Lasers in Medical Science
https://doi.org/10.1007/s10103-021-03424-9

BRIEF REPORT

CO_2 laser in the management of eccrine hidrocystomas: a retrospective study

G. Fazia[1] · G. Cannarozzo[2] · Luigi Bennardo[1] · S. P. Nisticò[1]

Received: 2 August 2021 / Accepted: 22 September 2021
© The Author(s), under exclusive licence to Springer-Verlag London Ltd., part of Springer Nature 2021

Introduction

Eccrine hidrocystomas (EH) are benign cystic proliferations of eccrine glands. They were first described by Robinson in 1893 [1]. They occur in the facial region, especially around the eyes, and are typically asymptomatic. Clinically, EH may appear as solitary (Smith type) or multiple facial lesions (Robinson type), such as translucent smooth cystic nodules ranging from 1 to 6 mm in diameter. EH color varies from skin colored to blue. Their clinical presentation is similar to other cystic lesions like sebaceous cysts, milia, mucoid cysts, and apocrine hidrocystomas.

For this reason, a histological diagnosis is often required [2]. Biopsy reveals a single cyst in the dermis with walls composed of two layers of cuboidal cells. The cyst does not communicate with the epidermis (Figs. 1 and 2).

Despite apocrine hidrocystomas, EH histochemically stain positive for S100 protein [3]. The cause of multiple EH has not been clarified. However, they probably result from pore closure, leading to secondary dilatation of cystic excretory eccrine glands with sweat retention as reported. EH are more frequent in middle-aged women exposed to heat; hot temperature or humid weather causes an increase in their size and number [4]. Therapeutic management of hidrocystomas may present difficulties due to the localization, the number of lesions, and the risk of scars. Therefore, many treatments have been suggested, such as surgical excision, electrocauterization, oral and topical anticholinergics, Botox treatments, cryotherapy, and lasers [5]. Currently, the most frequent treatment is the surgical excision that is effective but limited by the risk of scarring and ectropion formation, even if the use of lasers may prevent them.

Multiple lasers have been used, such as argon laser, erbium yttrium aluminum garnet laser, erbium yttrium scandium garnet laser, and carbon dioxide laser [6].

Based on the above, the study aims to treat EH with a carbon dioxide (CO_2) laser and evaluate the reduction of the risk of side effects and simplify post-treatment management.

Materials and methods

All patients were 18 years or older with previously untreated EH of the periocular region seeking their removal at the Magna Graecia University of Catanzaro. Patients were recruited from February 1, 2017, to April 1, 2020, and were recruited in this study. The study was approved by Calabria Region local ethical committee. All patients underwent treatment after a detailed personal history, clinical anamnesis (skin type, clinical manifestations, health conditions, previous medications, and lifestyle). Informed consent on the risks related to the procedure was obtained. Exclusion criteria included pregnancy or lactation, porphyria, immunosuppressive treatments, Fitzpatrick skin type IV–VI, history of keloid formation, and conditions associated with risk of poor compliance. Local anesthesia with mepivacaine 10 mg/ml (Carbocaine) was injected before treatment. The treatment protocol was performed by a single operator (G.C.) and consisted of a session of CO_2 laser (Glide, DEKA M.E.L.A, Calenzano, Italy), with a Power of 0.5–2 W and a frequency of 10 Hz (Smart Pulse mode) in order to vaporize the lesions. The power was then lowered down to 0.3 W to refine the more sensitive areas in the same surgical session.

Before treatment, clinical photographic documentation was carried out and repeated 6 months after the procedure. Pictures were taken using the same camera and parameters, the same shooting settings, a twin flash, and the same ambient light.

No EH evaluation scale removal exists in the medical literature. However, two independent dermatologists (G.F.

✉ Luigi Bennardo
luigibennardo10@gmail.com

[1] Department of Health Sciences, University of Magna Graecia, Viale Magna Graecia SNC, 87100 Catanzaro, Italy

[2] Laser Unit, University of Rome Tor Vergata, Rome, Italy

Published online: 27 September 2021



Fig. 1 Patient 16 before treatment (left) and 6 months after laser surgery (right)



Fig. 2 Patient 16 right periocular region before treatment (left), right after the procedure (central), and 6 months after laser surgery (right)

and G.C.) evaluated the pictures before and after treatment, providing a score on a 5-point scale (from 0 no improvement/worsening of the condition to 4 complete removal).

A visual analog scale (VAS) from 1 to 10 was administered to the patients at the 6-month follow-up to measure patient satisfaction.

Data analysis (mean, standard deviations, and rate calculations) was performed using Statistica 14.0 (TIBCO Software, Palo Alto, California).

Results

Twenty-six patients were enrolled in this study and treated with CO_2 laser. The mean age was 56.23 ± 11.07. At a 6-month follow-up, 35% reported the maximum degree of satisfaction (VAS score 10), while 54% reported an excellent score (VAS 8–9). Only 11% reported a good response (VAS 6–7). The mean VAS score was 9.04 ± 0.96. Dermatologist evaluation reported the maximum score in two-thirds of the patients; only one-third did not receive full marks. The mean dermatologist evaluation mark was 3.62 ± 0.57. No severe side effects were reported. Four patients reported inflammation in the surgery site, which was easily managed with antibiotic and corticosteroid creams, while two patients reported slight changes in the pigmentation of the treated area. Patients' characteristics and results are reported in Table 1.

