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**Original Article**

# Becker Nevus in Focus: Clinical and Histopathological Insights with a Pattern of Epidermal Pigmentation Mimicking Regional Fitzpatrick Type VI Skin Implant

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## Abstract

***Background*** Becker nevus is an uncommon form of acquired cutaneous malformation marked by a unilateral, pigmented patch frequently accompanied by an excessive hair growth later on. It usually observed on the upper chest, scapular region, and proximal portions of the arms.

***Objective*** To redefine the clinical and histopathological assessment of Becker nevus.

***Methods*** This descriptive case study included patients of all ages, both sexes, clinically and histopathologically diagnosed with Becker nevus. A careful physical examination was conducted. Wood's light examination, as well as skin biopsy by a 5-mm punch was obtained.

***Results*** The higher age of onset was during the second decade of life. A positive family history was reported in 7.6% of cases, while consanguinity was present in 15.4% of patients, and the congenital presentation was detected in 3.8% of cases. The hypertrichosis was presented in 63.5% of cases. The histopathology showed hyperkeratosis and acanthosis, the melanin store was only epidermal while the dermal element was almost lacking.

***Conclusion*** Becker nevus is relatively frequent among the Iraqi population. It could be considered as localized Fitzpatrick type VI skin implanted in Fitzpatrick type II-IV person with increased epidermal melanin storage. Eastern and Western populations showed comparable findings, except for the higher frequency of consanguinity and positive family history.

***Keywords*** Becker nevus; Becker melanosis; Fitzpatrick type VI skin; Hypertrichosis.

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## Introduction

Becker nevus (BN), also referred as Becker melanosis or pigmented hairy epidermal nevus, is an uncommon form of acquired cutaneous malformation marked by a unilateral, pigmented patch frequently accompanied by excessive hair growth.[1] Samuel Becker in 1949 originally identified and described BN as a late-onset epidermal nevus with unique clinical characteristics.[2]

The cutaneous lesion usually emerges around puberty, shows a higher prevalence in males, and is most often observed on the upper chest, scapular

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region, and proximal portions of the arms. Generally, BN presents as an irregular, well-defined brownish patch, with progressive thickening and darkening over time. Hypertrichosis typically becomes more obvious after puberty, suggesting evidence of androgens in its pathogenesis.[1] Very rarely, BN has been presented with bilateral lesions on the lower limbs. It may also be accompanied by other ectodermal abnormalities, known as Becker nevus syndrome, such as smooth muscle hamartomas; hypertrophy of pectoral muscle, fat, and limb; hypoplasia of the breast; accessory scrotum; and adrenal gland hyperplasia.[1]

The particular etiology of Becker nevus remains uncertain, but theories proposed androgen receptor hyper-responsiveness. Another suggests an evidence of autosomal dominant pattern of inheritance with reduced penetrance; however, some researchers propose that a predominant mode of inheritance may better explain the regional distribution and mosaic presentation of BN.[3,4]

The estimated prevalence of BN is 0.5% among men, and a male to female ratio of 5:1. Disease most frequently presents during puberty, but unusually may present at birth or in early childhood. Furthermore, familial existence of BN has been reported. Some reports have shown a higher occurrence among Fitzpatrick type VI people.[3,4] The differential diagnoses for BN include the following: Smooth muscle hamartoma, congenital melanocytic nevus, post-inflammatory hyperpigmentation, and café-au-lait macules.[5]

Histopathological findings show mild epidermal acanthosis, hyperkeratosis, and rete ridges elongation. There is an increased melanin in the basal layer but without melanocytic cells proliferation in additional to the hyperplasia of sebaceous gland, smooth muscle, and dermal nerve fibers. On the other hand, immunohistochemical studies have revealed increased appearance of melan-A, keratin 15, and epidermal Ki-67, in the lesional and perilesional skin.[6]

Generally, melanosomes are separately distributed in human skin according to pigmentation level, in the deep pigmented skin, most melanosomes (around 60%) embedded in cells of the stratum basale, in addition, the melanosomes hold up to five times in the total epidermis than fair skin. Besides, abundant melanosomes can similarly be observed in keratinocytes of different epidermal layers even the stratum corneum. Low magnification transmission electron microscopy of the whole epidermis, showed that melanosomes distribution differs with the pigment level **(Figure 1)**.[7]

Indeed, BN is a fairly not uncommon disorder, but often unnoticed. Accordingly, for an accurate diagnosis, this study aims to correlate the clinical presentation and histopathological spectrum of the disease.

