Abstract 9

Do ACEIs on the Morning of Surgery Increase Risk of Intraoperative Hypotension?

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Purpose: Several studies have described an increased incidence of hypotension with induction of anesthesia in patients taking angiotensin-converting enzyme inhibitors (ACEIs), and many anesthesiologists recommend withholding them on the morning of surgery. However, this hypotension has not been associated with an increased risk of clinically significant perioperative complications, and continuation of the drug may be beneficial. We undertook this pilot study to evaluate the safety of our current policy of continuing ACEIs on the morning of surgery, hypothesizing that it was not associated with increased risk of intraoperative hypotension.

Methods: We performed retrospective observational chart review of 93 consecutive patients on ACEIs seen in our preoperative medical consultation clinic who had elective ambulatory or same-day-admit surgeries (all types of procedures and anesthesia). Patients were instructed to continue ACEIs and all antihypertensive medications (except diuretics) on the morning of surgery. Preoperative blood pressure (BP) levels in clinic upon entrance to the operating room were recorded, as were the highest and lowest intraoperative values. *Primary outcome*: intraoperative hypotension, defined as systolic BP < 90 mm Hg; *secondary outcomes*: postoperative myocardial infarction, heart failure, stroke, or cardiac death.

Results: The results are summarized in the **Table**. Six of 93 (6.5%) patients developed hypotension (none within 30 minutes of induction of anesthesia). Four were treated with pressors, and three had blood loss of at least 100 cc. Risk factors associated with hypotension included duration of surgery 3 hours or longer and general anesthesia. There was no significant association with ACEI dose at least 50% maximum dose, use of three or more other antihypertensive medications, American Society of Anesthesiologists class, Revised Cardiac Risk Index, diabetes mellitus, type of surgery, or preoperative BP. There were no inhospital perioperative cardiac complications or deaths.

Conclusion: Continuation of ACEIs on the morning of surgery in our small study was associated with few episodes of hypotension, unrelated to induction of anesthesia, that were easily treated and did not result in any significant adverse outcomes. Future research with larger randomized controlled trials is needed to provide more evidence regarding the risk of hypotension with ACEIs.

1. *Rosenman DJ, McDonald FS, Ebbert JO, et al. Clinical consequences of withholding versus administering renin-angiotensin-aldosterone system antagonists in the preoperative period. J Hosp Med 2008; 3:319–325.*

2. *Comfere T, Sprung J, Kumar MM, et al. Angiotensin system inhibitors in a surgical population. Anesth Analg 2005; 100:636–644.*

TABLE
Selected factors and their association with intraoperative hypotension

	Hypotension (intraoperative BP < 90 mm Hg) (n = 6)	No hypotension (n = 87)
Age (range)	54.7 (39–71)	61.6 (31–88)
Gender (male)	2 (33%)	42 (48%)
Duration of surgery (hr)	4.3	2.1
Surgery ⩾ 3 hr	5 (83%)	20 (23%)
Type of surgery		
Vascular	1 (17%)	12 (14%)
Abdominal	1 (17%)	14 (16%)
Other	4 (66%)	61 (70%)
Type of anesthesia—general (vs other)	5 (83%)	38 (44%)
ACEI dose ⩾ 50% maximum	3 (50%)	30 (34%)
⩾ 3 other BP medications	2 (33%)	15 (18%)
Diuretic use	4 (67%)	52 (60%)
ASA class	3.0	3.0
Diagnosis of diabetes mellitus	1 (16%)	45 (52%)
RCRI score	0.8	1.1
Preop clinic BP		
Systolic/diastolic	134/79	140/77
Mean arterial pressure	98	98
Initial OR BP		
Systolic/diastolic	144/79	139/78
Mean arterial pressure	101	98
Change from clinic to OR systolic BP	+10 mm Hg	−1 mm Hg

ACEI = angiotensin converting enzyme inhibitor; ASA = American Society of Anesthesiologists (physical status); BP = blood pressure; OR = operating room; RCRI = Revised Cardiac Risk Index