Swept Source optical coherence tomography of choroidal nevi

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ABSTRACT • RÉSUMÉ

Objective: The aim of this article is to report on retinal and choroidal morphology in choroidal nevi documented with Swept Source optical coherence tomography (SS-OCT).
Design: This is a retrospective, observational study.
Participants: We included 27 consecutive patients with choroidal nevi. Mean age was 66.3 years (21–95 years).
Methods: The SS-OCT scanning protocol consisted of a single line scan through the centre of the nevi with a resolution of 3 μm, built from 1024 A-scans, with a length of 12 mm. We attempted to visualize the outer choroidoscleral boundary and suprachoroidal layer (SCL) below the choroidal nevus and to observe any other defects of retinal or choroidal morphology.
Results: In all cases, we observed that the inner margin of benign tumours was separated from the retinal pigment epithelium with a hyporeflective band. Melanotic nevi cast partial (41%) or complete shadow (41%) on the underlying structures. The outer choroidoscleral boundary was visible under the tumour in 8 eyes (25%). SCL and suprachoroidal space were noted in 40% of eyes in close proximity to the lesion, but in no case were these lines visible directly below the lesion. Thinning of the choriocapillaries was observed in 8 eyes (25%) and thinning of the choroid in 5 eyes (15.6%).
Conclusions: Using SS-OCT, we observed that the inner border of benign choroidal lesions was always situated below a hyporeflective band, possibly corresponding to the choriocapillaries. A new finding was that we observed the SCL in 40% of cases. This was always visible in close proximity to the nevus, never directly below it.

Objet : Faire rapport sur la morphologie rétinienne et choroïdienne dans des cas de nævi choroïdiens documentés grâce à la tomographie par cohérence optique Swept Source (TCO-SS).
Nature : Étude observationnelle rétrospective.
Participants : L'étude a porté sur 27 patients consécutifs avec des nævi choroïdiens.L'âge moyen était de 66,3 ans (étendue : 21 à 95 ans).
Méthodes : Le protocole de balayage TCO-SS consistait en un balayage d'une seule ligne au centre des nævi avec une résolution de 3 μm, construit à partir de 1024 échographies de mode-A, avec une longueur de 12 mm.Nous avons tenté de visualiser la limite choroïde/sclère externe et la couche suprachoroïdienne sous le nævus choroïdien et d'observer toute autre anomalie de la morphologie rétinienne ou choroïdienne.
Résultats : Dans tous les cas, nous avons observé que la limite interne des tumeurs bénignes était séparée de l'épithélium pigmentaire par une bande hyporéflective. Les nævi mélaniques projetaient une ombre partielle (41 %) ou complète (41 %) sur les structures sous-jacentes.La limite choroïde/sclère externe était visible sous la tumeur dans 8 yeux (25 %).La couche suprachoroïdienne et l'espace suprachoroïdien ont été observés dans 40 % des yeux, à proximité de la lésion, mais ces lignes n'étaient en aucun cas visibles directement en dessous de la lésion.Un amincissement des choriocapillaires a été observé dans 8 yeux (25 %) et un amincissement de la choroïde, dans 5 yeux (15,6 %).
Conclusions : Au moyen de la TCO-SS, nous avons observé que la limite interne des lésions choroïdiennes bénignes était toujours située en dessous d'une bande hyporéflective, qui pourrait correspondre aux choriocapillaires.Comme nouvelle conclusion, nous avons observé la couche suprachoroïdienne dans 40 % des cas.Celle-ci était toujours visible à proximité du nævus, jamais directement en dessous de celui-ci.

INTRODUCTION

Choroidal nevi have been recorded in 6.5% of an adult Caucasian population and 1.4% of an adult Asian population.[1,2] Although they are mostly benign, in rare cases they show signs of growth and may progress to choroidal melanoma.

Recent advances in choroidal imaging have enabled the identification of several characteristics of choroidal nevi. Using enhanced depth optical coherence tomography (EDI-OCT), Shields et al. observed changes in retinal morphology such as atrophy or nodules of retinal pigment epithelium (RPE) (65%); photoreceptor layer defects (43%); external limiting membrane defects (20%); irregular outer nuclear layer (ONL) (8%), outer plexiform layer (OPL) (8%), and inner nuclear layer (INL) (6%); drusen 45%; and subretinal fluid (16%). They also reported the following characteristics of the choroid in nevi: complete or partial shadowing of the choroid (94%), and thinning of choriocapillaries (94%).[3] Swept Source OCT (SS-

