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Research Article

# WHAT INFLUENCES DOES FASTING RAMADAN HAVE ON EYE PARAMETERS?

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**A R T I C L E I N F O**

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Fasting ramadan, non contact ocular biometry, anterior chamber parameters, high order aberrations.

**A B S T R A C T**

**Purpose:** To investigate influence of fasting ramadan on the following ocular parameters: ocular biometry, anterior chamber characteristics and high order aberration using respectively: non contact ocular biometer (Lenstar®), Pentacam® and Zywave II® aberrometer.

**Material and methods:** 32 healthy people were included in the study, their ocular parameters were investigated fifteen days before fasting and compared to those obtained after fifteen days of fasting.

Results: there was no significant change in axial length and intraocular lens power calculations, but anterior chamber increased and lens thickness diminished during fasting.

**Discussion:** In Pentacam® parameters there was an increase in corneal thickness both central and minimal, and a diminished anterior chamber angle with statistically significant difference. The anterior chamber volume diminished but without statistically significant difference. In aberrometry; there was a slight increase in values of HOA, vertical coma, horizontal coma but without statistical significance. spherical aberrations remained unchanged.

**Conclusion:** non contact ocular biometry is safe to calculate IOL power during fasting. ACA decreases and corneal thickness increases during fasting; and further investigations are necessary to confirm the increased values of HOA in our study.

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## INTRODUCTION

Islamic fasting in ramadan (the ninth month of the Islamic calendar) consists of abstaining from food and water intake from sunrise until sunset during one month.

Islamic fasting in ramadan is known to induce some physiological changes that can affect the eye.

In this paper we investigate influence of fasting on ocular parameters by comparing non contact ocular biometry (Lenstar®, Haag-Streit), anterior chamber (Pentacam®, Oculus) and aberrometry (Zywave II®, Bausch & lomb ) parameters before and during fasting. Fasting influence on eye parameters was extensively studied by many investigators ; we elected to perform this study for the following 3 reasons :

1. moroccans and north african population in general is known for having thin corneas ( 1 ) .
2. there are conflicting results reported in previous studies about influence of fasting on eye parameters.
3. we investigate for the first time aberrometry; since tear film quality and quantity could be affected by fasting as reported by many investigations.

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## MATERIAL AND METHODS

This is a prospective comparative study in which 32 healthy subjects were involved. ocular biometry, anterior chamber parameters and eye aberrations were compared before and during fasting period using Lenstar® biometry, Pentacam® of anterior segment, and aberrometry. The study was a conducted in the university hospital Hassan II of Fez during Ramadan , from 26 May to 24 june 2017.

Measurements of different parameters were taken at a one month interval, fifteen days before ramadan and after fifteen days of fasting. All the measurements were performed in the afternoon period.

The primary outcome measure was the means of the different following parameters before and during fasting:

1. for anterior chamber parameters (Pentacam®) : central corneal thickness (CCT) , minimal corneal thickness (MCT) , anterior chamber angle (ACA), corneal volume (CV), anterior chamber volume (ACV).
2. for non contact biometry (Lenstar®): anterior chamber depth (ACD) , lens thickness (LT),axial length (AL) , IOL power (IOLP) using SRK-T formula.

3. for aberrometry: root mean square (RMS) of total high order aberrations (HOA), vertical coma (VC), horizontal coma (HC), spherical aberrations (SA).

   Paired student's t-test Kolmogorov-Smirnov test to assert normal distribution of samples. Dependent student T test was used to test significance of differences . A p value of less than 0.05 was considered to be statistically significant. statistical analysis was performed using Epi InfoTM.

The study was conducted with respect of Helsinki declaration , all the volunteer participants were informed about the study and signed informed consent to participate in the investigation.

## RESULTS

A total of 32 healthy individuals were enrolled in this study. The mean age of the participants was 27 years-old ( aged of 25 to 33 years ) and sex ratio was 1,4 (13 women and 19 men ). all the participants were healthy persons with no previous past medical history.

***For non-contactant biometric parameters (table 1)***

Axial length mean remained unchanged being 23,79 mm and 23,8 mm before and during fasting respectively with no statistically significant difference ( p=0.053) .

The anterior chamber depth mean increased from 2,98 mm before fasting to 3,04 mm during fasting with a significant statistical difference ( p=0,00027 ).

Lens thickness mean decreased from 3,87 mm before fasting to 3,79 mm during fasting with statistically significant difference ( p=0,00035 ).

Finally ; intraocular lens power calculations showed a mean before fasting of 20,56 D and 20,6 D during fasting with no significant statistical difference( p=0,22).

***For anterior chamber Pentacam® parameters (table 2)***

The anterior chamber angle decreased from 45.29º before fasting to 42.88º during fasting time with a statistically significant difference (p< 0,0001 ).

The central pachymetry increased from 536,5µ to 540,3µ before and during fasting respectively with a statistically significant difference (p<0.00001).

Minimal pachymetry increased from 533,02µ to 536,06µ before and during fasting respectively with statistically significant difference (p=0,00067).

Corneal volume in the 10mm zone increased from 60,24 mm3 to 60,72 mm3 before and during fasting respectively with statistically significant difference (p<0.00001).

Volume of anterior chamber mean decreased from 198.58mm3 to 196.78mm3 before and during fasting respectively but the difference was not statistically significant ( p=0.0659).

***For aberrometry parameters (table 3)***

The root mean square of high order aberrations (HOA) in the central 5 mm showed a very slight increase before fasting from 0.21µ to 0.23µ during fasting but with no statistically significant difference (p=0.32 ).

