

# The importance of statistics in ophthalmology

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*Comment on:* Wang X, Feng K, He S, Xie X, Ma Z. The continuous treatment of anterior segment open globe injury: an eye injury vitrectomy study. *Quant Imaging Med Surg* 2023;13:6257-67.

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I recently read the article by Wang *et al.* about continuous surgical treatment (CST) to improve the scarring process and probably patient outcomes in anterior segment open globe injuries (1). An interesting idea, as other researchers in different fields have demonstrated the benefits of debridement when healing a wound after trauma.

However, I would like to address some concerns regarding the statistical analysis due to the small sample size, with an  $n$  of 19 (eyes and patients) for a quasi-experimental design, where two groups were compared, one with CST and the other without it, and the multiple tests applied to the data.

Having a small sample size has its limitations. Researchers are limited mostly to descriptive analysis and analysis of independence. Statistical models, correlations, associated factors, or predictions are hindered by the lack of power that small numbers give. Interceptions between variables with small numbers and multiple categories are likely to produce tables with zeros in some cells, which is often a challenge to reach reliable conclusions from the data.

To analyze any variable, test selection is vital. One needs to study first if the assumptions of the test are fulfilled. Two tests are used to analyze independence between two categorical variables: the chi-squared test and the Fisher's

exact test. Selection of the proper test is based on the expected value for each cell in the table  $n \times n$ , which are calculated as follows:

*Expected values,  $E(x) = (\text{row total} \times \text{column total}) / \text{overall total}$*  [1]

Using the data from *Tab. 1* to *3* in the Wang *et al.* study, one can find that there are expected values that are lower than 5. Running tests, both the chi-squared and Fisher's exact tests using Stata18<sup>®</sup>, it seems that the authors used chi-squared where it should not be used, generating inaccurate P values and, therefore, results and conclusions (2). Most of the P values in *Tab. 3* change when a Fisher's test is applied, and the significance is lost in most of the variables as described in *Table 1* of this letter.

Amendments to this manuscript are worthy as the analysis has serious limitations due to the small sample size, but mostly because the analysis was not carried out with the proper test. Another pending discussion might be the effect of multiple tests on the study's outcomes.

I encourage the authors to consider these points in a revised analysis or future research. Such improvements could greatly enhance the reliability and applicability of the study's findings, further benefiting the field of ophthalmology.

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**Table 1** Data from *Tab. 3* by Wang *et al.* (1) comparing presumably significant complications associated with anterior chamber injury between the group with CST (n=9) and without CST (n=10)

Complication	Group 1, n [E(x)]	Group 2, n [E(x)]	P value (Chi <sup>2</sup> )	P value (Fisher's exact test)	Wang <i>et al.</i> , P value
Adhesive corneal leucoma			0.005	0.011	0.011
Yes	0 [2.8]	6 [3.2]			
No	9 [6.2]	4 [6.8]			
Uneven anterior chamber by slit lamp/AS OCT/UBM			0.027	0.057*	0.022
Yes	1 [3.3]	6 [3.7]			
No	8 [5.7]	4 [6.3]			
Blocking the light passing through the pupil			0.073	0.211*	0.037
Yes	0 [1.4]	3 [1.6]			
No	9 [7.6]	7 [8.4]			
Fibrosis or scarring in the AS			0.040	0.070*	0.040
Yes	3 [5.2]	8 [5.8]			
No	6 [3.8]	2 [4.2]			
Secondary glaucoma			0.073	0.211*	0.037
Yes	0 [1.4]	3 [1.6]			
No	9 [7.6]	7 [8.4]			
Severe destruction of the AS			0.156	0.474	0.474
Yes	0 [0.9]	2 [1.1]			
No	9 [8.1]	8 [8.9]			

n, sample size. E(x): expected value. \*, P values that compared with Wang *et al.*'s (1) P values changed from significant to non-significant. Group 1: patients with AS open globe injuries who received CST; group 2: patients without CST after the initial wound repair. CST, continuous surgical treatment; AS, anterior segment; OCT, optical coherence tomography; UBM, ultrasound biomicroscope.

**Appendix 1:** Response to “The importance of statistics in ophthalmology”.

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## Footnote

*Conflicts of Interest:* The author has completed the ICMJE uniform disclosure form (available at <https://qims.amegroups.com/article/view/10.21037/qims-23-1843/coif>). The author has no conflicts of interest to declare.

*Ethical Statement:* The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## References

1. Wang X, Feng K, He S, Xie X, Ma Z. The continuous treatment of anterior segment open globe injury: an eye injury vitrectomy study. *Quant Imaging Med Surg* 2023;13:6257-67.
2. McDonald JH. *Handbook of biological statistics*: 3rd ed. Baltimore, MD: Sparky House Publishing, 2014.

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# Response to “The importance of statistics in ophthalmology”

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We are writing to express our heartfelt gratitude for Mr. Lozano-Cruz’s attention to our recently published research paper “The continuous treatment of anterior segment open globe injury: an eye injury vitrectomy study” (1). His comments and feedback have been truly insightful, and we appreciate his time and consideration (2).

Our research aimed to study on the impact of wound healing in the anterior segment after open globe injury (OGI), especially evaluated whether a better prognosis can be obtained from continuous surgical treatment (CST).

It focuses more on the clinical issues themselves. We believe that CST of OGI, particularly in the anterior segment, has the potential to yield better outcomes compared to allowing the wound to undergo fibrosis or scar formation. This viewpoint has been continuously confirmed in our clinical practice, we hope that upon publication, our study will benefit more trauma patients and encourage more doctors to engage in discussions on this topic. However, as mentioned in our article, cases of anterior segment trauma alone are rare, and the control group of patients who do not receive treatment after trauma and seek medical

attention is even more rare. Therefore, the small sample size and insufficient statistical evidence are also one of the limitations of the article. We will continue to accumulate more cases and experience in the future, with a goal to publishing articles with better experimental and statistical design.

The suggestions on statistics have been invaluable in helping us to improve our research. Additionally, we are particularly interested in his comments on our findings and its potential impact on this field. We will consider more about his suggestions in our future randomized controlled study.

## References

1. Wang X, Feng K, He S, Xie X, Ma Z. The continuous treatment of anterior segment open globe injury: an eye injury vitrectomy study. *Quant Imaging Med Surg* 2023;13:6257-67.
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