

# Frictional Asymptomatic Darkening of the Extensor Surfaces

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## GOAL

To understand frictional asymptomatic darkening of the extensor surfaces (FADES) to better manage patients with the condition

## OBJECTIVES

Upon completion of this activity, dermatologists and general practitioners should be able to:

1. Recognize the clinical presentation of FADES.
2. Explain the histologic findings in patients with FADES.
3. Discuss the treatment options for FADES.

CME Test on page 348.

This article has been peer reviewed and approved by Michael Fisher, MD, Professor of Medicine, Albert Einstein College of Medicine. Review date: May 2005.

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Ms. Krishnamurthy and Drs. Sigdel and Brodell report no conflict of interest. The authors report no discussion of off-label use. Dr. Fisher reports no conflict of interest.

*Frictional asymptomatic darkening of the extensor surfaces (FADES), also known as hyperkeratosis of the elbows and knees, is commonly seen by*

*dermatologists but has never been well characterized. Patients present with uniform, asymptomatic, brown darkening over the extensor surfaces of the elbows and knees with minimal scaling. Both frictional stress and family history may play a role in the pathogenesis of this condition. The results of cutaneous biopsy specimens typically reveal hyperkeratosis, acanthosis, and mild papillomatosis with minimal inflammation. Keratolytic agents such as lactic acid and urea cream along with avoiding frictional stress can be effective in the management of this condition. We describe a series of cases of FADES and its etiology and management options.*

*Cutis.* 2005;75:349-355.

Accepted for publication April 11, 2005.

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**F**rictional asymptomatic darkening of the extensor surfaces (FADES) is commonly seen in our practice but has not been well characterized in the dermatologic literature. We can find no mention of frictional dermatitis or hyperkeratosis of the elbows and knees in any of the major textbooks of dermatology.<sup>1-6</sup> Young to middle-aged adults present with asymptomatic “dirty” brown pigmentation over the extensor surfaces of their elbows and knees, which the patients find cosmetically objectionable. The lesions are generally uniform and bilateral, with little evidence of scaling. A positive family history and a history of frictional stress to the involved areas can be elicited in some cases. Patients deny any symptoms of pain or pruritus, as well as exposure to contact allergens or a personal or family history of psoriasis vulgaris.

We collected data from 9 patients diagnosed with FADES, including detailed histories, biopsy results, and treatment outcomes. The cases of 4 representative patients are discussed.

### Case Reports

*Patient 1*—A 47-year-old white woman presented with brownish discoloration of her knees and elbows of 5 years’ duration. The left knee and both elbows showed darkening. She denied any pain, pruritus, history of trauma, family history, or contact allergen exposure. The patient reported kneeling on her left knee when working around the house. She was unable to kneel on her right knee because of pain associated with osteoarthritis. There was no history of diabetes mellitus or obesity. Results of a physical examination revealed a 3-cm area of brownish discoloration along the extensor surface of her left knee without any erythema or scaling (Figure 1). The skin over the right knee appeared normal. Similar but milder changes were noted on the extensor surfaces of her elbows bilaterally. No evidence of the velvety hyperpigmentation of acanthosis nigricans was present in flexural areas. Treatment with lactic acid 12% cream twice a day for 3 months led to slow steady improvement, which was quite satisfying to the patient, but the dark coloration was not totally eliminated.

*Patient 2*—A 58-year-old white man presented with “dirty” brown discoloration of his elbows bilaterally of 40 years’ duration. He denied any pain or pruritus. No precipitating, exacerbating, or relieving factors were elicited. His medical history was significant for hypertension and arthritis. There was no history of diabetes mellitus or obesity. Family history was significant for the same condition in his mother and daughter. Results of a physical examination revealed a 4- to 5-cm

