

## Original Article

# Patterns of Macular Edema in Uveitis as Diagnosed by Optical Coherence Tomography in Tertiary Eye Center

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## Abstract

**Aim:** The aim of the study is to classify the patterns of uveitic macular edema using Optical Coherence Tomography as a diagnostic tool. **Methodology:** It is the Descriptive, cross-sectional study. All patients fulfilling the diagnostic criteria with Optical coherence tomography diagnosed macular edema were enrolled from 1 January 2012 to 30 June 2013. Patterns of uveitic macular edema were classified. **Results:** A total of 65 eyes of 47 patients were included. Twenty eight (59.57%) were male. The male to female ratio was 1.5:1. The mean age was 38 years (SD 14.68). Twenty nine patients (61.71%) had unilateral involvement and 18 (38.29%) had bilateral involvement. Forty five eyes of 33 cases (69.23%, 70.21%) had intermediate uveitis, followed by 10 eyes of 7 cases (15.38, 14.9%) of posterior uveitis, 6 eyes of 5 cases (9.23%, 10.63 %) of anterior uveitis and 4 eyes of 2 cases (6.16%, 4.2%) of pan-uveitis. Patterns of macular edema were classified: diffuse macular edema (DME), cystoid macular edema (CME) and serous retinal detachment (SRD) of which 35 (53.84%) eyes had CME. The etiological diagnosis was found in 7(14.90 %) out of 47 patients. **Conclusion:** A significant percentage of cases were idiopathic. Macular edema may go unnoticed unless OCT is performed. Macular detachment is an important feature of macular edema that affects visual acuity and is not readily detected by Fundus Fluorescein Angiography (FFA). Optical coherence tomography (OCT) is safe and non-invasive technique and has the potential for measuring changes in retinal thickness and axial extent of edema.

**Key words:** Cystoid macular edema (CME), Diffuse macular edema (DME), Macular edema (ME), Optical coherence tomography (OCT), Serous retinal detachment (SRD).

## Introduction

The term uveitis denotes inflammation of the uveal tract that is the middle coat of the eye.

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The word *uvea* is derived from the Greek word *uva* which means *grape*. The uveal tract consists of the iris, the ciliary body and the choroid which form the vascular coat of the eyeball. Uveitis Study Group classification (i.e., anterior, intermediate, posterior, and panuveitis) is commonly used. Anterior uveitis inflammation involves the iris (iritis), anterior ciliary body (cyclitis), or both (iridocyclitis).



Posterior uveitis refers to inflammation involving the choroid (choroiditis), retina (retinitis), both (chororetinitis), or retinal vessels (retinal vasculitis). Panuveitis involves all three parts of the uvea. Uveitis may extend to involve the cornea (keratouveitis) or sclera (sclerouveitis). (Durand ML. 2010). Macular edema in uveitis is a consequence of a number of underlying mechanisms including the disruption of the inner blood-retinal barrier due to inflammation, vitreous traction, choroidal inflammation and pigment epithelial dysfunction. (Markomichelakis NN et al.2007)

Fluorescein angiography, which was used to detect and confirm macular edema, is an invasive technique and may even cause anaphylaxis. (Markomichelakis NN et al. 2004, Yannuzzi LA et al.1986). By contrast, OCT has the potential for measuring changes in retinal thickness. It is ideal for repeat measurements and quantification of ME in conditions, such as uveitis, in which management decisions are required longitudinally on the basis of this information. Besides, as uveitic macular edema occurs at the fovea, a scanning strategy centered on this area minimizes the possibility of missing retinal thickening significantly. (Antcliff RJ et al.2000)

Macular edema and its sequelae are among the most important causes of decreased vision in patients with uveitis. Studies have shown three different types of macular edema associated with uveitis: CME, DME and SRD which are demonstrable on optical coherence tomography. (Markomichelakis NN et al. 2004, Tran TH et. 2008). CME is commonly associated with visual loss in uveitis patients (Lardenoye CW et al.2006).

### **Materials And Methods**

This is a descriptive, cross-sectional, a hospital-based study conducted from 1<sup>st</sup> January, 2012 to 30<sup>th</sup> June, 2013 at B. P. Koirala Lions Center for Ophthalmic Studies, Institute of Medicine,

Tribhuvan University, Kathmandu Nepal; A total 65 eyes of 47 patients diagnosed as uveitis with macular edema diagnosed by optical coherent tomography (OCT) and who fulfilled the inclusion criteria were enrolled.

