Original Article

Diagnostic Value of Dermoscopic Structures in Predicting Superficial Basal Cell Carcinoma in the Skin of Color

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Abstract

Background: Basal cell carcinoma (BCC) manifests different dermoscopic patterns in individuals with dark skin complexion compared to those with fair skin types. This study aimed to investigate the diagnostic utility of dermoscopy in discerning superficial BCC from other types of BCC, specifically in patients with dark skin complexion.

Materials and Methods: This cross-sectional study focuses on patients diagnosed with BCC who were referred for skin biopsy between July 2020 and September 2022. Initially, the demographic characteristics of patients, clinical attributes of lesions, and pathological sub-types of BCC were documented. Subsequently, videodermoscopy was employed to capture comprehensive views and dermoscopic images of the lesions. Univariate logistic regression analysis was then utilized to assess the reliability of dermoscopic structures in distinguishing superficial BCC from other BCC types. Last, the study evaluated the sensitivity, specificity, positive predictive value, and negative predictive value of dermoscopy in the differentiation of superficial BCC from other BCC sub-types.

Results: The study enrolled 49 patients diagnosed with BCC, with a mean age of 66.22 ± 10.41 years. The most prevalent pathological sub-type observed was nodular (53.1%).Dermoscopy exhibited a higher specificity compared to the naked eye in the differentiation of superficial BCC from other types (55% vs. 35%, respectively).Univariate analysis revealed a significant association between spoke-wheel structures and superficial BCC ($P = 0.02$, odds ratio = 7.2, 95% confidence interval = 1.35–38.32).

Conclusion: Dermoscopy exhibited superior specificity compared to the naked eye in differentiating superficial BCC from other BCC types. Notably, the spoke-wheel structure demonstrated the most robust correlation with superficial BCC.

Keywords: Basal cell carcinoma, dermoscopy, pathology, specificity

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Introduction

Basal cell carcinoma (BCC) accounts for approximately three-quarters of non-melanoma skin tumors (NMSCs) and predominantly affects fair-skinned men in their seventh decade of life or beyond. While BCC typically does not lead to mortality, a delay in treatment can result in substantial morbidity. Therefore, early detection is crucial to prevent extensive tissue destruction.[1-3]

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There are currently 26 sub-types of BCC; however, the superficial and nodular sub-types are the most prevalent. Superficial BCC manifests as an erythematous or pigmented patch or plaque with a well-defined pearly border and central atrophy or hemorrhagic crust, commonly affecting the trunk and extremities. Clinically, it can be mistaken for other inflammatory dermatologic diseases or skin neoplasms such

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as Bowen disease, actinic keratosis, superficial spreading melanoma, benign lichenoid keratosis, seborrheic keratosis, psoriasis, dermatitis, and discoid lupus erythematosus.[4-6] The nodular type of BCC typically presents as a translucent papule or nodule with a rolled border, which may be ulcerated. This sub-type is commonly found in the head and neck areas. The nodular BCC should be distinguished from other skin neoplasms such as benign melanocytic nevi, sebaceous hyperplasia, nodular melanoma, squamous cell carcinoma, fibrous papule, Merkel cell carcinoma, and adnexal neoplasms.[2,4-6]

Currently, the gold standard for diagnosing BCC is skin biopsy, a procedure that is invasive, time-consuming, and relatively expensive. In contrast, dermoscopy serves as a rapid, uncomplicated, and cost-effective diagnostic tool. Dermoscopy not only aids in the early diagnosis of BCC but also assists to select the optimal biopsy site and estimate prognosis and recurrence rates.[6-10]

Dermoscopy has demonstrated high sensitivity and specificity in distinguishing BCC from other skin diseases such as melanomas, melanocytic nevi, and non-melanocytic lesions. The reported values stand at 93% sensitivity and 89–92% specificity.[6] Indeed, dermoscopy serves as a valuable tool for evaluating complete tumor clearance following medical treatment for BCC. The disappearance of pigmented structures, ulceration, and arborizing telangiectasia are indicative signs of complete clearance observed through dermoscopic examination. Considering the poor response of pigmented BCC to photodynamic therapy and the under-diagnosis of nearly 30% of pigmented BCC cases based only on the clinical findings, dermoscopy can be a valuable tool in selecting the optimal therapeutic approach in a pigmented type of BCC.[9-19]

