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Title:

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Date:

2021-09-01

Citation:

Tan, C. L., McGuinness, M. B., Essex, R., Dawkins, R. C. H. & Allen, P. J. (2021). Post-traumatic endophthalmitis: A novel risk scoring system identifying high risk open globe injuries. *Clinical and Experimental Ophthalmology*, 49 (7), pp.757-759. <https://doi.org/10.1111/ceo.13982>.

Persistent Link:

<https://hdl.handle.net/11343/298963>

Letter to the Editor

Post-traumatic endophthalmitis: a novel risk scoring system identifying high risk open globe injuries

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Received 21 April 2021; accepted 7 August 2021

Funding sources / Financial disclosure: Dr Rosie Dawkins holds an RVEEH Early Career Research Grant, which supports this work.

Conflict of interest: None

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: [10.1111/ceo.13982](https://doi.org/10.1111/ceo.13982)

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Post-traumatic endophthalmitis (PTE) is a sight-threatening complication of open globe injury. Antibiotic prophylaxis following any traumatic full thickness defect is known to be important, and its use should be ubiquitous. Here, a nomogram is presented to stratify endophthalmitis risk based on presenting features. This could be used by clinicians to identify patients at greater risk, who may benefit from additional interventions.

Ethics approval was granted by the Royal Victorian Eye and Ear Hospital (RVEEH) Human Research Ethics Committee (HREC). Research observed principles outlined in the National Health and Medical Research Council (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the *Declaration of Helsinki*. The authors have no conflicts of interest. 448 open globe injuries (251 eyes, 250 patients between 01/01/1998 – 31/12/2000, and 197 eyes, 196 patients between 01/01/2016 – 31/12/2018) were included in a retrospective case series at a single tertiary centre in Melbourne, Australia. An open globe injury was defined as any traumatic full-thickness defect of the corneoscleral shell with or without intraocular foreign body (IOFB), including self-sealing defects. Posterior globe ruptures without direct environmental communication were excluded. PTE risk scores were derived via multivariable logistic regression using risk factors selected a priori (wound contamination, presentation delay, capsular breach, lens-iris diaphragm breach, retained IOFB) as they have been shown in this study and previous studies to be associated with PTE. (1, 2) Risk factors were defined as per our original study, previously detailed. (1) Data was not split into training and validation sets (common in risk prediction studies) due to small case numbers. Nomogram scores were compared via Wilcoxon's rank-sum test. Diagnostic accuracy was investigated through receiver operating characteristic (ROC) plots. Complete case analyses were performed. All analyses were conducted using Stata/SE version 16.1 (College Station, Texas).

Amongst 448 open globe injuries, 26 (5.8%) cases of endophthalmitis were recorded. 12 (2.7%) of these were apparent on presentation. 384 patients had non-missing data on the five risk factors of interest (see Figure 1). Delayed presentation

posed the greatest risk (10.0 points), followed by wound contamination (8.2 points), lens-iris diaphragm breach (5.1 points), capsular breach (3.8 points) and retained IOFB (2.1 points). Patients who did not develop PTE following open globe injury scored between 0 and 27.1 (median 8.9, IQR 2.1, 12.1), whilst those who did scored between 8.2 and 27.1 (median 18, IQR 12.1, 22.7, see Figure 2A). The risk score had good diagnostic accuracy (area under the ROC curve 0.84, 95% CI 0.77, 0.91, see Figure 2B).