### **Inclusion Criteria**

- All patients with uveitic macular edema (ME) as diagnosed by OCT
- Adequate media clarity for fundus visualization

### **Exclusion criteria**

- Presence of co-existing ocular diseases limiting fundus visualization like mature cataract, corneal opacities etc.
- Patient not willing to participate in the study

### **Assessment**

Detailed anterior segment examination was carried out with the help of a slit lamp bio-microscope (Haag-Streit 900 Ag., Switzerland). Posterior segment examination was carried out using direct ophthalmoscope, indirect ophthalmoscope with +20D Volk lens (USA) and the Haag Streit slit lamp with +90D Volk lens (USA) after pupil dilatation with tropicamide 0.5% and phenylephrine 2.5%. Uveitis was classified based on International Uveitis Study Group classification system (Bloch-Michel E et al. 1987)

All subjects underwent a fast mode macular scanning with the commercially available spectral domain (SD) OCT (Spectralis HRA+OCT; Heidelberg engineering, Inc., Heidelberg, Germany) with maximum pupil dilatation possible. The scan was performed over a 6X6 mm<sup>2</sup> area in the posterior pole to achieve a high quality image. The subjects were asked to focus on the target. The center point of each scan direction represented minimum foveal thickness (central minimum thickness, or foveola). A traditional Early Treatment Diabetic Retinopathy Study (ETDRS) grid, which

contains three concentric, rings of diameters 1, 3, and 6mm, and two reticules to divide the macula into nine sections were employed. The scanning results were then analyzed by using the OCT version 5.6.4 software.

Routine laboratory investigations including Total leucocyte count with differential leucocyte count, Erythrocyte Sedimentation Rate, Venereal Disease Research Laboratory, Rheumatoid factor, Chest x-ray, Mantoux test were done. In suspected cases, Serum calcium angiotensin-converting enzyme, Toxoplasma antibody titers were done when indicated. Imaging of sacroiliac joints was done when the diagnosis was inconclusive.

**Statistical analysis**

The data were analyzed with SPSS, version 20.

**Results**

A total of 65 eyes of 47 patients were included in the study. The mean age was 38 ± 14.68 years (range, 18-74 years). Most of the patients were in the age group 21-30 (31.91%) followed by 31-40 years (19.14%) and 41-50 years (19.14%) as shown in (Table 1)

Twenty eight (59.57%) were males and 19 (40.43%) were female (Figure 1)

Twenty nine (61.71%) cases had unilateral involvement and 18 (38.29%) cases had bilateral involvement. (Figure 2)

In our study, the most common type of uveitis was intermediate uveitis 45 eyes of 33 cases (69.23%, 70.21 %) followed by 10 eyes of 7

cases (15.38, 14.9%) of posterior uveitis,, 6 eyes of 5 cases (9.23%, 10.63 %) of anterior uveitis and 4 eyes of 2 cases (6.16%,4.26 %) of pan-uveitis. (Figure 3).

Patterns of uveitic macular edema detected on OCT imaging:

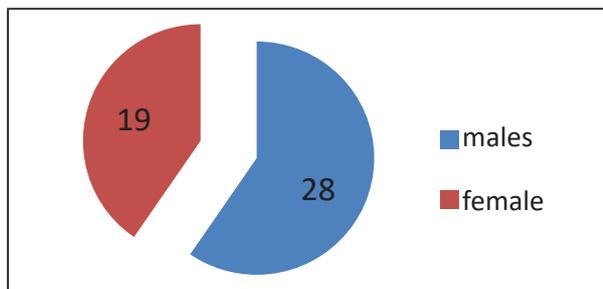
1. CME (Figure 4), 2. DME (Figure 5), 3. SRD (Figure 6).

Out of 65 eyes examined, the pattern of macular edema was classified as follows: 35 with CME (53.84%), and 30 with DME (46.16 %). SRD was found in 10 eyes (15.38%), always associated with other forms of edema. SRD with CME in 6 eyes (17.14 %) and with DME in 4 eyes (13.33 %) (Figure 7)

