

# Topical steroid application can induce branched/reticular vessels in Bowen disease on the upper trunk

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## Abstract

We aimed to elucidate the dermoscopic vasculature of patients with Bowen Disease (BD) that was misdiagnosed as chronic eczema and had branched and/or reticular vessels after topical steroid application. The medical records of 19 patients with BD on the upper trunk were retrospectively reviewed for steroid use history, vascular structure observed in dermoscopy, and corresponding histological findings. Four patients treated with strong topical steroids showed remarkable branched and/or reticular vessels on dermoscopy. Histopathology showed partial epidermal atrophy with irregular thin elongation of the rete ridges, atypical keratinocyte proliferation in the epidermis, and vasodilation in the superficial dermis. We considered that vasodilation and partial epidermal atrophy may be induced by topical steroid application in BD-affected areas. In cases of suspected BD with reddish-brown plaque showing branched and/or reticulated vessels in dermoscopy, confirming a history of topical steroid use is helpful.

## Introduction

Bowen Disease (BD) is sometimes mistaken for chronic eczema clinically and may be given topical steroids for a period. Glomerular vessels distributed regularly in clusters are the most common vascular feature in BD observed on dermoscopy.<sup>1</sup> However, based on the accumulation of our clinical cases of BD, we speculated that dermoscopy findings of BD on the upper trunk may show branched and/or reticular vessels due to the effect of topical steroids application.

To date, there are no reports on the effects of topical steroids on the vascular structure of the affected areas of BD. We conducted a retrospective study on the pur-

pose of medical records to identify details of the dermoscopic vasculature in BD patients who showed branched and/or reticulated vessels after topical steroid application.

## Materials and Methods

We reviewed the medical records of BD patients referred to Chiba University Hospital from November 2010 to April 2019. The patients' steroid use history, vascular structure observed in dermoscopy, and corresponding histological findings were examined. All dermoscopic images were recorded with Delta 20 Plus or Delta 20 T (Heine Optotechnik GmbH & Co. KG, Gilching, Germany) connected with a Canon EOS 60D, 70D, or 80D camera (Canon Inc., Tokyo, Japan). All dermoscopic image findings were evaluated, discussed, and agreed upon by two experienced observers (Y.T. and H.H.). This retrospective study was in accordance with the Helsinki Declaration and approved by the Chiba University School of Medicine Ethics Review Board (approval no. 3691). The requirement for obtaining written informed consent was waived owing to the retrospective nature of the study, but in accordance with the rule of the ethics committee, we made the patients aware of the study by posting in the outpatient department of our hospital and consent to use de-identified images was obtained from the four patients presented.

## Results

Nineteen patients with BD on the upper trunk were included in this study (8 men and 11 women; mean age, 68.9 years; range, 48–85 years; Table 1). The lesions were located on the back (n=9), chest (n=6), and shoulder (n=4). Of 19 patients, 18 (94.7%) showed at least one vascular structure (Table 1). Glomerular vasculature (n=13, 68%) was the most commonly observed type, followed by linear-irregular (n=6, 32%), dotted (n=5, 26%), reticular (n=3, 16%), branched (n=2, 11%), and hairpin (n=1, 5%) types. Of 19 BD patients, 4 (21%) showed branched and/or reticular vessels (Figure 1), with the following types of polymorphic vasculature: linear-irregular/reticular/glomerular, linear-irregular/reticular, linear-irregular/reticular/branched, and linear-irregular/branched; 1 patient had a biopsy scar on the periphery. The 4 patients were aged 48–84 years, and the male/female ratio was 3:1; they had previ-

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ously been treated with strong to very strong topical steroid for at least 1 month because they were mistaken for chronic eczema before the first visit to our department. Histopathological examination revealed partial atrophic epidermis with irregular, thin elongation of rete ridges and atypical keratinocyte proliferation with loss of polarity. Vasodilation in the upper dermis was observed in all patients.