Certainly, diverse sub-types of BCC manifest distinct dermoscopic patterns. For the nodular type, key dermoscopic features encompass blue-gray ovoid nests, arborizing telangiectasia, non-aggregated blue-gray globules, and ulceration. On the other hand, the superficial type of BCC displays varied dermoscopic patterns, such as SFT, erosion, spoke-wheel, and leaf-like structures.[5,19-21]

Diagnosing various sub-types of BCC solely through naked-eye examination of clinical features can be challenging. Dermoscopy serves as a valuable tool to improve diagnostic accuracy, particularly in distinguishing the superficial sub-type from other sub-types of BCC and determining the most appropriate treatment approach. This becomes particularly crucial in elderly patients who may unwilling to undergo surgery or skin biopsy.[5,11,17-20] As the clinical appearance of BCC can be different in fair-skin types compared with dark-skin types, the dermoscopic patterns of BCC can be different based on skin type. Currently, there are a few studies that evaluate diagnostic values (sensitivity and specificity) of dermoscopic features of BCC in the skin of color.[11,17-19] In this study, we decided to investigate the diagnostic value of dermoscopy in distinguishing superficial BCC from other types of BCC in patients with dark skin complexion referred to the dermatologic clinic of Afzalipour Hospital, Kerman.

Materials and Methods

Study design and population

This cross-sectional study involved 49 patients diagnosed with BCC who were referred to Afzalipour Hospital for skin biopsy between July 2020 and September 2022. This research was approved by the ethical committee of Kerman university of medical sciences with the ethical code of IR.KMU.AH.REC.1400.003.

First, informed consent forms were signed by patients. Then, demographic features of patients (sex, age, and Fitzpatrick's skin type) and clinical features of the lesions [site, size, sub-type, and morphology (patch, patch-to-plaque, or plaque)] were recorded. Overall views and dermoscopic pictures of the lesions were taken using a videodermatoscope in the polarized mode using both contact and non-contact techniques (FotoFinder, TeachScreen software GmbH, Bad Birnbach, Germany) by 20- and 70-fold magnification. Additionally, pigmentation was classified as lightly pigmented (<25%), moderately pigmented (25–75%), and heavily pigmented (more than 75%) based on the percentage of pigmentation. Following that, two dermatopathologists who were unaware of the clinical and dermoscopic features of the cases evaluated pathological slides of patients for characteristics of vessels (site and size), pigmentation site (superficial or deep), pathological sub-types, presence of fibrosis in the connective tissue, and nest configuration (confluence or separated). Finally, the percentage of pathology sub-types that correlate with dermoscopic structures was calculated, as well as the diagnostic value of dermoscopy in distinguishing superficial BCC from other types of BCC.

Statistical analysis

The data were analyzed using SPSS 24 (IBM, Armonk, NY, USA) software. Qualitative and quantitative data were presented as mean (± standard deviation), frequency, and percentage. The frequency of dermoscopic structures in superficial BCC was compared to other types of BCC using the Chi-square test. Univariate logistic regression analysis was used to assess the reliability of dermoscopic structures in distinguishing superficial BCC from other BCC types. Finally, the analyzer evaluated the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of dermoscopy in distinguishing superficial BCC from other BCCs.

Results

Clinical characteristics

The study included 49 participants (a male to female ratio of 3.9 to 1). The majorities of the patients were in seventh decades of life. With the naked eye examination, telangiectasia was observed in 30.6% of BCCs. The superficial type was

diagnosed in the majority of cases (73.5%), which included plaque, patch-to-plaque, and patch (58.3%, 27.8%, and 13.9%, respectively) [Table 1].

Pathological features

Nodular (53.1%) was the most common pathological subtype, followed by superficial (18.4%), micronodular (12.2%), infiltrative (8.2%), basosquamous (6.1%), and adenoid (2%). Most of the vessels were located in the superficial papillary dermis (73.5%), and the majority of them had large sizes (55.1%). The majority of basaloid nests (67.3%) are located separately from each other. Moreover, 16.3% of cases had fibrosis between nests in the stroma. Most BCCs (87.8%) had pigmentation, which was most frequently found in the papillary dermis and superficial reticularis dermis (89.8%).

Dermoscopic features

The most common vascular dermoscopic structure observed was arborizing telangiectasia (49%). Pigmentation was present in 91.8% of BCCs, with the most prevalent pigment-related dermoscopic feature being blue-gray ovoid nests (53.1%). The most common non-specific dermoscopic features included ulcer (49%), erosion (36.7%) and veil-like structures (34.7%) [Table 2].

