

Author response: OCT angiography in idiopathic macular hole, some methodological concerns

Yufei Teng^{1,2} · Wu Liu²

Received: 13 June 2017 / Accepted: 19 June 2017 / Published online: 9 July 2017
© Springer-Verlag GmbH Germany 2017

Dear Editor,

We appreciate the interests and comments from Dr. Joel Hanhart in our publication entitled “OCT Angiography Quantifying Choriocapillary Circulation in Idiopathic Macular Hole Before and After Surgery”. In our article [1], we found the flow area and parafovea vessel density of choriocapillaris in the macular area were significantly smaller and lower in IMH eyes than unaffected fellow eyes and healthy control eyes, and were increased 1 month after vitrectomy. Also, the choriocapillary circulation measurements were negatively correlated with macular hole diameters.

Joel Hanhart questioned that the reduction of choriocapillary flow area and parafoveal vessel density in IMH eyes may be due to the presence of retinal cysts, which might affect the image capture and data calculation in the OCTA system. Since OCTA is a newly developed OCT system that has just been widely applied in very recent years, there may exist some bias in the early usage due to the limitation of technique, which would be revealed and improved in further studies. We cannot deny the possibility that intraretinal cysts might be a factor influencing the measurement of choriocapillary blood flow, but our other considerations were as below:

Firstly, in our post-operative results, no intraretinal cysts existed in the macular area 1 month after vitrectomy, but the choriocapillary flow area and parafoveal vessel density were still lower than the unaffected fellow eyes. As shown in Table 4 and Fig. 3, the median of the flow area was 4.406 mm² in IMH eyes; and 4.583 mm² in Unaffected fellow eyes ($P = 0.001$, Friedman test). The median of parafoveal vessel density was 91% and 94%, respectively ($P = 0.002$, Friedman test). These results indicated that the significant difference of choriocapillary circulation still existed without the presence of cysts, so that our observation was not solely due to the artifact of retinal cysts. Moreover, in our unpublished data, we also recruited IMH patients for long-term observation, and the patients with more than 1 year follow-up showed an increased choriocapillary blood flow area and density as compared with 1 month and 6 months after surgery, which indicated that the restore of choriocapillary circulation was following the macular structure recovery.

Secondly, the reduction of choriocapillary flow area in IMH was not only detected by OCTA. Using Heidelberg Retinal Flowmetry (HRF), Cengiz Aras [2] reported that the foveal region of IMH fundus displayed a lower choroidal blood flow and velocity by comparing with healthy subjects, which could be another evidence for the choriocapillary circulation changes in IMH.

Finally, as Joel Hanhart mentioned, the duration of a macular hole could be a factor that correlating with the choriocapillary blood flow area and density, however, the duration of a macular hole in our study was obtained from the chief complaint of the patients, which may not be equal to the real duration of the macular hole. Therefore, the duration time of IMH in this study was found to be less relevant to the anatomic change of the macular area.

In conclusion, the choriocapillary blood flow was altered in the eyes with IMH, and will change following the closure of

✉ Wu Liu
wuliubj@yahoo.com

¹ Beijing Institute of Ophthalmology, Beijing Tongren Eye Center, Beijing Tongren Hospital, Capital Medical University, Beijing Key Laboratory of Ophthalmology and Visual Sciences, 17 Hougouhutong Street, Dongcheng District, Beijing 100005, China

² Beijing Tongren Eye Center, Beijing Tongren Hospital, Capital Medical University, Beijing Key Laboratory of Ophthalmology and Visual Science, 1 Dongjiaominxiang Street, Dongcheng District, Beijing 100730, China

the macular hole. The intraretinal cysts in the en face angiogram might be a factor influencing its underlying data analysis, but more validation is needed to prove this phenomenon. So in our further study, the area of intraretinal cysts will be included as a parameter to assess the possible correlation between IMH cysts and choriocapillary blood flow. We appreciate the comments of Dr. Joel Hanhart, giving us an opportunity to clarify the validity and reliability of our study.

Compliance with ethical standards

Funding No funding support was received for this research.

Conflict of interest All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers'

bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

References

1. Teng Y, Yu M, Wang Y, Liu X, You Q, Liu W (2017) OCT angiography quantifying choriocapillary circulation in idiopathic macular hole before and after surgery. *Graefes Arch Clin Exp Ophthalmol* 255(5):893–902. doi:10.1007/s00417-017-3586-0
2. Aras C, Ocakoglu O, Akova N (2004) Foveolar choroidal blood flow in idiopathic macular hole. *Int Ophthalmol* 25(4):225–231. doi:10.1007/s10792-005-5014-4