

Use of Therapeutic LED after Vaporization of Wart Lesions with CO₂ Laser: Case Report

<https://doi.org/10.32635/2176-9745.RBC.2024v70n1.4593>

Uso do LED Terapêutico após Vaporização de Lesões Verrucosas com Laser de CO₂: Relato de caso

Uso de Led Terapêutico después de la Vaporización de Lesiones de Verrugas con Láser de CO₂: Informe de caso

Isabela Oliveira Gomes¹; Maria Gabriela Baumgarten Kuster Uyeda²; Osmar Ferreira Rangel Neto³;
Samantha Karlla Lopes de Almeida Rizzi⁴

ABSTRACT

Introduction: The human papillomavirus (HPV) is a sexually transmitted virus, which can lead to the development of lesions on the skin and mucous membranes. A persistent infection can lead to the occurrence of precursor lesions or cancer in different regions, including vulvar lesions. **Case report:** Descriptive case report of a physiotherapeutic intervention with therapeutic light emitting diode (LED) in a patient with HPV-induced vulvar lesions who underwent an extensive vaporization procedure. After vaporization, she underwent physiotherapeutic treatment with therapeutic LED to accelerate the healing process, tissue regeneration and minimize pain. A LED blanket was used with 18 red LED diodes – 660 nm and 13 infrared LED diodes 850 nm, being the energy delivered by LED of 1 J every 3 minutes, with 10-minute duration. Two applications were performed during hospitalization, one on the first and the other on the second day after surgery. After hospital discharge, two applications, one per week. After the first two applications of LED in the hospital environment, it was possible to observe, in a subjective way, an improvement in local vascularization. There was also an improvement of local pain, urination after applications and reduction of edema reported by the patient. After two once-a-week outpatient applications, satisfactory healing occurred. **Conclusion:** LED appears to be a promising resource in the healing of lesions in the vulva caused after laser vaporization, however, further controlled clinical studies are needed to confirm this hypothesis.

Key words: Vulvar Neoplasms/therapy; Papillomavirus, Human; Laser Therapy/methods; Low Intensity Light Therapy/methods.

RESUMO

Introdução: O papilomavírus humano (HPV) é um vírus sexualmente transmissível que pode levar ao desenvolvimento de lesões na pele e mucosas. Uma infecção persistente pode cursar com lesões precursoras ou câncer em diferentes regiões, entre elas, lesões vulvares. **Relato do caso:** Caso descritivo de intervenção fisioterapêutica com *light emitting diode* (LED) terapêutico em paciente com lesões vulvares induzidas por HPV, que realizou um extenso procedimento de vaporização nas lesões. Após vaporização, realizou tratamento fisioterapêutico com LED terapêutico visando acelerar o processo cicatricial, regeneração tecidual e minimizar a dor. Foi utilizada manta de LED com 18 diodos de LED vermelho – 660 nm e 13 diodos de LED infravermelho 850 nm, sendo a energia entregue por LED de 1 J a cada três minutos, permanecendo por dez minutos. Foram realizadas duas aplicações durante a internação hospitalar, uma no primeiro e outra no segundo dia após a cirurgia. Após alta hospitalar, mais duas aplicações, uma por semana. Após duas primeiras aplicações de LED realizadas no ambiente hospitalar, foi possível observar, de maneira subjetiva, uma melhora da vascularização local. Houve também uma melhora relatada pela paciente, em relação à dor local, facilidade para urinar após as aplicações e redução do edema. Após duas aplicações ambulatoriais, uma vez por semana, ocorreu cicatrização satisfatória. **Conclusão:** O LED parece ser um recurso promissor na cicatrização de lesões na vulva ocasionadas após vaporização com *laser*, porém estudos clínicos controlados são necessários para confirmação dessa hipótese.

Palavras-chave: Neoplasias Vulvares/terapia; Papillomavirus Humano; Terapia a Laser/ métodos; Terapia com Luz de Baixa Intensidade/métodos.

