Letter to the Editor

Intravitreal injection does not change anterior chamber morphology on anterior segment optical coherence tomography

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Intravitreal injections (IVIs) are considered a safe treatment modality in posterior segment disease (1). Though complications are rare, IVI may cause raised intraocular pressure (IOP) (1). Therefore, we aimed to assess whether increases in vitreous pressure associated with IVI may lead to conformational changes in angle anatomy and thus increase the risk of sustained IOP rise. Anterior segment optical coherence tomography (AS-OCT) is a non-contact, non-invasive tool to assess the structures of the anterior segment and is sensitive in detecting angle closure (2). Thus, in the present study we evaluated the AS-OCT changes in the angle anatomy of eyes prior to and following IVI.

Thirty eyes of 25 patients received intravitreal injection of 0.05mL aflibercept or ranibizumab. IOP was measured with iCare Rebound tonometer (Tiolat Oy, Helsinki, Finland) immediately before and after injection. Axial length and anterior chamber depth were measured with IOL Master 700 (Carl Zeiss Meditec, CA, USA) prior to injection. AS-OCT images were obtained using Visante OCT (Visante Model 1000; Carl Zeiss Meditec, CA, USA) at baseline and within 5 minutes of intravitreal injection. The AS-OCT imaging was performed at the horizontal meridian (0° to 180° scan line). All images were obtained under identical light conditions by the same examiner. The study received Institutional Ethics Approval (HREC reference 13/1129h) and conforms to the provisions of the Declaration of Helsinki.

The nasal and temporal quadrants for all eyes were measured by one observer (GSA), who selected locations of the scleral spur and iris recess apex to allow calculation of the anterior chamber parameters by the in-built software. These parameters were: angle opening distance (AOD), trabecular-iris space area (TISA) at 500 and 750µm from the scleral spur and scleral spur angle (SSA) for both the nasal and temporal quadrants (Figure 1).

Figure 1: Schematic representation of the anterior segment optical coherence parameters. (a) Angle opening distance (AOD) and trabecular-iris space area (TISA) 500um from the scleral spur. (b) AOD and TISA 750um from the scleral spur. (c) Scleral spur angle (SSA).

Baseline characteristics of the patients are summarised in Table 1.

Age (Years $\pm$ SD)	71.28 $\pm$ 12.01
Gender	
Male (%)	20 (66.7)
Female (%)	10 (33.3)
Race	
White (%)	22 (88)
Asian (%)	3 (12)
Lens status	
Phakic (%)	23 (76.7)
Pseudophakic (%)	7 (23.3)
Axial length (mean $\pm$ SD)	23.05 $\pm$ 1.23

Table 1: Baseline characteristics of patients

Mean $\pm$ SD IOP before injection was 13.72 $\pm$ 3.98mmHg, which increased to 27.24 $\pm$ 10.48mmHg after injection. There was no significant change in any AS-OCT parameter after IVI (paired samples t-test) (Table 2).

Parameter	Mean	SD	95% CI	p-Value
Nasal AOD500 (mm)	0.0002	0.1166	-0.0433 – 0.0437	0.99
Nasal AOD750 (mm)	-0.0264	0.1860	-0.0958 – 0.0430	0.44
Nasal TISA500 (mm ²)	0.0020	0.0333	-0.0104 – 0.0144	0.75
Nasal TISA750 (mm ²)	0.0197	0.0990	-0.0173 – 0.0567	0.29
Nasal SSA (degrees)	-0.0233	9.0628	-3.4074 – 3.3607	0.99
Temporal AOD500 (mm)	0.0394	0.1427	-0.0138 – 0.0926	0.14
Temporal AOD750 (mm)	0.0091	0.1834	-0.0594 – 0.0776	0.79
Temporal TISA500 (mm ²)	0.0107	0.0537	-0.0093 – 0.0307	0.29
Temporal TISA750 (mm ²)	0.0152	0.0874	-0.0174 – 0.0478	0.35
Temporal SSA (degrees)	2.5931	11.2709	-1.6941 – 6.8803	0.23

Table 2: Change in anterior segment OCT parameters after intravitreal injection.

AOD – angle opening distance; TISA – trabecular-iris space area; SSA – scleral spur

angle; SD – standard deviation; 95% CI – 95% confidence interval. P-values obtained with paired samples t-test.

Neither axial length, phakic status nor anterior chamber depth were significant predictors of change on either univariate or multivariate linear regression analysis for any parameter. The results were validated with excellent intraclass correlation coefficient (>0.8) for almost all the parameters (Table 3).

Parameter	Average measures	95% CI
Nasal AOD500	0.9	0.625 – 0.975
Nasal AOD750	0.899	0.592 – 0.975
Nasal TISA500	0.819	0.308 – 0.954
Nasal TISA750	0.919	0.668 – 0.98
Nasal SSA	0.922	0.699 – 0.98
Temporal AOD500	0.84	0.338 – 0.961
Temporal AOD750	0.79	0.2 – 0.947
Temporal TISA500	0.685	-0.355 – 0.923
Temporal TISA750	0.811	0.248 – 0.953
Temporal SSA	0.887	0.547 – 0.972

Table 3: Intraobserver reproducibility of the angle measurements as determined by intraclass correlation coefficient. AOD - angle opening distance; TISA – trabecular-iris space area; SSA – scleral spur angle; SD – standard deviation.

Though some cases of angle closure after IVI have been reported, our results suggest that IVI does not significantly alter the anterior chamber angle, accounting for phakic status, axial length and anterior chamber depth. This is in keeping with Alkin et al, who showed that AS-OCT parameters of the nasal angle were not significantly altered in phakic, undilated pupils with either 0.05mL or 0.1mL IVIs (3).

To our knowledge, ours is the first study to assess change in dilated pupils and those who are pseudophakic in either the temporal or nasal angles.

Our results contrast those published by another group with similar patient numbers (4). However, that study did not perform an intraclass correlation coefficient to determine internal validity and imaged patients in undilated scotopic conditions, which is not generalisable to a clinical environment. Only 4 out of 12 parameters tested were statistically significant, with a weak correlation of anterior chamber depth and IOP change ($R^2=0.53$).

Limitations of our study include a lack of ethnic diversity (with only 3 Asian patients) and no assessment of the superior and inferior angles due to limitations with image quality. However, the reproducibility of measurements in the temporal and nasal angles is better than superior and inferior (5).

In summary, our results reflect a daily practice setting and demonstrate that AS-OCT parameters in either the temporal or nasal angle are not significantly altered by IVI, accounting for phakic status, axial length and anterior chamber depth.

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