PULSATILE PORTAL FLOW AND ACUTE KIDNEY INJURY AFTER CARDIAC SURGERY.

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Introduction: Venous congestion resulting from right heart failure and fluid overload could be an important mechanism leading to acute kidney injury (AKI) following cardiac surgery. Portal vein flow pulsatility is a known echographic sign of right heart failure and could be a marker of significant organ congestion. (1,2) We aim to assess whether the presence of portal flow pulsatility is independently associated with AKI after cardiac surgery.

Methods: We performed a retrospective cohort study and a prospective validation cohort study. In both cohorts, the association between portal flow pulsatility defined as a pulsatility fraction ≥ 50% and the risk of AKI was assessed using logistic regression analysis. Factors associated with the presence of portal flow pulsatility were also explored. We retrospectively reviewed 102 patients who had at least one Doppler assessment of portal flow during the week following cardiac surgery. In the prospective cohort study, portal flow was systematically assessed before, immediately after and during post-operative day 1 after cardiac surgery by bedside transthoracic echography. Both the retrospective and the prospective studies have been approved by the local ethics committee. Written consent was obtained for the prospective study.

Results: In the retrospective cohort (n=102), the detection of portal flow pulsatility was associated with an increased risk for subsequent development of overall (OR: 4.34 (95%CI: 1.56 – 12.1)) and AKI (OR: 4.38 (95%CI: 1.17 – 16.32)). The risk of overall acute kidney injury remained significant after adjustment for the mean cardiovascular SOFA score during post-operative days 0 and 1 (OR: 4.62 (95%CI: 1.58-13.49)). In the prospective cohort (n=115), portal flow pulsatility detected on post-operative day 1 was associated with an increased risk of subsequent severe AKI (OR: 7.75 (95%CI: 2.00 - 30.02)) and dialysis requirement (OR: 8.00 (95%CI: 1.45-44.19)) but not with overall AKI (OR: 1.40 (95%CI: 0.47-4.19)). Portal flow pulsatility during or immediately after surgery was not associated with AKI. In both cohorts, a higher cumulative fluid balance was associated with the presence of portal flow pulsatility.

Discussion: In these observational studies, the presence of portal flow pulsatility is associated with an increased risk of subsequent AKI after cardiac surgery. Assessment of portal flow using Doppler ultrasound at the bedside might be a promising tool to detect patients with AKI due to cardiogenic venous congestion.

References:

Figure 1: a) Right portal vein (RPV) position obtained from a posterior axillary view using the Vimedix simulator (CAE Healthcare) (b) corresponding 2D transthoracic ultrasound with color Doppler showing the relative position the portal vein (PV) and hepatic vein (HV) c) Pulse-wave Doppler waveform of a normal portal flow showing minimal variation during the cardiac cycle and d) of a pulsatile portal flow.
Pulsatility fraction: 66% (RPV: right portal vein, PoVF: portal vein flow.)