

## An 8-year-old Girl with Multiple Whitish Dots on the Hair Shaft: A Quiz

Jiamin XU, Yanjun TANG, Xiqing LI and Fengjie LIU\* 

Department of Dermatology, Sun Yat-sen Memorial Hospital, Sun Yat-sen University, Guangzhou, China. \*Email: liufengjie119@163.com

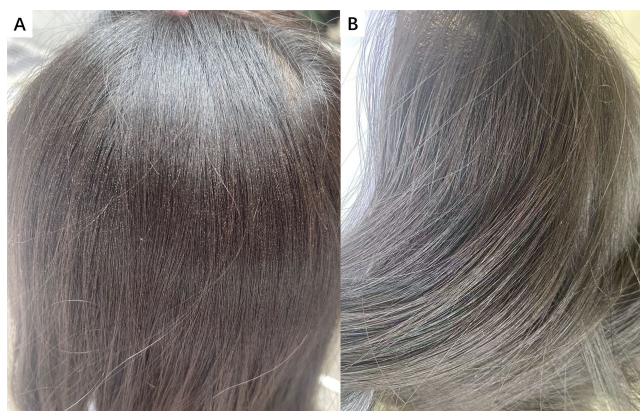
An 8-year-old girl was referred to our dermatology clinic with a 6-year history of multiple whitish dots on her scalp hair. The hair was slightly coarse, but she reported no significant fragility, breakage or associated symptoms such as pruritus or pain. She denied any history of hair dyeing, chemical exposure or traumatic hair handling. Her medical history was unremarkable, with no evidence of systemic disease. Notably, her younger sister exhibited identical hair abnormalities. Physical examination of the patient and her sister revealed scalp hair shafts with a characteristic banded appearance: alternating segments of normal black colour and small white-grey spots (Fig. 1). Hair tensile strength was preserved, and only a few broken hairs were elicited on gentle pull testing. No additional abnormalities involving other hair, skin or mucous membranes were detected.

The dermoscopic examination revealed prominent alternating black and white striped texture with multiple white nodes on the hair shafts, resembling a “zebra stripe” pattern (Fig. 2A). This appearance was more conspicuous under ultraviolet dermoscopy (Fig.

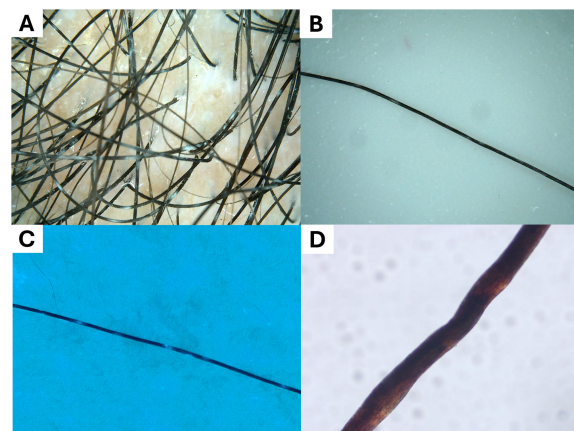
2B–C). Light microscopy revealed lighter and darker areas in the hair shafts, with an air-filled dark space or cavity in the bright bands or white-grey beads on the hair shaft (Fig. 2D). A scanning electron microscope showed surface undulations with “curtain-like” folding of the hair cuticle (Fig. 3A). A transmission electron microscopy from affected hair shafts showed the emergence of numerous cavities in the cortex, partial loss of cuticle and mild indentation on the surface of damaged hair (Fig. 3B).

*What is your diagnosis?*

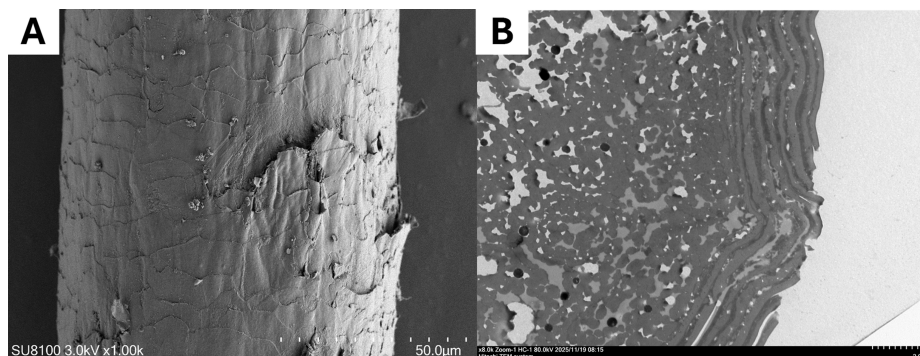
1. Pili annulati
  2. Pseudopili annulati
  3. Monilethrix
  4. Trichorrhexis nodosa.
- See next page for answer.