## Methods

This descriptive case study, was carried out from 2010 to 2025 years at the outpatient dermatology unit at Baghdad Teaching Hospital, Baghdad, Iraq, where patients of all ages, both sexes, clinically and histopathologically diagnosed with BN were included characterized clinically by a unilateral, irregular but sharp borders pigmented patch

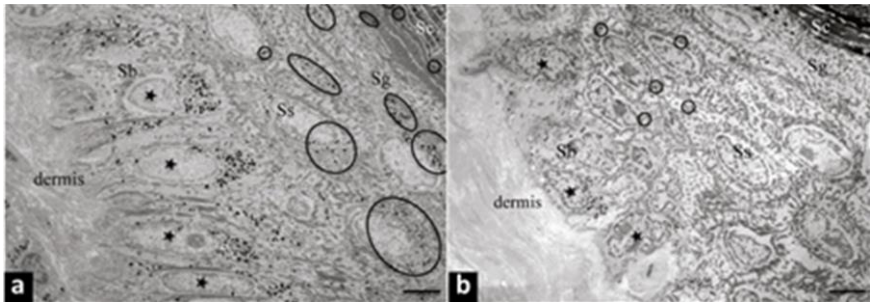



**Figure 1** Characteristics of pigmentation and melanosome distribution in skin from different color phenotypes: (a) Observation of melanosome distribution in epidermis by electron microscopy from highly pigmented skin, (b) lightly pigmented skin. Circles indicate melanosomes in keratinocytes while stars indicate pigmented keratinocytes in epidermis.[7]

accompanied by excessive hair growth. On the other hand, individuals with other pigmented disorders imitating Becker nevus such as congenital melanocytic nevus, café-au-lait spots or incomplete histopathological data were excluded.

Moreover, the age at onset and morphology of the lesions, correlated symptoms, any associated problems at the site of the lesion, consanguinity, family history of the same disease, and an associated concurrent chronic cutaneous and non-cutaneous disorder or malformations were recorded. Additionally, the color and site of BN, as well as the size of the lesion (the length and width of the patches) according to the following parameters: <10cm, 10-20cm, 21-30cm, >30cm were documented. A careful physical examination was conducted including skin type, hypertrichosis, skin texture in the BN and adjacent surrounding skin, Wood's light examination; the lesion whether or not enhanced by wood's light.

Skin biopsy by a 5-mm punch was obtained from distinctive BN, at Baghdad Teaching Hospital, after sterilization with antiseptics, the area was infiltrated with 2% xylocaine. The biopsy specimen was fixed in 10% formalin and sent for routine processing, staining and histopathological examination.

An informed consent was given by each participant or legal guardians before any data were collected, optimal privacy, safety, and confidentiality were taken into consideration when collecting data. This study was conducted in accordance with the principles of the Declaration of Helsinki (1964) and its most recent amendment in October 2024. The current study was approved by the University of Anbar Ethical Approval Committee (Ref No: 55; dated 20.08.2025).

Demographic data were entered and analyzed using Microsoft Excel 2019 and SPSS (Statistical Package for the Social Sciences), version 29 (IBM Corp., Released 2022, Armonk, NY, USA). Variables were summarized using frequencies and corresponding percentages, as well as means and standard deviations. The chi- square test was used to find out if there is a significant association between different variables. A P-value of less than 0.05 was considered as a statistically significant difference.

## Result

A total of 104 patients with BN were included in this study. Their ages ranged between 9 and 67 years, with a mean±SD of 23.96±11.81 years. The age of onset ranged between birth to 30 years, with a median age of 13 years. A positive family history was reported in 8(7.6%) cases, the consanguinity was present in 18 patients (15.4%). The age of onset was significantly high during the second decade of life, observed in 78(75%) participants, though the congenital presentation was detected in 4(3.8%) cases. There were 78 males (75%) and 26 females (25%), with a male to female ratio of 3:1. All patients complained of bad cosmetic appearance of BN, and 18 cases (15.4%) experienced mild itching. Their skin types were as follows: skin type IV in 68(65.4%) patients, skin type III in 32(30.8%) patients and skin type II in 4(3.8%) patients **(Table 1)**.

