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Inflammatory Linear Verrucous Epidermal Nevus

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Inflammatory linear verrucous epidermal nevus (ILVEN) is an unusual unilateral eruption with onset usually in infancy or childhood, female predominance, frequent left leg involvement, pruritus, refractoriness to therapy, and a psoriasiform histologic pattern. We review this disorder in describing a 5-year-old girl who also had melanodontia, an association not previously observed to our knowledge.

Inflammatory linear verrucous epidermal nevus (ILVEN) is a persistent linear dermatosis that is pruritic. It is usually first evident on a limb in early childhood. ILVEN begins as small discrete papules that are erythematous, slightly warty, and scaling. The papules tend to coalesce into linear plaques.[1] ILVEN was first mentioned by Unna[2] in 1896. There were scattered subsequent cases reported of linear verrucous epidermal nevi that were inflammatory and pruritic.[3,4] Then in 1971, Altman and Mehregan[1] first described and delineated ILVEN as a distinct entity in 25 patients. They considered it to be a clearly defined clinical and histopathologic variety of linear verrucous nevus that appeared inflammatory or psoriasiform.

We describe a 5-year-old girl with ILVEN and melanodontia. To our knowledge, this association has not been described previously. Melanodontia refers to dental discoloration that may be caused by extrinsic factors (smoking; foods and beverages [eg, tea]; and medications such as tetracyclines, iron, and chlorhexidine) or intrinsic factors such as seen in dentinogenesis imperfecta. In our patient, there was no history of tetracycline use by the child or by the mother during pregnancy or lactation. We discuss ILVEN, its associations, and the differential diagnosis of linear dermatoses in children.

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Case Report

A 5-year-old girl was seen with a 4-year history of linear pruritic plaques involving the left extremities. The plaques first appeared over the left lower limb at the age of 1 year. Lesions then extended to the left upper arm. She had no family history of similar dermatoses. Physical examination revealed multiple erythematous papules that were scaling, slightly verrucose, and arranged in linear bands over the anterior aspect of the lower left extremity (Figure 1) and over the upper left limb, extending from the axilla to the palm (Figure 2). There were areas of lichenification and excoriations. No other associated defects were found except melanodontia (Figure 3). There was no history of tetracycline use by the child or by the mother during pregnancy or lactation. Histologic examination of a biopsy specimen showed hyperkeratosis, marked parakeratosis, moderate acanthosis, and a decreased granular layer. A minimal perivascular inflammatory infiltrate consisting mostly of lymphocytes was evident in the upper dermis (Figure 4).

The pruritus was resistant to antihistamines. The plaques did not respond to various topical steroids, intralesional infiltration with triamcinolone acetonide, 4-(2-thiazolylazo) resorcinol, dithranol, local retinoids, or cryotherapy.

Comment

Although the clinical and histologic appearance of ILVEN may resemble linear psoriasis or linear lichen simplex chronicus, Altman and Mehregan[1] described 6 characteristic features of ILVEN and coined the name itself. The characteristics are early

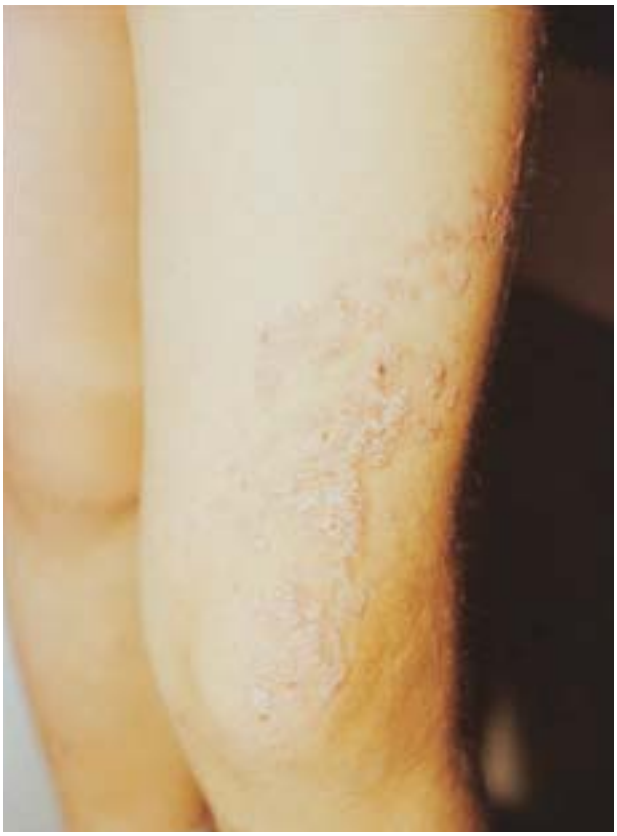

Figure 1. Bandlike configuration of papules following Blaschko lines on the lower left extremity.

