Treatment of Pigmented Basal Cell Carcinoma with Carbon Dioxide Laser

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Abstract : Seven patients with nine primary well-defined pigmented basal cell carcinomas (BCC), regardless of size, were successfully treated with carbon dioxide laser. There has been no evidence of recurrence in the 3 months to 2 years following surgery. This may be the result of the dermal pigment at the lesion shoulder that more clearly marks the tumor margin. However, if the tumor was located in the reticular dermis, healing occurred with an atrophic scar. Surgical excision is recommended in cases of deep BCCs located in the convex area in terms of cosmetic results. It is therefore suggested that, in addition to the BCC subtype, the depth of invasion should always be stated in the routine histopathological report in order to determine the most appropriate treatment.

เรื่องย่อ : การรักษา Pigmented Basal Cell Carcinoma ด้วยเลเซอร์คาร์บอนไดออกไซด์

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รายงานการรักษาผู้ป่วย pigmented basal cell carcinoma ที่มีขอบเขตชัดเจน 7 รายซึ่งมี 9 รอยโรค ด้วยเลเซอร์คาร์บอนไดออกไซด์ได้ผลดีไม่ว่าจะมีขนาดเท่าใดก็ตาม การติดตามผู้ป่วยหลังการรักษาตั้งแต่ 3 เดือน ถึง 2 ปี ยังไม่พบว่ามีผู้ป่วยรายใดเกิดการกลับซ้ำ อาจเนื่องจากรอยโรคมีขอบเขตชัดเจนจากการที่มีสีดำที่ขอบ อย่างไรก็ตาม ถ้าเนื้อมะเร็งอยู่ลึกมากในชั้นหนังแท้ด้านล่างแล้ว แผลหายกลายเป็นรอยบุ๋ม การตัดออกน่าจะได้ผลสวยงามกว่าการรักษาด้วยเลเซอร์คาร์บอนไดออกไซด์ ฉะนั้นการอ่านผลชิ้นเนื้อของ BCC ควรระบุชนิด และความลึกของ BCC เพื่อประโยชน์ในการวางแผนการรักษา

INTRODUCTION

Basal cell carcinoma (BCC) is a malignant skin tumor arising from pluripotential primordial cells in the basal cell layers of the skin and, less frequently, from the outer root sheath of the hair follicle or sebaceous gland or other cutaneous appendages.

BCC is most commonly seen on the head and neck. It is a slowly growing tumor. It causes pro-

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gressive local tissue destruction that may lead to disfigurement or functional impairment. Histologic variants include nodular, superficial, micronodular, infiltrative, morpheic, mixed pattern.[1] These patterns may be associated with pigment formation. Nodulo-ulcerative BCC is the most common type in white ethnicity. In contrast, pigmented BCC is more common in Thai patients.[2]

Carbon dioxide laser emits a continuous beam having a wavelength of 10600 nm, which is absorbed by water. It can be used to cut or to vaporize the tissue. A previous report of vaporization of BCCs without attention to assess the wound for complete tumor removal revealed a recurrence rate of 50%.[3] Another study showed that it was effective in vaporization of superficial BCCs with histological evaluation of the laser treated areas.[4]

Many authors have commented on the dense pigment in the dermis peripheral to the tumor islands of BCC that more clearly marks the tumor margin.[5,6,7] It may be easier and more practical to use the black pigment in BCC to assess the laser wound for complete tumor removal instead of biopsy. Therefore, the present study was conducted to evaluate the efficacy of carbon dioxide laser using the absence of black pigment as the endpoint in the treatment of well-defined pigmented BCC, the most common type of BCC in Thai patients.

MATERIALS AND METHODS

This study was performed at Siriraj Hospital. Patients were eligible to participate if they had a previously untreated, biopsy-confirmed pigmented BCC with clearly visible margins. Biopsy was performed through what was considered to be the thickest (most elevated) portion of the clinical lesions. Patients who were in poor health that precluded surgery, or who were pregnant were excluded from the study. The Maloney group classification of histological subtypes was used to classify the BCC subtype[1]. Histological location was defined as "superficial" if the tumor was located only in the papillary dermis and "deep" if the tumor was also located in the reticular dermis.

Each lesion was photographed and measured before treatment. Clinical borders were estimated by visual inspection and were marked with gentian violet. Local anesthesia with 1% lidocaine without epinephrine was administered. The Sharplan CO_2 laser was used in a continuous mode with a spot size of 3 mm at 5-10 watts. A cotton-tipped applicator soaked in saline solution was used to remove vaporized debris after each pass. The tumor and 4 mm of surrounding normal skin were ablated and vaporized with a defocused beam until absence of black pigment. The tumor was friable and bled easily. After surgery, 2% mupirocin ointment and a mild pressure dressing were applied. The wound was cleaned twice a day with normal saline with subsequent application of mupirocin ointment. Patients were followed up at 1 week, 4 weeks, 6 months, and yearly thereafter if applicable.