The majority of cases (53.1%) were classified as nodular types, and the remainder as superficial types (46.9%). In addition, most of the cases were diagnosed as highly pigmented (55.1%). Only in 4.1% of cases, one color was detected. Dots were observed more prevalently in lightly pigmented BCC (60%) than moderately (57.1%) and heavily (22.2%) pigmented BCCs; the result was statistically significant ($P = 0.03$) [Table 3].

Leaf-like structures and spoke-wheel structures were found to be significantly more common in superficial BCC compared to other types of BCC (55.5% and 22.5% for leaf-like structures and 44.4% and 10% for spoke-wheel structures, respectively). Moreover, erosions were observed more frequently in superficial BCC than in other types of BCC (66.7% vs. 30%, respectively), and this difference was statistically significant ($P = 0.03$) [Table 2].

Ultimately, the accuracy of dermoscopic structures in distinguishing the superficial type from other types of BCC was evaluated. Univariate logistic analysis revealed that spoke-wheel-like structures had a significant correlation with superficial BCC ($P = 0.02$, OR = 7.2, 95% CI = 1.35–38.32). Even though leaf-like structures ($P = 0.058$, OR = 4.3,95% CI = 0.95–19.48) and erosion ($P = 0.05$, OR = 4.66,95%, CI = 0.99–21.81) were correlated more frequently with superficial BCC, the results were not statistically significant [Figures 1–3] [Table 4]. The sensitivity, specificity, PPV, and NPV of dermoscopy for distinguishing of superficial BCC from non-superficial types of BCC were 55.5%, 55%, 21.7%, and 84.6%, respectively.

Table 1: Clinical characteristics of patients with BCC

	n (%)
Gender	
Male	39 (79.6)
Female	10 (20.4)
Age mean±SD (range)	
Years	66.22±10.41 (36-85)
Skin type *n* (%)	
II	9 (18.4)
III	22 (44.9)
IV	18 (36.7)
Location *n* (%)	
Face	36 (73.5)
Scalp	11 (22.4)
Trunk	2 (4.1)
Duration mean±SD (range)	
Months	29.08±18.99 (5-96)
Diameter *n* (%)	
≤1 cm	17 (34.7)
>1 cm	32 (65.3)
Subtypes *n* (%)	
Pigmented	26 (53.1)
Non-pigmented	23 (46.9)
Superficial	36 (73.5)
Nodular	13 (26.5)

SD, standard deviation

Discussion

This study evaluated the diagnostic value of dermoscopic structures in distinguishing superficial BCC from other sub-types in patients with a dark skin, who made up the majority of cases (81.7%). Compared to findings from studies on BCC patients with a fair skin, this study's findings showed a higher prevalence of pigmented structures.[14,21]

The most common pigmented structures in the superficial type of BCC in this study were leaf-like structures, blue-gray ovoid nests, and spoke-wheel-like structures (55.5%, 44.4%,

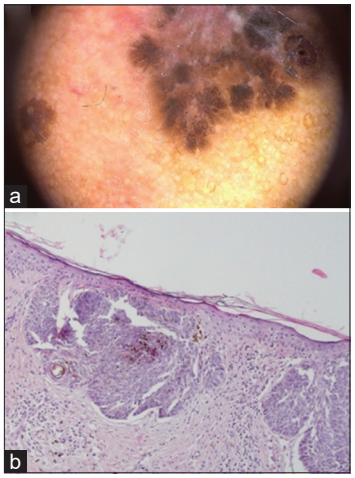

Figure 1: SBCC. (a) Dermoscopic image, the presence of leaf-like structure and absence of blue-gray ovoid nest of predictors of SBCC, (b) corresponding histopathology pigmented tumor nest extending from epidermis to papillary dermis (hematoxylin and eosin stain ×100)

Table 2: Prevalence of dermoscopic structures in superficial and non-superficial types of BCC

