THE CONTRIBUTION OF OPTICAL COHERENCE TOMOGRAPHY IN THE DIAGNOSIS AND CLASSIFICATION OF DIABETIC MACULAR EDEMA

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Keywords: *diabetic macular edema, optical coherence tomography*

Abstract: *Purpose: to evaluate the contribution of the optical coherence tomography (OCT) in the diagnosis and classification of diabetic macular edema. Material and methods: clinical study of 228 eyes with diabetic macular edema in which OCT was performed. The OCT examination was correlated with fluorescein angiography (FA) and biomicroscopy. Results: Four forms of macular edema were identified with OCT examination: macular edema with localized or diffuse retinal thickening (146 cases), cystoid macular edema (43 cases), tractional macular edema (19 cases), and macular edema associated with serous foveal detachment (10 cases). There was a good correlation between the OCT, FA and biomicroscopy examinations. Conclusions: OCT is an objective and precise technique in the diagnosis of diabetic macular edema, allowing at the same time a wider classificaton of it.*

Cuvinte cheie: *edem macular diabetic, tomografie in coerenta optica*

Rezumat: *Scopul lucrarii este de a evalua aportul tomografiei in coerenta optica (OCT) in diagnosticul si clasificarea edemului macular diabetic. Material si metode: studiu clinic realizat pe 228 ochi cu edem macular diabetic la care s-a efectuat OCT. S-a corelat examenul OCT cu cel angiofluorografic si examenul biomicroscopic. Rezultate: La examenul OCT au fost decelate 4 tipuri de edem macular: edem macular prin ingrosare retiniana localizata sau difuza (146 cazuri), edem macular cistoid (43 cazuri), edem macular tractional (19 cazuri) si edem macular asociat cu decolare seroasa foveolara (10 cazuri). A existat o buna corelare intre examinarea OCT, cea angiofluorografica si examinarea biomicroscopica a maculei. Concluzii: OCT reprezinta o tehnica obiectiva si precisa in diagnosticul edemului macular diabetic, permitand totodata o clasificare mai ampla a acestuia.*

INTRODUCTION

Diabetic macular edema (DME) is the main cause of visual loss in diabetic patients. The term macular edema (ME) refers at the actual retinal thickening in the region of the macula, secondary to a rupture of the inner hematoretinal barrier. The diagnosis of macular edema is based on binocular slit lamp biomicroscopy, leakage at fluorescein angiography (FA), and newly on the qualitative and quantitative information on retinal structure and thickness offered by optical coherence tomography (OCT).

AIM OF STUDY

The purpose of this study is to evaluate the contribution of OCT in the diagnosis and classification of DME, knowing that the therapeutic approach is different depending on the patterns of macular edema

MATERIAL AND METHOD

We performed a retrospective clinical study on 228 eyes with diabetic macular edema. The 160 patients included in the study suffered from type 1 and 2 diabetes and were investigated in the Ophthalmologic Investigations Center Review in Cluj-Napoca in the period January 2007-May 2010. All the patients were examined by OCT with Stratus OCT and by FA with Visucam Lite. Macular edema was considered in OCT when the foveal thickness was greater than 205μm and extrafoveal thickness more than 232 μm on the macular map. (3) Retinal thickening, the presence of cysts, tractional components and serous foveal detachment (SFD) were evaluated. In FA the macular hyperfluorescence was noted. Diffuse or focal patterns or pooling of dye in cystic spaces were differentiated. The fundus biomicroscopic examination was performed with a 90D or 78D Volk lense, using a narrow beam of light. Areas of retinal thickening, posterior vitreous detachment, vitreo-retinal traction, and epimacular membranes were noted. A correlation between OCT, FA and biomicroscopy was performed.

RESULTS AND DISCUSSIONS

In the OCT examination diffuse and/or focal ME was observed in the majority of cases, namely 64.03%.Cystoid ME was present in 43 eyes (18.85%). In 19 eyes (8.33%), the ME was associated with a tractional component represented by epimacular membrane in 8 eyes (3.5%), fibro-glial proliferation in 7 eyes (3.07%) and posterior hyaloid in 5 eyes (1.75%). In 10 eyes (4.38%) a serous foveal detachment was observed accompanying a ME usually of cystoid pattern (in 8 eyes from 10). In 10 eyes (4.38%) the foveal thickness was normal in OCT whereas leakage was noted in FA. Patterns of macular edema in OCT examination are presented in picture 1. In FA the presence of diffuse and/or focal macular edema was noted also in the majority of cases (150 eyes, 65.78%). Cystoid ME was observed in 51 eyes (22.36%) and ME associated with a tractional component in 12 cases (5.26%). Macular ischemia was observed in 10 eyes (4.38%). In 5 eyes (2.19%) no leakage

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was noted. Patterns of macular edema in FA are presented in picture 2.