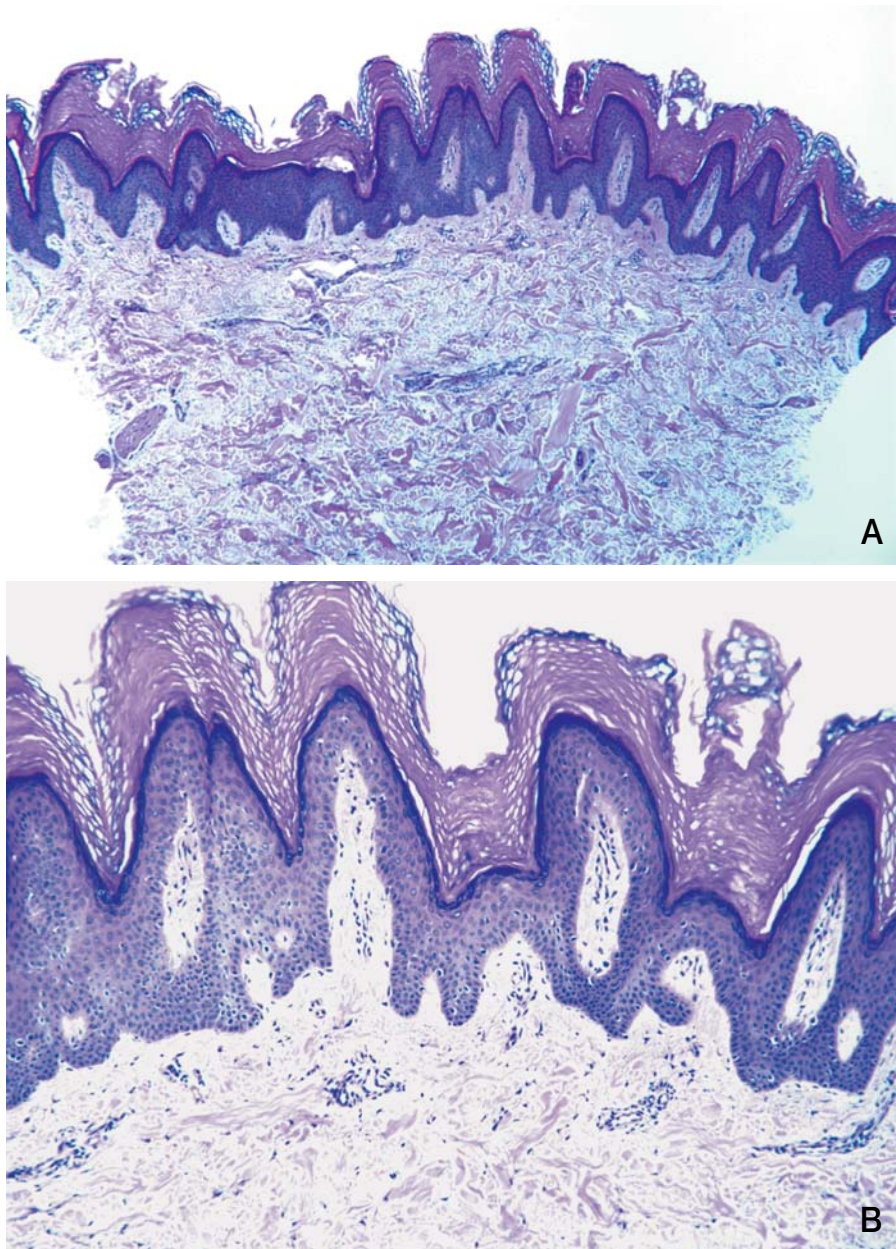


**Figure 1.** Brown discoloration on the extensor surface of the left knee in a patient with history of frictional stress to this area.



**Figure 2.** Brown discoloration on the extensor surface of the left elbow with no scaling or erythema.

macular area of brown discoloration along the extensor surfaces of each elbow without any erythema or scaling (Figure 2). No evidence of acanthosis nigricans was present in flexural areas. Results of a 4-mm punch biopsy on his left elbow



**Figure 3.** Papillomatosis with acanthosis, hyperkeratosis, and no significant inflammation (A)(H&E, original magnification ×40). Papillomatosis and hyperkeratosis are noted without keratinocyte atypia (B)(H&E, original magnification ×100).

revealed benign papillomatosis with acanthosis, hyperkeratosis, and no significant inflammation (Figure 3). Treatment was initiated with urea 40% cream twice a day for 3 to 4 months with gradual improvement of the discoloration leading to overall mild to moderate improvement.

*Patient 3*—A 32-year-old white woman presented with “dirty” brown discoloration of her elbows and knees of 7 years’ duration without associated pain or pruritus. She noted that the area on her knees appeared darker after several days of scrubbing the floors on her knees. Family history was positive for similar lesions on her father’s

elbows. There was no history of diabetes mellitus. Unsuccessful treatments included over-the-counter vitamin E lotion. Results of a physical examination revealed hyperpigmentation and lichenification with very mild scaling on the extensor surfaces of her knees (Figure 4) and elbows bilaterally. The changes were more pronounced on her knees than her elbows. There was no evidence of acanthosis nigricans in flexural areas. Results of a 4-mm punch biopsy on her right knee revealed benign papillomatosis with acanthosis and hyperkeratosis without any significant atypia, intradermal melanin deposition, or inflammation. She was



treated with urea 40% cream once a day and instructed to advance to twice-a-day treatment if tolerated. No improvement was noted after one month of treatment, and she refused further treatment suggestions.