## Discussion

Topically applied steroids show side effects if the application is continued for extended periods (*e.g.*, weeks to months).<sup>2</sup> The most prominent cutaneous adverse effect is skin atrophy of the epidermis and dermis, with increased fragility, and vasodilation. After prolonged treatment, vasodilation may become fixed and more conspicuous as a result of dermal and epidermal atrophy.<sup>3</sup> Therefore, we speculated that steroid topical application could induce the formation of branched and/or reticular vessels on dermoscopy due to the side effects. In fact, we confirmed that branched and/or reticular vessels were observed in all 4 cases using topical steroids with BD on the upper trunk. Consequently, we compared our 4 cases with previously reported cases and with our other 15 cases that BD developed in the same part of the body.

The main dermoscopic features of typical BD are scaly surface, small brown glob-

ules, structureless gray to brown pigmentation, and glomerular vessels distributed in clusters.<sup>1,4-16</sup> On dermoscopy, glomerular vessels distributed in clusters are observed most frequently and are identified in 90% of the cases.<sup>1,7</sup> Dotted, linear-irregular, arborizing, polymorphic, and atypical vessels are less frequently observed in BD.<sup>1,4-11,16</sup> However, the frequency of appearance of each blood vessel structure differs depending on the report as follows: glomerular vessels (44.2%–94%), dotted vessels (12%–64%), hairpin vessels (7.1%–42.5%), linear-irregular vessels (7.1%–42.5%), arborizing vessels (1.1%–14.3%), and polymorphic or atypical vessels (3.4%–8.1%).<sup>1,4-8,10,11,16</sup> Among them, Yang *et al.*<sup>11</sup> reported the highest number of BD cases (n=149). Vascular structures were found in 129 (88.4%) patients; 101 (69.2%) lesions showed glomerular vessels, 62 (42.5%) lesions showed linear-irregular vessels, 26 (17.8%) lesions showed dotted vessels, 5 lesions (3.4%) showed polymorphous vessels, and 3 lesions (2.1%) showed arborizing vessels. Yang *et al.*<sup>11</sup> considered that differences of their vascular findings from those of previous reports were probably because of their larger number of cases, a

different percentage of pigmented and non-pigmented BD, or inclusion of Asian patients. Therefore, as a summary of previous reports,<sup>4-8,10,11,16</sup> vasculature other than glomerular blood vessels, such as linear-irregular vessels and arborizing vessels, was not so rare. Meanwhile, there were no reports of reticular vessels or the effects of topical steroids on dermoscopy findings of BD.

Branched vessels are, by definition, almost the same as arborizing vessels in terms of branching. Although arborizing vessels become thin after branching, branched vessels have no defined thickness after branching. In our cases, thin branched vessels were observed, and the vessel thickness did not change much after branching; some of them formed reticulated vessels. On dermoscopy, branched and/or reticular vessels corresponded to histopathological vasodilation in the upper dermis with partial atrophic epidermis (Figure 2). In contrast, glomerular vessels seen in typical BD correspond to histopathological regular epidermal elongation and simple capillary vessel dilation of the dermal papilla similar to psoriasis.

