Optical coherence tomography in diagnosing, differentiating and monitoring of choroidal nevi – 1 year observational study

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Abstract

OBJECTIVE: To assess the utility of the optical coherence tomography (OCT) in diagnosing, differentiating and monitoring of choroidal nevi situated in the posterior pole and optic disc area.

MATERIAL AND METHOD: 116 consecutive patients (65 women, 51 men) aged 27–95 years, with choroidal nevus were included to the research. Routine ophthalmoscopic evaluation and OCT using the Zeiss Stratus OCT as well as fundus photography were performed in each patient. The OCT was used to assess the structure of the retina overlying the choroidal nevus, the retinal pigment epithelium (RPE) – choriocapillaris complex, as well as the anterior portion of the choroidal lesion. In 31 patients due to suspected malignant melanoma fluorescein angiography and ultrasound were additionally performed. Follow-up OCT was done after 12 months in 51 out of 85 patients with characteristics of choroidal nevi, and after 6 and 12 months in 27 patients with “suspicious” lesion.

RESULTS: The basal dimension of the lesion ranged from 0.5 mm to 12 mm (mean 2.75mm), mean thickness was 1.25 mm. The pigmented lesion did not affect visual acuity. In 85 patients the lesion was flat or slightly elevated, without secondary changes in the retina. In 31 patients additional changes in the retina were observed – most frequently subretinal fluid. Two patients were eventually diagnosed with malignant melanoma. The follow-up OCT did not show progression in neither patients without secondary changes nor those with risk factors of malignancy.

CONCLUSION: Optical coherence tomography enables detailed evaluation of the retina overlying the pigmented lesion. Secondary changes in the retina need additional exams and strict observation. OCT could be an additional tool in the evaluation of treatment of malignant melanoma.
INTRODUCTION

Choroidal nevi occur in approximately 6–10% of Caucasian population and are usually benign. They require close observation due to possible malignant transformation. Differentiation between choroidal nevi and small malignant melanomas could be especially difficult because of their similar clinical presentation (Shields et al. 1995, Singh et al. 2005). Shields et al. based on their observations distinguished five risk factors of malignant melanoma and created a mnemonic TFSOM (“To Find Small Ocular Melanoma”) where T (Thickness) stands for tumour thickness > 2 mm, F (subretinal Fluid) – presence of subretinal fluid, S (Symptoms) – clinical symptoms (flashes, floaters), O (Orange pigment) – presence of lipofuscin deposits and M (Margin touching optic disc) – margin touching or less than 3 mm from optic disc (Shields et al. 2002, Shields et al. 2004). In 2009 three new risk factors were identified: UH – ultrasound hollowness, H – absence of surrounding halo, D – absence of drusen, which created the new mnemonic TFSOMUHHD (To Find Small Ocular Melanoma Using Helpful Hints Daily ) (Shields et al. 2009). Usually none of these risk factors are present in choroidal nevi, on the other hand tumours displaying 2 or more factors have an over 50% risk of transformation into melanoma at 5 years. The presence of the following factors: TSM shows an especially poor prognosis and increases the risk to 69% (Shields et al. 2009). Amelanotic nevi need to be differentiated from choroidal metastasis, granuloma, osteoma, or sclerocchoroidal calcification (Shields et al. 2008).

Pigmented lesion diagnosis is based on slitlamp, angiographic and ultrasound examination, with the use of Doppler technique where necessary. These methods cannot determine the histological type of the tumour which is necessary to establish the appropriate treatment and prognosis. The introduction of optical coherence tomography to the field of diagnostics of retinal diseases and the possibility of histological evaluation of retina in vivo raised hopes that similar evaluation could be possible for the choroid. Despite much research however and advances in the OCT equipment the low penetration of the light beam to the choroid makes imaging thereof difficult and histological evaluation in vivo of choroidal tumours remains still in the field of research.

PURPOSE

To determine the utility of optical coherence tomography in diagnosing and differentiating of pigmented choroidal lesions as well as in their regular monitoring.

MATERIAL AND METHOD

116 consecutive patients (65 women, 51 men), aged 27–95 years, with pigmented choroidal lesion situated in the posterior pole or near the optic disc were included in the study. Routine ophthalmoscopic examination and OCT using the Zeiss Stratus OCT as well as fundus photography were performed in each patient. The lesions were discovered upon routine examination, they were clinically silent.

The OCT images were obtained using 3–8 mm linear scans. The following structures were analysed: structure of the retina overlying the lesion, the RPE – choriocapillaris complex as well as the accessible anterior portion of the lesion. In those cases where the basal dimension of the lesion was over 7 mm or its thickness over 2 mm the OCT evaluation was difficult. The scans obtained went either through the edge or apex of the lesion. Further exams (angiography and ultrasound) were performed in 31 patients where malignant melanoma was suspected.

Follow up OCT was done after 12 months in patients with features of benign lesion (51 patients), and after 6 and 12 months in patients with “suspicious” lesion (27 patients).

