Dermatology Practical & Conceptual

Applying RCM-Based Criteria to LC-OCT for Classifying Mucosal Melanoses: A Proof-of-Concept Study

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Key words: Line-field confocal optical coherence tomography, Microscopy, Confocal [MeSH], mucosal melanoma, melanoses [MeSH]

Citation: Piscazzi F, Ardigò M, Suppa M, Malvehy J, Puig S, Perez-Anker J. Applying RCM-Based Criteria to LC-OCT for Classifying Mucosal Melanoses: A Proof-of-Concept Study. *Dermatol Pract Concept*. 2026;16(2):6544. DOI: https://doi.org/10.5826/dpc.1602a6544

Accepted: September 2, 2025; **Published:** April 2026

Funding: The research at the Melanoma Unit in Hospital Clinic of Barcelona is partially financed by grants PI22/01457 and grant PI23/0692, from Fondo de Investigaciones Sanitarias (Spain), by the CIBERER of the Instituto de Salud Carlos III, Spain, co-funded by ISCIII- Subdireccion General de Evaluacion and European Regional Development Fund (ERDF), "a way to make Europe"; AGAUR 2017_SGR_1134 and CERCA Programme by Generalitat de Catalunya, Spain; European Commission under the 6th Framework Programme, Contract No. LSHC-CT-2006-018702 (GenoMEL), by the European Commission under the 7th Framework Programme, Diagnostics, and the European Commision under the HORIZON2020 Framework Programme, iTobos grant CE_H2020-SC1_20_2s04, Qualitop grant CE_H2020-SC1_19_1s24, MELCAYA grant CE_HE_CANCER21_RIA; The National Cancer Institute (NCI) of the US National Institute of Health (NIH) (CA83115); a grant from "Fundació La Marató de TV3" 718/C/2019, Catalonia, Spain; and a grant from "Fundación Científica de la Asociación Española Contra el Cáncer" GCB15152978SOEN, Spain.

Competing Interests: JM and SP are co-founders of Diagnosis Dermatologica and Athena Care and investors in Dermavision. JM received honorarium from Canfield Scientific for consultancy and Fotofinder for educational activities. DAMAE provide resources to perform research studies at the Dermatology Department at Hospital Clínic Barcelona.

Authorship: All authors have contributed significantly to this publication.

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Introduction

The classification of pigmented mucosal lesions using clinical and dermoscopic images remains a significant diagnostic challenge [1,2]. Mucosal melanoses can clinically and dermoscopically mimic mucosal melanoma [3], making differential diagnosis particularly difficult when relying solely on dermoscopy. A novel reflectance confocal microscopy (RCM) classification has recently been proposed, dividing mucosal melanoses into three distinct types with prognostic

relevance [4]. In this proof-of-concept report, it is proposed that these RCM-based criteria may also be applied to line-field confocal optical coherence tomography (LC-OCT).

Cases Presentation

Four representative cases were analyzed. In case one, a 65-year-old female presented with stable melanosis of the labia minora, consistent with type I melanosis, defined by rimmed papillae without dendritic cells. LC-OCT demonstrated homogeneous hyper-reflective cells in the basal epithelial layers. In the second case, a 68-year-old female exhibited stable pigmentation on the lower lip, corresponding to type II melanosis, characterized by rimmed papillae and dendritic cells. LC-OCT clearly identified dendritic hyper-reflective cells interspersed among pigmented keratinocytes, particularly evident in vertical imaging due to superior lateral resolution (1.1 µm vs. 1.3 µm horizontally) [5].

The third case involved a 49-year-old female with stable vulvar pigmentation matching type III melanosis, characterized by partially rimmed papillae and significant dendritic cell infiltration disrupting the basal layer in LC-OCT scans. Concurrent vulvar lichen sclerosus et atrophicus was also noted. Currently, as neither RCM nor LC-OCT can definitively distinguish between melanocytes and inflammatory dendritic cells, histological confirmation remains necessary. Previous studies using CD1a and Melan-A immunostaining did not consistently identify a predominance of melanocytes or Langerhans cells, indicating that either population could account for observed dendritic structures [3].

In the fourth case, a 69-year-old female presented with previously biopsied mucosal melanoma on the right labia minora. LC-OCT identified atypical roundish melanocytic nests in the dermis and pagetoid spread of atypical melanocytes in the epidermis (Figure 1). Type I mucosal melanosis was concurrently observed on the contralateral side of the vulva.

Discussion

This letter highlights the potential value of RCM and LC-OCT in monitoring mucosal melanoses. These tools may identify benign melanotic features, reducing the number of unnecessary excisions. For extensive or multifocal lesions, LC-OCT integrated with dermoscopy can facilitate targeted biopsies in cases of atypical findings. Given the dynamic nature of melanoses regarding pigmentation and dendritic cell presence [4], RCM and LC-OCT may provide valuable non-invasive monitoring, further minimizing unnecessary biopsies.

