

Question: Is the administration of Vasopressors through a peripheral intravenous line safe?

Background: Using Vasopressors through a peripheral intravenous line (PIV) remains a controversial issue within our community practice environment. The traditional viewpoint that all vasopressors require a central line due to concerns of PIV extravasation and local tissue injury has continued as dogma. This has been despite evidence in the last few years that lay a foundation for PIV as a safe method of treatment. There are two different practice patterns related to PIV administered vasopressors. The first practice is use of vasopressors through this route of administration as a definitive therapy (i.e. to treat hypotension from sepsis) without need of a central line. The second practice uses PIV vasopressors as a bridge to stabilize a patient until a central line can be placed. In our residency, we primarily employ this method to stabilize a patient while we prepare to place a central line. In the following literature presented, the authors investigate PIV administration of vasopressors calling into question the need for central lines for this therapy. They argue that central lines increase substantial risk to patients through central line infections, structural damage, line thrombosis, among other risks. Our goal for this journal club is to present the current literature on this topic and to provide our residents with the tools to support their practice when challenged out in the community.

Discussion: The first article was a systemic review (Loubani & Green, 2015) that set out “to collect and describe all published reports of local tissue injury or extravasation from vasopressor administration via either peripheral intravenous (IV) or central venous catheter.” They searched 3 major data bases going back to 1946. In total 85 studies were included and there were 325 separate events of extravasation or tissue injury reported. Of these, 318 were from administration with PIV and 7 were from central line administration. Of the tissue injury group from PIV administration totaling 204 events, which included skin necrosis primarily, 9 events contributed significantly to patient morbidity and 4 contributed to patient mortality. Per discussion the highlights included the scope of the authors search and inclusion of articles. Despite the large scope of the systemic review it did not yield huge numbers in total though no frequency could be established from the data. Additionally, most the articles were case reports rather than aggregate studies. The data does suggest that local tissue injury was more likely with longer administration of peripheral vasopressors and with administration distal to the antecubital fossa, again nothing conclusive can be established. We included this article because it does establish that there are bad outcomes and risk associated with PIV administration of vasopressors.

The second article (Lewis et al, 2017) was a single center retrospective review of electronic charts over a 15-month period at New York University Langone Medical Center ICU. Their primary goal was to describe incidence of extravasation and tissue injury from PIV administration of vasopressors with secondary goals to describe location of PIV, gauge of PIV, vasopressor utilized, management of extravasation events, and time until central venous catheter (CVC) inserted. They found that out of 202 patients treated with PIV administered 8 had an extravasation event, no tissue injury, no treatment required, 7/8 had new PIV placed and continued on PIV administered vasopressor. Secondary questions established that 46% of patients eventually got CVC, placement was forearm greater than antecubital fossa, gauge of PIV was 20 gauge or less, and vasopressors used were norepinephrine and phenylephrine. Per discussion, while this was a retrospective study with small group of patients it again suggests that

peripherally administered vasopressors are safe. More importantly for us it showed this in an environment without a strict safety protocol regarding this practice and therefore more representative of our practice in the community. It was notable that 54% of patients ended up not getting a CVC. Again, the tough question of frequency, especially frequency of severe adverse events is not defined, so the question of safety is not yet satisfactorily answered.

The third article (Cardenas-Garcia et al, 2015) was a single arm consecutive patient observational study conducted over 20 months in the ICU at Long Island Jewish Medical Center. Primary outcome was the rate of local tissue injury at site of PIV administered vasopressors. Importance of this study and the difference between article two was the rigid and strictly held to protocol for safety for PIV administration of vasopressors. This include a multidisciplinary team with nurses, doctors and pharmacist involved. The full list can be referenced in the article but included ultrasound confirmation that a vein was at least 4mm in diameter, every 2 hour checks of IV site, and in the event of extravasation prompt initiation of treatment locally at site with phentolamine and topical nitroglycerin. A total of 734 patients received this therapy, duration of treatment was 49 hours +/- 22 hours, total of 19 (2%) events of extravasation, all were treated with nitroglycerin past and phentolamine. No tissue injury was observed. Ninety-five (13%) of the total treated eventually had a CVC placed. This article provided a good set of guidelines that may be employed for this practice. This suggest that this practice is safe, but again without a good randomized control trial, it cannot be said whether this practice is safer than CVC administered vasopressors. Group discussion yielded a collective agreement that to follow the guidelines strictly would place a large burden on the nurses and staff and would make this practice impractical in our clinical setting.

Bottom line: These articles lay a solid foundation of evidence for our practice of using vasopressor medications through a peripheral line in order to stabilize a patient while getting ready to place a central line in the immediate future. The evidence suggests that using this method solely for the delivery of vasopressor medications without a central line is also safe but more evidence including a good randomized control trial is needed before this is ready for mainstream. We recommend when using this therapy to adhere as best possible to using as proximal as a vein you can, if able to utilize US ensure using a vein greater than 4 mm, limit duration of use and limit dosing to minimal amount required, and if extravasation occurs to treat locally with phentolamine and nitroglycerin paste.

#### References:

1. Loubani OM, Green RS. A systematic review of extravasation and local tissue injury from administration of vasopressors through peripheral intravenous catheters and central venous catheters. *J Crit Care*. 2015 Jun;30(3):653.e9-17. doi: 10.1016/j.jcrc.2015.01.014. Epub 2015 Jan 22. Review. PubMed PMID: 25669592.
2. Lewis T, Merchan C, Altshuler D, Papadopoulos J. Safety of the Peripheral Administration of Vasopressor Agents. *J Intensive Care Med*. 2017 Jan 1;885066616686035. doi: 10.1177/0885066616686035. [Epub ahead of print] PubMed PMID: 28073314.

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3. Cardenas-Garcia J, Schaub KF, Belchikov YG, Narasimhan M, Koenig SJ, Mayo PH. Safety of peripheral intravenous administration of vasoactive medication. *J Hosp Med.* 2015 Sep;10(9):581-5. doi: 10.1002/jhm.2394. Epub 2015 May 26. PubMed PMID: 26014852.