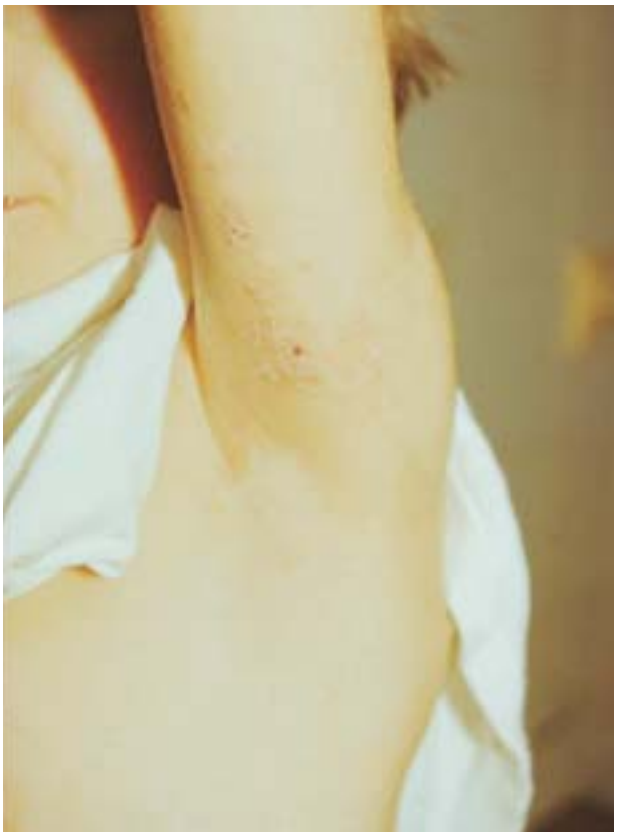

Figure 2. Inflammatory linear verrucous epidermal nevus on the arm.

age at onset, a predominance ratio in females of 4:1, frequent involvement of the left leg, pruritus, marked refractoriness to therapy, and a distinctive psoriasiform and inflammatory histologic appearance. Although the lesions may have been evident at birth, most appeared during infancy and childhood. Eighteen of their 25 cases (72%) were evident by 5 years of age, and 12 cases (48%) were evident by 6 months of age. Six patients (24%) developed the eruption between the ages of 10 and 20 years. In one patient, ILVEN first appeared at 49 years of age. There was a predominance of lesions on the left side of the body, particularly in the lower left extremity.[1]

Persistent small, pruritic, erythematous, scaling papules tend to coalesce to form linear plaques.[5,6] Results of a histologic examination demonstrate psoriasiform hyperplasia of the epidermis, alternating parakeratosis without a granular layer, and orthokeratosis with a thickened granular layer.[4-7] In 1989, Rogers et al[6] reported that 6% of 131 patients with epidermal nevi had ILVEN. Similar results were found by Su[8] in a series of 160 epidermal nevi examined histologically. The presence of ILVEN in a mother and daughter also has been observed.[9]

The association of ILVEN with musculoskeletal abnormalities has been observed in a few children, some of whom might be classified as having ILVEN as part of the epidermal nevus syndrome.[4-7,10-14] One infant girl had ILVEN with congenital dislocation of the ipsilateral hip and Fallot's tetralogy of the heart.[11] One child had congenital ILVEN and congenital bony anomalies of the ipsilateral extremities.[12] One 7-year-old girl was observed with ILVEN and ocular and bony changes, including supernumerary digits and strabismus.[14] In addition, nevus depigmentosus and ILVEN have been described together,[15] and this report describes the presence of ILVEN with melanodontia.

Therapy for ILVEN is difficult. ILVEN is typically resistant to topical and intralesional steroids, dithranol, topical retinoids, and cryosurgery.[1,5,7,16,17] ILVEN in one patient may have improved slightly with topical steroids and petrolatum containing salicylic acid.[16] However, topical calcipotriene, an effective treatment for psoriasis,[17] also may be effective for ILVEN. Unfortunately, this medication is

Figure not available online

Figure 3. Melanodontia.

