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DOI 10.1055/s-0042-123172

Klin Monatsbl Augenheilkd

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Georg Thieme Verlag KG
Rüdigerstraße 14
70469 Stuttgart
ISSN 0023-2165

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“En face” OCT in Small Pigmented Choroidal Tumors

„En face“-OCT in kleinen pigmentierten choroidalen Tumoren

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Key words

“en face” OCT, spectral domain OCT, pigmented choroidal tumor, choroidal nevus, internal tumor reflectance

Schlüsselwörter

„En face“-OCT, Spectral-Domain-OCT, pigmentierter choroidaler Tumor, choroidaler Nävus, interne Tumorreflektanz

Bibliography

DOI <http://dx.doi.org/10.1055/s-0042-123172>

Published online | Klin Monatsbl Augenheilkd © Georg Thieme Verlag KG Stuttgart · New York | ISSN 0023-2165

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ABSTRACT

Background “En face” optical coherence tomography (OCT) is an imaging technique with optic sections parallel to the retinal pigment epithelium (RPE). This study aims to define the use of this technique in the evaluation of small pigmented choroidal tumors.

Patients and Methods Investigation of 27 small pigmented choroidal tumors with “en face” OCT. Following manual segmentation, the optic sections performed with a spectral domain OCT at 30, 80 and

130 μ under the RPE were selected for morphological and statistical analysis.

Results Internal tumor reflectance is variable (hyper-, iso-, or hypo-reflective), with a uniform or a bull’s eye appearance. The reflectance becomes progressively lower towards the centre of the tumor. The margins of the pigmented tumors appear similar or less extensive than ophthalmoscopically. Peritumoral vascularization appears distinct from the 80 μ section downwards.

Conclusions On “en face” OCT, small pigmented choroidal tumors present with a uniform or bull’s eye internal reflectance, and are of variable intensity relative to the surrounding choroid. Their margins can appear more restrained than those on colour fundus photography.

ZUSAMMENFASSUNG

Hintergrund „En face“ optische Kohärenztomografie (OCT) ist eine Bildgebungstechnik mit optischen Schnitten parallel zum retinalen Pigmentepithel. Mit dieser Studie möchten wir den Vorteil dieser Technik in der Evaluation von kleinen pigmentierten choroidalen Tumoren erläutern.

Patienten und Methoden Untersuchung von 27 kleinen pigmentierten choroidalen Tumoren mittels „En face“-OCT. Es wurden die optischen Sektionen 30, 80 und 130 μ unterhalb des retinalen Pigmentepithels ausgewählt, um die morphologische und statistische Analyse durchzuführen.

Ergebnisse Die interne Tumorreflektanz ist variabel (hyper-, iso- oder hypo-reflektiv) mit einem uniformen oder Schießscheibenmuster. Die Reflektanz nimmt Richtung Tumorzentrum ab. Die Tumorränder sind entweder ähnlich zur Ophthalmoskopie oder kleiner. Die peritumorale Vaskularisation ist ab 80 μ unterhalb des retinalen Pigmentepithels gut sichtbar.

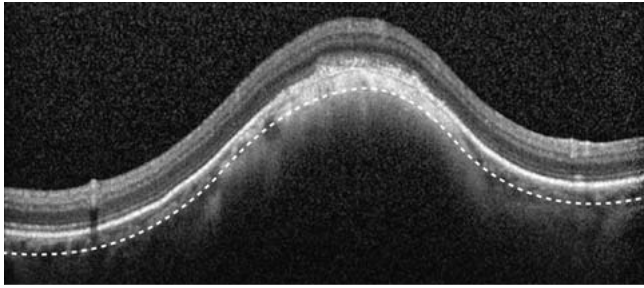
Schlussfolgerung Auf dem „En face“-OCT zeigen kleine pigmentierte choroidale Tumore eine variable interne Reflektanz mit einem uniformen oder Schießscheibenmuster. „En face“-OCT ist der Ophthalmoskopie bezüglich der Tumorränder nicht überlegen.