The correlation between sun exposure and lesion onset was identified in only 6(5.7%) patients, all of whom reported sun exposure prior to the appearance of the lesion. Skin texture of the lesions was normal in 58(55.8%) subjects, while rough thickened skin texture present in 46(44.2%) patients.

The color of lesion ranged from light-brown in 56(54%) of cases, and dark-brown in 48(46%) of patients. In two light-brown lesions (1.9%), gradual fading of the color was occurred. Only hyperpigmentation without hypertrichosis was found in 38(36.5%) patients, while in 66(63.5%) cases were presented with variable degrees of hypertrichosis, mild hypertrichosis was seen in 32(30.8%) patients, coarse hypertrichosis was noted in 26(25%), while in 46(44.23%) of cases no hypertrichosis was noted. Additionally, 8(7.6%)

**Table 1** The demography of Becker's nevus. (n=104)

| *Data* | *n (%)* |
|---|---|
| Age: 9-67 years (23.96 ± 11.81) | |
| Sex | |
| Male | 78(75%) |
| Female | 26(25%) |
| Consanguinity | 18(17.4%) |
| Positive family history | 8(7.6%) |
| Bilateral Becker's nevus | 2(1.9 %) |
| Age at onset (year) | |
| Inborn | 4(3.8%) |
| <10 | 18(17.4%) |
| 10-20 | 78(75%) |
| >20 | 4(3.8%) |
| Clinical features | |
| Hyperpigmentation | 104(100%) |
| Light-brown | 56(54%) |
| Dark-brown | 48(46%) |
| Hypertrichosis | 66(63.5%) |
| Mild | 32(30.8%) |
| Coarse | 26(25%) |
| On hairy face | 8(7.6%) |
| Associated skin diseases within the lesion | 20(19.1%) |
| Acne vulgaris | 14(13.4%) |
| Folliculitis | 2(1.9 %) |
| Pityriasis versicolor | 2(1.9 %) |
| Smooth muscle hamartoma | 1(0.96%) |
| Becker's nevus syndrome | 1(0.96%) |

cases were presented on normally hairy face skin **(Figure 2)**. Also, it was noted that pigmentation and hypertrichosis had tendency to increase overtime.

**Table 2** illustrates the distribution of cases according to the size, the width for all lesions was ranging between 3-40 cm with a mean±SD of 14.7±7.3 cm while the length ranged between 5-45 cm with a mean of cm 20.7±8.97 cm. Under Wood's light for 80 participants, it showed enhanced pigmentation in 50(62.5%) patients, while in 30(37.5%) no contrast was seen.

**Table 2** The distribution of cases according to the size. (n=104)

| *Diameter range (cm)* | *Length n (%)* | *Width n (%)* |
|---|---|---|
| 1-10 | 14(13.4%) | 28(26.5%) |
| 11-20 | 48(46.2%)* | 60(57.7%)* |
| 21-30 | 30(28.8%) | 14(13.4%) |
| 31-40 | 8(7.7%) | 2(1.9%) |
| 41-50 | 4(3.9%) | 0 |

* Significantly high frequency, *P* <0.002.

Concerning the anatomical site, single patch in 94(90.4%) cases and multiple in 10(9.6%). Almost all lesions were unilateral; However, a striking presentation of symmetrical bilateral BN that was observed in 2 male patients (1.9 %), one involving the thighs, and one at both his shoulders and arms **(Figure 3)**. Furthermore, patches were on the right side in 62(59.6%), and on the left side in 42(40.4%) patients. Moreover, the distribution of the lesions was as follows: on the shoulder in 26(25%) patients, on the posterior aspect of the chest (upper back) in 26(25%), upper extremities in 14(13.4%), neck in 14(13.4%), on the face in 8(7.6%), on the anterior aspect of the chest in 10(9.6%), on the gluteal region in 4(3.8%), on the lateral aspect of the chest in 4(3.8%), on the lower extremities in 4(3.8%), and on the loin region in 2(1.9%) patients **(Figure 4)**.




**Figure 2** Two different cases showing the intensity of color: (a) light-brown of facial BN, and (b) dark-brown with hypertrichosis of the right chest and shoulder.




**Figure 3** Showing the symmetrical bilateral BN that was observed in 2 male patients: (a) both thighs involvement, and (b) equally shoulders and arms affected.