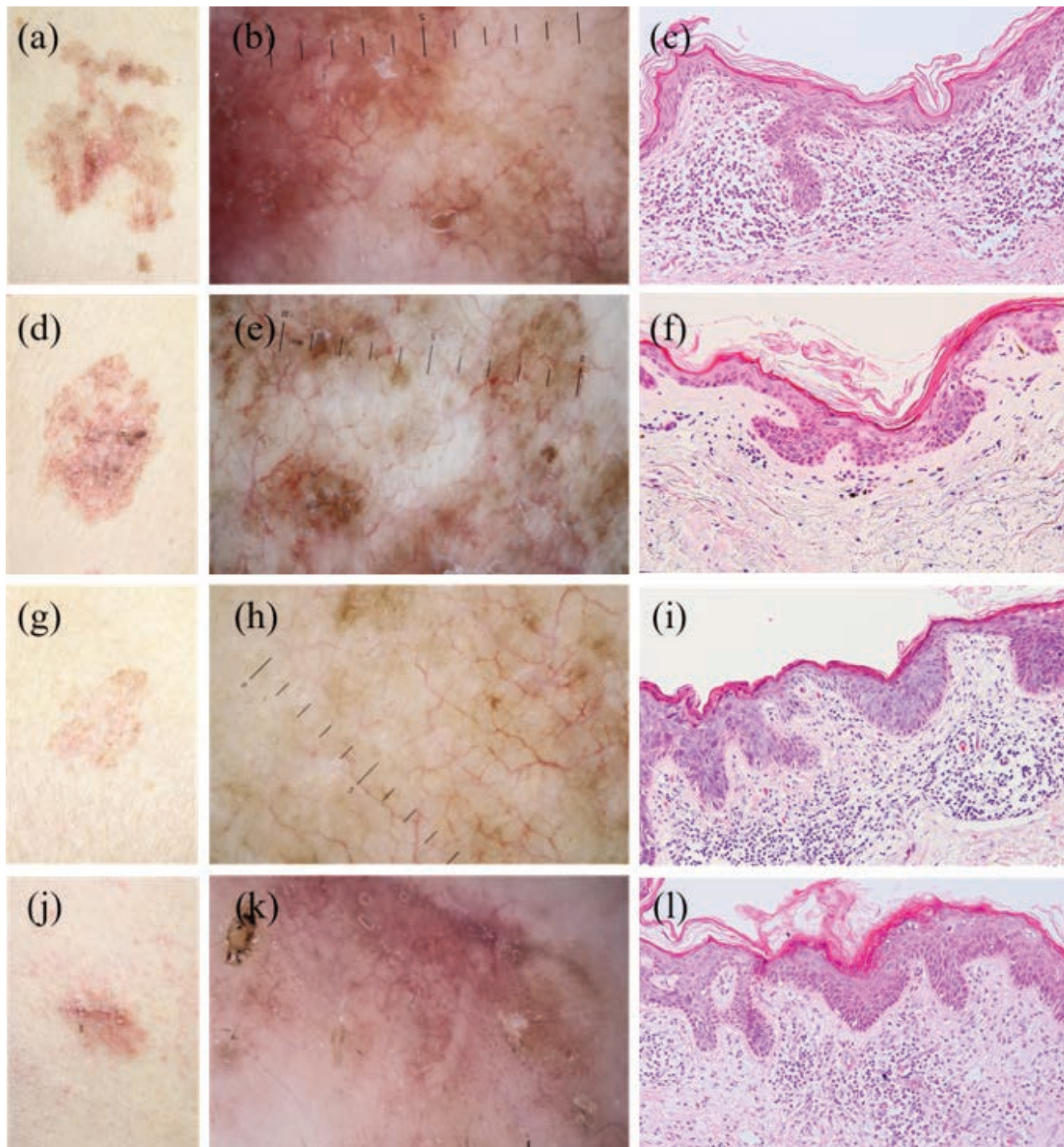
We investigated the dermoscopic vascu-

lar findings of 15 other cases of BD that did not use topical steroids, which showed that the lesions lacked branched and/or reticular vessels (Table 1), even if some cases showed skin atrophy with aging or partial spontaneous regression of BD with resultant inflammation.<sup>11</sup> In contrast, case 2, which had reticular/branched vessels, showed histopathologically remarkable epidermal atrophy with irregularly thin elongated rete ridges and decreased tumor cells in the epidermis, which signified spontaneous regression. Since the inflammation had already subsided, the regression had progressed considerably. In cases 1 and 3, the epidermis also showed similar atrophic change, but tumor cells were notable in the epidermis and prominent lymphocyte infiltration was seen in the dermis; thus, even if spontaneous regression occurred, it was still in an early stage. Thus, branched and reticulated vessels were observed in patients after using topical steroid regardless of the presence or the stage of spontaneous regression. Therefore, we speculate that long-duration (weeks to months) topical application of strong topical steroids can induce histopathological vasodilation in the upper dermis and epidermal atrophy with irregu-

