


CORRESPONDENCE

Open Access



# Reply to: 'comments on 'effects of refractive accommodation on subfoveal choroidal thickness in silicone oil-filled eyes''

Ying Yan<sup>1</sup>, Bo Zeng<sup>1</sup>, Chengyuan Gao<sup>1,2</sup>, Yanping Song<sup>1,2</sup> and Xiao Chen<sup>1,2\*</sup> 

## Abstract

In this article, we answered the questions in Lei Gao et al.'s comments on the "effects of refractive accommodation on subfoveal choroidal thickness in silicone oil-filled eyes" one by one.

**Keywords:** Choroidal mechanism of accommodation, Silicone oil, Refractive accommodation

We appreciate Lei Gao et al.'s comments on our study regarding the effects of refractive accommodation on subfoveal choroidal thickness (SFCT) in silicone oil (SO)-filled eyes.

We realise that accommodation partly depends on the change in lens refractive power according to the Helmholtz theory of accommodation [1, 2]. Accommodation is associated with many theories, including choroidal mechanism [3], ocular elongation and the scleral growth mechanism [4], and the classic Helmholtz [5] theory. Wallman pointed out that choroidal changes were transitory and rapid phenomena that compensated for myopic and hyperopic defocus [6]. For example, according to a study [7] performed on chickens, rapid choroidal thickening was produced at an average rate of  $53 \pm 36 \mu\text{m}/\text{day}$  after the positive lenses were removed. In our study, the mean SFCT in the SO-filled eyes increased within 24 h from  $221.52 \pm 38.41 \mu\text{m}$  to  $269.28 \pm 36.90 \mu\text{m}$  after refractive error (RE) correction. The rapid choroidal

mechanism of accommodation complements other slower recovery mechanisms, such as ocular elongation [6].

The lack of long-term follow-up on the changes in SFCT after the correction of RE in the SO-filled eyes was due to considerations of compliance and the safety of our patients. We note from Lei Gao's literature reports [8] that the change in lens refractive power in a short time mainly relies on the change of the lens's shape. However, the difference in lens thickness before and after wearing contact lenses was not the topic of our study. We focused on the effects of refractive accommodation on SFCT in SO-filled eyes because the choroid is a vascular layer that supplies oxygen and nutrients to the outer part of the retina. Previous studies have shown that the reduction in SFCT of SO-filled eyes after pars plana vitrectomy (PPV) might be related to the negative effects of intravitreal SO. However, the possible mechanism of SO tamponade leading to a decrease in choroid thickness is not clearly understood. Based on our study, we infer that the reduction in the SFCT of SO-filled eyes may primarily be due to the hyperopia caused by SO, which can be reversed after RE correction.

Regarding the diurnal variation in choroidal thickness (CT), all the examinations were performed between 9 a.m. and 10 a.m.

This comment refers to the article available at <https://doi.org/10.1186/s12886-022-02332-y>.

\*Correspondence: [cxfn817@163.com](mailto:cxfn817@163.com)

<sup>1</sup>Department of Ophthalmology, PLA Middle Theater General Hospital, 627 Wuluo Road, Wuhan 430070, China

Full list of author information is available at the end of the article



© The Author(s) 2022. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

To avoid the accommodation of the SO-filled eyes, taking the healthy eye as the reference, the healthy eye was covered, while the SO-filled eyes wore soft contact positive lenses. Furthermore, the other eye was covered while the subject eye was examined by optical coherence tomography. This was not described in details in the methods section of the original article.

It should also be pointed out that 4.5 D was not the amplitude of accommodation. It was the RE of the eyes after the SO tamponade screened with an autorefractor (Canon Autorefractor RK-F1, Canon Inc. Ltd., Tochigiken, Japan). The mean RE of the SO-filled eyes was  $+6.64 \pm 1.25$  D, ranging from +4.5 to +9.5 D (Table 1 in the original article).

#### Abbreviations

CT: Choroidal thickness; PPV: Pars plana vitrectomy; RE: Refractive error; SFCT: Subfoveal choroidal thickness; SO: Silicone oil.

#### Acknowledgments

Not applicable.

#### Authors' contributions

X C, Y Y and B Z contributed significantly to analysis and manuscript preparation; CY G and YP S helped perform the analysis with constructive discussions. The author(s) read and approved the final manuscript.

#### Funding

Not applicable.

#### Availability of data and materials

The datasets used and/or analyzed during the current study are not publicly available due to their containing information that could compromise the privacy of research participants, but are available from the corresponding author Xiao Chen ([cxfn817@163.com](mailto:cxfn817@163.com)) in a de-identified manner on reasonable request.

#### Declarations

##### Ethics approval and consent to participate

Not applicable.

##### Consent for publication

Not applicable.

##### Competing interests

The authors declare that they have no competing interests.

#### Author details

<sup>1</sup>Department of Ophthalmology, PLA Middle Theater General Hospital, 627 Wuluo Road, Wuhan 430070, China. <sup>2</sup>Southern Medical University, Guangzhou, China.

Received: 3 August 2022 Accepted: 14 November 2022

Published online: 08 December 2022

#### References

1. Glasser A, Kaufman PL. The mechanism of accommodation in primates. *Ophthalmology*. 1999;106(5):863–72.
2. de Jong PTVM. The quest for the human ocular accommodation mechanism. *Acta Ophthalmol*. 2020;98(1):98–104.

3. Woodman-Pieterse EC, Read SA, Collins MJ, Alonso-Caneiro D. Regional changes in choroidal thickness associated with accommodation. *Invest Ophthalmol Vis Sci*. 2015;56(11):6414–22.
4. McBrien NA, Gentle A. Role of the sclera in the development and pathological complications of myopia. *Prog Retin Eye Res*. 2003;22(3):307–38.
5. Helmholtz's Treatise on Physiological Optics. Translated from the third German edition. *JAMA*. 1925;85(6):461–1.
6. Wallman J, Wildsoet C, Xu A, Gottlieb MD, Nickla DL, Marran L, et al. Moving the retina: choroidal modulation of refractive state. *Vis Res*. 1995;35:37–50.
7. Wildsoet C, Wallman J. Choroidal and scleral mechanisms of compensation for spectacle lenses in chicks. *Vis Res*. 1995;35(9):1175–94.
8. Gao L, Zhuo X, Kwok AK, Yu N, Ma L, Wang J. The change in ocular refractive components after cycloplegia in children. *Jpn J Ophthalmol*. 2002;46(3):293–8.

#### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more [biomedcentral.com/submissions](https://biomedcentral.com/submissions)