Discussion

Eccrine hidrocystomas are benign tumors of the eyelid margin. Many treatments have been suggested, but the management may be complex because of the location and the risk of scarring [5]. In our study, we used a CO_2 laser to treat these lesions. CO_2 laser has already been proposed in the management of various periorbital lesions [7]. Several authors have shown that CO_2 represents an effective therapeutic option. A Spanish group reached successful EH treatment in three patients with CO_2 laser vaporization (maximal

Table 1 Patients' characteristics

Patient number	Sex	Age	Location	Dermatologists evaluation	VAS score	Side effects
1	F	63	Right	4	9	None
2	M	57	Left	3	8	None
3	M	37	Left	4	10	None
4	F	45	Left	3	9	Inflammation
5	F	72	Right	4	10	None
6	F	67	Right	4	9	None
7	M	71	Left	2	7	Hyperpigmentation
8	F	48	Left	3	9	None
9	F	43	Right	4	9	None
10	M	43	Left	4	10	Inflammation
11	M	61	Right	4	10	None
12	F	58	Left	4	9	None
13	F	63	Right	3	9	Inflammation
14	F	73	Left	4	10	None
15	M	52	Left	3	8	Inflammation
16	F	55	Bilateral	4	10	None
17	M	63	Right	4	9	None
18	M	42	Right	4	9	None
19	M	37	Left	3	7	None
20	F	58	Left	4	10	None
21	F	54	Right	4	9	None
22	F	67	Right	3	7	Hypopigmentation
23	F	72	Left	3	9	None
24	M	51	Right	4	9	None
25	M	63	Left	4	10	None
26	F	47	Left	4	10	None
Total	15F 11 M	56.23 ± 11.07	14L 11R 1B	3.62 ± 0.57	9.04 ± 0.96	

power density of 20 J/cm^2, using a continuous and defocused mode, with a power density of 5 J/cm^2) [8].

Otherwise, isotretinoin followed by ultrapulse CO_2 laser at 800 W, 20-Hz frequency, and 0.3-ms pulse duration was used to improve EH in a 57-year-old woman significantly [9].

Another study used isotretinoin, followed by erbium yttrium aluminum garnet (Fotona XP.

Dynamis, German, 250 µm, 19 J per pulse, 100-µs pulse length, 2-mm spot size, repetition rate 3 Hz) to treat multiple eccrine hidrocystomas in a 55-year-old man. After laser application, treatment started with oral isotretinoin 20 mg daily. This treatment showed more significant improvement regarding both size and color of the lesions [10].

Choi and colleagues showed a lack of effect of a 585-nm pulsed dye laser (PDL) in treating multiple eccrine hidrocystomas (MEH) in two patients. They compared the treated and untreated sides to evaluate the efficacy of the PDL. They showed that PDL might not be helpful for the treatment of MEH [11].

There is still no gold standard treatment option for EH, but CO_2 laser represents the most promising modality in dermatological surgery for soft tissue vaporization. It emits photons at a wavelength of 10,600 nm in the invisible infrared spectrum. Both intracellular and extracellular water represents the laser's chromophore [12, 13].

The CO_2 laser is an operator-sensitive technique: during treatment, "color indicators" show the skin layer reached step by step known as clinical "endpoint."

The epidermal layer appears opalescent with spherical microbubbles, and vaporization of the papillary derma reveals a "chamois skin" tissue, while reticular dermis vaporization may present as a waterlogged cotton thread [14, 15].

Coagulation, vaporization, or excision of the biological tissue are induced by the laser thermal energy.

Thermal relaxation time (TRT) represents the time required for the irradiated "target" tissue to lose 50% of the incident heat without conduction to the surrounding

tissues. This selective photothermolysis reduces thermal damage and scarring [16].

The advantages of using CO_2 lasers include minimal pain, with no edema or ecchymosis, reduced healing times, low incidence of unaesthetic scar, and an infrequent need for anesthesia. Thanks to the CO_2 laser, access to different anatomically tricky areas such as eyes, ears, fingers, or genitals may be possible. Moreover, patients with pacemakers can also be treated [17–19].

This treatment is very precise on the target tissue, protecting nearby areas [15].

Limitations of this study include a limited number of patients, justified by the fact that EH are not very common, and the absence of a histopathologic examination confirms the clinical diagnosis (various other similar lesions, such as apocrine hidrocystomas, mucoid cysts, and sebaceous cysts may be clinically indistinguishable) [20]. The 6-month follow-up period may also be considered a limitation of the study, as different authors report that some hidrocystomas tend to relapse after extended observation periods [9].