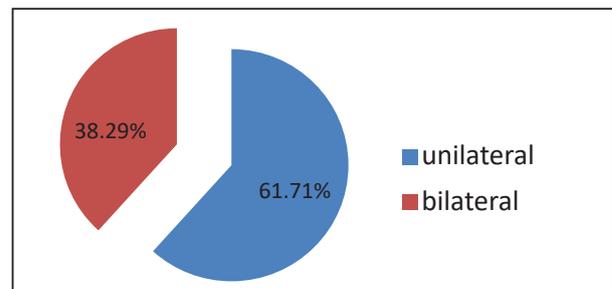
In subjects with intermediate uveitis, CME was detected in 23 eyes (51.12 %) and DME in 22 (48.88 %) followed by 6 eyes (60 %) of CME and 4 eyes (40%) of DME in posterior uveitis, 4 (66.66%) eyes of CME and 2 (33.34%) eyes of DME in anterior uveitis and 2 eyes (50%) in each of CME and DME in pan uveitis. (Figure 8)

One out of 6 eyes (16.66%) with anterior Uveitis, 4 out of 45 eyes (8.88%) with intermediate uveitis, 3 out of 10 eyes (30 %) with posterior uveitis, and 2 out of 4 eyes (50 %) with pan- uveitis had SRD.(Figure 9)

The etiological diagnosis could be established in 7 patients. A significant percentage of cases were idiopathic. Three patients had HIV immune recovery uveitis. Two patients each had sarcoidosis and ocular toxoplasmosis.



