Factors Associated With Postreperfusion Syndrome in Living Donor Liver Transplantation: A Retrospective Study

Abstract

Background: Postreperfusion syndrome (PRS) after portal vein reperfusion during liver transplantation (LT) has been reported to cause rapid hemodynamic changes and is associated with a prolonged postoperative hospital stay, renal failure, and increased mortality. Although there are some reports on risk factors for PRS in brain-dead donor LT, there are a few reports on those in living donor LT. Therefore, we retrospectively reviewed the factors associated with PRS to contribute to the anesthetic management so as to reduce PRS during living donor LT.

Methods: After approval by the ethics committee of our institution, 250 patients aged ≥20 years who underwent living donor LT at our institution between January 2013 and September 2018 were included in the study. A decrease in mean arterial pressure of ≥30% within 5 minutes after portal vein reperfusion was defined as PRS, and estimates and odds ratio (OR) for PRS were calculated using logistic regression. The backward method was used for variable selection in the multivariable analysis.

Results: Serum calcium ion concentration before reperfusion (per 0.1 mmol/L increase; OR, 0.74; 95% confidence interval (CI), 0.60-0.95; P < .001), preoperative echocardiographic left ventricular end-diastolic diameter (per 1-mm increase: OR, 0.90; 95% CI, 0.85-0.95; P < .001, men [versus women: OR, 2.45; 95% CI, 1.26-4.75; P = .008]), mean pulmonary artery pressure before reperfusion (restricted cubic spline, P = .003), anhepatic period (restricted cubic spline, P = .02), and graft volume to standard liver volume ratio (restricted cubic spline, P = .03) were significantly associated with PRS.

Conclusions: In living donor LT, male sex and presence of small left ventricular end-diastolic diameter, large graft volume, and long anhepatic period are associated with PRS, and a high calcium ion concentration and low pulmonary artery pressure before reperfusion are negatively associated with PRS.

Comments by Scott Byram M.D.

Summary:

Hemodynamic management is often difficult and complex during orthotopic liver transplantation (OLT). One stage that can be particularly challenging to the anesthesiologist is the initiation of the neohepatic stage signaled by reperfusion of the liver graft. Post reperfusion syndrome (PRS) is known to cause rapid hemodynamic changes and is seen within minutes of opening the portal vein. The exact mechanism of PRS is still not understood, but is most likely multifactorial. PRS has been associated with several poor postoperative outcomes including renal failure, increased length of stay, and increased mortality.

In this retrospective study, the authors sought to identify risk factors for developing PRS after living donor (LD) OLT. Most prior studies on this topic have examined PRS with brain death donors. For this study, PRS was defined as a decrease in mean arterial pressure by more than 30% within 5 minutes of reperfusion that persisted for longer than 1 minute. 250 charts of LD OLT recipients were reviewed. Of these patients, 73 (29%) met the criteria for PRS. There were no significant baseline differences in sex, age, liver function, general condition, comorbidities, blood

pressure, or medication between the two groups (PRS vs. non-PRS). Through multi-variable statistical analysis, the authors identified five significant risk factors for developing PRS. Characteristics associated with increased risk for PRS were: male sex, low left ventricular end-diastolic diameter on pre-op TTE, prolonged anhepatic duration, large graft volume, low ionized calcium just prior to reperfusion, and high mean pulmonary artery pressure (mPAP) just prior to reperfusion. These last two risk factors are particularly interesting because the anesthesiologist is able to modify both calcium concentration and mPAP prior to reperfusion, therefore potentially decreasing the risk for PRS.

The authors went on to speculate as to why these risk factors play a role in the development of PRS. However, they strongly cautioned readers not to assume that these associations were causative given the retrospective nature of this study. The ultimate conclusion of this paper was that these five factors could aid in predicting the probability of PRS, but randomized control trials would be needed to establish preventative strategies.

References

1. **Umehara K, Karashima Y, Yoshizumi T, Yamaura K. Factors Associated With Postreperfusion Syndrome in Living Donor Liver Transplantation: A Retrospective Study. Anesth Analg. 2022 Aug 1;135(2):354-361. doi: 10.1213/ANE.0000000000006002. Epub 2022 Jul 5. PMID: 35343925.**