

# Sporadic Congenital Leukonychia With Partial Phenotype Expression

Patrick J. Brown, MD, Charlottesville, Virginia

Julia K. Padgett, MD, Charlottesville, Virginia

Joseph C. English III, MD, Charlottesville, Virginia

## GOAL

To describe the characteristics and inheritance pattern of a case of congenital leukonychia.

## OBJECTIVES

1. To describe the etiologies of congenital and acquired leukonychia.
2. To discuss the differential diagnosis of leukonychia.
3. To outline inheritance patterns associated with leukonychia.

**CME** Test on page 124

This article has been reviewed by Michael Fisher, MD, Professor of Dermatology, Albert Einstein College of Medicine, in July 2000.

*Congenital total leukonychia is an autosomal dominantly inherited condition that manifests as complete whitening of both fingernails and toenails. A case of a sporadic congenital leukonychia with partial phenotypic expression is described and leukonychia is discussed.*

**L**eukonychia is defined as the whitening of the nail plate.<sup>1</sup> The disorder is classified as congenital or acquired, with total, partial, punctate, or striate forms. Congenital leukonychia is predominantly autosomal dominantly inherited, however other modes of inheritance have been suggested.<sup>2</sup> We report a case of a sporadic-appearing congenital leukonychia with partial phenotypic expression with no previous family history and review this topic.

## Case Report

A 12-year-old boy presented to the dermatology clinic for evaluation of white fingernails (Figures 1 and 2).

According to the patient's mother, the child had had this condition since birth but had become more self-conscious of his fingernails in the preceding months. He had never complained of any pain or decreased sensation in his nails or fingertips. The nail color was consistently white in his second, third, and fourth fingers on both hands since birth. The nails of his thumb and fifth finger on both his right and left hand alternated in color, such that at times the thumb would be white and the fifth finger pink and vice versa. This variability was not affected by temperature, activity, or stress, and he denied any specific trauma to his nails or fingers. He had no systemic complaints and is an otherwise healthy boy. His past medical history was significant for some minor delay in losing his deciduous teeth, but he had no specific problem with dental caries, hair growth, short stature, poor weight gain, or academic and social development. His family history was positive only for insulin-dependent diabetes mellitus in his father. There is no family history of nail discoloration in either his parents or grandparents. The patient is an only child. On physical examination, the patient was well grown with no obvious abnormalities besides his fingernails, which were white on both hands with the exception of some brownish linear distal streaks, suggestive of an ex-

---

From the University of Virginia, Departments of Pediatrics (Dr. Brown) and Dermatology (Dr. Padgett and Dr. English), Charlottesville, Virginia.

REPRINT REQUESTS to Assistant Professor of Dermatology, University of Virginia, Department of Dermatology, Box 800718, Lee Street, Charlottesville, VA 22908-0718 (Dr. English).



**FIGURE 1.** A 12-year-old Caucasian male with congenital leukonychia. The toenails were not affected.



**FIGURE 2.** Congenital leukonychia. The exogenous pigmentation was undetermined.

ogenous source to this change. Questioning failed to yield a specific agent. The nails were normal with respect to shape, texture, and hardness. At the time of our examination, both of his thumbnails were pink and blanched with pressure. His toenails were uniformly pink bilaterally. There were no punctate or striated regions appreciated. There was no nailfold telangiectasis. The child was diagnosed with a sporadic case of congenital leukonychia.

### Discussion

Leukonychia is the most common chromatic abnormality of the nail.<sup>2</sup> The condition may be congenital or acquired; may be total, punctate, striate, or partial; and may be associated with systemic illness or exist as an isolated finding in an otherwise healthy individual. True leukonychia results from a structural abnormality of the nail plate.<sup>3</sup> It is thought to be due to a defect in keratinization of cells of the nail plate so that immature, large nucleated cells containing keratohyaline are present throughout the entire length of the nail.<sup>4</sup> The keratohyaline-containing cells reflect light, resulting in a white nail that prevents visualization of the underlying pink vascular bed. The shape, texture, and hardness of the nail plate are otherwise normal.

Acquired leukonychia is fairly common and usually manifests as punctate lesions or transverse striae. The acquired form may arise after local trauma or in association with a wide range of systemic conditions, including epidermoid cysts and renal calculi,<sup>5</sup> pili torti,<sup>6</sup> knuckle pads, palmoplantar keratosis, sensorineural deafness,<sup>7</sup> cholelithiasis, duodenal ulcer disease, LEOPARD syndrome, mental retardation, koilonychia, and renal insufficiency.<sup>8</sup>

The differential diagnosis of acquired leukonychia includes: Mees' lines, Muehrcke's lines, Terry's nails,

and exogenous chemicals. Mees' lines (white transverse bands originating in the nail matrix) may be seen classically with arsenic poisoning; however, they have also been reported with the use of chemotherapeutic agents and in patients with Hodgkin's disease, myocardial infarction, parasitic infections, and carbon monoxide poisoning.<sup>8</sup> Muehrcke's lines are an abnormality of the nail vascular bed associated with hypoalbuminemia, which typically disappear when the underlying problem is corrected.<sup>8</sup> Acquired leukonychia has also been observed with cirrhosis of the liver (Terry's nails),<sup>9</sup> ulcerative colitis, anemia, and leprosy.<sup>2</sup> Exogenous causes of leukonychia include direct contact with nitric acid, nitrite solution, or concentrated sodium chloride.<sup>3</sup>