**Figure 1:** Pie chart showing gender distribution of the cases



**Figure 2:** Pie chart showing laterality of eyes involved

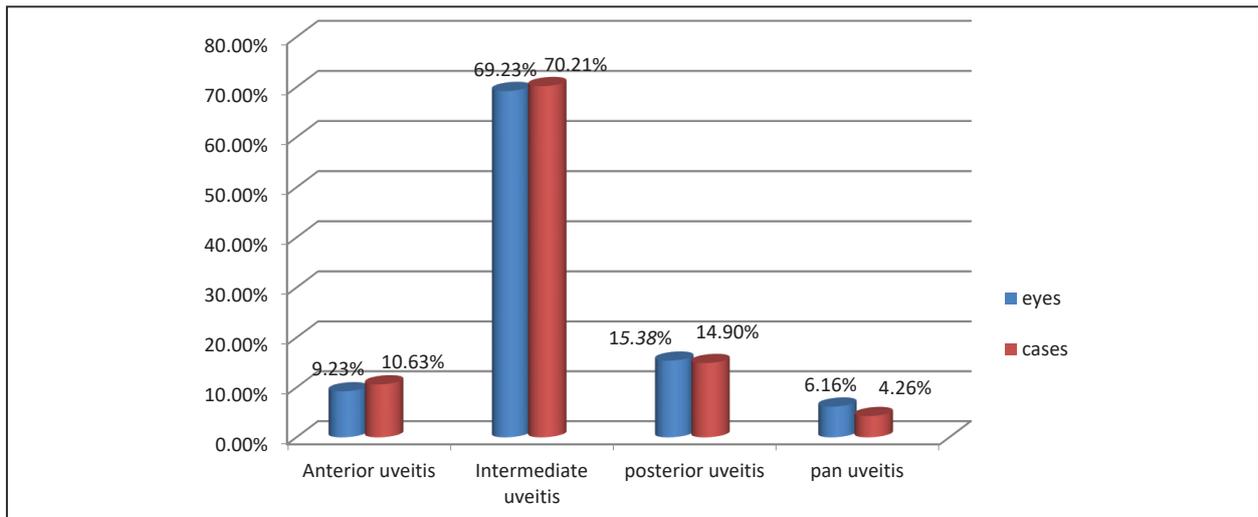


Figure 3: Bar diagram showing distribution of Uveitis

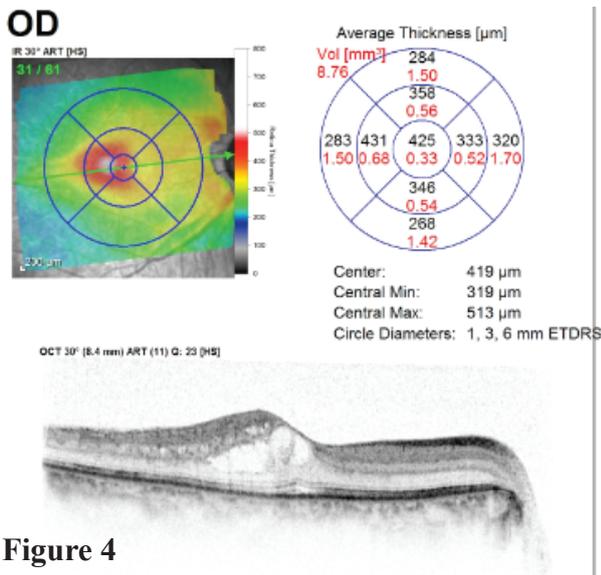


Figure 4

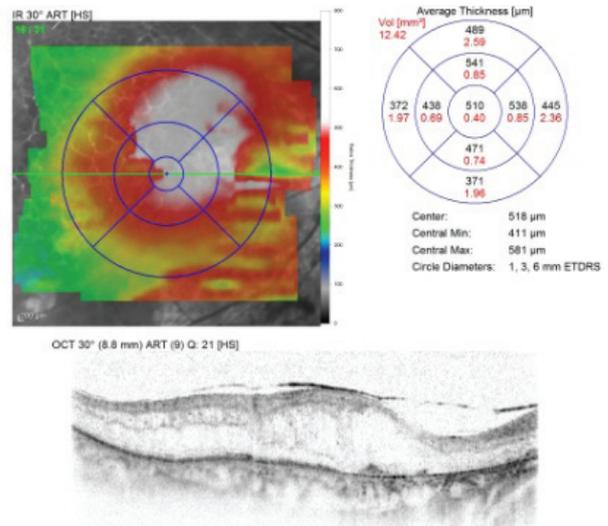


Figure 5

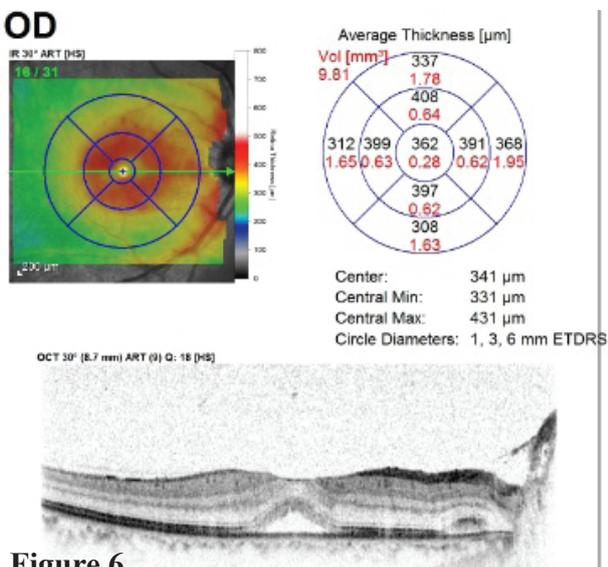


Figure 6

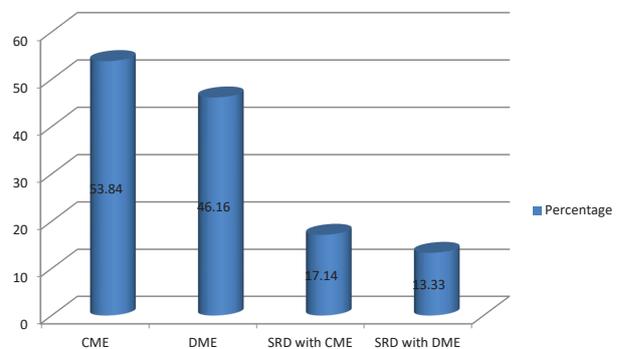
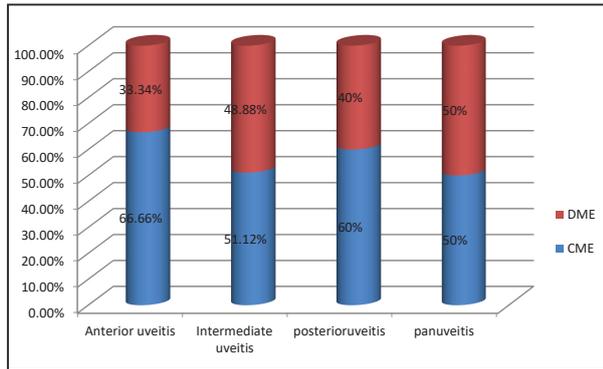
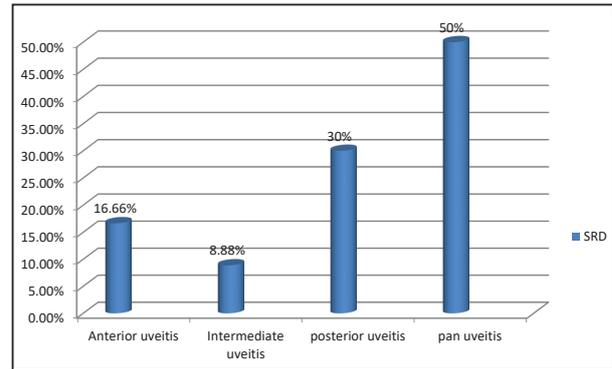


