COMPARISON BETWEEN FLUORESCEIN FUNDUS ANGIOGRAPHY, OPTICAL COHERENCE TOMOGRAPHY AND OPTICAL COHERENCE ANGIOGRAPHY IN DETECTING MACULAR ISCHEMIA IN DIABETIC MACULAR EDEMA

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Introduction

Diabetic macular edema (DME), one of the major complications of diabetic retinopathy (DR), is also one of the leading causes of visual impairment in the working-age population. DME was diagnosed by ophthalmoscope as clinical significance macular edema. Diabetic macular ischemia (DMI) is an important category of diabetic retinopathy (DR). Fundus Fluorescein Angiography (FFA) has been the gold standard for diagnosing and grading DMI. It shows enlargement and irregularities of the FAZ. FFA is an invasive, dye involving, time consuming procedure with potential hazards. Optical Coherence Tomography (OCT) is a perfect method for assessment of macular structural changes. Optical Coherence Tomography Angiography (OCTA) is a novel, rapid, non-invasive, non-dye involving technique demonstrating SCP and DCP individually. Unfortunately, OCTA has drawbacks as it can only detect motion signals, it doesn't detect leakage or show staining or pooling in contrast to FFA. The field of view in current OCTA devices is relatively narrow. Using the current technology, OCTA is more prone to artifacts than traditional angiographies.

Aim of the work

The aim of the work is to compare between the FFA, OCT and OCT-A in detecting macular ischemia in diabetic macular edema.

Patients and Methods

This study was carried on 100 eyes of 50 patients presenting with clinically significant diabetic macular edema to the outpatient clinic subjected to the following: Medical history taking (presence of diabetes mellitus, hypertension). Complete clinical ophthalmological examination:
Visual acuity testing using Snellen's chart .Intraocular pressure (IOP) measurement Dilated fundus examination using 90˚non-contact lens.

FA : to assess size FAZ

Scanning protocol:

Color photo mode.
Red-free photo mode.
Fluorescein photo mode, with its different phases.

OCT : Zeiss Cirrus High Definition OCT (Cirrus HD-OCT, model 5000, Software version 6.0, Carl Zeiss Meditec, Inc) a spectral domain OCT.

Scanning protocol:

Macular cube 512x 128
HD 5-line raster

OCT angiography: Zeiss AngioPlex OCT Angiography (Cirrus HD-OCT, model 5000, Software version 8.1, Carl Zeiss Meditec, Inc), to assess ischemia at the level of SCP and DCP.

Scanning protocol:

3 x 3 macular angiography cube
6 x 6 macular angiography cube .

Results

Table (1): Agreement between FFA and OCTA_SCP in each area.

OCTA superficial	FFA Absent No.	FFA Absent %	FFA Present No.	FFA Present %	k	p	Level of agreement
A1 (C)	(n = 35)		(n = 65)				
Absent	20	57.1	0	0.0	0.634*	<0.001*	Good agreement
Present	15	42.9	65	100.0			
A2 (I)	(n = 91)		(n = 9)				
Absent	80	87.9	2	22.2	0.453*	<0.001*	Moderate agreement
Present	11	12.1	7	77.8			
A3 (S)	(n = 90)		(n = 10)				
Absent	80	88.9	2	20.0	0.508*	<0.001*	Moderate agreement
Present	10	11.1	8	80.0			
A4 (N)	(n = 86)		(n = 14)				
Absent	72	83.7	3	21.4	0.469*	<0.001*	Moderate agreement
Present	14	16.3	11	78.6			
A5 (T)	(n = 89)		(n = 11)				
Absent	75	84.3	0	0.0	0.541*	<0.001*	Moderate agreement
Present	14	15.7	11	100.0			

Table (2): Agreement between FFA and OCTA-DCP in each area

OCTA deep	FFA Absent No.	FFA Absent %	FFA Present No.	FFA Present %	k	p	Level of agreement
A1 (C)	(n = 35)		(n =65)				
Absent	2	5.7	0	0.0	0.073	0.117	Poor agreement
Present	33	94.3	65	100.0			
A2 (I)	(n = 91)		(n =9)				
Absent	40	44.0	0	0.0	0.124*	0.009*	Poor agreement
Present	51	56.0	9	100.0			
A3 (S)	(n = 90)		(n =10)				
Absent	42	46.7	0	0.0	0.149*	0.005*	Poor agreement
Present	48	53.3	10	100.0			
A4 (N)	(n = 86)		(n =14)				
Absent	28	32.6	0	0.0	0.119*	0.012*	Poor agreement
Present	58	67.4	14	100.0			
A5 (T)	(n = 89)		(n =11)				
Absent	29	32.6	0	0.0	0.096*	0.025*	Poor agreement
Present	60	67.4	11	100.0			

Conclusion

OCTA is a new technology capable of imaging many layers of the retina including the two major layers the SCP and DCP without dye injection. OCTA is a promising tool for the detection and management of DME. OCTA is unlikely to replace conventional FA in its current form, it has the potential to alter clinical practice and reduce the indications for which FA is performed. OCTA may be superior to FA for the early detection of DR and for the evaluation of the FAZ in DR as vascular abnormalities are more pronounced in the deep layer. For the OCTA to be more accurate, OCTA machines needs to upgrade software for detection of vessel density and perfusion in the DCP not only the SCP. As this study has shown the DCP is the first predictor of DR and the first layer to show ischemic changes.