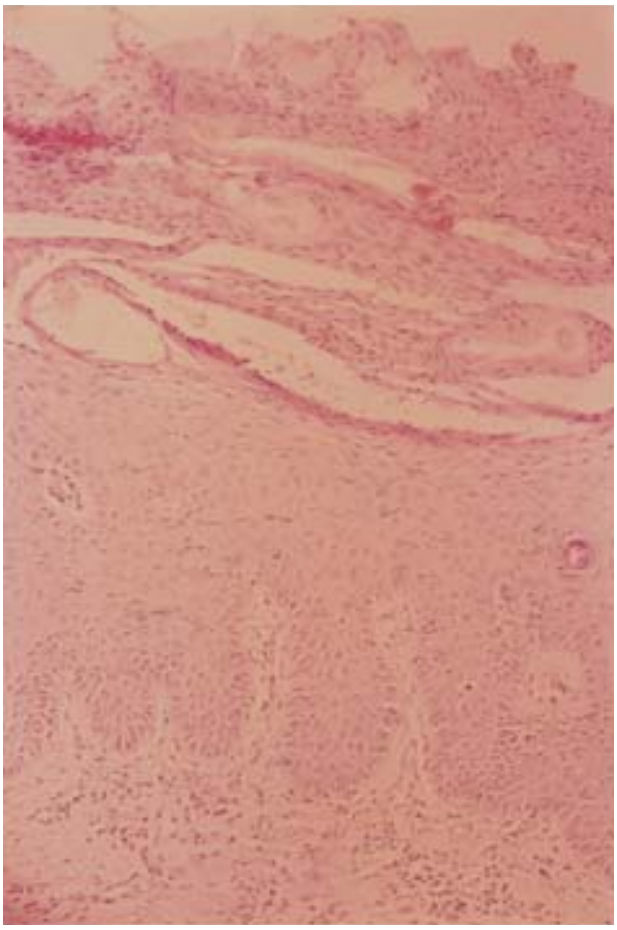

Figure 4. Histopathology shows hyperkeratosis, marked parakeratosis, a decreased granular layer, acanthosis, and a minimal perivascular inflammatory infiltrate in the upper dermis (H&E, original magnification ×100).

not approved in the United States for children younger than 12 years.

Differential diagnosis of ILVEN can be challenging. Linear psoriasis, an unusual type of psoriasis, shows papules in linear configuration and may represent a Köbner phenomenon.[6,7] Linear psoriasis as a true linear form distinct from ILVEN is based on reports of linear lesions developing later in life in patients with plaque-type psoriasis, congenital plaque-type psoriasis with subsequent linear distribution along the Blaschko lines, a different protein analysis, and a different pattern of epidermal keratin 16 and keratin 10 expression in ILVEN and psoriasis.[11,18-20] Adrian and Baden[11] performed polyacrylamide gel electrophoresis on the scale of ILVEN and demonstrated that its pattern could be distinguished from that of both normal stratum corneum and psoriatic scale. Extension of psoriasis into an epidermal nevus by the Köbner phenomenon has been described.[6,21,22] Patients may exhibit or develop typical lesions of psoriasis outside the linear area involved by the nevus. Although psoriasis and ILVEN are 2 distinct entities, they may share some common pathways in pathogenesis, probably mediated by interleukins 1 and 6, tumor necrosis factor α, and intercellular adhesion molecule-1.[23]

Linear epidermal nevi are commonly single and unilateral, demonstrating a striking linear distribution involving the buttock or hip with extension down the ipsilateral leg. They may be bilateral or evenly distributed over most of the body, often associated with abnormalities in other organ systems.[6] Clinically, there is no erythema or pruritus. The ichthyosiform nevus of CHILD syndrome may resemble ILVEN, but the former has yellowish waxy scaling and histologic features of a verruciform xanthoma.[10,24]

A variety of other linear eruptions may clinically resemble ILVEN. Their histologic findings, however, are usually specific enough to distinguish them. Both lichen striatus and ILVEN are conditions that tend to affect children rather than adults.[25] Clinically, lichen striatus consists of discrete erythematous, scaly, flat-topped papules on one of the extremities. Lesions are usually asymptomatic, and pruritus is a rare complaint.[8] The eruption appears suddenly, with spontaneous regression within one year. Linear lichen planus is a rare clinical variant. It usually affects children in whom the characteristic

discrete pruritic, polygonal, violaceous papules are arranged in a linear fashion, usually extending along an entire limb.[26] Linear porokeratosis is a rare type of porokeratosis that occurs predominantly during childhood. Clinically, there are small, ringlike, hypertrophic verrucous plaques with linear morphology appearing most commonly over a single extremity.[27,28] Other linear eruptions to be considered include linear lichen simplex chronicus, linear keratosis follicularis, linear lichen nitidus, and linear human papillomavirus–induced warts.

