carried out with 60 puerperal women to assess the intensity of nipple pain during breastfeeding, 23 reported pain, 11 of which with nipple lesions, showing that nipple pain is related to nipple trauma[9].

One of the factors linked to early weaning is nipple pain caused by damage in the nipple-areolar region[9]. This discomfort contributes to the cessation of EBF up to six months of age recommended by the health organizations[10].

Photobiomodulation with LLLT is valid for the treatment and relief of nipple pain, as it causes anti-inflammatory action, generating analgesia, accelerating healing and reducing pain[12].

In the first research study by Coca[11], with a randomized and triple-blind clinical approach, in which the *Laser Hand WL* device from *MMOptics*® was used with the intervention group, application was at the time the women were admitted to the research, being repeated 24 and 48 hours later, stating that there were no adverse reactions during the application of the laser therapy[11].

On the other hand, a later study carried out by Camargo[12], a randomized clinical trial conducted with the *Recover* laser equipment from *MMOptics*®, identified adverse effects such as tingling and prickling sensation during breastfeeding and immediately after laser application. In an isolated case, the patient complained about discomfort at the end of the application. Regarding satisfaction with the therapy, it was considered positive in the relief of pain and discomfort[12].

The current study by Camargo[12], when compared to the previous one conducted by Coca[11], asserts that, although it increased the energy, no evidence of efficacy was found, probably because the energy was continuously distributed. The analgesic effect of the red laser had better results when performed consecutively, and not when the energy was totally transferred to the tissue in a single session, even with a higher amount of energy[11,12].

Use of laser therapy in the healing of nipple fissures

The therapy performed by means of LLLT is one of the agents with an important contribution to the treatment of nipple lesions together with proper use of the breastfeeding technique[13], having the following as main causes for trauma occurrence: inadequate latch of the newborn, frequent suction, strong suction or use of milking pumps[14].

The literature points out that, in addition to pain threatening breastfeeding, trauma is associated with increased anxiety in the mothers, with the risk of developing mastitis, thus hindering breastfeeding[15]. The healing

time of nipple trauma varies according to its extension and severity, but it is known that, when installed without treatment during breastfeeding, the lesion will cause more damage to the breast, regressing healing[8].

There are countless therapeutic resources used for tissue repair, and LLLT is one of the innovative resources used to repair nipple traumas, as it provides biocellular and biochemical effects that contribute to the production of cellular energy, increasing cell division, and triggering the production of collagen and of fibroblast cells[16].

This review shows that nipple fissures represent a strong determinant of impact on EBF suspension. A study also highlights LLLT as a non-invasive and low-cost procedure, promising in tissue regeneration[13]. It is important to apply laser therapy as a method to prevent and treat nipple fissures, given the benefits shown by the studies, becoming an ally in maintaining EBF and the bond between mother and baby.

The study was limited to a reduced number of articles found, taking into account insufficient publications related to the theme, making it indispensable to produce studies of the clinical trial type, given that LLLT is a care practice with scientific evidence and proof. Despite the limits, conducting the research was sufficient to describe the purpose of the study objective.

CONCLUSION

Through this review, it was possible to identify that the application of LLLT presented good results both in the relief of nipple pain and in the regeneration of breast tissue in puerperal women, bringing positive contributions to the maintenance of BF.

Regarding the LLLT applications, some adverse effects such as tingling sensation in the nipples after laser application were identified. It was also evidenced that, when performed with low energy and in more than one session, the use of laser therapy is more effective, when compared to a single irradiation with high energy.

This study is relevant for the Nursing area as this is the field of activity of this profession, as well as for other professionals who work with LLLT in the treatment of nipple traumas, favoring scientific knowledge on this theme. It is also worth considering the need for new studies on the topic, such as of the randomized clinical trial type, with the objective of improving and scientifically contributing with knowledge for the professionals' practice and the academic community.

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