RESULTS

In the examined group the basal dimension of the choroidal lesion ranged from 0.5 mm to approximately 10–12 mm (mean 2.75 mm), mean thickness was 1.25 mm. The presence of the lesion did not affect visual acuity. In 58% of cases the lesions were located near the macula, in 30% near the optic disc, and in 12% near the upper or lower vessels (Figure 1). In 57% of cases the lesions had a hyporeflective surface (Figure 2), in 34% – the surface was hyporeflective, in 9% isoreflective – indistinguishable from surrounding tissue. In 66 patients (57%) the thickness and structure of retina overlying pigmented lesion was unaffected, these were flat or slightly elevated (<1 mm) nevi. In 13 patients (11%) the OCT revealed chronic changes in in the form of drusen in pigmented epithelium (Figure 3). Secondary changes in the retina overlying the lesion
were observed in 31 patients (27%), they were: photoreceptor disruption (1.7%) (Figure 4), subretinal fluid (8%) (Figure 5), retinal edema (4%), retinoschisis (0.8%), retinal pigment epithelium detachment (0.8%) (Figure 6), lipofuscin exudates (1.7%).

The lesion was elevated > 1 mm in 16 patients (14%). Further exams – angiography and ultrasound – were performed in the group of 31 patients with secondary changes, due to suspicion of malignant melanoma. Final diagnosis of malignant lesion was made in 2 cases with tumour elevation > 2 mm and serous retinal detachment, in 1st case the lesion was located above the optic disc, in 2nd case it surrounded the optic disc.

In follow up OCT there was no progression observed in neither groups – that without secondary changes nor that with risk factors – even in those cases where subretinal fluid was present.

DISCUSSION

Optical coherence tomography is not a routinely used tool in diagnosing pigmented choroidal lesions. This could be due to its technical limitations such as low light beam penetration and unsatisfactory visualisation. Reflectivity of the choroid does not change significantly in case of nevi nor tumours. The optical coherence tomography therefore does not help evaluate the structure of pigmented lesion nor draw conclusion about its histology, and as it is known the treatment and prognosis is based on the histological type of tumour (Schaudig et al. 1998, Rospond-Kubiak et al. 2006). The OCT however can precisely evaluate the structure of the retina overlying the lesion, the RPE – choriocapillaris complex, and the accessible anterior portion of the nevus.

The optical coherence tomography is important in determining the reason for deterioration of visual acuity in case of pigmented lesions located in the macula. The most common pathology is the presence of lipofuscin deposits on the surface, RPE detachment and macular oedema (Shields et al. 2007). In the examined group the location of the lesions was extra-foveal which did not affect visual acuity.

The morphology of the retina overlying the lesion plays an important diagnostic role and enables differentiation with malignant melanoma, especially a small one (Espinoza et al. 2004, Muscat et al. 2001, Muscat et al. 2004, Shields et al. 2005a,b).

The result of OCT image analysis are similar to those described by Shields on the group of 120 patients. The most frequently reported changes were the thickening of the retinal pigment epithelium and choriocapillar layer, with characteristic shadowing of the deeper layers, which depends on the amount of accumulated pigment as well as vascularization of the choroid. The reported features were seen in benign nevi as well as most of those lesions which due to their location or size could be suspected of malignancy. According to Shields, disruptions in the photoreceptor layer, retinal...
thinning or intraretinal edema are characteristic for chronic nevi. Subretinal neovascularization on the surface of the nevus is a rare complication and it is believed to be an indicator of benign nature of the lesion (Zografos et al. 2004). The presence of fresh subretinal fluid with undisturbed photoreceptor layer however could be a sign of a malignant tumour. Malignant melanomas of the choroid could lead to disorganisation of retinal layers and/or presence of optical shadowing associated with tumour calcification. According to Espinoza (2001) optical coherence tomography in the diagnosis of subclinical serous detachment of the macula secondary to a choroidal nevus. Ophthalmic Surg Lasers. 2(6): 474–476.

Muscat et al. (2002) observed spontaneous regression of fluid in 25% of patients with pigmented nevi accompanied by presence of subretinal fluid, in the rest of cases they applied treatment with corticosteroids, transpupillary thermotherapy or gas injection, obtaining regression of lesions (Duquesne et al. 2002). Our observations based on OCT exam show regression of subretinal fluid in 2 patients treated with thermotherapy due to malignant melanoma.

CONCLUSION

Optical coherence tomography enables detailed evaluation of the retina overlying the pigmented lesion. Secondary changes in the retina overlying the choroidal nevus need further diagnostic exams and strict observation of the lesion. Optical coherent tomography could be useful in frequent monitoring of patients with pigmented choroidal lesions, especially in detecting and observation of subretinal fluid – an important risk factor of malignant transformation. OCT could be an accessory method in evaluating the effects of treatment of malignant melanomas.

REFERENCES