Dermoscopy alone, particularly in the presence of gray pigmentation, may be insufficient to confidently exclude

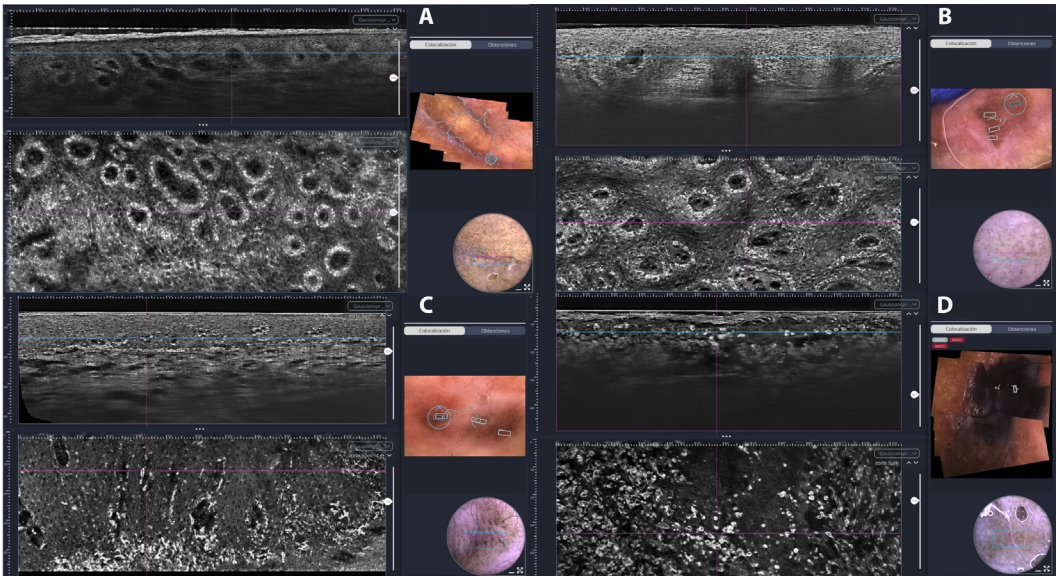

Figure 1. Three types of melanoses and mucosal melanoma. LC-OCT representations of the three types of melanoses and mucosal melanoma are shown. A) In the upper left, type I melanosis displays monomorphic, rimmed papillae without evidence of dendritic cells; B) In the upper right, type II melanosis features rimmed papillae with dendritic cells clearly visible at the dermo-epidermal junction in both vertical and horizontal LC-OCT projections; C) In the lower left, type III melanosis is characterized by non-rimmed or partially rimmed papillae, with a predominance of dendritic cells at the junction and within the supra-papillary plate; D) In the lower right, mucosal melanoma is identified by epithelial disruption and invasion of the upper layers, accompanied by a non-homogeneous distribution of polymorphic hyper-reflective dendritic and roundish cells.

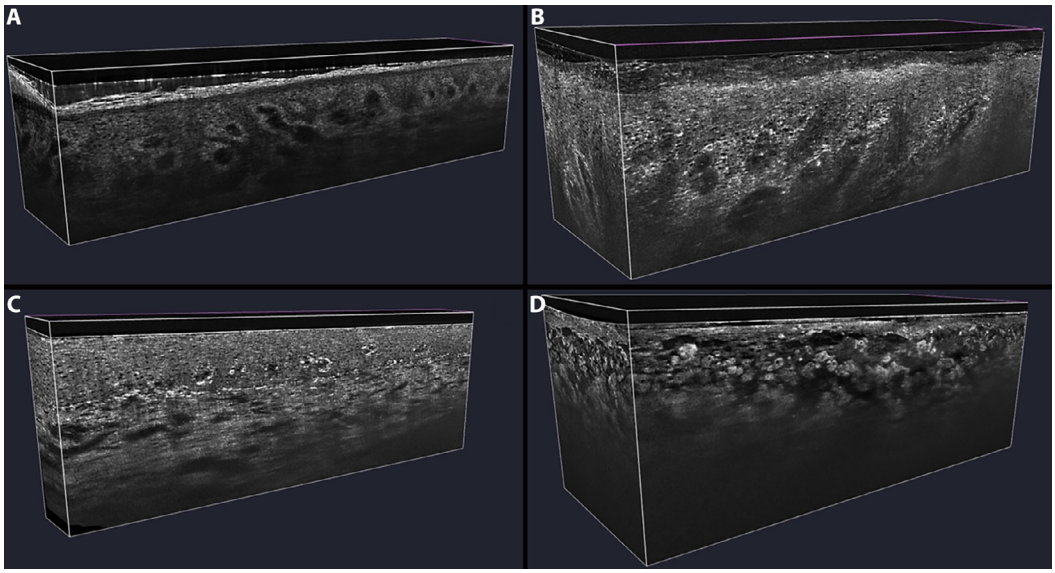

Figure 2. 3D visualizations of the three types of melanoses and mucosal melanoma. LC-OCT 3D visualizations of the three melanosis types and mucosal melanoma are presented. A) In the upper left, type I melanosis shows homogeneous hyper-refractive rimmed papillae without dendritic cells; B) In the upper right, type II melanosis is characterized by rimmed papillae and scattered dendritic hyper-reflective cells at the dermo-epidermal junction; C) In the lower left, type III melanosis features partially or non-rimmed papillae with abundant dendritic cells at the junction, absent within the epidermis; D) In the lower right, mucosal melanoma displays epidermal disruption by numerous aggregated heterogeneous roundish cells, with no clear dermo-epidermal junction identified.

melanoma [2]. Although biopsy remains the diagnostic gold standard, its use may be limited in genital areas due to patient discomfort. In such cases, the use of RCM or LC-OCT should be considered as supportive, noninvasive diagnostic tools.

Conclusion

In conclusion, LC-OCT appears effective in classifying mucosal melanoses similarly to RCM. Additionally, LC-OCT's three-dimensional evaluation capabilities (Figure 2) may enhance diagnostic accuracy through simultaneous assessment of multiple tissue layers. Future prospective studies correlating RCM and LC-OCT findings with histopathological outcomes are necessary to validate and further define LC-OCT's role in diagnosing mucosal pigmented lesions.

Acknowledgment Section: The authors declare they used ChatGPT (OpenAI) for assistance in refining the manuscript to enhance clarity and reader comprehension.

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