Dermoscopic pattern	Overall (*n*=49) *n* (%)	SBCC (*n*=9) *n* (%)	nBCC (*n*=40) *n* (%)	*P*
Arborizing telangiectasia	24 (49)	3 (33.6)	21 (52.5)	0.29
Ovoid nests	26 (53.1)	4 (44.4)	22 (25)	0.56
Ulceration	24 (49)	3 (33.3)	21 (52.5)	0.29
Globules	23 (46.9)	0 (0)	23 (57.5)	0.61
Leaf-like	14 (28.6)	5 (55.5)	9 (22.5)	0.04*
Spoke-wheal	8 (16.3)	4 (44.4)	4 (10)	0.01*
Superficial fine telangiectasia	12 (24.5)	3 (33.6)	9 (22.5)	0.49
Erosions	18 (36.7)	6 (66.7)	12 (30)	0.03*
Concentric structures	3 (6.1)	0 (0)	3 (7.5)	0.39
Blue-gray dot	19 (38.8)	2 (22.5)	17 (42.5)	0.25
Veil-like structures	17 (34.7)	3 (33.6)	14 (35)	0.92
Non-arborizing vessels	16 (32.7)	4 (44.4)	12 (30)	0.4
Pigment network	4 (8.2)	1 (11.1)	3 (7.5)	0.72
Shiny-white structures	4 (8.2)	0 (0)	4 (10)	0.32
White-scar like depigmentation	5 (10.2)	0 (0)	5 (12.5)	0.26
Rainbow pattern	1 (2)	0 (0)	1 (2.5)	0.63
Milky-red areas	11 (22.4)	1 (11.1)	10 (25)	0.36

SBCC: superficial basal cell carcinoma; nBCC: non- superficial basal cell carcinoma

Table 3: Prevalence of dermoscopic structures based on percentage of pigmentation

Dermoscopic structures	Lightly pigmented (*n*=15) *n* (%)	Moderately pigmented (*n*=7) *n* (%)	Heavily pigmented (*n*=27) *n* (%)	*P*
Arborizing telangiectasia	7 (46.7)	3 (42.9)	14 (51.9)	0.89
Ovoid nests	5 (33.3)	5 (71.4)	16 (59.3)	0.15
Ulceration	7 (46.7)	3 (42.9)	14 (51.9)	0.89
Globules	9 (60)	3 (42.9)	11 (40.7)	0.47
Leaf-like	3 (20)	3 (42.9)	8 (29.6)	0.53
Spoke-wheal	3 (20)	2 (28.6)	3 (11.1)	0.48
Superficial fine telangiectasia	4 (26.7)	2 (28.6)	6 (22.2)	0.91
Erosions	7 (46.7)	3 (42.9)	8 (29.6)	0.51
Concentric structures	2 (13.3)	0 (0)	1 (3.7)	0.35
Blue-gray dot	9 (60)	4 (57.1)	6 (22.2)	0.03*
Veil-like structures	2 (13.3)	2 (28.6)	13 (48.1)	0.07
Non-arborizing vessels	6 (40)	3 (42.9)	7 (25.9)	0.53
Pigment network	0 (0)	1 (14.3)	3 (11.1)	0.36
Shiny-white structures	1 (6.7)	1 (14.3)	2 (7.4)	0.81
White-scar like depigmentation	3 (20)	1 (14.3)	1 (3.7)	0.23
Rainbow pattern	1 (6.7)	0 (0)	0 (0)	0.31

and 44.4%, respectively). However, in Emiroglu *et al.*[14] study, where most of the patients had a fair-skinned type (91.7%), the only pigmented structure in superficial BCC was non-aggregated globules (28.6%).

Additionally, in the current study, milky-red areas were observed in a few of cases (11.1%), and shiny white structures were not observed in superficial BCC, whereas in Emiroglu *et al*.,[14] these structures were observed in 45.2% and 7.9% of cases, respectively. Similarly, Pampena *et al.*[21] evaluated dermoscopic structures in BCC patients with mostly a light-skinned type (type of II of Fitzpatrick's skin type, 68.4%) with a higher percentage of amelanotic or lightly pigmented BCC type (55.9%). The results of their study revealed a high percentage of red-white structureless areas (86.5%) and shiny-white structures (39.9%). In addition, pigment-related structures were observed in a lower percentage in the superficial type of BCC compared to the current study, except for globules that constitute a higher percentage than this study (63.8% vs. 0%).

According to prior research, dermoscopy improves the diagnosis of pigmented BCC by 30% when compared to the naked eye.[11,17] In the present study, the pigmented type of BCC was observed in 53.1% of cases with the naked eye, while dermoscopy identified pigmentation in 91.8% of cases.