RESULTS

Seven patients (two men, five women) with nine primary well-defined pigmented BCC were included. The clinical data and risk factors of the patients treated are summarized in Table I. The age ranges from 58 to 76 years old. The mean size of the BCC was 1.39X1.92 cm. Three patients (cases 2,3,7) had a long history of exposure to arsenic from herbal medicines. Another three patients (cases 1,4,6) had a history of significant sun exposure. No risk factor was found in case 5. The clinical lesions were black papules or nodules with a pearly translucent border. The dense pigment at the border accounts for a clearly visible margin. BCCs mostly developed on the face. Superficial BCCs in cases 4 and 7 were seen on the trunk. Complete healing after laser treatment was within 10 days without complications or any evidence of infection. Postoperative clinical appearance was very good (Figure 1,2). Atrophic scarring was noted only in cases 2 and 6. (Figure 3,4) The tumors in these patients were located in the reticular dermis and occurred on the convex areas. There has been no evidence of recurrence at follow up of 3 months to 2 years. Cases 1,5 and 7 had biopsy specimens taken after laser treatment which showed no residual tumor.

Table 1. Clinical data of patients whose BCCs were treated by carbon dioxide laser

Case No./ Age/Sex	Tumor type/ Depth	Site /Size (cm)	Duration of follow up (month)
1/44/ M	nodular/superficial	left temporal extending to left upper eyelid /5x5.5	20
2/73/ F	nodular/deep	forehead /0.4x0.6	18
	infiltrative/deep	right dorsum of nose /0.5x1	
3/76/ F	nodular/superficial	left nasal ala /0.3x0.4	17
4/69/ F	superficial BCC	left anterior chest wall /1.4x2.4	16
5/58/ F	nodular/superficial	left upper eyelid/0.7x1	14
6/68/ F	nodular/deep	right dorsum of nose /0.6x0.8	14
	nodular/deep	right nasal ala /0.9x1.2	
7/67 M	superficial BCC	left abdominal wall /2.7x4.4	3

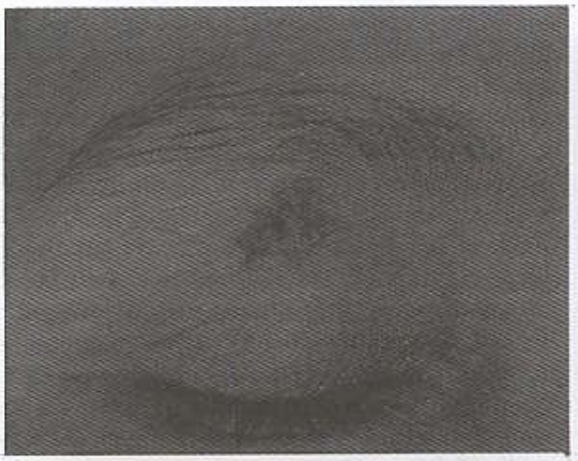

Figure 1. Case 5. BCC on left upper eyelid before treatment.

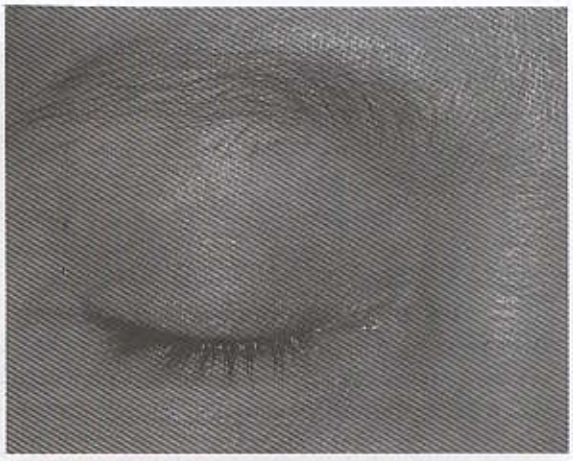

Figure 2. Case 5. Good cosmetic result after laser treatment.

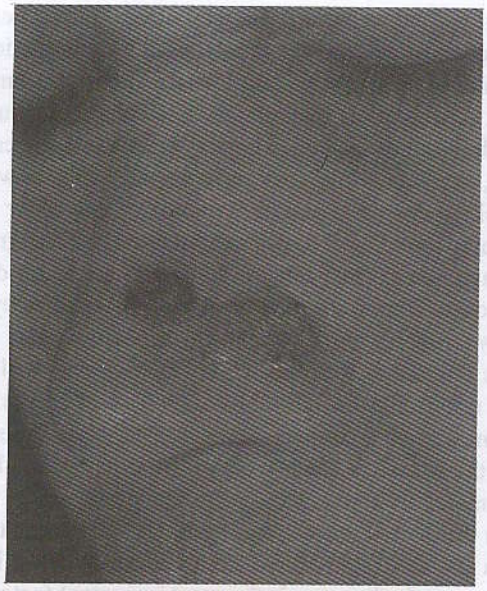

Figure 3. Case 6. BCC on nose before treatment.

Figure 4. Case 6. Atrophic scarring after laser treatment.