REFERENCES

1. Altman J, Mehregan AH. Inflammatory linear verrucose epidermal nevus. *Arch Dermatol.* 1971;104:385-389.
2. Unna PG. *The Histopathology of the Diseases of the Skin*. New York, NY: Macmillan Co; 1896:1148.
3. May SB. Epithelial nevus with marked pruritus. *Arch Dermatol.* 1961;83:340-341.
4. Schwartz RA, Jozwiak S. Epidermal nevus syndrome. *eMedicine* [serial online]. 2001;2(9). Available at: http://author.emedicine.com/derm/topic732.htm. Accessed October 2, 2001.
5. Zgrzyblowski A, Ryc K, Paradecki W. Inflammatory linear verrucose epidermal naevus—ILVEN. *Przegl Dermatol.* 1988;75:46-49.
6. Rogers M, McCrossin I, Commens C. Epidermal nevi and the epidermal nevus syndrome: a review of 131 cases. *J Am Acad Dermatol.* 1989;20:476-488.
7. Morag C, Metzker A. Inflammatory linear verrucose epidermal nevus: report of seven cases and review of the literature. *Pediatric Dermatol.* 1985;3:15-18.
8. Su WPD. Histologic varieties of epidermal nevus: a study of 160 cases. *Am J Dermatopathol.* 1982;4:161-170.
9. Hamm H, Happle R. Inflammatory linear verrucose epidermal nevus (ILVEN) in a mother and her daughter. *Am J Med Genet.* 1986;24:685-690.
10. Happle R. How many epidermal nevus syndromes exist? a clinicogenetic classification. *J Am Acad Dermatol.* 1991;25:550-556.
11. Adrian RM, Baden HP. Analysis of epidermal fibrous proteins in inflammatory linear verrucous nevus. *Arch Dermatol.* 1980;116:1179-1180.
12. Golitz LE, Weston WL. Inflammatory linear verrucous epidermal nevus: association with epidermal nevus syndrome. *Arch Dermatol.* 1979;115:1208-1209.
13. Baden HP, Rex IH Jr. Linear ichthyosis associated with skeletal abnormalitis? new entity. *Arch Dermatol.* 1970;102:126-128.
14. Dupré A, Christol B, Vialars ML. Naevus épidermique verruquex inflammatoire linéaire (N.E.V.I.L.): dermatose lichénoïde d'allure naevique, en plaques et en bandes prurigineuses (Boulle, Hewitt, Mme Boulle): ses relations avec le syndrome du naevus épidermique de Solomon. *Ann Dermatol Syphiligr (Paris).* 1973;100:261-274.
15. Ogunbiyi AO, Ogunbiyi JO. Nevus depigmentosus and inflammatory linear epidermal nevus—an unusual combination with a note on histology. *Int J Dermatol.* 1998;37:600-602.
16. Kawaguchi B, Takeuchi M, Ono H, et al. Adult onset of inflammatory linear verrucous epidermal nevus. *J Dermatol.* 1999;26:599-602.
17. Zvulunov A, Grunwald M, Halvy S. Topical calcipotriol for treatment of inflammatory linear verrucous epidermal nevus. *Arch Dermatol.* 1997;133:567-568.
18. Al-Fouzan AS, Hassab-El-Naby HMM, Nanda A. Congenital linear psoriasis: a case report. *Pediatric Dermatol.* 1990;7:303-306.
19. Bernhard JD, Owen WR, Steinman HK, et al. Inflammatory linear verrucose epidermal nevus: epidermal protein analysis in four patients. *Arch Dermatol.* 1984;120:214-215.
20. de Jong E, Rulo HF, van de Kerkhof PC. Inflammatory linear verrucose nevus (ILVEN) versus linear psoriasis. *Acta Derm Venerol.* 1991;71:343-346.
21. Bondi EE. Psoriasis overlying an epidermal nevus. *Arch Dermatol.* 1979;115:624.
22. Thivolet J, Goujon C. Linear psoriasis and systematized epidermolytic nevus. *Arch Dermatol.* 1982;118:285-286.
23. Welch ML, Smith KJ, Skelton HG, et al. Immunohistochemical features in inflammatory linear verrucous epidermal nevi suggest a distinctive pattern of clonal dysregulation of growth. *J Am Acad Dermatol.* 1993;29:242-248.
24. Fink-Puches R, Soyer H, Pierer G, et al. Systematized inflammatory epidermal nevus with symmetrical involvement: an unusual case of CHILD syndrome? *J Am Acad Dermatol.* 1997;36:823-826.
25. Taieb A, el Youbi A, Grosshans E, et al. Lichen striatus: a Blaschko linear acquired inflammatory skin eruption. *J Am Acad Dermatol.*1991;25:637-642.
26. Brownstein MH, Silverstein L, Lefing W. Lichenoid epidermal nevus: "linear lichen planus". *J Am Acad Dermatol.* 1989;20:913-915.
27. Rahbari H, Cordero AA, Mehregan AH. Linear porokeratosis: a distinctive clinical variant of porokeratosis of Mibelli. *Arch Dermatol.* 1974;109:526-528.
28. Jurecka W, Neumann RA, Knobler RK. Porokeratoses: immunohistochemical, light and electron microscopic evaluation. *J Am Acad Dermatol.* 1991;24:96-101.