

HOT TOPICS

Vascular based non conventional dye laser treatment for basal cell carcinoma

P. CAMPOLMI, M. TROIANO, P. BONAN, G. CANNAROZZO & T. LOTTI

Department of Dermatological Science, University of Florence, Florence, Italy

ABSTRACT: Basal cell carcinoma is the most common skin tumor in humans which can be removed in a variety of ways (depending on the type of the lesion, the affected area, and depth of the lesion). Laser therapy offers another option to the traditional methods of treatment; thus, the purpose of this work is to valuate the efficacy of dye laser in a selected group of patients affected by superficial basal cell carcinoma. We suggest that the success of pulse dye laser treatment lies in the fact that as all tumors, basal cell carcinomas contain an increased number of dilated blood vessels. Twenty patients (eight males and 12 females) with superficial basal cell carcinoma were given five treatments with a flashlamp-pumped pulse dye laser every 20 days. The clinical follow up was 12–24 months after the fifth treatment. A complete response was obtained in 16 patients out of 20. Three recurrences and one no response was observed during the study. Pulse dye laser is effective and safe in the treatment of superficial basal cell carcinoma

KEYWORDS: basal cell carcinoma, dye laser, non conventional treatment

Introduction

Basal cell carcinoma (BCC) is the most common skin tumor in humans generally characterized by a relatively benign course slowly invasive and rarely metastasizes.

The incidence of BCC increases with the exposure to ultraviolet light because the tumor favors the sun exposed sites of the body such as the head, neck and forearms.

It clinically appears as an opalescent plaque that can be pigmented, cystic, or ulcerative and it is composed of islands of mitotic epithelioid cells in a proliferating connective tissue stroma with lymphocytes, chronic inflammatory components, and many microvessels.

As different types of lesion can be observed, numerous treatment are available, including destructive agents (cryotherapy, electrocautery, CO₂ laser, photodynamic therapy, Roentgener therapy), immunosuppressive, (imiquimod, bleomycin, retinoids) and surgery.

What we propose in our study is to treat especially the superficial type of BCC, using a flashlamp-pumped pulse dye laser; however the lesion must not be pigmented and rich in microvessels.

Moreover, dye laser is a nonconventional therapy for BCC treatment and must be only used in a selected group of patients (Table 1).

It appears to be really useful in cardiopathic patients, who use anticoagulant drugs and cannot undergo an anesthesia or when the tumor is localized in particular areas such as the tip of the nose, the nasal wings or when disfiguring scars must be avoided, on the face for example, or on the décolleté

Address correspondence and reprint requests to: P. Campolmi, MD, Department of Dermatological Sciences, University of Florence, Florence, Italy, or email: olsen001@mc.duke.edu

Table 1. Inclusion, exclusion criteria and treatment modalities

Category	Instance
Inclusion criteria	Tumor features: superficial basal cell carcinoma, not pigmented, rich in microvessels Patients: cardiopathics, allergics to anesthetics, who use anticoagulant drugs Areas involved: face (tip of the nose, nasal wings), Decollète area
Exclusion criteria	Tumor features: pigmented, cystic, deep or ulcerative basal cell carcinoma Patients: those who do not have any contraindication to others cheaper therapy
Number of sessions	5
Treatment intervals	3 weeks
Number of passes	5–10
Laser wavelength	595 nm
Follow up	12–24 months

region, where cheloids can be frequent side effects of a surgery treatment.

In all these cases, we suggest that the success of pulse dye laser treatment lies in the fact that BCC contains an increased number of dilated blood vessels which represent the target of the therapy.

In a previous study, treating BCC using superpulsed CO₂ laser with intraoperative histopathologic and cytologic examination (1), we have demonstrated that in BCC like all kinds of tumor, a neoangiogenesis process has been realized, and this is a crucial requirement for tumor nutrition, growth, and, in some cases, metastasis. Using CO₂ laser, the neoangiogenesis process appears, after a first vaporization of the lesion, as a flaming red surface with central bleeding surrounded by pink peripheral area (unaffected skin). At this level, the cytologic examination taken shows numerous erythrocytes, while performing a further vaporization a yellowish surface with big beams of fibers, similar to waterlogged cotton threads corresponding to the deep dermis shows at the cytologic examination a complete absence of epithelial cells and red and white blood cells which means that the tumor is completely removed. However, as BCC contains an increased number of dilated blood vessels, dye laser, whose wavelength is absorbed from hemoglobin and oxyhemoglobin and leads to selective microvascular destruction, can be considered (in a selected group of patients) a new therapeutical approach for superficial BCCs treatment.

Materials and methods

Twenty patients (8 males and 12 females) with superficial BCC were recruited in a prospective study over a period of 12 weeks. The age of the patients was from 49–72 years (mean 63 years).

Table 2. Dye laser parameters

Energy density	Pulse duration	Diameter spot
7.5 J/cm ²	1.5 ms	7 mm
6.5 J/cm ²	0.5 ms	10 mm

Most of the patients enrolled in our study have a BCC localized on the face, in particular on the tip of the nose (six patients) and on the nasal wings (four patients). Four of them presented the tumor on the décolleté area. One of the patients was allergic to anesthetics and five were cardiopathics.