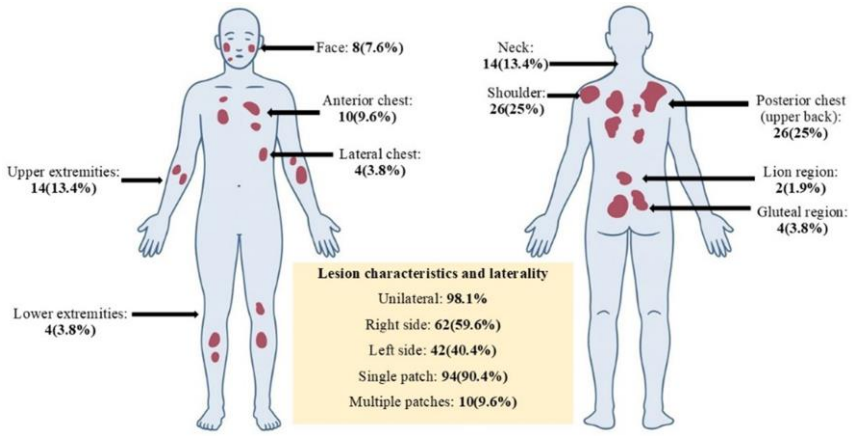



**Figure 4** A diagram showing the distribution of Becker's Nevus according to the sites.

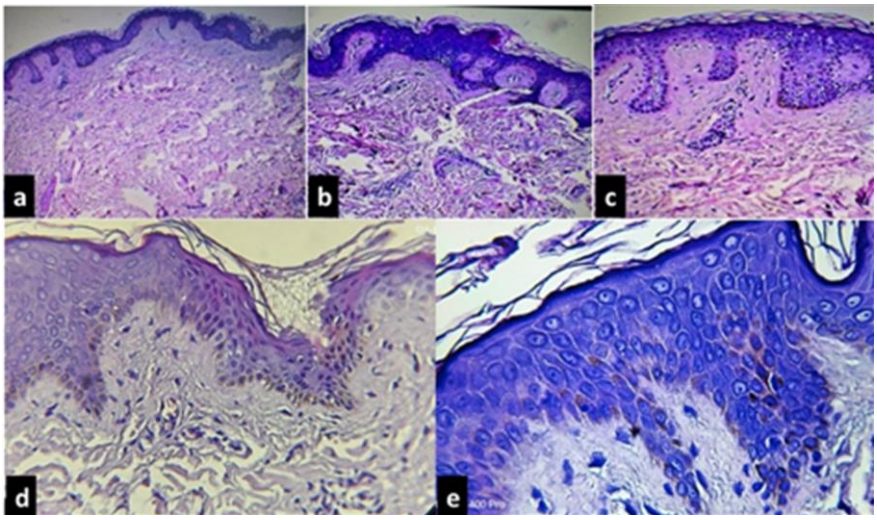



**Figure 5** The histopathological examinations were stained with Hematoxylin & Eosin. Hyperkeratosis, Mild acanthosis with elongation of rete ridges, pigmentation of epidermal layer was increased in almost all cases, with melanin predominantly concentrated in the basal and supra-basal layers. In the dermis, there were few melanophages, (H&E stains: a, b &c, X4; d, X10; e, X 40).

Association of other skin conditions on the BN lesions were present in 20(19.1%) cases: acne vulgaris in 14(13.4%) cases, folliculitis in 2(1.9 %), pityriasis versicolor in 2(1.9%), and smooth muscle hamartoma was present in 1(0.96%), and Becker's nevus syndrome associated with ipsilateral hyperplasia of the left side of the buttock and lower limb was reported in One (0.96%) case.

The histopathological examination was performed on 40 specimens of BN (excluding facial lesions), that were stained with Hematoxylin & Eosin **(Figure 5)**, were as follows **(Table 3)**:

▪ Hyperkeratosis was seen in 32(80%) specimens, 30(75%) of them showed mild hyperkeratosis while 2(5%) specimens demonstrate marked hyperkeratosis.

▪ Mild acanthosis was present in 34(85%) of cases with elongation of rete ridges was observed in 38(95%), while papillomatosis was recorded in 2(5%) specimens.

▪ Pigmentation of epidermal layer was increased in almost all cases, with melanin predominantly concentrated in the basal and supra-basal layers.