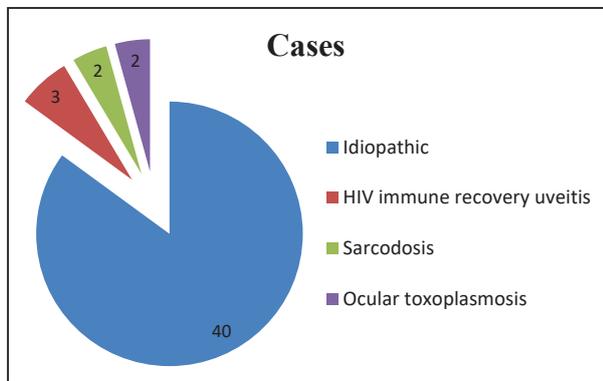
Figure 7: Bar diagram showing patterns of macular edema



**Figure 8:** Distribution of CME and DME according to the anatomic location of uveitis.



**Figure 9:** Distribution of SRD according to anatomical location of uveitis



**Figure 10:** Etiological diagnosis of the patient

**Discussion**

This is a descriptive; cross-sectional a hospital-based study conducted from 1<sup>st</sup> January, 2012 to 30<sup>th</sup> June, 2013 at tertiary eye care center.

In our study, a total of 65 eyes of 47 patients were included. The mean age was 38 ± 14.68

years (range, 18-74 years).Twenty eight (59.57%) were males and 19 (40.43%) were females. The male to female ratio was 1.5:1. Twenty nine (61.71%) patients had unilateral involvement and 18 (38.29%) patients had bilateral involvement. Markomichelakis et al. (2004) included 81 eyes of 60 patients, the mean age group was 35.8 ±16.2 years (range, 8-73 years) and the male to female ratio was 1:1, thirty six (60%) patients had unilateral involvement and 24 (40%) patients had bilateral involvement. In a study done by Markomichelakis et al (2007), in 84 eyes of 60 patients, the mean age group was 35.8 ±16.2 years (range, 8-73 years) and the male to female ratio was 1.8:1, thirty five (58.33 %) patients had unilateral involvement and 24 (41.64%) patients had bilateral involvement. Out of 43eyes of 39 patients, a study done by Iannetti et al. (2008), the mean age was 42.5

**Table 1:** Age and Gender distribution of the patients

Age(years)	Male	Female	Total	Percentage
< 20	4	0	4	8.51
21- 30	10	5	15	31.91
31- 40	3	6	9	19.14
41- 50	3	6	9	19.14
51- 60	5	1	6	12.79
>60	3	1	4	8.51
<b>Total</b>	<b>28</b>	<b>19</b>	<b>47</b>	<b>100</b>

+ 17 years (range: 6–79 years), 25 (64%) had bilateral uveitis and 14 (36%) had unilateral uveitis and the male to female ratio was 1:05. Their mean age, sex ratio and laterality are comparable to our study.

In our study, out of 47 patients, 5 (10.63%) had anterior uveitis, 33 (70.21%) had intermediate uveitis, 7 (14.9%) had posterior uveitis and 2 (4.26%) had pan-uveitis. Markomichelakis et al. (2004) included 60 patients out of which 3 (5%) had anterior uveitis, 42 (70%) had intermediate uveitis, 12 (20%) had posterior uveitis and 3 (5%) patients had pan-uveitis. Out of 60 patients enrolled, three (5%) patients of anterior uveitis, 40 (70%) patients of intermediate uveitis, 12 (20%) patients of posterior uveitis and 3 (5%) patients of pan-uveitis were found in a study done by Markomichelakis et al. (2007).

Three patterns of macular edema were found in our study. CME (35 eyes, 53.84 %) was the most common followed by DME (30 eyes, 46.16%) and SRD in 10 eyes (15.38%). CME associated with SRD was found in 6 eyes (17.14 %) and DME with SRD in 4 eyes (13.33 %). Otani et al. (1999), described morphological features of diabetic macular edema in 59 eyes of 42 patients: swelling alone in 25 eyes, swelling and cystoid macular edema in 18 eyes, retinal detachment and swelling in 6 eyes, retinal detachment, swelling and cystoid macular edema in 3 eyes; and cystoid macular edema alone in 7 eyes (DME in 88%, CME in 47%, and RD in 15%). Eighty four eyes of 60 patients examined, DME (46 eyes, 54.8%), CME (21 eyes, 25%), DME and RD (5 eyes, 5.9%), CME and RD (12 eyes, 14.3%) was found in a study done by Markomichelakis et al. (2004). Iannetti L et al. (2008), out of 43 eyes of 39 patients, 25 eyes with CME (58.2%), 18 with DME (41.8%), SRD with CME in 5 eyes (20%) and SRD with DME in 7 eyes (38.8%). Macular detachment is an important feature of macular edema that affects VA and is not readily detected by Fundus Fluorescein

