



Authors' Reply: Intra-Abdominal Hemorrhage Control—the Need for Routine Four-Quadrant Packing Explored

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Dear Editor,

We thank Dr. Dhakre and colleagues for their interest in our recently published article [1]. Clarifications and information regarding the surgical technique of four-quadrant packing (4QP) were requested and are provided as follows:

In the present study, we challenged the frequently performed 4QP for hemorrhage control on entry during emergent trauma laparotomy. For this purpose, we defined bleeding sites from the liver/ retrohepatic inferior vena cava (RIVC), spleen or retroperitoneal zone 3 as potentially benefiting from packing. These sites are surrounded by rigid walls, and bleeding can potentially be compressible by packing. Other bleeding sites were considered as not suitable for packing. Directed packing was defined as indicated if the bleeding was restricted to only one of these anatomic sites suitable for packing; 4QP was defined as indicated if bleeding was present in more than one of the anatomic sites suitable for packing. According to these predefined indications, 22 of 148 patients (15%) would have benefitted from initial 4QP, 90 of 148 patients (61%) from directed packing and in 36 of 148 patients (24%) packing would not have been of any value (Table 2). We agree with Dhakre et al. that liver and spleen packing (2

quadrant packing) can be performed faster than 4QP and in most cases would be preferable to 4QP.

The outcomes according to the bleeding site (single vs. multiple bleeding sites) are presented in Supplemental Table 2. It is important to emphasize that not all patients in our study were packed according to the criteria defined above. In many cases, 4QP was performed even though it was not indicated. The effectiveness and outcomes of packing (directed vs. 4QP) can therefore not be evaluated in any meaningful way. Future prospective studies are needed to validate our packing approach in terms of its efficacy in hemorrhage control (re-bleeding, re-packing, angiointervention rate) and longer-term outcomes.

A standardized approach to packing would be optimal, but does not exist. There are wide variations in practice, and, in the architecture of the individual injuries. We do agree with the comment that liver packing may need to be adapted to the specific bleeding site within the liver, especially for retrohepatic venous injuries; however, this was not the primary purpose of this study. We hope that these data force surgeons who care for trauma patients to rethink traditional dogma, and to ask if there is a better way to care for our most critically ill patients. Thank you so much again for your valuable comments.

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Reference

1. Jakob DA, Liasidis P, Schellenberg M et al (2021) Intra-abdominal hemorrhage control: the need for routine four-quadrant packing explored. *World J Surg* 45:1014–1020. <https://doi.org/10.1007/s00268-020-05906-3>

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