**Patient 4**—A 68-year-old white man presented with asymptomatic brown discoloration of his elbows and knees bilaterally of 20 years' duration. He denied any known precipitating factors but stated that he worked on his elbows and knees a lot when gardening. There was no history of diabetes mellitus or obesity. Unsuccessful treatments included intermittent use of over-the-counter Udderly SMOOth® Udder Cream for 3 to 4 years without any noticeable improvement. Family history was significant for similar lesions on his son's knees. Results of a physical examination revealed mildly hyperpigmented erythematous patches bilaterally on the extensor surfaces of his knees (Figure 5) and, to a lesser degree, on his elbows without any scaling. No evidence of acanthosis nigricans was present in flexural areas. Treatment was initiated with lactic acid 12% cream twice a day. After 3 years of daily use, the brown discoloration improved by 75% to 80%.

### Comment

To our knowledge, this is the first report in the United States of FADES. "Dirty" brown discoloration is noted over the extensor surfaces in areas prone to frictional stress. Pain and pruritus are uniformly absent.

Biopsy results of these lesions reveal mild papillomatosis with acanthosis and hyperkeratosis, with minimal underlying inflammation (Figure 3). Melanin deposition in the dermis is not identified

as is commonly seen in postinflammatory hyperpigmentation (PIH). Spongiosis typical of eczema and psoriasiform hyperplasia typical of psoriasis are not present. We chose to use the word *darkening* in the name rather than *hyperpigmentation* because the color change in this condition is a result of



**Figure 4.** The brownish discoloration on the extensor surface of the right knee in this patient with frictional asymptomatic darkening of the extensor surfaces is easily distinguished from psoriasis and eczematous processes, which show more scaling and erythema.



**Figure 5.** Frictional asymptomatic darkening with symmetric erythematous patches on the extensors surfaces of the knees bilaterally with little scaling.

### Descriptive Clinical Data of 9 Cases of Frictional Asymptomatic Darkening of the Extensor Surfaces\*†

Case No.	Age, y (Sex)	Disease Duration, y	Site(s) Involved	Family History	History of Frictional Stress	Treatment	Treatment Response‡	Pathology
1	47 (F)	5	L knee, B elbows	No	Scrubs floors on knees	LA BID (3 mo)	3	None
2	58 (M)	40	B elbows	Mother and daughter	No	UC BID (3–4 mo)	2–3	Papillomatosis, acanthosis, hyperkeratosis, no inflammation
3	32 (F)	7	B knees, B elbows	Father	Scrubbing floors on knees	UC QD to BID (1 mo), OTC vitamin E lotion (occ)	1	Papillomatosis, acanthosis, hyperkeratosis, no inflammation
4	68 (M)	20	B elbows, B knees	Son	Gardening	LA BID (3 y), OTC Udderly SMOOth® Udder Cream (occ, 3–4 y)	3	None
5	56 (F)	10	B elbows	No	Leans on desk	LA BID (6 mo)	4	None
6	62 (F)	25	B elbows	No	No	LA BID to TID (6 mo)	3	Hyperkeratosis, sparse perivascular inflammation
7	65 (F)	15	B elbows	No	Leans on desk	UC BID (1 y), clobetasol cream BID (prn scaling), OTC moisturizers (15 y)	2–3	Hyperkeratosis, no inflammation
8	55 (M)	30–35	B elbows	Father and brother	More brown with friction	LA BID (2–3 mo)	3	Papillomatosis, acanthosis, hyperkeratosis, mild lentiginous melanocytic hyperplasia
9	45 (F)	5	B knees	No	Scrubbing deck on knees	LA BID (1 mo); use d/c d/t cost	1	None

\*F indicates female; M, male; L, left; B, bilateral; LA, lactic acid 12% cream; BID, twice a day; UC, urea 40% cream; QD, daily; OTC, over-the-counter; occ, occasional; TID, 3 times a day; prn, as needed for; d/c, discontinued; d/t, due to.

†None of the patients had diabetes mellitus, obesity, or a flexural rash, all of which are suggestive of acanthosis nigricans.

‡1 indicates no response; 2, mild improvement; 3, moderate improvement; 4, major improvement; 5, complete resolution.

papillomatosis, acanthosis, and hyperkeratosis rather than excess melanin pigment. The pathology also led us to use keratolytic agents as treatment rather than hydroquinone-based fade creams. In most cases of FADES, treatment with lactic acid 12% or urea 40% cream over 3 to 6 months is at least partially effective (Table).

A review of world literature reveals several cases that may be similar to FADES. In 1954, Ber<sup>7</sup> reported "dirty" brown patches of hyperkeratosis of the elbows and knees, which he named "the sign of dirty knees and elbows," as an early clinical sign of mild hypothyroidism in adults and children. No mention is made of frictional stress in these patients.<sup>7</sup> None of the patients we describe with FADES has a history of hypothyroidism.