The congenital form of leukonychia has been observed to have an autosomal dominant pattern of inheritance with variable expression.<sup>10,11</sup> There have been reported cases of total leukonychia in a mother and partial leukonychia in her daughter, as well as a patient with leukonychia who experienced documented periods of total and partial involvement.<sup>11</sup> Autosomal recessive inheritance of leukonychia has been suggested in the study of two siblings with leukonychia born to unaffected consanguineous parents, although a parental somatic mutation with gonadal mosaicism was also considered as a possible etiology for this event.<sup>12</sup>

In the case presented here, an apparently new phenotype has been expressed as a novel event in this child's pedigree. The phenotype is total in three fingernails of each hand and variable in the nails of the thumb and fifth finger. This phenotype might be explained as either a sporadic germ line mutation of an autosomal dominant condition or, less likely, as an expression of a somatic mosaic mutation that may or may not have germ cell involvement. No treatment is indicated or available for this benign condition. Cosmetic concerns can be reduced with nail polish.

Genetic mosaicism is a condition seen in individuals who have a mixture of genetically distinct cell populations. These patterns are believed to be caused by the clonal proliferation of two genetically distinct groups of cells that arise from a postzygotic mutation during embryogenesis.<sup>13</sup> The process of genetic mosaicism has been invoked as an explanation for the occurrence of many skin diseases that have a typically mosaic pattern (*ie*, regions of normal skin appearing side-by-side with regions of disease). Mosaicism is most often attributed to defects of X-linked disorders, but may also occur in autosomal dominant conditions. Examples include Darier's disease,<sup>14</sup> neurofibromatosis type 2,<sup>15</sup> syringomas,<sup>16</sup> trichoepithelioma,<sup>17</sup> epidermolytic hyperkeratosis of Brocq,<sup>18</sup> and McCune-Albright syndrome.<sup>19</sup>

## REFERENCES

1. Scher RK, Daniel III CR: Nails: Therapy, Diagnosis, Surgery. WB Saunders Co., Philadelphia, 1990.
2. Stevens KR, Leis PF, Peters S, Baer S, Orengo I: Congenital leukonychia. *J Am Acad Dermatol* 39: 509-512, 1998.
3. Zaun H: Leukonychias. *Semin Dermatol* 10: 17-20, 1991.
4. Kates SL, Harris GD, Nagle DJ: Leukonychia totalis. *J Hand Surg* 11: 465-466, 1986.
5. Bushkell LL, Gorlin RJ: Leukonychia totalis, multiple sebaceous cysts, and renal calculi. *Arch Dermatol* 111: 899-901, 1975.
6. Giustina TA, Woo TY, Campbell JP, Ellis CN: Association of pili torti and leukonychia. *Cutis* 35: 533-534, 1985.
7. Bart RS, Pumphrey RE: Knuckle pads, leukonychia and deafness. *N Engl J Med* 276: 202-207, 1967.
8. Hepburn MJ, English JC III, Meffert JJ: Mee's lines in a patient with multiple parasitic infections. *Cutis* 59: 321-323, 1997.
9. Terry R: White nails in hepatic cirrhosis. *Lancet* 1: 757-759, 1954.
10. Albright SD, Wheeler CE: Leukonychia. *Arch Dermatol* 90: 392-399, 1964.
11. Grossman M, Scher RK: Leukonychia. *Int J Dermatol* 29: 535-541, 1990.
12. Frydman M, Cohen HA: Leukonychia totalis in two sibs. *Am J Med Genet* 47: 540-541, 1993.
13. Happle R: Mosaicism in human skin: understanding the patterns and mechanisms. *Arch Dermatol* 129: 1460-1470, 1993.
14. O'Malley MP, Haake A, Goldsmith L, Berg D: Localized Darier disease: implications for genetic studies. *Arch Dermatol* 133: 1134-1138, 1997.
15. Hager CM, Cohen PR, Tschien JA: Segmental neurofibromatosis: case reports and review. *J Am Acad Dermatol* 37: 864-869, 1997.
16. Wilms NA, Douglass MC: An unusual case of preponderantly right-sided syringomas. *Arch Dermatol* 117: 308, 1981.
17. Oh DH, Lane AT, Turk AE, Kohler S: A young boy with large hemifacial plaque with histopathologic features of trichoepithelioma. *J Am Acad Dermatol* 37: 881-883, 1997.
18. Paller AS, Syder AJ, Chan Y, *et al*: Genetic and clinical mosaicism in a type of epidermal nevus. *N Engl J Med* 331: 1408-1415, 1994.
19. Rieger E, Kofler R, Borkenstein M, Schwingshandl J, Soyer HP, *et al*: Melanotic macules following Blaschko's lines in McCune-Albright syndrome. *Br J Dermatol* 130: 215-220, 1994.

### FACULTY DISCLOSURE

The Faculty Disclosure Policy of the College of Medicine requires that faculty participating in a CME activity disclose to the audience any relationship with a pharmaceutical or equipment company that might pose a potential, apparent, or real conflict of interest with regard to their contribution to the program. Dr. Brown, Dr. Padgett, and Dr. English report no conflict of interest. Dr. Fisher reports no conflict of interest.