Background

“En face” optical coherence tomography (OCT) with enhanced depth imaging (EDI) is an imaging technique with optic sections parallel to the retinal pigment epithelium (RPE) visualizing a different dimension of fundus lesions. Reports in the literature on “en face” OCT imaging of choroidal tumors are scarce [1,2]. This study aims to define the contribution of “en face” OCT in the evaluation of small pigmented choroidal tumors.

Patients and Methods

This study analyzed 27 small pigmented choroidal tumors that had been investigated between December 2013 and December 2015 with “en face” OCT in EDI mode (Spectralis® Spectral Domain (SD-EDI)-OCT, Heidelberg Engineering), using a 30° lens. The scan size was 30° × 25° (9 × 7.5 mm), with a B-scan density of 60 μ interspace between the lines and 9 averages per B-scan. For morphological and statistical analysis, we selected optic sections at 30, 80 and 130 μ underlying the RPE. Wherever the latter was deformed, the segmentation was corrected manually, if needed (► Fig. 1, dotted white line). The color fundus pictures were usually taken with the Panoret-1000™ fundus camera (n = 21) and,



► **Fig. 1** SD-OCT B-scan of a small pigmented choroidal tumor. The dotted white line under the RPE is the result of a manual segmentation, leading here to the optic section at 80 μ .

when not available, with the Optos®200 Tx™ scanning laser (n = 5) or the Topcon (TRC-50IX) fundus camera (n = 1).

The characteristics analyzed for each lesion at each section were internal tumor reflectance, tumor margins, and peritumoral vascularization. Follow-up data with regard to tumor progression were also recorded.

Results

The internal tumor reflectance observed was higher (hyper-reflective), the same (iso-reflective) or lower (hypo-reflective) compared to the surrounding choroid. In general, the reflectance lowered towards the base of the lesion (i.e. the 80 μ and even more the 130 μ sections). At a given optic section, this reflectance had

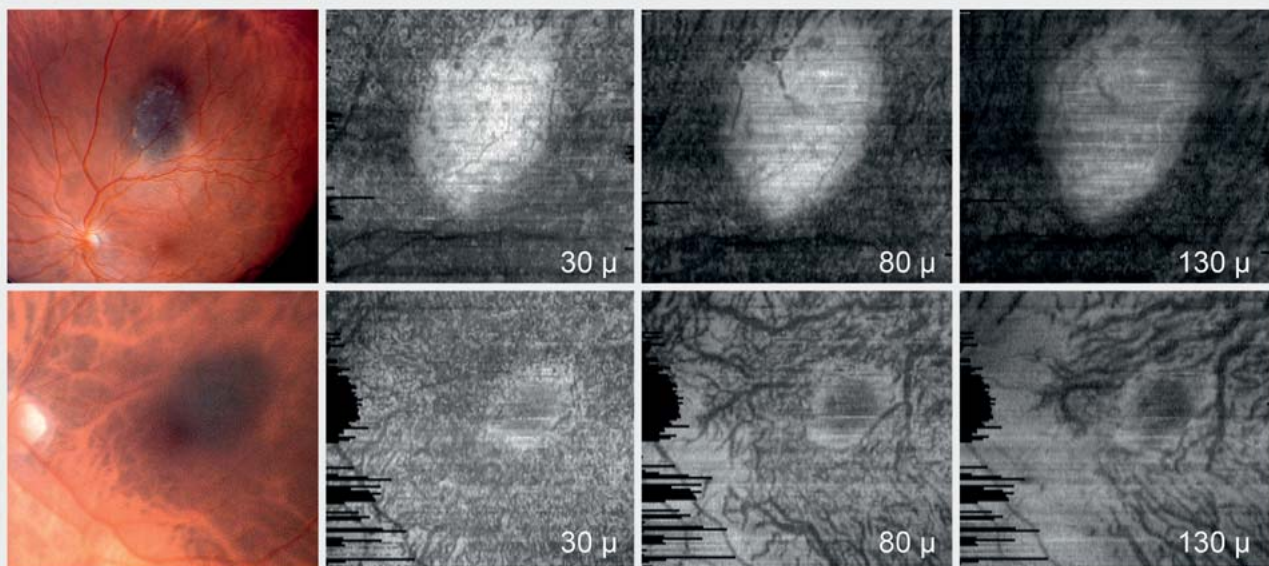
either a uniform (► **Fig. 2**, top) or bull's eye appearance (► **Fig. 2**, bottom).