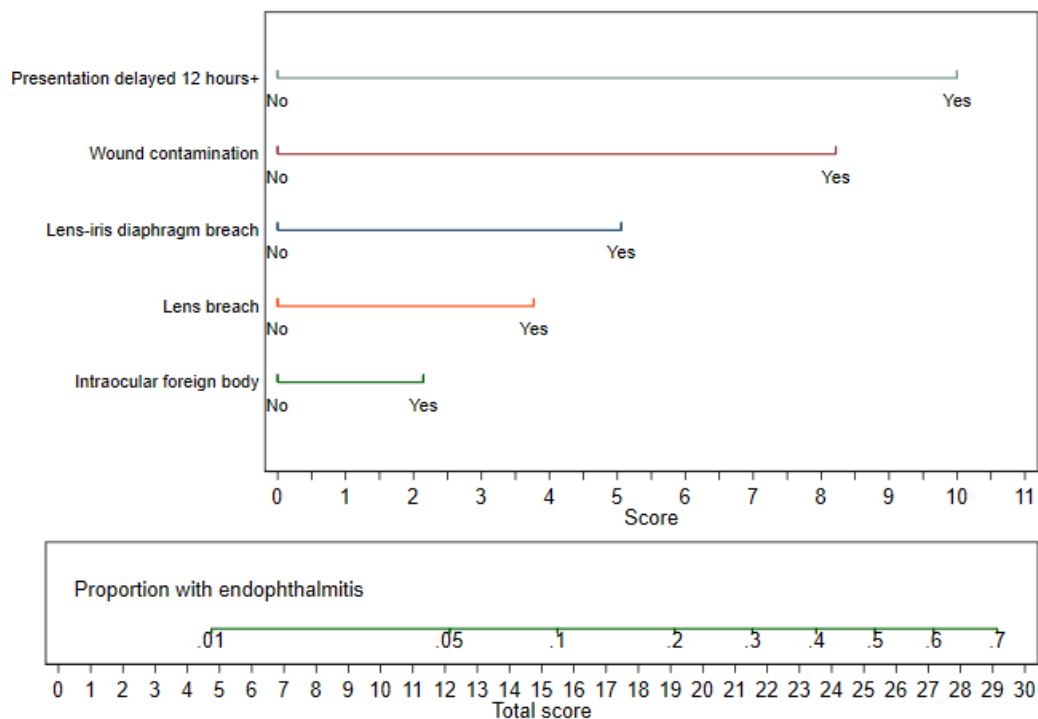


Figure 1: Risk score nomogram for post-traumatic endophthalmitis by presenting characteristics. Scores were derived from multivariable logistic regression (n=384).

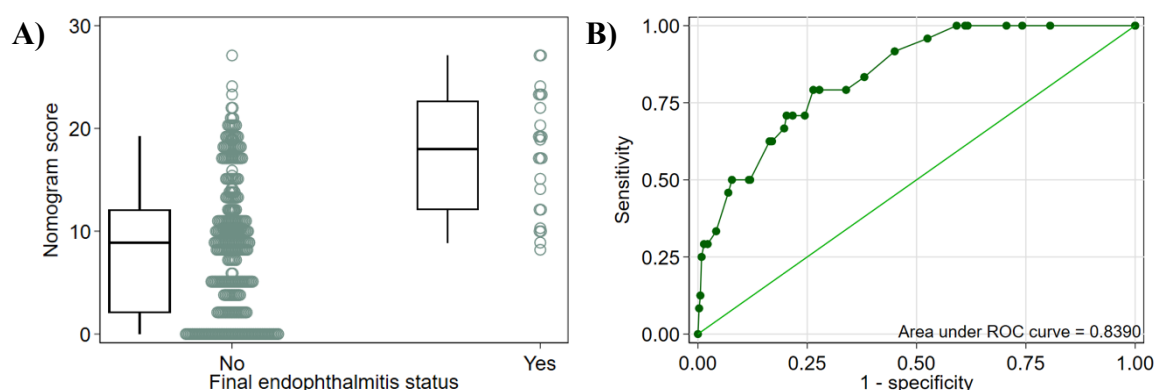


Figure 2: A) Distribution of risk scores derived from multivariable logistic regression among patients with complete data on the risk factors of interest (n=384). Each circle represents a patient. The box indicates the median and interquartile range and the whiskers extend to the 5th and 95th centiles. B) ROC curve for PTE risk score in patients presenting with open globe injury to investigate diagnostic accuracy.

Delay in primary repair (the sum of presentation delay and in-hospital delay) is an important and modifiable risk factor for PTE. (1, 2) Presentation delay scored the highest number of points, representing the greatest infection risk by any presenting feature (10.0 points). Prompt wound closure should be standard practice in the management of open globe injuries.

Wound contamination (scoring 8.2 points) posed the second highest risk. Studies have strongly associated this with increased risk of PTE. (1, 2) The addition of prophylactic antibiotics when managing an open globe injury is known to be important, and their use should be ubiquitous. Local epidemiological data should be used to guide empirical therapy. As per trauma management protocols within this tertiary centre in Melbourne, Australia, topical ophthalmic antibiotics are prescribed as per individual cases. Intraoperatively, intracameral cefazolin 1mg/0.1mL is recommended for penetrating injuries involving the anterior segment with or without

IOFB. Subconjunctival cefazolin, 100mg/1.0mL, may be used as an alternative to intracameral cefazolin. In high risk cases, intravitreal injections of vancomycin 1mg/0.1mL, ceftazidime 2mg/0.1mL are recommended for PTE prophylaxis, amphotericin B 5microg/0.1mL or voriconazole 100microg/0.1mL when fungal infection is suspected, dexamethasone 0.4mg/0.1mL when fungal infection is thought to be unlikely. Important to the rationale behind this study, only two randomised control trials (RCT) have investigated the efficacy of prophylactic intravitreal antibiotics (3, 4) In this context, a risk scoring system may inform selection criteria for a randomised study on intravitreal prophylaxis in high risk open globe injuries.

The risk score was a good predictor of PTE risk. External validation is required. In practice, it may be used by clinicians to identify patients at greater risk, who have been shown to benefit from additional interventions. (3, 4) This will guide decisions at the time of primary repair, and inform hospital-wide trauma protocols for the management of open globe injuries. It may also be used to select higher risk groups in a future RCT on intravitreal prophylaxis.

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