Angiography. Antcliff et al. (2000) reported an incidence of RD of 19.5% (15 of 77 cases). Our study showed SRD in 10 (15.38%) eyes, always in combination with CME or DME.

In our study, CME was detected in 23 eyes (51.12%) and DME in 22 eyes (48.88%) in intermediate uveitis followed by 6 eyes (60 %) of CME and 4 eyes (40 %) of DME in posterior uveitis, 4 (66.66%) eyes of CME and 2 (33.34%) eyes of DME in anterior uveitis, 2 eyes (50%) each of CME and DME in pan uveitis. Iannetti L et al. (2008), found 2 eyes (50%) each of CME and DME in anterior uveitis, 9 eyes (56.3%) and 7 eyes (43.7%) of CME and DME in intermediate uveitis, 5 eyes (55.5%) and 4 eyes (45.5%) of CME and DME in posterior uveitis and 9 eyes (64.2%) and 5 eyes (35.8%) of CME and DME in pan-uveitis.

In our study, 4 out of 45 eyes (8.88%) with intermediate uveitis had SRD followed by, 3 out of 10 eyes (30 %) with posterior uveitis, 2 out of 4 eyes (50 %) with pan-uveitis and 1 out of 6 eyes (16.66%) with anterior uveitis. Iannetti L et al. (2008), found SRD in 1 out of 4 eyes (25%) with anterior uveitis followed by 3 out of 16 eyes (18.8%) with intermediate uveitis, 5 out of 9 eyes (55.5%) with posterior uveitis and 4 out of 14 eyes (28.5%) with pan-uveitis.

We were able to establish etiological diagnosis in 7 (14.90%) out of 47 patients. Three patients had HIV immune recovery uveitis. Two patients each had sarcoidosis and ocular toxoplasmosis. Rest of cases was idiopathic. Markomichelakis et al. (2004), out of 60 patients examined, 23 cases had undefined intermediate uveitis, followed by 13 cases of Adamantiades-Behcet disease, 6 cases of HLA-B27-associated uveitis, 6 cases of sarcoidosis, 4 cases of HIV-immune recovery uveitis, 3 cases of Retinal vasculitis, 2 cases of Multiple sclerosis, 1 case each of acute retinal necrosis, Cat scratch disease and Toxoplasmosis. Twenty eight cases

of Idiopathic uveitis, 5 cases of Bechet disease, 2 cases of Sarcoidosis and 1 case each of Birdshot chorioretinopathy, HLA B27 positive anterior uveitis, Sympathetic Ophthalmia and Vogt-Koyanagi-Harada disease were included by Iannetti L et al (2008) in their study.

OCT is a safe and noninvasive diagnostic modality for investigation of macular diseases allowing morphological assessment by producing 2D images of the retina. It allows quantification of macular edema objectively. (Markomichelakis NN et al. 2004). It is not compromised by a low or medium degree of optical haze (Khan MM et al. 2009). OCT is more sensitive than slit-lamp bio microscopy to changes in retinal thickness and helps in objectively monitoring patients with macular edema. (Hee MR. et al. 1995). Detailed interpretation of OCT images can replace fluorescein angiography for evaluation of macular edema, especially in uveitis cases. (Schaudig U et al. 2004)

### Conclusion

We found three types of macular edema: DME, CME and SRD. CME was the most common as detected by OCT. A significant percentage of cases were of idiopathic in origin. Macular edema may go unnoticed unless OCT is performed. OCT is good diagnostic tool for measuring changes in retinal thickness. Macular detachment is an important feature of macular edema that affects visual acuity and is not readily detected by FFA. It is ideally suited to repeated measurement of macular edema in conditions like uveitis, in which management decisions are required longitudinally on the basis of OCT information. The ultimate goal of the practitioner, regarding the management of the patients with uveitis to treat the inflammatory process within the eyes effectively, while minimizing the complications of both the disease process and the therapeutic modality in the regimen selected.

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