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Continuation of Angiotensin Converting Enzyme Inhibitors on the Day of Surgery Is Not Associated with Increased Risk of Hypotension Upon Induction of General Anesthesia in elective Non-Cardiac Surgeries

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Dear Editor

Angiotensin-converting-enzyme inhibitors (ACE-I) and angiotensin-II receptor blockers (ARB) have become progressively popular to treat hypertension due to their beneficial effect in reducing morbidity and mortality. At the same time the rate of major noncardiac surgical procedures is increasing and the use of these agents may pose challenges in the perioperative setting. Intraoperative hypotension in the setting of ACE-I and ARBs use has been reported in the literature[1]. However, the effect on ACE-I and ARB on induction related hypotension has not been studied. Induction related hypotension almost always occurs, is immediate and plateaus soon after due to increased volume loading, vasopressor use and cardiovascular adaptation[2]. The question was raised whether ACE-I or ARB continuation increases the risk of induction related intraoperative hypotension within 15 minutes after general anesthesia in elective non-cardiac surgeries.

WE conducted a retrospective-cohort-study among elective non-cardiac surgery patients. The study was approved by the institutional review board and informed consent was waived. 400 electronic medical records with patients who had an ACE-I or ARB on their list of preoperative home medications were screened. Patients were divided into two groups: continuation of ACE/ARB and discontinuation of ACE/ARB. Patient who received regional anesthesia were excluded. Hypotension was defined as either: systolic-BP <90 mm Hg or systolic-BP decrease of >20%.

349 patients were included for final analysis. The mean admission ASA-status was 2.7±0.5, age 65±11 years, and BMI 31±6.9 kg/m2. There were no statistically significant changes between the ACE-I/ARB continuation and discontinuation group in terms of SBP ($p=0.853$), DBP ($p=0.357$), MAP ($p=0.782$) and HR ($p=0.220$), figure 1. There were also no significant differences in induction medication dose (propofol, fentanyl and rocuronium) and pressor use ($p=0.137$). Hypotension ($p<0.001$) occurred equally in both groups over 15 minutes.

Hollman et al[3] meta-analysis showed that continuation of ACE-Is/ARBs was associated with increased risk of intraoperative hypotension up to 60 minutes after induction. However, most included studies had a low sample size, pertains to a specific type of surgery such as vascular, cardiac, or bariatric, and reported only small incidences of hypotension. The heterogeneity was very high (I^2=71%) and the results may not be generalizable or reproducible in a larger patient population. Furthermore, no study looked specifically for the effect on induction related hypotension. Despite intraoperative hypotension was reported, the meta-analysis was unable to demonstrate an association between perioperative ACE-I/ARB administration and mortality, MACE, CHF, AKI, or CVA.

The decision whether to continue or withhold ACE-I/ARB preoperatively in elective non-cardiac surgeries is still controversial. Currently, the 2014 American College of Cardiology/American Heart Association guidelines[4] state that it is reasonable to continue therapy preoperatively, and if withheld, therapy may be reinstituted as soon as clinically feasible.
The European Society of Cardiology/European Society of Anaesthesiology [5] bases its recommendations on the indication for treatment with an ACE-I/ARB, recommending discontinuation for 24-hours before surgery if prescribed for hypertension, and continuation if prescribed for heart failure and left ventricular systolic dysfunction.

In conclusion the continuation of ACE-I/ARB on the day of surgery was not associated with increased risk of intraoperative hypotension upon induction and within 15 minutes of general anesthesia in elective non-cardiac surgeries. However, the risk of intraoperative hypotension even after the induction phase with continuation of ACE/ARB still remains controversial, and the current evidence has failed to correlate the impact of intraoperative hypotension with adverse patient outcome. Our study adds another piece of data into the discussion and we suggest that individual perioperative risk factors should be considered before making the decision whether to continue or withhold ACE-I/ARB. Discontinuation may be considered for patients at high risk for hypotension-related complications, including patients with critical cardiovascular or cerebrovascular disease.

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Figure 1. Mean ± SEM Mean Arterial Pressure (MAP) measured pre-induction and at six additional time points for 15 minutes post induction