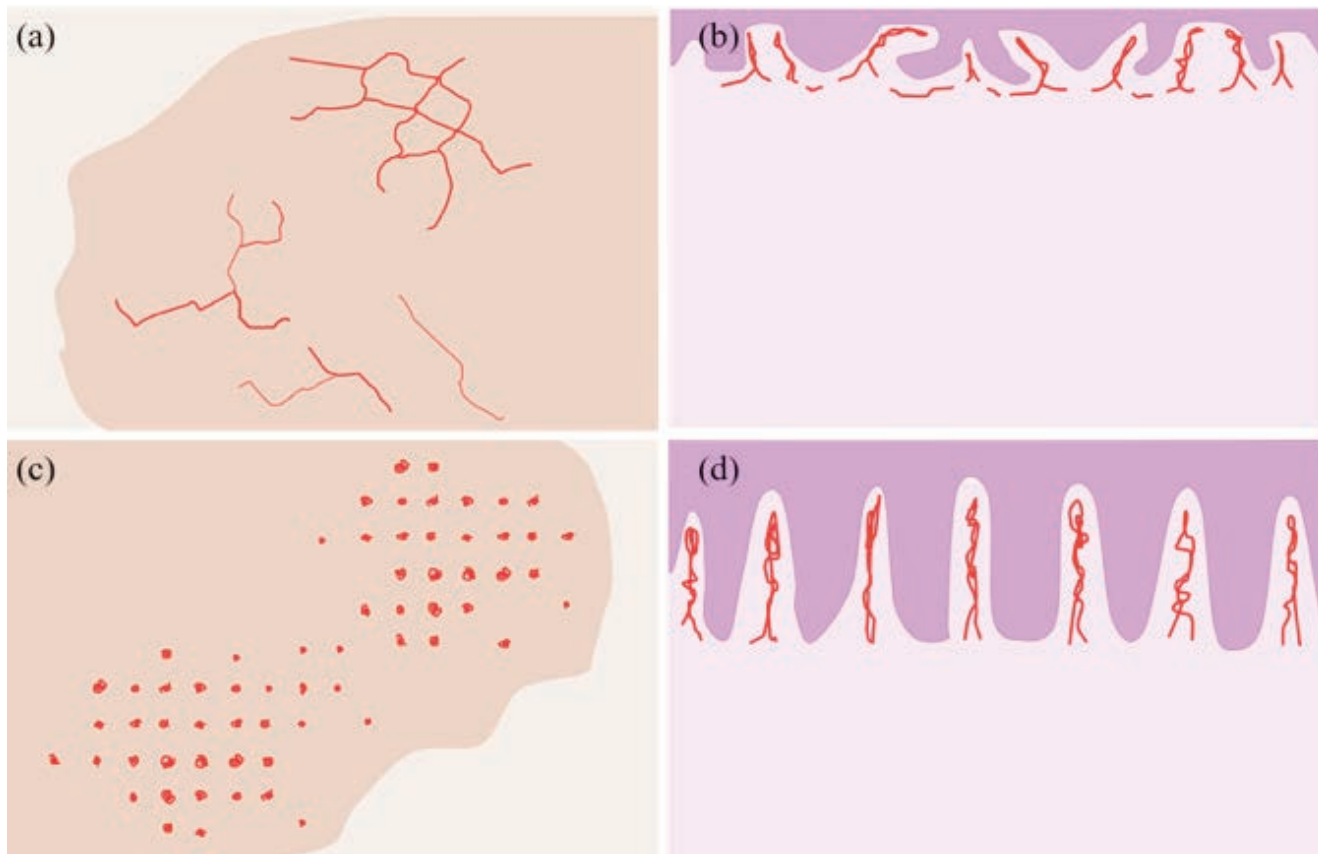
**Table 1. Summary of 19 cases of Bowen disease on the upper trunk with or without topical steroid pretreatment.**

Case	Age (years)	Sex	Affected part	Dermoscopic finding in vessels						Topical steroid application	Vasodilation in the upper dermis with thin elongated rete ridges
				Glomerular	Dotted	Hairpin	Linear-irregular	Branched	Reticular		
1	77	M	Back	-	-	-	+	-	+	+*	+
2	84	M	Shoulder	-	-	-	+	+	+	+†	+
3	84	M	Shoulder	-	-	-	+	+	-	+‡	+
4	48	F	Chest	+	-	-	+	-	+	+§	+
5	74	F	Back	+	-	+	-	-	-	-	-
6	63	F	Back	-	+	-	-	-	-	-	-
7	78	M	Back	+	-	-	-	-	-	-	-
8	63	M	Chest	+	+	-	-	-	-	-	-
9	69	F	Back	+	+	-	-	-	-	-	-
10	87	M	Back	+	-	-	-	-	-	-	-
11	76	F	Shoulder	+	-	-	-	-	-	-	-
12	85	F	Chest	+	-	-	-	-	-	-	-
13	70	F	Shoulder	+	-	-	-	-	-	-	-
14	60	M	Chest	-	-	-	-	-	-	-	-
15	77	F	Chest	+	-	-	-	-	-	-	-
16	78	F	Back	+	-	-	-	-	-	-	-
17	58	F	Chest	-	+	-	-	-	-	-	-
18	75	M	Back	+	-	-	+	-	-	-	-
19	72	F	Back	+	+	-	-	-	-	-	-