In the bull's eye sections, the reflectance lowered relatively towards the center of the lesion. Twelve tumors had a uniform internal reflectance at all 3 sections, 7 a bull's eye appearance, and 8 switched from a uniform to bull's eye appearance, or vice versa, depending on the depth of the optic section. Internal reflectance irregularities within the lesion were correlated to RPE alterations such as drusen, fibrotic scars or orange pigment, causing optic shadows.

The tumor margins on "en face" OCT appeared less extensive (n = 14: Panoret n = 13, Optos n = 1) or at most similar (n = 13: Panoret n = 8, Optos n = 4, Topcon n = 1) compared with their borders on the color fundus pictures. The peritumoral choroidal vascularization could be distinctly recognized from the 80 μ section downwards (► **Fig. 2**). Above this section, it was mainly the retinal vascularization that was visible, as a projection artifact. Interestingly, this proved to be helpful to compare the tumor margins with those of the color fundus pictures. During follow-up (mean duration: 9; range: 0–28 months) two pigmented tumors, one with a uniform and one with a bull's eye appearance progressed and were treated with proton therapy, after 3 and 25 months of periodic observation respectively.

Discussion

This study evaluates "en face" OCT characteristics of small pigmented choroidal tumors. To the best of our knowledge, no other such study has been reported in the literature yet.



► **Fig. 2** Top: Panoret color fundus photo and "en face" OCT of an atypical choroidal nevus with a uniform, hyper-reflective internal tumor reflectance at all optic sections under the RPE. Bottom: Panoret color fundus photo and "en face" OCT of a small choroidal nevus with a bull's eye internal tumor reflectance at all optic sections. The reflectance lowers towards the center of the lesion, from hyper-reflective to iso- (30 and 80 μ) and hypo-reflective (130 μ), compared to the surrounding choroid.

Flores-Moreno et al. [1] recently described “en face” OCT characteristics in circumscribed choroidal hemangioma, finding a characteristic multilobular pattern, with a hyper-reflective halo surrounding the tumor. In contrast, small pigmented tumors on “en face” OCT have a more homogeneous (uniform or bull’s eye) appearance, and relative to the surrounding choroid an internal tumor reflectance that varies from hyper-, iso-, or even hypo-reflective. These different patterns reflect these tumors’ different histology. For bigger tumors, standardized A-scan ultrasonography translates the presence or absence of densely packed tumor vessels in a respectively high or low internal reflectivity, thus differentiating vascular from melanocytic choroidal tumors. However, in smaller tumors, the contribution of ultrasonography is limited because of its resolution, and these “en face” OCT findings might well represent an alternative diagnostic tool, especially in differentiating small, non-pigmented choroidal lesions.

Cennamo [2] suggested different “en face” OCT sub-RPE “wall aspects” between choroidal nevi and melanomas, noting hypo-reflective, uniform margins in the former and hyper-reflective, irregular margins in the latter. We could not confirm this observation as only two pigmented tumors of our series eventually progressed, without significantly different internal reflectances or tumor margins at presentation. The potential use of “en face” OCT in identifying small pigmented tumors at risk of growth would require bigger patient samples and longer follow-up times.

With regard to follow-up and possible treatment planning it is important to note that the tumor margins could appear more restrained on “en face” OCT than on the color fundus pictures,

which were mostly acquired using transscleral illumination though we also observed it in one case with confocal scanning laser images [3].

Limitations of this study are that the images were acquired with SD-OCT. Additional characteristics might be highlighted when using the more recent Swept Source (SS)-OCT.

In conclusion, this is to the best of our knowledge the first study to describe “en face” OCT characteristics of small pigmented choroidal tumors. They appear as lesions with a uniform or bull’s eye internal reflectance, with a variable intensity relative to the surrounding choroid and sometimes more restrained margins than those on color fundus photography.

Conflict of Interest

No financial interests.

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