Vertical coma mean increased from 0.014µ before fasting to 0.021µ during fasting but with no of statistical significance (p=0,55 ).

Horizontal coma doubled from 0,004µ to 0,008µ after fasting but without statistically significant difference (p=0,564 ).

Spherical aberration remained unchanged before fasting and after fasting, -0.06µ and -0.07µ respectively and non statistically significant difference (p=0,29 ).

## DISCUSSION

***Non contact ocular Biometry***

In our study we found axial length to be not influenced by fasting which is in line with results of other authors such as Sedaghat *et al* (2) who used IOL master® in his study. on the contrary Nowroozzadeh *et al* (3) and baser *et al* found decreased AL after fasting ; this could be explained by the fact that they used ultrasound (US) biometry which could induce shortening of the AL of the eye due to pressure exerted by the examiner.

For anterior chamber depth: we found an increased anterior chamber depth due to fasting , but in sadaghat *et al* (2) study it was unchanged , in another study by baser *et al* (4) they found a reduced anterior chamber during fasting. Nowroozzadeh *et al* (3) found an increased AC depth in the morning of fasting days because probably of important water intake in the pre-dawn meal.

For lens thickness: it was decreased in our study, but remained unchanged in Baser's *et al* (4) study may be because of lack of sensitivity of the used US biometry technique .

IOL power: in our study we found this parameter unchanged by fasting , and it was significantly increased in the study of Nowroozzadeh *et al* (3) again using US biometry.

***Anterior chamber Pentacam® parameters***

The anterior chamber angle was decreased by fasting in our study as in a study published by sarici *et al* (5) using Pentacam® , These results were not found by selver *et al* (6) also using Pentacam® . Even though Sedaghat *et al* (2) used Pentacam® , they didn't explore ACA. Kerimoglu *et al* (7) again state in their article that there were no significant change in anterior segment parameters in Pentacam® but without precising which those parameters. Central pachymetry: increased in our study as in Kerimoglu *et al* (7) study who found an increase in central corneal thickness in ramadan for measurements of 8 o'clock ( may be secondary to important fluid overload ), sedaghat *et al* (2) showed thickening when used Corvis® but no difference when using Pentacam® , also no change was found for Selver *et al* (6) and Sarici *et al* (5) in their respective studies.

Minimal pachymetry: increased in our study ,but no other study compared this parameter. Corneal volumen: increased in our study but saris *et al* (5) found no difference.
Volume of anterior chamber: no significant change in our study , just as Selver *et al* (6), but found diminished in Sarici *et al* (5).

***High order aberrations***

To our knowledge our study is the first to investigate HOA, we indeed found a slight increasing of HOA 5 mm, in coma V and

coma H, after fasting but without statistically significant difference maybe due to the limited size of our sample.

The diminished lens thickness after fasting is probably due to hydrique restriction, and this lens thickness decreasing would probably explain the increase of anterior chamber depth. We can infer that hydrique restriction could be of interest in some cases of lens diseases such the intumescent cataract or the pupillary block; these statements need further clinical assessment. On the other hand , we found that axial length and IOL power calculations didn't change ; so it's safe to perform non contact ocular biometry during fasting time. From the fact that corneal thickness was increased by 5 microns in our study during fasting, we would be concerned about refractive surgery candidates assessed during fasting times especially those with borderline corneal thickness values in which 5 microns could be a significant amount. As for the diminished ACA, we don't advice assessing the anterior chamber angle by gonioscopy in a fasting patient ; also narrowing of AIC coud be a concern in patients with predisposed angles.
Further investigations are needed to confirm influence of fasting on visual performance by modifying high order aberrations. in our study we found a slight increase of total HOA, but we couldn't show a statistically significant difference. further studies are needed to assess visual performance during ramadan especially in very demanding occupations like pilotes and military personnel.

Our study is not perfect since there are other factors that could interfere: effort, meals, time of acquisitions. besides ; we did the study in hot weather and we don't know if these results are replicable in tempered weather.

## CONCLUSION

we can conclude that non contact ocular biometry is safe to calculate IOL power during fasting. ACA decreases and corneal thickness increases during fasting ; and further investigations are necessary to confirm the increased values of HOA after fasting in our study.

**Table 1** non contact ocular biometry before and during fasting

| | Mean 1 | Mean 2 | T value | P value |
|---|---|---|---|---|
| AL | 23.79mm | 23.8mm | 1.96 | 0.053 |
| ACD | 2.98mm | 3.04mm | 3.86 | 0.0002 |
| LT | 3.87mm | 3.79mm | -3.77 | 0.0003 |
| IOL P | 20.56D | 20.6D | 1.21 | 0.22 |

**Table 2** anterior segment Pentagram parameters before and during fasting

| | Mean 1 | Mean 2 | T value | P value |
|---|---|---|---|---|
| ACA | 45.29° | 42.88° | -6.44 | p<0.00001 |
| CP | 536.5µ | 540.3µ | 6.54 | p<0.00001 |
| MP | 533.02µ | 536.06µ | 3.57 | 0.0006 |
| CV | 60.24mm³ | 60.72mm³ | 5.87 | p<0.00001 |
| ACV | 198.58mm³ | 196.78mm³ | -1.87 | 0.06 |

**Table 3** high order aberrations before and during fasting

| | Mean 1 | Mean 2 | T value | P value |
|---|---|---|---|---|
| HOA 5mm | 0.21µ | 0.23µ | 0.1 | 0.32 |
| VC | 0.014µ | 0.021µ | 0.58 | 0.55 |
| HC | 0.004µ | 0.008µ | 0.57 | 0.56 |
| SA | -0.06µ | -0.07µ | -1.06 | 0.29 |

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