M: male; F: female. \*Very strong class, a few years, †strong class, several years, ‡strong class, 7 months, §very strong class, 1 month.



**Figure 1.** Bowen disease: clinical, dermoscopic, and histopathological (hematoxylin and eosin staining,  $\times 100$ ) images of cases 1 to 4. Case 1: (a) a 5.5 $\times$ 5-cm reddish-brown plaque with scaly and crusty surface and central erythema on the left upper back; (b) branched and/or linear-irregular vessels with hypopigmented background; (c) atypical keratinocyte proliferation in the partial atrophic epidermis with irregularly thin elongated rete ridges. Vasodilation in the upper dermis with moderate infiltration of mononuclear cells. Case 2: (d) a 3-cm brown plaque with scaly and crusty surface and central erythema on the right shoulder; (e) reticular/branched and linear-irregular vessels with or without brown background; (f) mild proliferation of atypical keratinocytes in the partial atrophic epidermis and irregularly thin elongated rete ridges. Vasodilation in the upper dermis with mild fibrosis. Case 3: (g) a 1.9 $\times$ 1.5-cm erythema with brown periphery on the left shoulder; (h) branched and linear-irregular vessels with brown dots and shiny white lines on the hypopigmented areas in the periphery of the lesion; (i) partial atrophic epidermis with atypical keratinocyte proliferation with loss of polarity in all layers of the epidermis and irregularly thin elongated rete ridges. Vasodilation in the superficial dermis with infiltration of mononuclear cells. Case 4: (j) a 1.1 $\times$ 0.9-cm scaly erythema with peripheral scar of biopsy on the right chest; (k) reticular and linear-irregular vessels on the hypopigmented areas and glomerular vessels in the periphery of the lesion; (l) atypical keratinocyte proliferation with loss of polarity in the partial and slight atrophic epidermis and irregularly thin elongated rete ridges. Vasodilation in the superficial dermis with mild fibrosis and infiltration of mononuclear cells.



**Figure 2. Bowen disease: dermoscopic and histological schema of vascular findings in BD with partial epidermal atrophy after topical steroid application and typical BD. (a) Branched and/or reticular vessels with linear-irregular vessels observed after topical steroid application in BD with partial epidermal atrophy. (b) Partial atrophic epidermis with irregularly thin elongated rete ridges and vasodilation in the upper dermis. (c) Typical BD with glomerular vessels distributed regularly in clusters. (d) Regular elongation of the rete ridges and capillary vessel dilation in the dermal papilla.**

larly thin elongated rete ridges corresponding to dermoscopic branched/reticulated vessels. Similarly, in case 4, reticulated blood vessels were also seen. However, this case's biopsy may be considered an exception because scars can affect the arrangement of the blood vessels of the superficial dermis and the epidermis atrophy was minimal.

The limitation of our retrospective study is the small number of cases ( $n=4$ ); thus, more cases are needed for the generalization of the results. However, it is difficult to gather cases for a prospective study because topical steroids are not generally used to treat BD.

## Conclusions

This is the first report on the formation of branched and/or reticular vessels, observed on dermoscopy, after topical steroid application in BD patients for at least 1 month. It is often helpful to confirm

the history of topical steroid use when examining cases of suspected BD that show branched and/or reticulated vessels on dermoscopy. Additionally, it should be noted that even if BD patients apply topical steroids for a longer duration (months to years), there is a possibility that BD may be misdiagnosed because branching and reticulated vessels, which are not commonly observed, are conspicuous in dermoscopy.

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