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Letter to the Editor

Letter to the editor: "Decreased renal cortical perfusion post-EGDT is associated with MAKE-30 in sepsis"

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The recent article by Li et al., titled "Decreased renal cortical perfusion post-Early Goal-Directed Therapy (EGDT) is associated with MAKE-30 in sepsis" is commendable and offers valuable insights, though several aspects merit further consideration. The authors report that, despite restored systemic hemodynamics following EGDT in septic patients, those who develop Major Adverse Kidney Events within 30 days (MAKE-30) present with reduced renal cortical perfusion. This reduction in perfusion was independently associated with an increased Rise Time, as measured by contrast-enhanced ultrasound (CEUS). Additionally, the Renal Resistive Index (RRI) was found to correlate with renal cortical perfusion. Notably, the authors observed a considerable variation in renal cortical perfusion outcomes among MAKE-30 patients: while some exhibited decreased cortical perfusion, others maintained normal values, and some even showed an increased perfusion [1]. This heterogeneity highlights a major shortcoming of relying solely on cortical blood flow to assess the risk of acute kidney injury (AKI) [2].

RRI was not identified as an independent risk factor for MAKE-30, possibly due to the multiple factors associated with it and its limited ability to reflect microcirculatory dynamics [2]. This underlines the importance of direct assessment of the renal microcirculation. In this study, other direct indicators assessing microcirculatory perfusion, such as Perfusion Index, Relative Blood Volume, and Area Under the Curve, showed no significant association with the occurrence of adverse events in sepsis patients at 30 days. These findings suggest that measured perfusion may not accurately reflect the amount of functional blood flow. Factors such as shunting in the interlobular veins of the renal medulla and arteriovenous shunting between afferent and efferent arterioles within the glomeruli may exist, thereby reducing functional blood flow even when microcirculatory blood flow appears to be unchanged [1]. In other words, variation in cortical blood flow does not reliably predict AKI in post-EGDT sepsis patients [2].

In a pivotal study using a sheep model, Lankadeva et al. identified a hemodynamic oxygenation mismatch between renal cortex and medulla that preceded the onset of AKI [3]. Despite substantial increases in global renal blood flow (RBF) and renal oxygen delivery, their findings demonstrated that significant hypoperfusion and hypoxia were observed in the medulla, while cortical perfusion remained preserved. Previous research has suggested that cortical perfusion largely depends on global renal perfusion, whereas medullary oxygenation appears to be regulated by distinct autoregulatory mechanisms. This discrepancy in oxygenation may result from a sepsis-induced impairment of renal autoregulatory capacity, attributed to nitric oxide synthase activity, which renders the medulla particularly vulnerable to hypoxic conditions [4]. Additionally, the unique vasculature of the renal medulla, which relies primarily on oxygen diffusion rather than direct perfusion, exacerbates this oxygenation mismatch in septic conditions [5].

In the context of AKI in septic shock patients, the critical factor may be a redistribution of blood within the kidney that favors cortical over medullary perfusion, rather than a global decrease in RBF due to increased RRI. Lankadeva et al. observed that while the administration of noradrenaline in septic shock effectively normalized mean arterial pressure (MAP) and enhanced cortical RBF, this response did not extend to the medulla. Given that medullary perfusion lacks a well-structured vascular network and relies on microcirculatory diffusion and convection for oxygen delivery, noradrenaline further compromised medullary oxygenation, increasing its vulnerability to hypoxia [3–6].

Similarly, Harrois et al., using CEUS, observed a mean decrease in cortical renal perfusion (CRPF) among septic shock patients ($N = 20$) compared to those without shock ($N = 10$). The findings suggest an association between decreased CRPF and the development of AKI. Further analysis revealed that patients with AKI tended to require higher doses of noradrenaline, exhibited lower MAP, and had reduced cardiac index, although these trends did not reach statistical significance. However, a statistically significant increase in serum lactate levels was observed in patients who developed AKI [7]. In a prospective study assessing the diagnostic accuracy of renal Doppler ultrasonography in critically ill patients, Wiersema et al. reported that neither arterial nor venous Doppler measurements significantly improved the accuracy of AKI diagnosis [8].

For all the aforementioned reasons, renal cortical blood flow, as

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measured by Doppler ultrasonography, is not a reliable marker for predicting AKI. Greater emphasis should be placed on studies evaluating medullary blood flow [2].

Availability of data and materials

Not applicable.

CRediT authorship contribution statement

Julien Moury: Conceptualization, Writing – original draft, Writing – review & editing. **Thibault Gennart:** Writing – original draft, Writing – review & editing. **Sydney Blackman:** Writing – review & editing, Writing – original draft. **Nathan De Lissnyder:** Writing – original draft, Writing – review & editing. **Oumayma Errais:** Writing – original draft, Writing – review & editing. **Sarah Dahma:** Writing – original draft, Writing – review & editing. **Patrick M. Honore:** Conceptualization, Writing – original draft, Supervision, Writing – review & editing.

Consent for publication

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Ethics approval and consent to participate

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Declaration of competing interest

The authors declare to have no competing interests.

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References

[1] Li Q, Li R, Wang C, Zhang Q, et al. Chinese critical UltraSound study group(CCUSG). Decreased renal cortical perfusion post-EGDT is associated with MAKE-30 in sepsis. J Crit Care 2025;85:154943. https://doi.org/10.1016/j.jcrc.2024.154943 (Epub 2024 Nov 6. PMID: 39510025).
[2] Robert A, Moury J, Perriens E, Blackman S, Honore PM. What every intensivist should know about medullary renal perfusion. J Crit Care 2025;86:154989. https://doi.org/10.1016/j.jcrc.2024.154989.
[3] Lankadeva YR, Kosaka J, Evans RG, et al. Intra-renal and urinary oxygenation during norepinephrine resuscitation in ovine septic acute kidney injury. Kidney Int 2016;90(1):100–8. https://doi.org/10.1016/j.kint.2016.02.017.
[4] Post EH, Kellum JA, Bellomo R, Vincent JL. Renal perfusion in sepsis: from macro- to microcirculation. Kidney Int 2017;91(1):45–60. https://doi.org/10.1016/j.kint.2016.07.032.
[5] Chen X, Wang X, Honore PM, et al. Renal failure in critically ill patients, beware of applying (central venous) pressure on the kidney. Ann Intensive Care 2018;8(1):91. https://doi.org/10.1186/s13613-018-0439-x.
[6] Hilderink BN, Crane RF, Arbous SM, et al. Low postoperative mitochondrial oxygen tension is an early marker of acute kidney injury after cardiac surgery: a prospective observational study. J Crit Care 2025;88:155088. https://doi.org/10.1016/j.jcrc.2025.155088.
[7] Harrois A, Grillot N, Figueiredo S, et al. Acute kidney injury is associated with a decrease in cortical renal perfusion during septic shock. Crit Care 2018;22(1):161. https://doi.org/10.1186/s13054-018-2067-0.
[8] Wiersema R, Kaufmann T, van der Veen HN, SICS Study Group, et al. Diagnostic accuracy of arterial and venous renal Doppler assessment for acute kidney injury in critically ill patients: a prospective study. J Crit Care 2020 Oct;59:57–62. https://doi.org/10.1016/j.jcrc.2020.05.012.

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