▪ In the dermis, generally, there was no remarkable dermal melanosis apart from scattered few melanophages that were seen in 30(75%) specimens while completely absent in remaining cases. Accordingly, there is increase in the epidermal melanin store while there were negligible dermal melanin stores. Moreover, there was evidence of smooth muscle bundles in the dermis in 22(55%) samples, but this finding does not represent the marked smooth muscle proliferation seen in smooth muscle hamartoma.

## Discussion

Becker nevus or Becker melanosis appears to be a relatively common skin condition reported in the literature, and similarly was also noted in Iraqi patients which was characterized by an asymmetrical pigmented patch, with irregular but sharp borders.

**Table 3** The histopathological and clinical findings in 40 specimens.

| *Features* | *n (%)* | *Pigmentation (n=40)* | *Hypertrichosis (n=40)* | *P value* |
|---|---|---|---|---|
| Hyperkeratosis: | 32(80%) | 23(57.5%)* | 6(15%) | .0001 |
| Mild | 30(75%) | 21(52.5%)* | 5(12.5%) | .002 |
| Marked | 2(5%) | 2(5%) | 2(5%) | -- |
| Mild acanthosis: | 34(85%) | 29(72.5%) | 77(17.5%)* | .0001 |
| Elongation of rete ridges | 38(95%) | 38(95%)* | 7(17.5%) | .0001 |
| Papillomatosis | 2(5%) | 1(2.5%) | 1(2.5%) | -- |
| Hyperpigmented basal cell layer | 40(100%) | 40(100%)* | 19(47.5%) | .006 |
| Dermal few scattered melanophages | 30(75%) | 21(52.5%) | 9(22.5%) | .028 |
| Mild smooth muscle bundles in the dermis | 22(55%) | 14(35%) | 8(20%) | .201 |
| Peri-vascular inflammatory cells infiltrate | 6(15%) | 2(5%) | 4(10%) | .414 |

*Significantly high frequency of clinical feature in association with histopathological finding

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The majority of cases had been reported in second decade of life,[8] and this was very comparable to the present study. The disease is commonly acquired and this similarly documented by the present work. On the other hand, congenital BN is rarely reported,[9,10] while the present study 3.8% of cases were noted at birth. Consanguinity and a positive family history were reported in 17.4% and 7.6% of participants, respectively, findings that have not been reported in previous literature. The exact genetic basis of BN is unidentified; a dominant mode of inheritance is proposed, given the mosaic/regional distribution of BN, as well as, the presence of sporadic and familial occurrences.[8,11] Hence we can propose, depending on the clinical and histopathological findings, that Becker nevus is Fitzpatrick type VI cutaneous mosaicism that did not follows Blaschko's lines, and appears as genetic mutations early in embryogenesis.

Furthermore, BN is mainly a disease of males in a ratio of 5:1, and was suggested as result of an increased density of androgen receptor, or there is a disturbance in the action of androgen receptors.[12,13] This observation was similarly noticed in the present study but in lower proportion, with a male to female ratio of 3:1.

In previous studies, lesion size was not meticulously evaluated. Most previous reports measured only lesion length, which was mainly described to range between 10-20 cm.[12] In the current work, both the length and the width of the lesions were studied. The size of lesions ranged between 3-40 cm for the width and 5-45 cm for the length. But the majority of cases for both width and length were found to be between 10-20 cm. Furthermore, BN may continue to expand for several years after initial recognition before stabilizing in size. Although BN might involve any part of the body, but commonly reported on the shoulder, anterior aspect of chest or the scapula in a unilateral distribution.[11] Similarly, this study reported that more than two-thirds of participants had lesions involving the most common sites: the shoulder, upper back, upper limbs, or anterior aspect of chest.

Herein, the interesting observation was the symmetrical bilateral BN in 2(1.9%) male patients, affecting various anatomical places and not associated with other body anomalies. Up till now, reviewing the published literature overword showing only 7 reported cases of non-syndromic bilateral BN. All of them displayed a more limited extent of involvement compared to our patients, two cases had been documented in Middle East.[11]

Although BN classically presents as a pigmented patch, no previous studies have assessed the depth of pigmentation using Wood's light examination. In an ideal world, the Wood's light illustrated an enhanced contrast in 62.5% of cases (epidermal pigmentation), while in 37.5% no contrast was noted (dermal pigmentation). However, a recent study found that Wood's light was not a good tool to define the depth of melanin deposition.[14] This interpretation is

supported by the present histopathological assessment, which demonstrated increased epidermal melanin stores mainly basal and supra-basal in almost all examined specimens and this is considered a novel interesting finding. This result supports that therapy might depend on clearing the epidermal pigmentation by different means.

