



Relationship between aortic calcification and postoperative delirium in elderly patients undergoing spine surgery



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Introduction

- Postoperative delirium (POD) is a serious complication following anesthesia and surgery in elderly patients.
- The presence of aortic calcification has been reported to be associated with neurocognitive impairment in elderly patients, and it has also been reported to contribute to postoperative neurocognitive dysfunction in patients undergoing cardiac surgery.
- However, its effect on POD following non-cardiac surgery is unclear.
- In this study, we evaluated the effect of aortic calcification on POD in elderly patients undergoing spine surgery.

Methods

- In a single medical center, the medical records of elderly patients ≥ 65 years of age who underwent spine surgery from January 2018 to December 2022 were reviewed.
- The delirium characteristics were routinely monitored using Nursing Delirium Screening Scale. Patients with any delirium characteristics were routinely consulted to psychiatrist, and presence of delirium was defined according to the psychiatrist's diagnosis.
- Presence of aortic calcification was assessed in a routine postero-anterior chest X-ray.
- Perioperative data, including type of surgery, admission type (elective or emergency), durations of surgery and anesthesia, maintenance drug for anesthesia (inhalational vs. total intravenous), bispectral index during anesthesia, estimated blood loss, volume of fluid infused, transfusion, hypotension, perioperative numerical rating scale ranging from 0 to 10, rescue opioid for analgesia after surgery for postoperative three days, postoperative delirium, postoperative 30-day complications and length of stay.
- The primary outcome was the relationship between the presence of aortic calcification and the incidence of POD. Secondary outcome was the relationship of postoperative 30-day neurologic complications other than POD (stroke or hemorrhage) with aortic calcification.



Figure 1. Aortic calcification

Results

- POD occurred in 29 patients (10%) of the 290 patients, and aortic calcification was detected in 99 of 290 patients (34.1%).
- Older age ($P<0.001$), postoperative day 1 pain score ($P=0.017$), and the use of sevoflurane ($P=0.021$) were associated with increased odds of POD after adjusting for confounding factors (Table 1)
- The presence of aortic calcification was not related to postoperative hospital stay ($P=0.569$ and $P=0.268$, respectively) and 30-day cerebrovascular complication ($P=0.679$ and $P=0.660$, respectively) (Table 2).

Table 1. Univariable and multivariable logistic regression analyses of risk factors for postoperative delirium

Factors	Univariable		Multivariable	
	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Aortic calcification	0.782 (0.381, 1.603)	0.501	0.974 (0.402, 2.365)	0.954
Age	1.183 (1.094, 1.279)	<0.001	1.220 (1.109, 1.343)	<0.001
ASA physical status ≥ 3	1.823 (0.825, 4.027)	0.137	1.208 (0.466, 3.128)	0.698
Diabetes mellitus	2.157 (1.062, 4.382)	0.033	2.273 (0.992, 5.208)	0.052
Postoperative day 1 NRS	1.342 (1.115, 1.614)	0.002	1.333 (1.053, 1.688)	0.017
Rescue use of opioids	3.684 (1.484, 9.146)	0.005	1.468 (0.509, 4.237)	0.478
Duration of anesthesia	1.003 (1.000, 1.007)	0.051	1.000 (0.995, 1.006)	0.937
Infused fluid	1.000 (1.000, 1.001)	0.011	1.000 (1.000, 1.001)	0.134
Transfusion	2.090 (1.025, 4.260)	0.042	0.754 (0.430, 3.206)	0.754
Sevoflurane (vs. Propofol)	3.592 (1.579, 8.172)	0.002	4.120 (1.549, 10.954)	0.021

ASA=American Society of Anesthesiologists, NRS=numeral rating scale, CI=confidence interval, Estimate was odds ratio from the logistic regression.

Table 2. Univariable and multivariable logistic regression analyses of risk factors for postoperative delirium

Responsible variable	Aortic stenosis vs. Non aortic stenosis			
	Adjusted by covariates			
	Estimate (95% CI)	P-value	Estimate (95% CI)	P-value
Postoperative hospital stay ^a	0.034 (-1.844, 3.350)	0.569	0.065 (-0.050, 0.179)	0.268
30-day cerebrovascular complication ^b	0.619 (0.064, 6.021)	0.679	0.581 (0.052, 6.498)	0.660

CI=confidence interval, ^aEstimate was odds ratio from the logistic regression. ^bEstimate was coefficient from the linear regression.

Conclusion

- Preoperatively detected aortic calcification on chest X-ray was not related to the occurrence of POD or other neurologic complications in elderly patients undergoing spine surgery. Larger prospective studies of this issue are required.