Conclusions

This is, to our knowledge, the first study evaluating the use of CO_2 laser to manage EH. A CO_2 laser is an effective and safe therapy to manage EH, with a very low risk of side effects. In our cohort of patients, almost 90% were very satisfied with the optimal cosmetic outcome, with more than a third reporting the maximum degree of satisfaction and only six (23% of patients) reported a minor side effect, such as post-treatment inflammation (in 15% of patients) and small changes in pigmentation of the treated area (in 8% of patients). However, a clinical trial comparing the use of CO_2 laser with surgery and other treatment modalities would be necessary to confirm this study's findings.

Data availability Available after request due to privacy from the corresponding author.

Declarations

Ethics approval The study was approved by the local ethical committee.

Consent to participate/publication All patients gave their informed consent to participate in the study.

Competing interests The authors declare no competing interests.

References

1. Robinson AR (1893) Hidrocystoma. J Cut Gen Urin Dis 11(1):292–303
2. Maeng M, Petrakos P, Zhou M, Levine B, Lelli G, Setabutr P (2017) Bi-institutional retrospective study on the demographics and basic clinical presentation of hidrocystomas. Orbit 36(6):433–435
3. Alfadley A, Al Aboud K, Tulba A, Mourad MM (2001) Multiple eccrine hidrocystomas of the face. Int J Dermatol 40(2):125–129
4. Sperling JD, Sakas EL (1982) Eccrine hidrocystomas. J Am Acad Dermatol 7:763–770
5. Trischman T, Scott JF (2020) Comparative efficacy of hidrocystoma treatments: a systematic review. J Cutan Med Surg 24(5):474–480
6. Clever HW, Sahl WJ (1991) Multiple eccrine hidrocystomas: a nonsurgical treatment. Arch Dermatol 127:422–423
7. Mercuri SR, Brianti P, Dattola A et al (2018) SP. CO2 laser and photodynamic therapy: study of efficacy in periocular BCC. Dermatol Ther. 31(4):e12616. https://doi.org/10.1111/dth.12616
8. del Pozo J, García-Silva J, Peña-Penabad C, Fonseca E (2001) Multiple apocrine hidrocystomas: treatment with carbon dioxide laser vaporization. J Dermatolog Treat 12(2):97–100
9. Park HC, Kim EJ, Kim JE, Ro YS, Ko JY (2013) Treatment of multiple eccrine hidrocystomas with isotretinoin followed by carbon dioxide laser. J Dermatol 40(5):414–415
10. Demirkan S (2019) Treatment of multiple eccrine hidrocystoma with oral isotretinoin following erbium-yttrium aluminum garnet laser. J Cosmet Laser Ther 21(1):11–13
11. Choi JE, Ko NY, Son SW (2007) Lack of effect of the pulsed-dye laser in the treatment of multiple eccrine hidrocystomas: a report of two cases. Dermatol Surg 33(12):1513–1515
12. Nistico SP, Silvestri M, Zingoni T, Tamburi F, Bennardo L, Cannarozzo G (2021) Combination of fractional CO2 laser and rhodamine-intense pulsed light in facial rejuvenation: a randomized controlled trial. Photobiomodul Photomed Laser Surg 39(2):113–117. https://doi.org/10.1089/photob.2020.4876
13. Lodi G, Sannino M, Caterino P et al (2021) Fractional CO2 laser-assisted topical rifamycin drug delivery in the treatment of pediatric cutaneous leishmaniasis. Pediatr Dermatol. https://doi.org/10.1111/pde.14608
14 Cannarozzo G, Bennardo L, Negosanti F, Nisticò SP (2020 Fall) CO2 laser treatment in idiopathic scrotal calcinosis: a case series. J Lasers Med Sci 11(4):500–501. https://doi.org/10.34172/jlms.2020.79
15. Campolmi P, Bonan P, Cannarozzo G et al (2012) Highlights of thirty-year experience of CO2 laser use at the Florence (Italy) department of dermatology. ScientificWorldJournal 2012:546528
16. Fitzpatrick RE, Goldman MP (1994) CO_2 laser surgery. In: Goldman MP, Fitzpatrick RE (eds) Cutaneous laser surgery: the art and science of selective photothermolysi. Mosby-Year Book, St. Louis, Miss, USA, pp 198–259
17. Kołodziejczak A, Rotsztejn H (2021) Efficacy of fractional laser, radiofrequency and IPL rejuvenation of periorbital region. Lasers Med Sci. https://doi.org/10.1007/s10103-021-03329-7
18. Nilforoushzadeh MA, Heidari-Kharaji M, Alavi S, Zolghadr S, Mahmoudbeyk M, Nikkhah N (2021) Comparison of carboxy therapy and fractional Q-switched ND:YAG laser on periorbital dark circles treatment: a clinical trial. Lasers Med Sci. https://doi.org/10.1007/s10103-021-03274-5
19. Toyos MM (2017) Continuous wave fractional CO2 laser for the treatment of upper eyelid dermatochalasis and periorbital

rejuvenation. Photomed Laser Surg 35(5):278–281. https://doi.org/10.1089/pho.2016.4225
20. Koumaki D, Papadakis M, Lagoudaki E, Manios GA, Kassotakis D, Doxastaki A, Krasagakis K, Manios A (2021) Apocrine and eccrine hidrocystomas: a clinicopathological study. Acta Dermatovenerol Alp Pannonica Adriat 30(2):53–56

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.