Intraoperative Blood Transfusion Contributes to Decreased Long-Term Survival of Patients with Esophageal Cancer: Comments on Regression Model Estimation: Reply

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To the Editor

We are grateful to Fancesco and colleagues for their thoughtful comments on our recent article, Intra-operative Blood Transfusion Contributes to Decreased Long-term Survival of Patients with Esophageal Cancer [1]. We entirely agree with their comments that it was inappropriate to perform a multivariate Cox proportional hazard regression analysis by introducing ten explanatory variables when the sample size was small ($n = 37$), and to include both intraoperative blood loss and blood transfusion as explanatory variables in the multivariate analysis due to their high correlation.

We performed the Kendall Tau correlation test, which demonstrated a high correlation between intraoperative blood loss and intraoperative blood transfusion (correlation coefficient 0.535). Excluding intraoperative blood transfusion, we introduced four possible explanatory variables, including intraoperative blood loss, stage of the disease, age, and sex in the multivariate Cox proportional hazard regression analysis (Table 1). The stage of the disease and intraoperative blood loss were shown to be two independent risk factors for reduced survival ($p = 0.001$ and 0.002 , respectively), whereas the other variables did not reach statistical significance. For these reasons, reanalysis using

Table 1 Multivariate Cox proportional hazard regression analysis

Variables	Hazard ratio	95 % Confidence interval	<i>p</i> Value
Stage of the disease	2.637	0.663–1.049	0.001*
Intraoperative blood loss	1.004	1.001–1.006	0.002*
Age	1.095	0.993–1.207	0.069
Sex	0.507	0.096–2.683	0.424

* $p < 0.05$ is considered significant

the reduced number of variables did not change our conclusions and consistently demonstrated that intraoperative blood loss is an independent prognostic factor in this setting.

However, the present study is a non-randomized retrospective study involving a relatively small number of patients ($n = 37$) with a short-term follow-up (mean 3.3 years). To evaluate the actual role of intraoperative blood loss in patients with esophageal cancer, a prospective, randomized controlled study with a larger number of subjects and longer-term follow-up will be required.

Conflict of interest None.

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