RESUMEN

Introducción: El virus del papiloma humano (VPH) es un virus de transmisión sexual, que puede provocar el desarrollo de lesiones en la piel y mucosas. Una infección persistente puede provocar lesiones precursoras o cáncer en diferentes regiones, incluidas las lesiones en la vulva. **Informe del caso:** Caso descriptivo de intervención fisioterapêutica con *light emitting diode* (LED) terapêutico en paciente con lesiones en la vulva inducidas por VPH, a quien se le realizó un extenso procedimiento de vaporización de lesiones en la vulva. Luego de la vaporización, la paciente se sometió a un tratamiento de fisioterapia con LED terapêutico, con el objetivo de acelerar el proceso de curación, regeneración de tejidos y minimizar el dolor. Se utilizó una manta LED, con 18 diodos LED rojos - 660 nm y 13 diodos LED infrarrojos 850 nm; la energía se entrega mediante LED a 1 J cada tres minutos, permaneciendo durante diez minutos. Se realizaron dos aplicaciones durante la estancia hospitalaria, una el primer día y otra el segundo día postoperatorio. Tras el alta hospitalaria, dos aplicaciones más, una por semana. Luego de las dos primeras aplicaciones de LED, realizadas en el hospital, fue posible observar, subjetivamente, una mejora en la vascularización local. También hubo una mejoría reportada por el paciente, en relación con el dolor local, facilidad para orinar y reducción del edema. Después de dos aplicaciones ambulatorias, una vez por semana, se produjo una cicatrización satisfactoria. **Conclusión:** El LED parece ser un recurso prometedor en la cicatrización de lesiones en la vulva ocasionadas por vaporización con láser, sin embargo, son necesarios estudios clínicos controlados para confirmar esta hipótesis.

Palabras clave: Neoplasias de la Vulva/terapia; Papillomavirus Humano; Terapia con Láser/métodos; Terapia de luz de baja intensidad/métodos.

¹⁻⁴Universidade Federal de São Paulo (Unifesp). São Paulo (SP), Brasil.

¹E-mail: isabela.gomes@unifesp.br. Orcid iD: <https://orcid.org/0000-0001-6182-0764>

²E-mail: mgbkuster@unifesp.br. Orcid iD: <https://orcid.org/0000-0003-4189-3645>

³E-mail: osmar.neto@unifesp.br. Orcid iD: <https://orcid.org/0000-0003-1008-9718>

⁴E-mail: samantha.rizzi@unifesp.br. Orcid iD: <https://orcid.org/0000-0002-5969-9499>

Corresponding Author: : Samantha Karlla Lopes de Almeida Rizzi. Rua Napoleão de Barros, 875 – Vila Clementino. São Paulo (SP), Brasil. CEP 04024-002. E-mail: samantha.rizzi@unifesp.br



INTRODUCTION

The human papillomavirus (HPV) is a sexually transmitted virus, which can cause the development of lesions on the skin and mucous membranes¹. A persistent infection can lead to the occurrence of precursor lesions and/or cancer in different regions, including the cervix, vagina and vulva². HPV oncogenic strains, mainly HPV 16 and 18, are responsible for most cases of cervical cancer³.

About 80% of women who develop intraepithelial vulvar lesions are positive for HPV infection⁴. Among the risk factors associated to the development of vulvar lesions by HPV are sexual relations, including early sexual initiation, multiple partners, and unprotected sexual relations, as well as smoking, compromised immune system and history of lichen sclerosis^{1,5,6}.

The diagnosis occurs after anamnesis and general and gynecological physical examination. It may be necessary to perform a vulvoscopy to guide the biopsy which will assert the diagnosis via histopathological study⁷. In some cases, lesions can spontaneously regress without the need of specific treatment¹, however, in persistent or severe cases, procedures such as surgical excision of lesions, cryotherapy (freezing of lesions), chemical cauterization or topic immunotherapy, high intensity laser ablative therapy or photodynamic therapy^{7,8} may be recommended.

Photobiomodulation obtained through low intensity laser or light emitting diode (LED) application is a therapy in which red and infrared light is emitted. Studies have demonstrated that photobiomodulation may have beneficial effects on healing through the effect of light on cellular processes, such as cell proliferation, collagen synthesis and reduction of local inflammation⁹.

Surgeries in the vulva may cause postoperative complications, such as dehiscence and infection¹⁰, which could be avoided or minimized using photobiomodulation, whose healing process acceleration effects may promote a faster regeneration of the affected tissues¹¹. There is no evidence in the literature on the effectiveness of using photobiomodulation in the healing of vulvar lesions induced by HPV, whether through surgical treatment or laser vaporization.

