Novel nicastrin mutation in hidradenitis suppurativa–Dowling–Degos disease clinical phenotype: more than just clinical overlap?

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Dear Editor, In familial hidradenitis suppurativa (HS), mutations in the genes encoding three subunits of the gamma secretase complex, presenilin-1 (PSEN1), presenilin enhancer (PSENEN) and nicastrin (NCSTN), have pointed to impaired Notch signalling as a pathogenic disease mechanism.1 Dowling–Degos disease (DDD; MIM 179850, 615327 and 615696), a rare reticulated pigmentary disorder, has also been associated with deficient Notch signalling, and patients with mutations in PSENEN suffering from both HS and DDD seem to confirm a potential link between two apparently different conditions.2,3 However, why mutations in PSENEN cause DDD, HS or the combined HS-DDD phenotype, and why mutations in NCSTN have never been associated to DDD, is not yet understood. In this study, we describe a patient with familial HS and concomitant DDD harbouring a novel nonsense mutation in NCSTN associated with a reduced number of critical subunits of gamma secretase.

A 54-year-old male patient, with a diagnosis of HS and Hurley stage II disease, was examined for recurrent inflammatory lesions affecting the inguinal and genital regions. He reported a family history of HS (father and daughter). In addition, physical examination showed a typical reticulated flexural pigmentation, localized on the scrotum and inguinal crease (Figure 1a).

![Figure 1](image_url)

**Figure 1** (a) Dowling–Degos disease (DDD): flexural reticulate hyperpigmentation with representative dermoscopy and histology. (b) Family pedigree of the proband. (c) Chromatograms of the heterozygous single-nucleotide variation in the nicastrin gene (NCSTN) exon 15 encoding a premature stop codon identified in the proband (Patient 1) and hidradenitis suppurativa (HS)-affected daughter (Patient 2), absent in the clinically healthy son. (d) Western blot analysis of three independent cultures of outer root sheath (ORS) cells isolated from the proband with HS and DDD and his healthy son. Passage 1 ORS cells were seeded in a six-well plate, grown to confluence and proteins extracted in radioimmunoprecipitation assay buffer. Gamma secretase protein expression was studied with antibodies against NCSTN (clone 716910), PEN2 (D6G8), PSEN2 (D30G3) and PSEN1 N-terminal fragment (N-ter; E3L9X) and C-terminal fragment (C-ter; D39D1). Beta-actin was used as loading control. Results from the three experiments were pooled and their distribution compared using an unpaired t-test. m, mature; im, immature. *P < 0.05; **P < 0.01; ***P < 0.001.
Histopathological examination of lesional skin confirmed diagnosis of classic DDD. Onset of HS lesions was reported at the age of 25 years, while first signs of flexural hyperpigmentation were reported at the age of 40 years. The patient never smoked, had a normal body mass index, and no other comorbidities.

Patient DNA was extracted from saliva. We sequenced, with the Sanger method, using exon-flanking intronic primers, all coding regions of genes associated to DDD: KRT5 (nine exons), POGLUT1 (11 exons), POFUT1 (seven exons) and PSENEN (four exons). We identified only two missense single-nucleotide variations in KRT5, both reported as benign in ClinVar (National Institutes of Health, Bethesda, MD, USA).

As the proband suffered from HS, we sequenced the coding region of NCSTN (17 exons) and detected a single-nucleotide variation in NCSTN exon 15 (NM_015331:2.c:1747C>T), encoding a premature stop codon [NP_056146:1.p.(R583*)] (Figure 1c, d). This genetic variant was not present in the Genome Aggregation Database (gnomAD) v.2.1.2

We have further expanded the spectrum of the combined HS-DDD phenotype, reporting the novel role of NCSTN and genetic overlap of HS-DDD may also have a clinical relevance, translating into a personalized therapeutic management, such as the combination of retinoids and sulfones.8

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