There have been several reports of dermatoses secondary to occupational frictional stress. Wahlberg<sup>8</sup> described cases of asymptomatic hyperkeratosis on the dorsal hands and feet of Swedish carpet installers thought to be secondary to friction. Menne and Hjorth<sup>9</sup> described cases of red, scaly, vesicular, and pustular dermatoses on the palms and fingertips of workers handling pressure-sensitive carbonless paper in Denmark. The condition typically cured in a few weeks by avoidance of frictional trauma. Menne<sup>10</sup> also described a similar dermatitis on the palms of post office workers caused by prolonged rubbing against a rough plastic table.

Physicians in Jordan,<sup>11</sup> Mexico,<sup>12</sup> Iraq,<sup>13</sup> Japan,<sup>14-16</sup> and Italy<sup>17</sup> also described cases of skin darkening that they termed *friction melanosis*,<sup>11,12,14,16,17</sup> *friction dermal melanosis (lifa disease)*,<sup>13</sup> and *nylon clothes friction dermatoses*.<sup>15</sup> These patients presented with asymptomatic brownish patches over bony prominences that were associated with long-term rubbing with scrub pads (sedge pads,<sup>12</sup> lifas<sup>13</sup>), clothing,<sup>12</sup> nylon towels,<sup>14-16</sup> and horsehair gloves.<sup>17</sup> Most of these cases, however, occurred predominantly in young thin women and involved the skin overlying the clavicle, vertebra, lateral neck, and upper back. This differs from FADES, which appears to be equally prevalent among men and women, affects young to middle-aged adults of average body weight, and presents with discoloration of the extensor surfaces of the elbows and knees. Most significantly, results of histopathologic examinations in frictional melanosis demonstrate increased melanin deposition within the epidermis and dermal macrophages. Our patients with FADES failed to show evidence of an increase in dermal melanin pigment. This histologic difference might relate to the fact that friction more easily produces PIH in patients with

darker skin types in Jordan, Mexico, Iraq, Japan, and Italy.

Iwasaki et al<sup>18</sup> described a case of biphasic amyloidosis arising from friction melanosis in a Japanese woman with a history of long-term use of nylon towels. The brown asymptomatic hyperpigmentation on the woman's back, characteristic of friction melanosis, became gradually more itchy and associated with several small papules. The results of biopsy specimens taken from both the papular and macular pigmented lesions on her back revealed dermal amyloid deposits. It appears that amyloid deposits are produced by the same frictional stress that causes friction melanosis.<sup>18,19</sup> Our patients with FADES showed no evidence of amyloidosis.

Acanthosis nigricans involving the elbows, knees, and knuckle pads in patients with diabetes mellitus and obesity rarely has been described.<sup>20,21</sup> None of our FADES patients had a history of diabetes mellitus, obesity, or hyperpigmentation involving the neck or axilla, which are commonly involved in acanthosis nigricans.

FADES can be distinguished easily from conditions that produce brown discoloration, including lichen simplex chronicus, macular amyloidosis, terra firma-forme dermatosis, PIH, psoriasis, acanthosis nigricans and pseudoacanthosis nigricans, reticular and confluent papillomatosis of Gougerot and Carteaud, and X-linked ichthyosis.<sup>22</sup> Patients with lichen simplex chronicus<sup>23</sup> and macular amyloidosis<sup>24</sup> can be distinguished from patients with FADES because they have severe pruritus, xerosis, history of atopy, and specific distinguishing histopathologic changes. Terra firma-forme dermatosis is not caused by friction but is related to a buildup of dirt and scale in areas that are not scrubbed.<sup>25-27</sup> This condition is not found on the extensor surfaces, and the patches rub off with alcohol. PIH is caused by melanin deposition within melanophages in the papillary dermis rather than by the epidermal changes of FADES.<sup>28</sup> Psoriasis occurs on extensor surfaces but has thick, white, micaceous scaling and psoriasiform hyperplasia of the epidermis. Acanthosis nigricans and pseudoacanthosis nigricans involve flexural areas rather than the extensor surfaces.<sup>29</sup> Reticular and confluent papillomatosis of Gougerot and Carteaud involves the central upper back or chest rather than the extensor surfaces.<sup>30</sup> X-linked ichthyosis can be distinguished from FADES because it shows considerable scaling, involves the flexural surfaces of the extremities, occurs in young adulthood, and is restricted to men.

We believe FADES is a common condition that easily can be recognized and differentiated from other conditions with skin darkening. A biopsy

rarely is required. Treatment with keratolytic agents and avoidance of frictional stress are modestly effective in some cases.

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