Figure no. 1. Patterns of ME in OCT

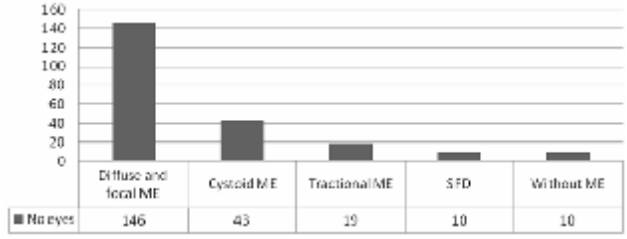
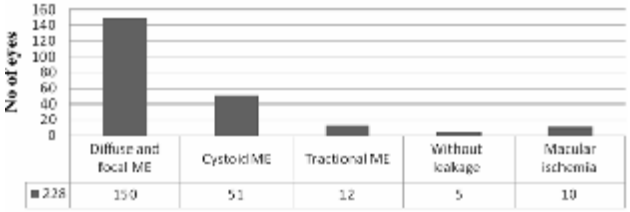
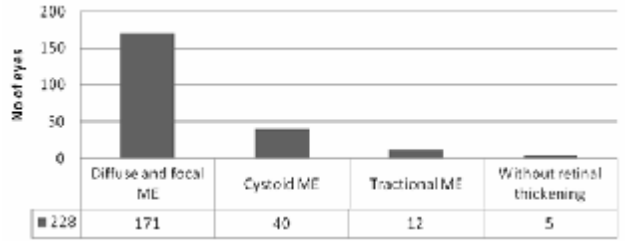


Figure no. 2. Patterns of ME in FA



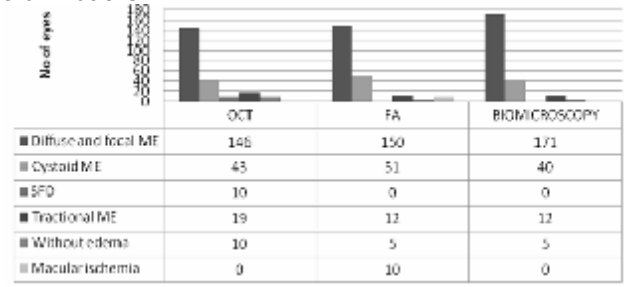
At the fundus biomicroscopic examination diffuse and focal ME was observed in the majority of cases (171 eyes representing 75%).Cystoid ME was noted in 40 eyes (17.54%), and ME associated with macular traction in 12 cases (5.26%). Macular edema was not observed in 5 cases (2.19%). Patterns of ME found at fundus biomicroscopy are presented in picture 3.

Figure no. 3. Patterns of ME at fundus biomicroscopy



The comparative results of the three types of examinations are presented in picture 4.

Figure no. 4. Comparative results of the three types of examinations



It can be observed that serous foveal detachment (SFD) can be distinguished only by OCT, whereas macular ischemia only by FA. Diabetic ME must be differentiated from macular ischemia which is produced by the occlusion of the capillaries in the center of the macula with widening of the foveal avascular zone. Macular ischemia was observed just on FA in 10 eyes (4.38%). Isolated macular ischemia is not treated by laser photocoagulation. In few cases ME was not observed at fundus biomicroscopy, whereas the OCT examination noted a small increase in macular thickness. This is because a macular thickening is suspected in fundus biomicroscopy when the retinal thickness is more than 310 μm.

In other cases a mild macular leakage was observed in FA, whereas the retinal thickness was normal on OCT, explained by the efficiency of pump mechanisms in the inner hematoretinal barrier.

OCT enables a quantitative evaluation of the macular edema, measuring exactly the retinal thickness. This measurement is reproducible and precise. (8,10) Diffuse and focal (localized) ME was observed in the majority of cases (in 64.03% of cases on OCT, 65.78% on FA and 75% on macular biomicroscopy). The diagnosis of this pattern of ME is important because it responds well to grid or focal macular laser photocoagulation. (9) Cystoid ME produce in general a more important retinal thickening and represent a negative prognostic factor. (6) In these cases macular laser photocoagulation is often ineffective, and we can opt to use intravitreal steroids or anti-VEGF agents. OCT enables a better examination of the vitreo-retinal interface and facilitates the diagnosis of tractional ME, identifying the tractional component. There is a significant correlation between the presence of vitreo-retinal traction and functional degradation. (7) The diagnosis of a tractional component in macular edema is very important because of the different therapeutic approach. It was demonstrated that this type of edema does not respond well to laser treatment. (1,5) In these patients vitreo-retinal surgery can be considered to release the macular traction. (4,11)

Serous foveal detachment (SFD) accompanying a ME was identified only by OCT. It was observed in few cases (10 eyes, representing 4.38%) and could not be identified by FA or fundus biomicroscopy. Other authors found a greater percent of SFD associated with ME in OCT, namely 23.6%. (2) The prognostic value and pathogeny of SFD are not clarified yet.

The presence of cystoid ME, of ME associated with serous foveal detachment (SFD) or with macular traction represent a risk factor in the evolution of diabetic macular edema. Because of that we thought that a classification of diabetic macular edema regarding its patterns on OCT is useful:

1. Macular edema with diffuse or localized (focal) retinal thickening
2. Cystoid macular edema
3. Tractional macular edema
4. Macular edema with serous foveal detachment

This classification is useful in the therapeutic approach and explains in the same time the physiopathological mechanism of ME. This classification includes parameters like diffuse or focal type of edema, its location, its aspect, especial if it is cystoid or not, the existance or absence of macular traction or an associated SFD. These parameters are important for the functional prognosis and the therapeutic approach.

CONCLUSIONS

In diabetic macular edema OCT completes with succes macular biomicroscopy and fluorescein angiography. OCT analyses with accuracy the structure of the retinal tissue, and measures exactly the retinal thickness, offering also information about the vitreo-retinal interface. OCT represents an objective and precise technique in the diagnosis of macular edema, allowing at the same time a wider classification of it.

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