Commentary

The choice of catecholamines in septic shock: more and more good arguments to strengthen the known position, but don't lose the faith!

Andreas Meier-Hellmann

Department of Anesthesiology, Intensive Care Medicine and Pain Management, HELIOS Klinikum Erfurt GmbH, Erfurt, Germany

Corresponding author: Andreas Meier-Hellmann, ameier-hellmann@erfurt.helios-kliniken.de

Published: 8 March 2006
This article is online at http://ccforum.com/content/10/2/127

Critical Care 2006, **10:**127 (doi:10.1186/cc4859)

See related research by Seguin *et al.* in issue 10.1 [http://ccforum.com/content/10/1/R32]

Abstract

The choice of catecholamines for hemodynamic stabilisation in septic shock patients has been an ongoing debate for several years. Several studies have investigated the regional effects in septic patients. Because of an often very small sample size, because of inconsistent results and because of methodical problems in the monitoring techniques used in these studies, however, it is not possible to provide clear recommendations concerning the use of catecholamines in sepsis. Prospective and adequate-sized studies are necessary because outcome data are completely lacking.

The choice of catecholamines for hemodynamic stabilisation in septic shock patients has been an ongoing debate for several years. The well-performed investigation from Seguin and colleagues [1] adds further knowledge to this debate by demonstrating that a combination of norepinephrine and dopexamine might be superior to the use of epinephrine alone. The superiority of the combination of norepinephrine with dopexamine can be explained by the fact that norepinephrine seems to be a better vasopressor than epinephrine. The fact that epinephrine is not the vasopressor of first choice due to its harmful effects on intestinal perfusion might be well accepted since several studies have demonstrated such adverse effects [2-4] and no study has demonstrated beneficial effects on regional perfusion. Perhaps only the addition of dopexamine caused the beneficial effects of this catecholamine combination, but this cannot be answered by the chosen study design. A clear assessment of the value of dopexamine is not possible. In some studies dopexamine either given alone or in combination with another catecholamine improves intestinal perfusion [5,6], but in other studies dopexamine does not affect or even deteriorates intestinal perfusion [7,8].

Translating these results into clinical practice, we have to ask whether we should stop the use of epinephrine and start to increase the blood pressure in our patients primarily with the combination of norepinephrine and dopexamine? One answer could be 'yes and no' – yes, do not use epinephrine, because I am an 'epinephrine is bad' believer; and no, do not use dopexamine, because I am a 'dopexamine doesn't work' believer. Of course another answer also seems to be reasonable, but unfortunately not because of deeper insight into the effects and side effects of catecholamines rather than just a different conviction.

Why do we have, on one hand, more and more studies dealing with the global and regional effects of catecholamines, but on the other hand we have no clear or even controversial recommendations concerning the use of vasoactive drugs? There are only a few basic rules concerning the use of catecholamines in the stabilisation of septic patients that are widely accepted without further need for discussion. We know that parameters of the global hemodynamic in a normal range do not guarantee adequate regional perfusion [9]. We have learned that the effects of catecholamines can be different in septic and nonseptic conditions [10]. Moreover, there is evidence that these effects can even be different in severe sepsis and septic shock [11]. Furthermore, it is well accepted that hemodynamic stabilisation has to be achieved as soon as possible [12].

For all other aspects of hemodynamic stabilisation, there is wide room for discussion but no clear evidence. What are the problems?

We do not know whether the use of a specific catecholamine can affect patient outcome. Adequate-sized, prospective, randomised studies are missing – and because the

catecholamines are low-budget drugs, industrial sponsoring of such studies seems unrealistic.

The techniques used to assess the regional effects of catecholamines in patients have several pitfalls [13]. What is the clinical relevance of an increase in blood flow in a hepatic vein? What is the relevance of a changed laser Doppler signal from the gastric mucosa, a technique used in the recent study from Seguin and colleagues, especially in view of evidence that mucosal perfusion in different regions of the gut does not always occur in parallel [14]?

As already mentioned, we are aware of different effects of dopamine in severe sepsis and in septic shock. We cannot exclude the fact that there are also differences in individual patients, depending for example on more or less pronounced cardiomyopathy or on differences in volume loading. Such effects could explain the several studies investigating the effects of catecholamines using the same techniques but producing controversial results [6,7].