DISCUSSION

Several different effective treatment modalities are available for BCC. These include cryotherapy, curettage and electrodesiccation (C&E), radiation, excision, and Mohs micrographic surgery (MMS). The choice of treatment depends on the patient and on tumor variables. Patient variables include age, medical status, psychological factors and concomitant medications. For example, patients who are immunocompromised may be at a greater risk because some of their lesions demonstrate very aggressive behavior. Tumor variables include whether the tumor is primary or recurrent, or its histological subtype. Simple excision, C&E or cryotherapy give good results when reserved for small, well-defined, superficial primary BCC but its success is highly operator-dependent and usually leaves hypopigmentation and scarring. Radiation is useful for the palliation of inoperable tumors. MMS is the treatment of choice in aggressive BCC. Aggressive BCCs include those that are recurrent[8], large, poorly defined, or which display an aggressive histological subtype, such as a morpheic[9], or an infiltrative type[10].

Carbon dioxide laser has been used in the treatment of BCC with varying degree of success. Adams, et al[3] reported the treatment of 24 BCCs with a carbon dioxide laser without attention to assess the wound for complete tumor removal with a success rate of only 50%. The tumor type of those lesions which recurred included 8 nodular BCCs and 4 superficial BCCs. Humphreys, et al[4] showed that carbon dioxide laser was effective for the destruction of 12 superficial BCCs with histological evaluation of the laser treated areas. Potential advantages of carbon dioxide laser include better visualization in a bloodless plane, shortened healing time, and better cosmetic outcome compared with other ablative method such as C& E.

The dense pigment at the border of pigmented BCC accounts for a clearly visible margin. Therefore, it may be easier and more practical to use the black pigment in BCC to asssess the laser wound for complete tumor removal instead of biopsy. This study confirmed that using the absence of black pigment in BCC as the endpoint of the laser treatment was effective. In addition, this may be also due to

the less aggressive behavior of pigmented BCC. The prognostic significance of pigment in BCC has been debated. Sloane[11], in his review of 156 recurrent BCCs, found no correlation with the presence or absence of pigment. He did not indicate how many of these tumors were pigmented. In contrast, many studies suggested that pigmented BCCs were more likely to be completely excised than nonpigmented tumors.[5,7,12,13]

Wolf and Zitelli[14] demonstrated that 4 mm margins were necessary to totally eradicate BCCs less than 2 cm in diameter in more than 95% of cases, whereas the BCCs with diameters greater than 2 cm had wider subclinical invasion. In this study, all patients had a border of clinically uninvolved skin treated of at least 4 mm. The recommendation regarding deep margins was the absence of black pigment. The tumor was also friable and bled easily.

The selection of BCCs in this study was limited to pigmented BCCs with well-defined borders. This offered several advantages. A 4-mm margin for BCCs greater than 2 cm as in cases 1,4,7 was also adequate. Secondly, a well-defined pigmented infiltrative BCC in case 2 was successfully treated with the laser. Poorly-defined clinical borders of nonpigmented infiltrative or morphea BCCs probably explains high rate of recurrence after excision[1]. However, this apparent efficacy needs to be confirmed in larger studies. Lastly, it provided the preservation of tissue and ease of surgery in the treatment of BCC in the periorbital area, a site with a high rate of recurrence, as in cases 1 and 5. A well-defined border and the less aggressive behavior of pigmented BCC in Thai patients may account for these advantages.

Surgical wounds after laser treatment are allowed to heal by second intention. If the wound is superficial (epidermis and papillary dermis only), true epithelialization occurs so that clinically and histologically there is little or no evidence of scarring. Deep wound extending into reticular dermis heals by second intention by the process of granulation, contraction and epidermization. Cosmetic outcomes vary with location, wound size, skin color and wound depth. Wounds located in concave areas (medial canthus, nasolabial fold, postauricular sulcus) heal with excellent cosmetic results. Wounds on the other areas may look best if a surgical repair can be designed to maintain normal tension lines and cause no distortion of important nearby structures, such as eyebrows. Small wounds heal with better cosmetic results than large wounds. The healed wound will be less noticeable in light-colored skin than in darkly pigmented or telangiectatic skin. The more superficial the wound is, the less scar formation occurs. Experiments in animals suggest that the layers of the skin transected are of importance in scar formation than the actual measured depth of an incision is.[15] However, the location is the most important factor in predicting the cosmetic outcomes. The goal of any form of treatment for BCC is complete elimination of the tumor with an optimal cosmetic result. If the tumors were deep and located in the convex areas as in cases 2 and 6, healing occurred with an atrophic scar. Therefore, surgical excision is preferred if the deep BCCs are located in the convex areas in terms of cosmetic results.

In conclusion, carbon dioxide laser is very useful in the treatment of well-defined pigmented BCC in Thai patients. It also provides preservation of tissue, and ease of excision in difficult surgical sites such as periorbital area. Surgical excision is preferred in case of deep BCC located in the convex area in terms of cosmetic result. It is therefore suggested that, in addition to the BCC subtype, the depth of invasion should always be stated in the routine histopathological report in order to determine the most appropriate treatment.

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