R package mentioned and in a number of commercial packages.

The paper of Drs Zhang and Sun,[3] which Dr Dulku[1] cites, briefly discusses interval censoring in face of competing risks. However, commercial software for this purpose is not yet marketed. Formal adjustment is available either for interval censoring[1,3,6] or for competing risks.[5,7–10] To address simultaneously both biases, one reasonable approach at present is to undertake cumulative incidence analysis and to plot two curves, the first modelling the event of interest as occurring when it was recorded, and the second assigning it to the immediately preceding visit. The former curve will exaggerate the probability of success and the latter the probability of failure. Alternatively, a cumulative incidence curve based on the midpoint of the review interval may be used as an approximation of interval censoring.[9]

Interval censoring and competing risks bias in survival analysis are ill known to authors, reviewers, and readers, risking misinterpretation of study results.

Conflict of interest

The authors declare no conflict of interest.

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T Kivelä[1], E Kujala[1], E Forsman[1] and E Vesti[2]

[1]Department of Ophthalmology, Helsinki University Central Hospital, Helsinki, Finland

[2]Department of Ophthalmology, Turku University Central Hospital, Turku, Finland
E-mail: tero.kivela@helsinki.fi

Sir,
Reply to Kivelä *et al*

Kivelä *et al*[1] raise an important point regarding survival analysis in glaucoma surgery in that bias is caused when the competing risk of death is not taken into account. A glaucoma operation that does not fail in the patient's lifetime can be considered a complete success (as long as the patient does not die before they could be expected to benefit from the procedure). The current implementation of survival analysis in glaucoma surgery does not account for this by considering such patients still at risk of failure even after they have died.

Kivelä *et al*[1] note that current statistical packages do not yet allow for the routine analysis of competing risks data subject to interval censoring. While methods have been devised to deal with such data,[2,3] such techniques are considerably more difficult to apply than standard Kaplan–Meier survival analysis.

As the proportion of deaths in the population decreases, the effect of the competing risk of death will reduce. Studies with shorter follow-up are less likely to encounter bias than those with longer follow-up. However, death is a common outcome in studies with longer follow-up. The 20-year outcomes of trabeculectomy have been reported[4] and in this study, 21% of patients were censored due to death. In the TVT study,[5] 13% of patients had died by 5 years. Surgical failure is, therefore, likely to have been overestimated in these studies.

Competing risks analysis in glaucoma studies could be extended to competing risks other than death. For trabeculectomy, an important competing risk is the requirement for needling. Current studies usually ignore needling as an event;[5] competing risks analysis would provide a mechanism whereby this could be taken into account.

Given the above, it may be necessary to rethink the application of survival analysis to glaucoma surgery so that we can make more accurate predictions of survival and better use of the available data. A more sophisticated approach will ultimately allow us to more accurately describe the likely postoperative course when counseling patients regarding glaucoma surgery.

Conflict of interest

The author declares no conflict of interest.

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S Dulku

Moorfields Eye Hospital, London, UK
E-mail: simon.dulku@doctors.net.uk