Table 3. Association of Postoperative Hypotension, as Duration under Multiple MAP Thresholds, and Myocardial Injury

Postoperative MAP Thresholds	Duration under MAP Threshold (h)	Total (n = 1,710)	Myocardial Injury (n = 238)	Adjusted Odds Ratio* (95% CI)† [Full Model]	*P* Values†
MAP < 60 mmHg					
	0	1,010	114 (11.29)	Ref	
	0–1	466	70 (15.02)	1.53 (1.04–2.26)	0.030
	1–2	91	23 (25.27)	2.73 (1.45–4.99)	0.001
	2–4	76	16 (21.05)	3.30 (1.57–6.64)	0.001
	> 4	67	15 (22.39)	2.04 (0.93–4.28)	0.065
MAP < 65 mmHg					
	0	693	74 (10.68)	Ref	
	0–1	474	64 (13.50)	1.47 (0.97–2.23)	0.067
	1–2	153	26 (16.99)	1.78 (0.97–3.16)	0.055
	2–4	160	23 (14.37)	1.81 (0.98–3.26)	0.054
	> 4	230	51 (22.17)	3.01 (1.79–5.06)	< 0.001
MAP < 70 mmHg					
	0	466	49 (10.52)	Ref	
	0–1	371	50 (13.48)	1.25 (0.77–2.03)	0.359
	1–2	174	16 (9.20)	0.80 (0.39–1.56)	0.527
	2–4	195	28 (14.36)	1.28 (0.71–2.29)	0.407
	> 4	504	95 (18.85)	2.19 (1.37–3.57)	0.001
MAP < 75 mmHg					
	0	268	24 (8.96)	Ref	
	0–1	285	32 (11.23)	1.15 (0.61–2.19)	0.662
	1–2	157	21 (13.38)	1.53 (0.74–3.13)	0.245
	2–4	178	21 (11.80)	1.29 (0.63–2.61)	0.482
	> 4	822	140 (17.03)	2.04 (1.19–3.64)	0.012
MAP < 80 mmHg					
	0	153	17 (11.11)	Ref	
	0–1	191	13 (6.81)	0.52 (0.22–1.22)	0.132
	1–2	122	18 (14.75)	1.48 (0.66–3.36)	0.344
	2–4	164	23 (14.02)	1.20 (0.55–2.66)	0.646
	> 4	1080	167 (15.46)	1.39 (0.75–2.73)	0.319

There were no significant interactions between postoperative and intraoperative hypotension within the models. MAP, mean arterial pressure.

*Multivariate logistic model adjusted for age, sex, high-risk surgery, emergency procedures, intraoperative hypotension, intra- and postoperative heart rate, previous history of hypertension, insulin-dependent diabetes mellitus, coronary artery disease, congestive heart failure, cerebrovascular disease, renal disease, estimated blood loss, length of surgery, and preoperative use of β-blockers, statins, angiotensin-converting enzyme inhibitors, angiotensin II antagonists, calcium channel blockers, diuretics, aspirin, and oral anticoagulants; one observation deleted because of missingness. †Bonferroni correction was used to adjust for the five defined MAP thresholds for postoperative hypotension. $P < 0.05/5 = 0.01$ was considered statistically significant.

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Anesthesia and Circulating Tumor Cells: Comment

To the Editor:

With great interest we have read the article by Hovaguimian *et al.*[1] regarding the effect of different anesthesia drugs (sevoflurane or propofol) on the number of circulating tumor cells in patients undergoing breast cancer surgery. We appreciate and congratulate the authors for setting up a meaningful randomized, controlled trial and sharing such useful findings. There are, however, two important points of concern.

First of all, the study used a mixed Poisson model. However, we noted that the first quartile of circulating tumor cell count results at all time points was zero, and the median was also zero

in the 48-h sevoflurane group and the 72-h propofol group, so it was reasonable to assume that there were many zeros (at least 25 to 50%). Therefore, a zero-inflated Poisson regression model[2,3] should be adopted when applying the Poisson model. However, the authors did not report the details or provide the raw data, so we had some doubts about the conclusion based on the questionable statistical methods.

Second, some variables that might affect the number of circulating tumor cells were not mentioned in the study, such as postoperative cancer-related infection and preoperative treatment regimen.[4] In addition, in figure 2 of the article, we noted that some data are missing, but the authors did not report the reasons for the missing data.

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Competing Interests

The authors declare no competing interests.

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Anesthesia and Circulating Tumor Cells: Reply

In Reply:

We thank Dr. Zhu *et al.* for their valuable inputs[1] regarding our study.[2] Dr. Zhu rightly points out that there is a relatively large proportion of zeros in our data set, which may support the use of mixed zero-inflated Poisson models. In our case, however, the use of such statistical approach was not formally indicated: the rationale underlying zero-inflation is that certain individuals might—because of some unknown factors—not be able to present values other than zero. If this is indeed the case, the logistic regression part of zero-inflated models is used to model that inability. In our trial, though, in-depth review of our longitudinal data revealed that most patients presented values other than zero on at least one of the time points. Most notably, the percentage of patients presenting zero values over the entire observation time was only around 6%. This percentage was deemed too low to justify the use of a mixed zero-inflated Poisson model.

Nonetheless, because the comparison of varying methodologic approaches is always valuable in the appraisal of results robustness, a mixed zero-inflated Poisson model was fitted to our main outcome (*i.e.*, counts of circulating tumor cells over time). Our findings remained unchanged (*i.e.*, there was no evidence of a difference between sevoflurane and propofol anesthesia).

A second concern of Dr. Zhu is that some variables that may affect the outcome were not captured by our analysis. It is worth remembering, however, that our study is based on a randomized design, which aims to control for the risk of confounding (both for known and unknown confounders). In our trial, the size of the sample and the randomization process led to successful control of pre-, intra-, and postoperative confounders, as reflected in tables 1 and 2. As for missing data in figure 2, the reason for data loss is mentioned in the Methods section and pertained to early hospital discharge.

Competing Interests

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