**Fig. 1.** Regular alternating bright light and dark bands on the hair shafts of the patient (A) and her sister (B).



**Fig. 2.** (A) Alternating dark and bright bands on the hair shafts, like “zebra stripe”, appeared on the dermoscopic examination (X50); images of the hair under conventional light (B) and ultraviolet (C) dermoscopic examination (X10); (D) periodic air-filled dark bands in the hair shaft under light microscopy (X100).



**Fig. 3.** (A) Scanning electron microscopy with “curtain-like” folding of the cuticle (X1,000); (B) transmission electron microscopy from affected hair shafts – with the emergence of numerous cavities in the cortex, partial loss of cuticle, and mild indentation on the surface of damaged hair (X8,000).

## ANSWERS TO QUIZ

**An 8-year-old Girl with Multiple Whitish Dots on the Hair Shaft: A Commentary**

*Acta Derm Venereol* 2026; 106: adv-2026-0421.  
DOI: 10.2340/actadv.v106.adv-2026-0421

**Diagnosis: Pili Annulati (PA).**

PA, also known as ringed hair, is a rare hereditary structural disorder of the hair shaft that was first documented by Landois in 1866. Its hallmark is alternating light-dark “zebra-stripe” bands on the hair shaft, mostly present at birth/infancy but occasionally detected in adolescence/adulthood (1). Most patients have normal hair tensile strength, though rare cases involve dryness with split ends, fragility and breakage (1, 2). Interestingly, the prevalence of alopecia areata (AA) among patients with PA is approximately 9%, which is significantly higher than the 1–2% reported in the general population (3), indicating a notable co-occurrence of the 2 conditions. However, the association between PA and AA remains controversial. Accumulating evidence favours a coincidental rather than causal relationship, supported by no shared genetic susceptibility loci and rare familial clustering of dual-affected individuals (3, 4). Additionally, PA may coexist with other autoimmune disorders, such as autoimmune thyroid disease and primary IgA deficiency (1–4), suggesting overlapping immune susceptibility in affected individuals.

Usually, the diagnosis of PA relies on multimodal imaging: dermoscopy reveals “zebra-stripe” alternating black and white band patterns; light microscopy shows air-filled cavity-induced light-dark bands (disappearing in 10% KOH); scanning electron microscopy exhibits irregular ridging and grooving, presenting distinctive “curtain-like/cobblestone-like” changes on the hair shaft; transmission electron microscopy identifies numerous air-filled cavities of varying sizes within the cortical layer. Additionally, the cortical dark bands, which reflect the organized arrangement of protein fibres in normal hair, display a disorganized, “wood-grain-like” pattern in PA (5). Based on these findings, a diagnosis of PA was made in our case.

The differential diagnosis of pili annulati (PA) primarily encompasses several clinically similar hair shaft disorders. Key conditions to be distinguished include pseudopili annulati, which is characterized by periodic twisting of the hair shaft or an elliptical cross-section, rather than the true cortical cavities seen in PA (6). Another important differential diagnosis is monilethrix, a genetic hair disorder presenting with a periodic beaded appearance, featuring alternating elliptical nodes and constrictions along the hair fibre, typically caused by pathogenic mutations in keratin genes, such as *KRT81*, *KRT83* or *KRT86*. Additionally, trichorrhexis nodosa should also be considered, which manifests as localized fracture sites on the hair shaft with a distinctive “double-brush” appearance under microscopic examination (7). These disorders may share some overlapping clinical features with PA, but can

be differentiated based on their specific morphological characteristics and underlying aetiologies.