The presence of blue-gray ovoid nests and non-aggregated blue-gray globules are more commonly associated with

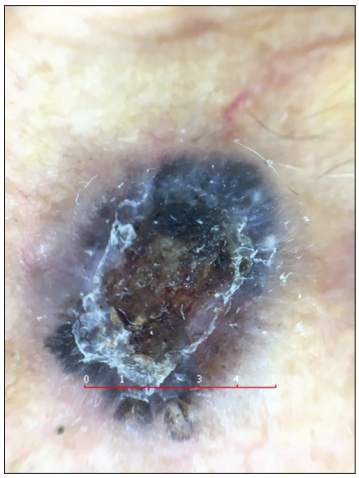

Figure 2: The dermoscopic picture of nodular BCC that reveals ulceration, large ovoid nests, brown dots, veil-like structures, and shiny-white structures

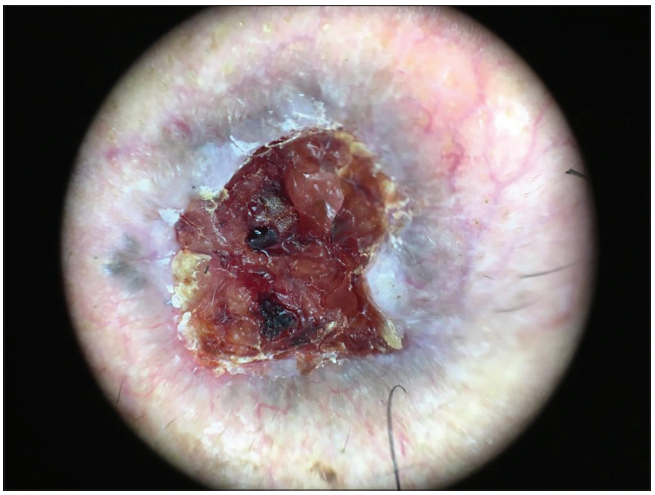

Figure 3: Dermoscopic picture of nodular BCC that demonstrates ulceration, blue-gray ovoid nests, leaf-like structures, veil-like structures, white-scar like depigmentation, and arborizing telangiectasia

Table 4: Dermoscopic structures predicting superficial BCC

Dermoscopic structures	OR	95% CI		*P*
		Lower limit	Upper limit	
Arborizing telangiectasia	0.45	0.09	2.06	0.30
Ovoid nests	0.65	0.15	2.80	0.56
Ulceration	0.45	0.09	2.06	0.36
Globules	0	NA	NA	0.99
Leaf-like	4.30	0.95	19.48	0.05
Spoke-wheal	7.2	1.35	38.32	0.02*
Superficial fine telangiectasia	1.72	0.35	8.29	0.49
Erosions	4.66	0.99	21.81	0.05
Concentric structures	0	NA	NA	0.99
Blue-gray dot	0.38	0.07	2.09	0.21
Veil-like structures	0.92	0.2	4.29	0.92
Non-arborizing vessels	1.86	0.42	8.18	0.4
Pigment network	1.54	0.14	16.8	0.72
Shiny-white structures	0	NA	NA	0.99
White-scar like depigmentation	0	NA	NA	0.99
Rainbow pattern	0	NA	NA	1

OR: Odds ratio; CI: Confidence interval; NA: Not applicable

non-superficial types of BCC, while spoke-wheel and leaf-like structures are more commonly predictors of superficial BCC.[5,12-16] In the present study, leaf-like and spoke-wheel structures were found more frequently in the superficial type of BCC (55.5% and 44.4%, respectively) compared with non-superficial types of BCC (22.5% and 10%, respectively), which was statistically significant. Tabanlıoğlu Onan *et al*.[18] described that spoke-wheel structures, blue-gray ovoid nests, and leaf-like structures were the most common pigmented structures in pigmented type BCC (37.5%, 35%, and 27.5%, respectively). Moreover, similar to the current study, Lallas *et al*.[16] reported a higher percentage of leaf-like and spoke-wheel structures in superficial BCC (37.7% and 18.2%, respectively) compared to the nodular type of BCC (8.4% and 5.8%, respectively). Other studies reported that gray-blue ovoid nests were the most common dermoscopic pictures of the pigmented type of BCC.[13,16]

In the present study, pigmented-related structures were observed most frequently in heavily pigmented types of BCCs compared to less pigmented types. The most common pigment-related structure in the heavily pigmented type of BCC was the blue-gray ovoid nest that was observed in 59.3% of highly pigmented BCCs compared to 33.3% and 71.4% of lightly pigmented and moderated pigmented BCCs. Altamura *et al*.[12] reported that the most common dermoscopic structures in highly pigmented BCCs were blue-white veil, ovoid nests, and globules, whereas the most common structures in lightly pigmented cases were arborizing telangiectasia, ovoid nests, and ulceration.