There is no doubt that well-performed studies such as that by Seguin and colleagues enable us to gain deeper insight into the regional effects of catecholamines. Nevertheless, for the safe and beneficial use of catecholamines in the stabilisation of septic patients we need hard data concerning the effects of patient outcome. In the light of this, it is good to know that there is an increasing number of study groups aiming to find answers on many important questions in intensive care medicine. Perhaps one day we will lose our faith and will use catecholamines based on hard data.

Competing interests

The author declares that they have no competing interests.

References

1. Seguin P, Laviolle B, Guinet P, Morel I, Malledant Y, Bellissant E: **Dopexamine and norepinephrine vs epinephrine on gastric perfusion in setic shock patients: a randomized study.** *Crit Care* 2006, **10:**R32.
2. Meier-Hellmann A, Reinhart K, Bredle DL, Specht M, Spies CD, Hannemann L: **Epinephrine impairs splanchnic perfusion in septic shock.** *Crit Care Med* 1997, **25:**399-404.
3. Day NP, Phu NH, Mai NT, Bethell DB, Chau TT, Loc PP, Chuong LV, Sinh DX, Solomon T, Haywood G, *et al.*: **Effects of dopamine and epinephrine infusions on renal hemodynamics in severe malaria and severe sepsis.** *Crit Care Med* 2000, **28:**1353-1362.
4. Levy B, Bollaert PE, Charpentier C, Nace L, Audibert G, Bauer P, Nabet P, Larcan A: **Comparison of norepinephrine and dobutamine to epinephrine for hemodynamics, lactate metabolism, and gastric tonometric variables in septic shock: a prospective, randomized study.** *Intensive Care Med* 1997, **23:**282-287.
5. Maynard ND, Bihari DJ, Dalton RN, Smithies MN, Mason RC: **Increasing splanchnic blood flow in the critically Ill.** *Chest* 1995, **108:**1648-1654.
6. Smithies M, Yee TH, Jackson L, Beale R, Bihari D: **Protecting the gut and the liver in the critically ill: effects of dopexamine.** *Crit Care Med* 1994, **22:**789-795.
7. Meier-Hellmann A, Bredle DL, Specht M, Hannemann L, Reinhart K: **Dopexamine increases splanchnic blood flow but decreases gastric mucosal pH in severe septic patients treated with dobutamine.** *Crit Care Med* 1999, **27:**2166-2171.
8. Kiefer P, Tugtekin I, Wiedeck H, Bracht H, Geldner G, Georgieff M, Radermacher P: **Effect of a dopexamine-induced increase in cardiac index on splanchnic hemodynamics in septic shock.** *Am J Respir Crit Care Med* 2000, **161:**775-779.
9. Ruokonen E, Takala J, Kari A, Saxen H, Mertsola J, Hansen EJ: **Regional blood flow and oxygen transport in septic shock.** *Crit Care Med* 1993, **21:**1296-1303.
10. Bersten AD, Hersch M, Cheung H, Rutledge FS, Sibbald WJ: **The effect of various sympathomimetics on the regional circulations in hyperdynamic sepsis.** *Surgery* 1992, **112:**549-561.
11. Meier-Hellmann A, Bredle DL, Specht M, Spies C, Hannemann L, Reinhart K: **The effects of low dose dopamine on splanchnic blood flow and oxygen uptake in patients with septic shock.** *Intensive Care Med* 1997, **23:**31-37.
12. Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, Peterson E, Tomlanovich M: **Early goal-directed therapy in the treatment of severe sepsis and septic shock.** *N Engl J Med* 2001, **345:**1368-1377.
13. Brinkmann A, Calzia E, Trager K, Radermacher P: **Monitoring the hepato-splanchnic region in the critically ill patient — measurement techniques and clinical relevance.** *Intensive Care Med* 1998, **24:**542-556.
14. Lang CH, Bagby GJ, Ferguson JL, Spitzer JJ: **Cardiac output and redistrubution of organ blood flow in hypermetabolic sepsis.** *Am J Physiol* 1984, **246:**R331-R337.