

# Comment on “The Goal of Intraoperative Blood Loss in Major Hepatectomy Resection for Perihilar Cholangiocarcinoma Saving Patients From a Heavy Complication Burden”

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We found the retrospective study by Kawakatsu et al,<sup>1</sup> regarding the association between increased intraoperative blood loss (adjusted for body weight, aBL) and the elevated overall risk of developing postoperative complications (estimated through the Comprehensive Complication Index [CCI]), extremely interesting and relevant, specifically when applied to surgery of perihilar cholangiocarcinoma (pCCA). Despite technical and clinical advances, this field of hepatopancreatobiliary (HPB) surgery continues to be burdened by unrestrained surgical risks.<sup>2</sup> Lowering postoperative complication rates is a pressing goal to exploit the benefits of the aggressive surgical resection needed. The authors applied a spline regression model to prove the existing association between high aBL and increased CCI and concluded that a primary goal inferior to 10 ml/kg blood losses should be achieved to effectively reduce overall CCI.

Several points of interest were raised.

First, despite the authors' utilization of a cubic spline model adjusted for several pre- and intraoperative risk factors associated with an elevated risk of postoperative complications (i.e., type of hepatectomy, necessity for vascular resection), the real intraoperative surgical complexity may be underestimated by relying on a model controlled through a selection of predetermined variables. Factors encompassing complex anatomy and vascular involvement, macroscopic nodal involvement, prior surgical interventions, coexisting medical conditions or comorbidities, and obesity have the potential to elevate a seemingly easily affordable surgical scenario into an extremely challenging procedure.<sup>3</sup> Additionally, the complexity of the surgical intervention can also be a function of the disease's oncological burden. As the disease advances, technical challenges may escalate, adding another layer of intricacy to the surgical approach.

Therefore, intraoperative aBL could be considered an epiphenomenon of intraoperative clinical and technical complexity, with postoperative complications being linked to overall surgical complexity rather than aBL.

Second, no details of intraoperative management of transfusions are reported. The administration of packed red blood cells, fresh frozen plasma, platelets, or cryoprecipitate is essential to maintain adequate hemostasis, correct abnormal coagulation, and ensure sufficient tissue perfusion and oxygenation. Nevertheless, a restricted application of packed red blood cell transfusions has been recommended, for major surgical resections, due to its association with heightened postoperative morbidity. On the other hand, the influence of fresh frozen plasma and platelets on postoperative complications continues to be a subject of ongoing debate.<sup>4,5</sup> Considering that over 85% of the overall cohort failed to meet the primary objective of maintaining aBL below 10 ml/kg, it would be interesting to understand the intraoperative transfusion management of these patients.

Over the years, preoperative scores have been developed to predict the risk of blood transfusion and identify those who could benefit from preoperative blood conservation strategies. These scores help stratify patients' risks and standardize perioperative transfusion management protocols.<sup>6</sup>

Specifically, detailing the incidence of intraoperative transfusions and the type of red blood cells or hemo-derivatives transfusions administered would provide valuable insights. To date, the potential correlation between intraoperative transfusions and postoperative complications, as well as the extent of this association, remains unclear.

Third, the study cohort encompasses all patients undergoing major hepatectomy for pCCA in an Eastern high-volume tertiary referral center specialized in HPB surgery and biliary tract malignancies. However, even within this carefully selected patient cohort, almost 40% experienced aBL exceeding 20 ml/kg. Several studies have highlighted significant differences in postoperative outcomes between Eastern and Western centers, with Western centers reporting higher rates of postoperative morbidity and mortality.<sup>7</sup> In a surgical field where there are already notable differences among centers worldwide, achieving such a strict aBL cutoff, which is challenging to obtain even in an advanced center, would be difficult. Before implementing strict protocols for aBL, it is necessary to improve and standardize preoperative management protocols.<sup>8</sup> Within preoperative optimization strategies for pCCA, precise assessment and improvement of the preoperative coagulation profile, along with patients' stratification using preoperative transfusion risk scores, can be an essential tool in reducing aBL and transfusion needs. An overall standardized and effective optimization of preoperative care could serve as a pivotal approach to better prepare and stratify patients for surgery, potentially resulting in less technically demanding procedures.

Finally, we would like to compliment the authors for a thorough analysis of intraoperative aBL which led to an empirical determination of optimal target ranges for aBL to be referenced and pursued.

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