Clinical and Experimental Emergency Medicine

Clin Exp Emerg Med 2015;2(2):131-132
http://dx.doi.org/10.15441/ceem.15.010

Push-dose pressors for immediate blood pressure control

Scott Weingart

Critical Care Corner Section Editor

eISSN: 2383-4625

INTRODUCTION

When a patient's blood pressure drops to critical levels, dysrhythmia and cardiac arrest ensue. While this level is patient dependent, Brunauer et al.[1] have identified a mean arterial pressure of 45 mmHg to be a critically low blood pressure associated with hemodynamic collapse. When a patient is moving towards this blood pressure, whether due to their disease state or iatrogenic factors, we must act immediately. Fluids, even when infused under pressure, take time to exert a significant effect. Vasopressor infusions require mixing, pump set-up, and available nursing staff.

For decades in the operating room, bolus administration of intravenous vasopressors and inotropes have been used by anesthesiologists to temporize blood pressure. However, this technique has not penetrated into standard emergency medicine or intensive care practice. These 'push-dose pressors' are the perfect solution to short-lived hypotension, e.g., post intubation or during procedural sedation. They also can act as a bridge to infusion vasopressors, while the latter are being mixed or while a central line is being placed.[2]

The standard push-dose pressors in the anesthesia armamentarium are phenylephrine and ephedrine. While phenylephrine is a useful drug for the emergency department because of its short half-life and easy dosing, ephedrine may not be ideal. Ephedrine has a long half-life and when misdosed, has been associated with cardiac complications. Instead, epinephrine may be the ideal second push-dose pressor for the emergency department and intensive care unit. Phenylephrine is a pure vasoconstrictor, so its use makes sense in tachycardic patients, because it will not increase the heart rate and may even decrease it by reflex parasympathetic response. Epinephrine is an inopressor; in addition to vasoconstriction, it will increase heart rate and inotropy.

Received: 17 February 2015
Revised: 1 March 2015
Accepted: 1 March 2015

Correspondence to: Scott Weingart
Stony Brook Medicine, 101 Nicolls Rd, Stony Brook, NY 11794, USA
E-mail: scott.weingart@stonybrookmedicine.edu

Capsule Summary

Bolus doses of vasopressors have been used in the operative setting for decades. This technique of administration offers immediate control of hypotension. For some reason, this technique has not penetrated to the Emergency Department or Intensive Care Unit. This brief review discusses implementation of push-dose pressors for critically ill patients.

How to cite this article:
Weingart S. Push-dose pressors for immediate blood pressure control. Clin Exp Emerg Med 2015;2(2):131-132.

SAFETY

Both drugs are safe to use in peripheral lines. Phenylephrine is approved for use intramuscularly or subcutaneously, so obviously extravasation from an intravenous line should not be concerning. The epinephrine concentration we use for push-dosing is the same as that contained in lidocaine with epinephrine (1:100,000). So, unless your intravenous line is located in those rare areas where local anesthetics with epinephrine may be a problem (i.e., tip of nose, penis, toes), there are no extravasation worries.

PHENYLEPHRINE DOSING AND USE

As mentioned above, phenylephrine is a pure alpha agent, so there is no intrinsic inotropy, but the increase in heart perfusion from normalizing the mean arterial pressure can improve cardiac output. The onset of effects is seen in < 1 minute and while the duration of a single dose may last 20 minutes, in almost all cases the effects are gone within five minutes.

Mixing instructions: Take a 3 mL syringe and draw up 1 mL of phenylephrine from the vial of phenylephrine 10 mg/mL. Inject this into a 100 mL bag of normal saline. Now you have 100 mL of phenylephrine with a concentration of 100 mcg/mL. Draw up some into a syringe; each milliliter in the syringe is 100 mcg. Label the syringe.

Dose: 0.5–2 mL (50–200 mcg) every 1–5 minutes.

Phenylephrine is also available commercially in premixed syringes. This may represent the only reason to use push-dose phenylephrine in preference to epinephrine.

EPINEPHRINE DOSING AND USE

Epinephrine has alpha 1 and 2 and beta 1 and 2 effects, so it is an inopressor. The onset of effects are seen in < 1 minute and while the duration of a single dose may last 10 minutes, in almost all cases the effects are gone within five minutes.

Mixing instructions: Take a 10 mL syringe filled with 9 mL of normal saline. If premade saline syringes are available, eject 1 mL of saline from the 10 mL saline syringe. Into this syringe, draw up 1 mL of epinephrine from the cardiac epinephrine amp (cardiac amp contains 10 mL of epinephrine concentration 100 mcg/mL or 1:10,000). Shake well. Now you have 10 mL of epinephrine 10 mcg/mL (1:100,000). Label the syringe.

Dose: 0.5–2 mL (5–20 mcg) every 1–5 minutes.

When faced with a crashing patient with hypotension, some may choose to avoid mixing and simply administer a full amp (1 mg) of cardiac epinephrine. Choosing this strategy can result in malignant hypertension, dysrhythmia, and cardiac arrest.[3] Do not give cardiac arrest doses (1 mg) to patients with a pulse. If due to expediency, mixing must be avoided, give 0.5 mL of the cardiac epinephrine. This amount is easily seen on the gradations of a cardiac epinephrine syringe. While the delivered dose (50 mcg) is still higher than ideal, it is far safer than administration of the entire amp. Given the time of mixing push-dose concentrations is less than 10 seconds, the far safer course is to simply avoid pushing any epinephrine directly from a cardiac amp.

CONCLUSION

Push-dose pressors have been used for decades in the operating room. The translation of this technique to the emergency department or intensive care unit is logical and useful. If only one push-dose pressor is to be used, epinephrine should be the choice. While literature to support the use of push-dose pressors outside of the operating room is only now emerging, its use in temporizing critically low blood pressures can be life-saving.

Note: Mixing instructions, cheat sheets, videos, and a podcast on push-dose pressors can be found at http://emcrit.org/push-dose.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Brunauer A, Kokofer A, Bataar O, Gradwohl-Matis I, Dankl D, Dunser MW. The arterial blood pressure associated with terminal cardiovascular collapse in critically ill patients: a retrospective cohort study. Crit Care 2014;18:719.
2. Weingart S. Upstairs care downstairs: delayed sequence intubation (DSI) [Internet]. Dallas, TX: American College of Emergency Physicians; 2010 [cited 2015 Mar 2]. Available from: http://www.acep.org/Clinical---Practice-Management/Upstairs-Care-Downstairs--Delayed-Sequence-Intubation-(DSI).
3. Campbell RL, Bellolio MF, Knutson BD, et al. Epinephrine in anaphylaxis: higher risk of cardiovascular complications and overdose after administration of intravenous bolus epinephrine compared with intramuscular epinephrine. J Allergy Clin Immunol Pract 2015;3:76-80.