CASE REPORT

Case report of a physiotherapeutic intervention with therapeutic LED in a patient that underwent vaporization of vulvar lesions. The data was obtained by verification of photographic and electronic medical records.

This study has been submitted to *Plataforma Brasil* and to the Research Ethics Committee of the

Universidade Federal de São Paulo, approval report number 1.051.996 (CAAE (submission for ethical review): 44335415.2.0000.5505), in compliance with Resolution number 466/2012 of the National Health Council. The patient was informed about the study, having agreed, and signed the Informed Consent Form (ICF) and the Image Concession Term.

Female patient, 39-years-old, kidney transplant recipient since 2008, followed-up in the Lower Genital Tract Pathology clinic linked to the *Universidade Federal de São Paulo*, where she was diagnosed in February 2019 with a carcinoma *in situ* with a papillomatous lesion on the vulva, with compromised margins, after incisional biopsy and vaginal biopsy with vaginal intraepithelial neoplasm 1 (VAIN1). In December 2019, the medical team performed a focal vaporization with ablative CO₂ laser in the external face of the right labia minora and in the inferior third of the right labia majora.

After diagnosis and initial treatment, she was directed to the institution's Gynecological Oncology clinic, however, due to the COVID-19 pandemic, the follow-up was interrupted. The patient resumed follow-up in February 2022, revealing extensive vulvar condyloma, involving the labia majora and minora and the perineal region (Figure 1a), with new biopsies performed. The medical team concluded that the case required a vulvectomy; however, due to the patient's kidney transplant history, the surgical resection of the extended lesioned area would be impracticable, with a possibility of graft rejection.

Thus, it was decided to perform a CO₂ laser vaporization in a surgical center (Figure 1b), which occurred on August 1st, 2022.

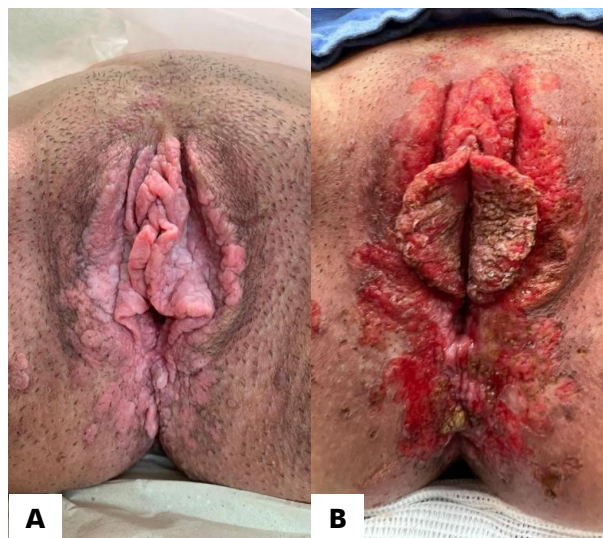


Figure 1. a) before the procedure; b) immediately after the vaporization procedure

After the procedure, the patient underwent physiotherapeutic treatment with therapeutic LED to accelerate the healing process, tissue regeneration and minimize pain.

The Cosmedical brand LED blanket was used, measuring 12 cm high x 10.5 cm wide x 5 mm thick with 18 red LED diodes of 660 nm and 13 infrared LED diodes of 850 nm; average power in each LED of 5 mW (total power of 360 mW), with energy delivered per LED of 1 J every three minutes (Figure 2a). The applications consisted of placing the properly cleaned and plastic-protected LED plate directly in touch with the vulvar region for ten minutes (Figure 2b).



Figure 2. a) LED plate for the vulvar region; b) LED application

The intervention consisted of four LED applications in the patient's vulvar region, two during hospitalization and two in the outpatient clinic. The first two applications occurred on August 2nd and 3rd, 2022, in the gynecology ward, with improvement in the vascularization of the wounded region according to subjective assessment (Figures 3a, b) and pain relief and easier urination according to the patient. Soon after, the patient was discharged from the hospital and referred for an outpatient follow-up with physiotherapy within a week, starting to undergo weekly LED applications. The two photobiomodulation outpatient applications occurred weekly, from August 9 to 16, 2022, with significant lesion improvement being observed. The patient was asked to return within 15 days (Figures 3c, d).