Skin texture of the lesions was normal in more than half of cases, while rough thickened skin texture present in 44.2% of patients, which was not reported in the literatures. Additionally, the main described feature in BN is the increase in the color pigment, that ranged between light-brown to dark-brown. Approximately 63.5% of cases presented with variable degrees of hypertrichosis, usually grows in the center or follows the hyperpigmentation, closely similar to the Italian cases were observed an increased terminal hairs in 70% of participants.[15] Moreover, an updated article was observed the hypertrichosis in more than 50% of Becker's patch.[16] By contrast, another report observed a less lesional hypertrichosis that was found only in 17% of cases.[17] The possible theoretical explanation is an increased density of androgen receptor, or there is a disturbance in the action of androgen receptors, that might stand behind the higher number of hypertrichosis cases.[13] In addition, the deeply pigmented men showed higher DHT to testosterone ratios and DHT levels than lightly pigmented skin. Other approved that there were racial variances in androgen levels.[18] Also, this hypertrichosis depends on how early the age of lesions as over years the hair density might increase as observed by the present work.

Although acne rarely appears in a segmental style, there were several reports revealed the association between BN and acne or pityriasis versicolor, that also, considered as a secondary to the overexpression of androgen receptors during puberty.[19] In this study, 19.1% of patients had an association of additional cutaneous conditions, such as acne vulgaris, folliculitis, pityriasis versicolor, and smooth muscle hamartoma over the BN lesions.

Furthermore, one interesting case (0.96%) involved a man with Becker's nevus syndrome presenting with ipsilateral lower-limb hypertrophy. Previous publications observed the rare presentation of BN syndrome that considered as benign hamartoma, and associated extracutaneous defect, predominantly breast (mainly ipsilateral breast hypoplasia), and/or underlying musculoskeletal abnormalities.[2,20]

Generally, the histopathological findings were comparable with preceding publication.[16,21] This study observed a high frequency of mild hyperkeratosis, mild acanthosis, elongation of rete ridges, hyperpigmented basal and supra-basal cell layer, with minimal dermal melanosis. These findings may explain the varying degrees of epidermal pigmentation demonstrated in BN patches.

The etiopathogenesis of pigmentation is difficult to be elucidated, in spite of BN did not follow lines of Blaschko but the histopathology of this disease suggests regional distribution of cutaneous pigmentation mimicking Fitzpatrick type VI skin, by increased melanin storage of the thickened epidermal. Furthermore, future electron microscopic and genetic studies might show the melanin distribution similar to Fitzpatrick type VI skin, such as large pheomelanin granules that are dispersed individually inside the cytoplasm of keratinocytes, and elongated epidermal melanin unite that might reach to stratum corneum.[7] Besides, molecular analyses which could have provided stronger evidence to support the pathogenesis of BN.[21]

Several limitations essential to the design and methodology of this case series, included descriptive, single-center case series, long and variable recruitment period (2010-2025), single-site biopsy sampling, and lack of long-term follow-up data.

## Conclusion

BN carries a disfiguring disease, and leads to an

undesirable cosmetic appearance among Iraqi population. However, the depth of pigmentation could be assessed by using Wood's light examination. In addition, the clinical findings are comparable between Eastern and Western nations, except for the higher frequency of consanguinity, positive family history, bilateral BN, and syndromic Becker's nevus in our study. This study showed increased epidermal melanin storage and this a novel clinical finding. The BN could be considered as regional pigment distribution mimicking Fitzpatrick type VI skin, that could be expressed as localized skin implanted in Fitzpatrick type II-IV person. This increased epidermal pigmentation has a therapeutic implication, so, the treatment needs only to decrease the thickness of epidermis that contains the melanin store using different therapeutic techniques.

***Declaration of patient consent*** Authors certify that they have obtained all appropriate patient consent.

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***Conflict of interest*** No conflict of interest.

***Author's contribution***

**KES:** Substantial contributions to study design, acquisition of data and manuscript writing.

**TAK:** Substantial contributions to acquisition of data and manuscript writing.

**KMA:** Substantial contributions to concept, study design and critical review of the manuscript.

Every author has given final approval of the manuscript version to be published and agreed to be accountable for all aspects of the work.

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