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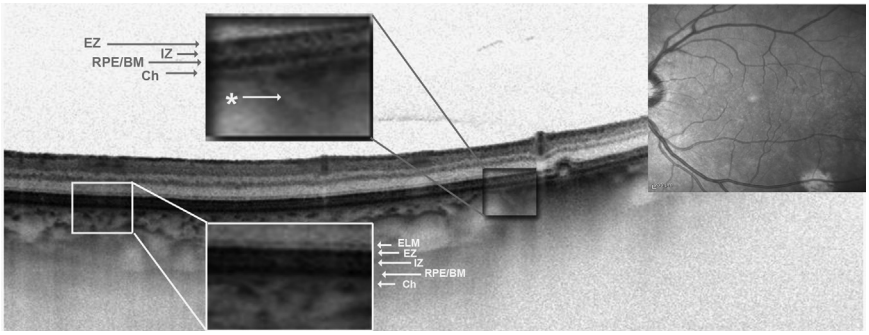

Fig. 1—Choroidal nevus in Swept Source optical coherence tomography in a 59-year-old man. The nevus was localized near to the lower arcades. The enlarged image parts present the inner part of the choroid directly above the nevus (upper enlarged image) and above the unchanged choroid (lower enlarged image). A druse is visible above the nevus. A hyporeflective band is visible between retinal pigment epithelium and the choroidal nevus, probably corresponding to choriocapillaries. A white star indicates a hyporeflective band on the margin of the nevus, probably corresponding to a choroidal vessel. EZ, ellipsoid zone; IZ, interdigitation zone; RPE/BM, retinal pigment epithelium/Bruchs membrane complex; Ch, choriocapillaries; ELM, external limiting membrane.

OCT) uses a longer wavelength than EDI-OCT (1050 nm vs 850 nm), which hypothetically enables deeper penetration into ocular structures. Previous reports have confirmed that the device might visualize sclera and scleral vessels.[4] Thus, we hypothesized that this device may add information on clinical dormancy of choroidal nevi.

In this article we will focus on the appearance of the choroid in asymptomatic benign choroidal lesions seen with SS-OCT. Additionally, we will encounter the outer choroidoscleral boundary (CSB) under those choroidal tumours.

Methods

This was a retrospective, observational study designed to describe asymptomatic choroidal nevi of <3 mm thickness in SS-OCT. We included consecutive patients visiting our outpatient clinic between March 2013 and April 2014 in whom we incidentally discovered a benign choroidal tumour during a routine ophthalmic examination. We excluded patients with tumours located in the retinal periphery, which prevented visualization with SS-OCT. The study adhered to the tenets of the Declaration of Helsinki and received Institutional Review Board approval. Several measures were taken to ensure confidentiality of the collected information. All authors signed a confidentiality agreement. After identities have been established to compile the statistical tables, all personal identifying information was removed, and therefore privacy and confidentiality were safeguarded. Patients' names were not included in the final database.

We performed routine ophthalmic examination, fluorescein angiography, and ultrasonography in all eyes.

The SS-OCT device (DRI-OCT, Topcon, Tokyo, Japan) uses a wavelength of 1050 μm. The scanning protocol consisted of a single line scan through the centre of the nevi with a resolution of 3 μm, built from 1024 A-scans with a length of 12 mm. The correct localization of the scan was always confirmed with the fundus image obtained simultaneously by the device. Three-dimensional scanning was always performed in the nevus area (256 B-scans in an area of 12×9 μm). All of the scans were reviewed, and the central one was taken into statistical analysis. We attempted to document the outer CSB and suprachoroidal layer (SCL)[5] below the choroidal nevus, and to observe any other defects of retinal or choroidal morphology. Thinning or thickening of the choroid was recognized when a change in thickness >10 μm was observed between the choroid in the central area of the nevus and the choroid at the margin of choroidal nevus. All scans were evaluated by

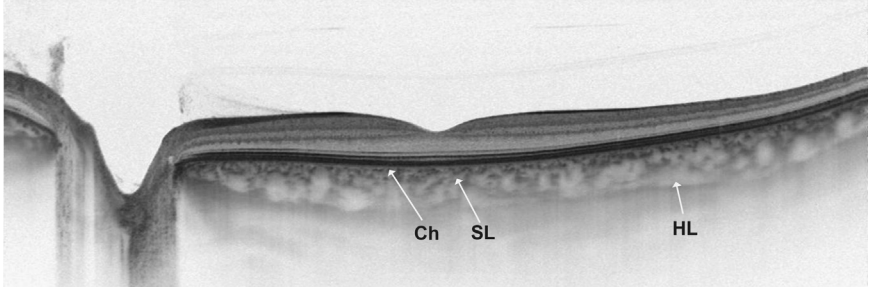

Fig. 2—Swept Source optical coherence tomography in a healthy eye. The 12-mm scan visualizes the macula and optic nerve simultaneously. Vitreous, retina, and choroid are visible. Ch, choriocapillaries; HL, Haller layer; SL, Sattler layer.