The precise mechanism underlying the formation of air-filled cavities in PA has not yet been fully elucidated. To date, several major hypotheses have been proposed to explain this pathological change. Genetic mapping studies have localized the PA-associated locus to chromosome 12q24.32–24.33, yet the underlying candidate genes remain to be identified (8). Abnormal assembly or remodelling of the basement membrane zone has been observed in hair follicles of PA patients, which may be due to the genetic defect in proteins involved in signalling and regulation of formation and degradation of the lamina densa and sublamina densa region (9). Moreover, alterations in amino acid composition – decreased cystine and elevated lysine content – may serve as part of the underlying pathogenic process (1).

Currently, PA patients usually show excellent prognosis and management focuses on symptomatic support and care, such as avoiding chemical hair treatments, perming, dyeing and excessive mechanical trauma, as well as encouraging the use of wide-tooth combs to reduce physical stress on the hair shaft. Notably, topical 2% minoxidil has been reported to be effective in patients with concomitant AA (10). In the present case, no specific pharmacological interventions were administered and the patient received detailed instructions on daily hair care, including avoidance of perming and dyeing, and gentle combing with a wide-tooth comb. At the 6-month telephone follow-up, the patient’s guardians reported no obvious changes in the whitish dotted appearance of the hair shafts compared with the initial presentation. Clinicians should enhance their recognition of PA to avoid misdiagnosis and provide appropriate genetic counselling and long-term management recommendations to affected individuals and their families. Future research should prioritize identifying pathogenic genes and mechanisms. Optimizing non-invasive diagnostics (e.g. ultraviolet-enhanced trichoscopy) is crucial for early accurate diagnosis, especially in dark-haired individuals in whom typical morphological features may be subtle or obscured.

## REFERENCES

- Giehl KA, Ferguson DJP, Dawber RPR, Pittelkow MR, Foehles J, de Berker DAR. Update on detection, morphology and fragility in pili annulati in three kindreds. *J Eur Acad Dermatol Venereol* 2004; 18: 654–658. <https://doi.org/10.1111/j.1468-3083.2004.01036.x>
- Nam CH, Park M, Choi MS, Hong SP, Kim MH, Park BC. Pili annulati with multiple fragile hairs. *Ann Dermatol* 2017; 29: 254–256. <https://doi.org/10.5021/ad.2017.29.2.254>
- Giehl KA, Schmuth M, Tosti A, De Berker DA, Crispin A, Wolff H, et al. Concomitant manifestation of pili annulati and alopecia areata: Coincidental rather than true association. *Acta Derm Venereol* 2011; 91: 459–462. <https://doi.org/10.2340/00015555-1088>
- Castelli E, Fiorella S, Caputo V. Pili annulati coincident with alopecia areata, autoimmune thyroid disease, and primary IgA

deficiency: Case report and considerations on the literature. *Case Rep Dermatol* 2012; 4: 250–255. <https://doi.org/10.1159/000345469>

5. Chen S, Yang X, Lu Z. Pili annulati under the electron microscope: A case report and literature review. *Clin Exp Dermatol* 2025; 50: 424–425. <https://doi.org/10.1093/ced/llae365>
6. Lee SS, Lee YS, Giam YC. Pseudopili annulati in a dark-haired individual: A light and electron microscopic study. *Pediatr Dermatol* 2001; 18: 27–30. <https://doi.org/10.1046/j.1525-1470.2001.018001027.x>
7. Ahmed A, Almohanna H, Griggs J, Tosti A. Genetic hair disorders: A review. *Dermatol Ther (Heidelb)* 2019; 9: 421–448. <https://doi.org/10.1007/s13555-019-0313-2>
8. Giehl KA, Rogers MA, Radivojkov M, Tosti A, de Berker DAR, Weinlich G, et al. Pili annulati: refinement of the locus on chromosome 12q24.33 to a 2.9-Mb interval and candidate gene analysis. *Br J Dermatol* 2009; 160: 527–533. <https://doi.org/10.1111/j.1365-2133.2008.08948.x>
9. Giehl KA, Ferguson DJP, Dean D, Chuang YH, Allen J, Berker DARD, et al. Alterations in the basement membrane zone in pili annulati hair follicles as demonstrated by electron microscopy and immunohistochemistry. *Br J Dermatol* 2004; 150: 722–727. <https://doi.org/10.1111/j.0007-0963.2004.05837.x>
10. Singh G, Miteva M. Prognosis and management of congenital hair shaft disorders without fragility-part II. *Pediatr Dermatol* 2016; 33: 481–487. <https://doi.org/10.1111/pde.12902>