In the current study, dermoscopic structures, including spoke-wheel and leaf-like, were more predictive of the superficial type of BCC. Similar to this study, Lallas *et al*.[16] revealed that leaf-like and spoke-wheel structures significantly correlate with superficial BCC.

Previous studies estimated the prevalence rate of 8–81.3% for the presence of arborizing telangiectasia in BCC.[5,11-16] In the current study, arborizing telangiectasia was the most common vascular dermoscopic structure observed in 49% of BCCs (52.5% and 33.6% of non-superficial and superficial BCC types, respectively). Other studies showed arborizing telangiectasia in 52.4–88.9% and 0–46.2% of nodular and superficial BCCs, respectively.[14,20]Arborizing telangiectasia was not associated with superficial BCC in the current study. Similar to this study, Lallas *et al*.[16] demonstrated a low association between arborizing telangiectasia and superficial BCC.

SFT was found in 24.5% of BCCs in the current study (33.6% and 22.5% of superficial and non-superficial BCC, respectively),

and the difference was statistically significant. Furthermore, SFT was only a weak predictor of superficial BCC (OR = 1.72, 95% CI = 0.35–8.29, $P = 0.49$). Other studies reported SFT in 15.3–92% of BCCs.[5,11-16] Moreover, in agreement with this study, other studies demonstrated a significantly higher percentage of SFT in superficial BCC compared to nodular BCC (38.5–77.1% vs. 3.6–48.7, respectively).[5,7,14,16,20] Additionally, Lallas *et al*.[16] showed a high association between SFT and superficial BCC that was statistically significant.

In this study, the ulcer was most commonly observed in non-superficial types of BCC compared to superficial types (52.5% and 33.3%, respectively). In addition, the presence of erosion had a high predictor of superficial BCC (OR = 4.66, 95% CI = 0.99–21.81, $P = 0.05$). In contrast, ulceration shows a low association with superficial BCC (OR = 0.45, 95% CI = 0.09–2.06, $P = 0.36$). Lallas *et al*.[16] showed that ulceration is a low predictor of superficial BCC (OR = 0.32, 95% CI = 0.1–0.5, $P = 0$), which was in concordance with this study.

In the present study, the sensitivity and specificity of dermoscopy for distinguishing superficial BCC from non-superficial types of BCC were 55.5% and 55%, respectively. In addition, dermoscopy revealed higher specificity in differentiating superficial BCC from other types compared with the naked eye (55% and 35%, respectively). Ahnlide *et al*.[7] reported relatively higher specificity (88.7%) with relatively similar sensitivity (50.8%) compared to the present study for differentiating superficial BCC from other BCC's types. Furthermore, Lallas *et al*.[16] revealed a sensitivity and specificity of 81% for distinguishing the superficial type from nodular type BCC, which was higher than the current study. The current study was performed in patients with darker skin complexion compared to the other studies mentioned above; this can explain this disagreement. On the other hand, this study was performed on a small number of patients with BCC with a small ratio of the superficial type; thus, this can be another reason for these dissimilarities in the results.

This study was performed on a small number of patients with a small ratio of the superficial type. Moreover, we were not able to compare the diagnostic value of dermoscopic structures in distinguishing various BCC types between the skin of color and fair-skinned population due to predominance of the dark-skinned population in our study region. Thus, a larger study on BCC patients with various skinned types is recommended to better evaluate the liability and validity of dermoscopy in distinguishing different types of BCC based on skin type.

Conclusion

Dermoscopy revealed higher specificity in differentiating superficial BCC from other types compared with the naked eye and also leads to increased diagnosis of pigmented BCC by 38.7% compared to the naked eye. Moreover, the presence of dermoscopic structures, including spoke-wheel and leaf-like, can be a positive predictor of the superficial type of BCC.

Ethics approval

This research was approved by ethical committee of Kerman university of medical sciences with ethical code of IR.KMU.AH.REC.1400.003.

Consent for publication

The authors declare that they have obtained consent from patients.

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Conflicts of interest

There are no conflicts of interest.

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