In all these patients we used a flashlamp-pumped dye laser (Dermobeam 2000, Deka M.E.L.A., Florence, Italy) which have no contraindications for these group of patients, with a 595-nm wavelength able to penetrate deeper into the skin (2) to the target (oxyhemoglobin or nuclear chromatin).

The treatment was performed five times a month.

Laser energy density was approximately 7.5 J/cm² with a spot size of 7 mm and a pulse duration of 1.5 ms. We used a dose of 7.5 J/cm² at the beginning of treatment to see how the patient reacted, increasing or reducing it in the following sessions if necessary. In some cases, other parameters were used as follows: energy density of 6.5 J/cm², pulse duration of 0.5 ms and a 10-mm diameter spot. (Table 2).

Lesions were uniformly irradiated with the minimum of overlap including about 5 mm of apparently healthy skin at the periphery of the tumor and without using intralesional or topical anesthetic. Dye laser was also equipped with a cryogen spray cooling. Five to ten shots (until the lesions were covered) were necessary to each BCC depending on the size and thickness of the tumor before a livid discoloration. This discoloration, which persisted for up to 10 to 14 days, enabled us to decide whether the dose was correct. If there was no discoloration and the patient did not feel a



FIG. 1 Basal cell carcinoma (BCC) on the wing of the nose before treatment (a), immediately after the typical purpura can be observed (b); BCC is completely healed (in this case only one treatment was performed) (c).

“pinprick,” then the dose of the individual pulse per site was not sufficient. All patients wore protective eyeglasses and after the treatment a wet gauze was applied, anyway the patient was allowed normal activity and no bandage was necessary. The clinical follow up was 12–24 months after the fifth treatment.

Results

Dye laser therapy was tolerated well by all patients. Minimal pain during application subsided immediately afterward.

The typical purpura seen after laser treatment which enabled us to decide whether the dose was correct disappeared in 2 weeks.

In addition to discomfort during laser application and itching during the healing phase, transient postlesional hyperpigmentation was observed in few patients.

In 16 patients, all lesions were completely healed after five sessions (FIG. 1). Three recurrences, one at 3 months follow up and two at 6 months follow

up, were also observed during the study period. Only one patient had no response in our collective. No scarring or persistent postlesional hyperpigmentation was seen.

Discussion

Many different types of therapy have been used in the treatment of BCC but treating BCC is a therapeutic challenge.

In some cases for example, when the tumor is superficial and involves particular areas such as the face or the décolleté area, a surgical treatment must be chosen, paying attention to eventually disfiguring scars.

Moreover, in cardiopathics, allergics or patients who use anticoagulant drugs, the selection of the right therapy can be difficult.

In these conditions, we suggest to treat superficial BCC using a flashlamp-pulsed dye laser. The wavelength of dye laser is found in the yellow light spectrum (595 nm), which is absorbed from hemoglobin and oxyhemoglobin. Therefore, the

laser is normally used in vascular malformation therapy (3,4).

Basal cell carcinomas contain dilated, congested blood vessels due to angiogenesis process which is a crucial requirement for tumor nutrition, growth, and, in some cases, metastasis (1). Oxyhemoglobin adsorbs this yellow light leading to selective microvascular destruction. The result is a purpura which will be resorbed by macrophages within 10 days.

The effect of dye laser on superficial BCC has been discussed controversially in literature.

Allison et al. treated superficial BCC using a single 585-nm dye laser treatment in seven superficial BCCs obtaining only one superficial BCC of the seven effectively healed at 8 weeks follow up and concluded that the treatment was not a realistic alternative to other treatment which yield much higher cure rates (5).

In our experience, 16 BCCs of 20 were completely healed after five sessions while three recurrences and only one no response case were observed during the study. We conclude that dye laser is a

safe method with low side effects, ranging from erythema, edema of the skin, crust formation, hematoma, and burning pain, which are mainly tolerated by patients.

The risk of cicatrix formation and pigment alteration is low, making this technology useful especially when face and décolleté area must be treated.

References

1. Campolmi P, Brazzini B, Urso C, et al. Superpulsed CO₂ laser treatment of basal cell carcinoma with intraoperative histopathologic and cytologic examination. *Dermatol Surg* 2002; **28**: 909–912.
2. Campolmi P, Bonan P, Cannarozzo G. *Laser e Sorgenti Luminose in Dermatologia*. Milano, Italy: Masson. 2003.
3. Kenton-Smith J, Tan ST. Pulsed dye laser therapy for viral warts. *Br J Plast Surg* 1999; **52**: 554–558.
4. Kauvar AN, McDaniel DH, Geronemus RG. Pulsed dye laser treatment of warts. *Arch Fam Med* 1995; **4**: 1035–1040.
5. Allison KP, Kiernam MN, Waters RA, Clement RM. Pulsed dye laser treatment of superficial basal cell carcinoma: realistic or not? *Laser Med Sci* 2003; **18**: 125–126.