Upon return on August 30, 2022, a white punctate lesion in the labia minora region was observed, suggesting lesion recurrence, reason for which the LED application was not performed. The patient was advised to seek a new medical appointment for better evaluation of the lesion and determine the safety of continuing with the treatment.

During follow-up assessment on September 15, 2022, the medical team confirmed the lesion recurrence and scheduled a new laser vaporization in the outpatient clinic.

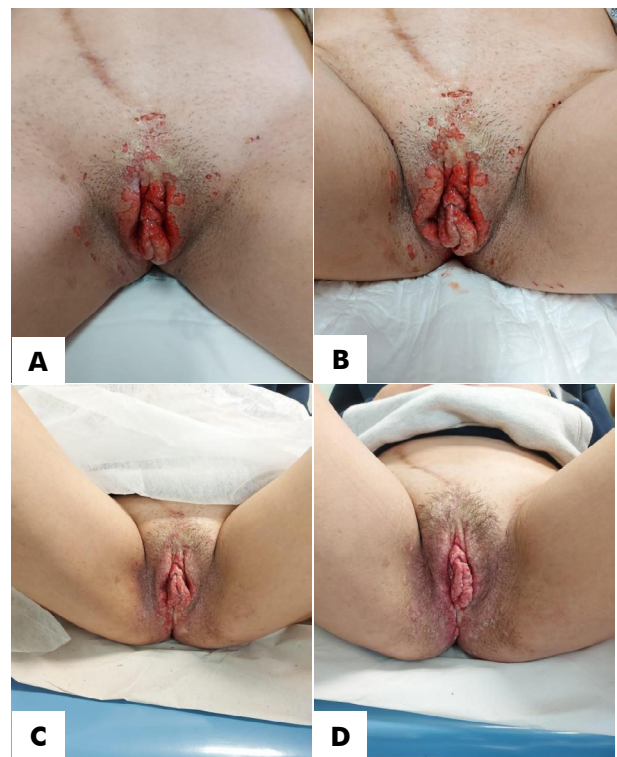


Figure 3. a) vulva after the first LED application, on the 1st day after vaporization; b) vulva after the second LED application, on the 2nd day after vaporization; c) vulva after the third LED application; d) vulva after the fourth LED application

DISCUSSION

The photobiomodulation effect on the healing process and pain control is widely described in the literature⁹, but with no specific evidence regarding its action on vulvar lesions. In this case report, after the first two LED applications performed in the hospital environment it was possible to subjectively observe improvements in the local vascularization, pain reporting and edema, which translated into easiness to urinate, according to the patient's report on the second application. After being discharged from the hospital, it was observed, in the short period of two weeks, with a weekly LED application, that the patient achieved satisfactory healing of the wounds caused by the laser vaporization.

Low intensity light therapy is believed to stimulate healing processes and tissue regeneration through photochemical and photo-induced effects on the cell, by modulating the expression of growth factors, promoting angiogenesis, reducing inflammation, and increasing cellular proliferation¹¹. These effects can contribute to healing and regenerating tissues affected by HPV-induced vulvar lesions after treatment¹¹. The local vascularization was visible after the LED plate application in the two appointments during hospitalization.

The vaporization, used to treat the patient's HPV-induced lesions in this case report, caused an extensive scarring vulvar injury. Due to the severity of the impacts on the life of women affected by vulvar lesions, it is necessary to verify an effective healing treatment capable of minimizing sequelae caused by the lesion treatment and accelerate the recovery process. The LED plate is an easy-to-apply, low-cost device that causes no discomfort as reported by the patient during applications, being a promising resource to accelerate healing processes after vulvar procedures.

Regarding the condyloma recurrence presented by the patient, there are no studies that support its connection with photobiomodulation; however, immunosuppression, a characteristic of transplant recipients such as this patient, is a significant risk factor for recurrences of HPV-induced lesions¹³.

This study is limited to a case report. Randomized controlled studies are necessary to provide robust evidence on the effectiveness and safety of this therapeutic approach following vaporization of HPV-induced vulvar lesions. Moreover, it is important to consider that photobiomodulation may present variations regarding the parameters used, such as wavelength, energy dose, treatment protocols and exposure time, which can influence the results. This case report, however, can guide further scientific studies on the subject.

CONCLUSION

The increase in local vascularization, pain, and edema relief with greater easiness to urinate were the effects observed after post-operative LED application following recent vaporization of HPV-induced lesions, with satisfactory healing after a short period. However, as this is a case report and not a controlled clinical trial, it is not possible to determine that these effects were a consequence of the intervention and not of the natural course of the healing process. The objective of the present report is to contribute to the scientific community by signaling the need for further studies on the matter, seeing that LED seems to be a promising resource for healing vulvar lesions resulting from laser vaporization.

CONTRIBUTIONS

All the authors have substantially contributed to the study design, acquisition, analysis and interpretation of the data, wording, and critical review. They approved the final version for publication.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

FUNDING SOURCES

None.

REFERENCES

- Oliveira, AKSG, Jacyntho CMA, Tso FK, et al. "HPV infection - screening, diagnosis and management of HPV-induced lesions." *Rev Bras Ginecol Obstet.* 2021;43(3):240-6. doi: <https://doi.org/10.1055/s-0041-1727285>
- Kamolratanakul S, Pitisuttithum P. "Human papillomavirus vaccine efficacy and effectiveness against cancer." *Vaccines.* 2021;9(12):1413, doi: <https://doi.org/10.3390/vaccines9121413>
- Shapiro G. "HPV vaccination: an underused strategy for the prevention of cancer." *Curr Oncol.* 2022;29(5):3780-92. doi: <https://doi.org/10.3390/currncol29050303>
- Hoang LN, Parque KJ, Soslow RA, et al. "Squamous precursor lesions of the vulva: current classification and diagnostic challenges." *Pathology.* 2016;48(4):291-302. doi: <https://doi.org/10.1016/j.pathol.2016.02.015>
- Thuijs NB, Beurden MV, Bruggink AH, et al. "Vulvar intraepithelial neoplasia: incidence and long-term risk of vulvar squamous cell carcinoma." *Inter J Cancer.* 2021;148(1):90-98. doi: <https://doi.org/10.1002/ijc.33198>
- Preti Mario, et al. Vulvar intraepithelial neoplasia. *Best pract res Clin obstet gynaecol.* 2014;28(7):1051-62. doi: <https://doi.org/10.1016/j.bpobgyn.2014.07.010>
- Federação Brasileira das Associações de Ginecologia e Obstetrícia. Lesões pré-invasivas da vulva, da vagina e do colo uterino. *Protocolos Febrasgo.* São Paulo: FEBRASGO; 2021. (Ginecologia, n. 7).
- LeBreton M, Caixa I, Brousse S, et al. Vulvar intraepithelial neoplasia: classification, epidemiology, diagnosis, and management. *J Gynecol Obstet Hum Reprod (Online).* 2020;49(9):101801. doi: <https://doi.org/10.1016/j.jogoh.2020.101801>
- Kohli N, Jarnagin B, Stoehr AR, et al. An observational cohort study of pelvic floor photobiomodulation for treatment of chronic pelvic pain. *J comp eff res (Online).* 2021;10(17):1291-9. doi: <https://doi.org/10.2217/cer-2021-0187>
- Rahm C, Adok C, Dahm-Kähler P, et al. Complications and risk factors in vulvar cancer surgery – a population-based study. *Eur j surg oncol.* 2022;48(6):1400-6. doi: <https://doi.org/10.1016/j.ejso.2022.02.006>
- René-Jean B, Epstein JB, Nair RG, et al. Safety and efficacy of photobiomodulation therapy in oncology: a

- systematic review. *Cancer Med.* 2020;9(22):8279-300. doi: <https://doi.org/10.1002/cam4.3582>
12. Conselho Nacional de Saúde (BR). Resolução nº 466, de 12 de dezembro de 2012. Aprova as diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos. *Diário Oficial da União, Brasília, DF.* 2013 jun 13; Seção I:59.
 13. Satmary W, Holschneider CH, Morena LL, et al. Vulvar intraepithelial neoplasia: risk factors for recurrence. *Gynecol Oncol.* 2018;148(1):126-31. doi: <https://doi.org/10.1016/j.ygyno.2017.10.029>.

Recebido em 27/2/2024
Aprovado em 27/3/2024