https://doi.org/10.1245/s10434-026-19301-0 Annals of Surgical Oncology (2026) 33:3967

ASO AUTHOR REFLECTIONS

ASO Author Reflections: Beyond the Margin: The Safety of Vascular Detachment in Minimally Invasive Liver Surgery

Fabio Procopio, MD[1,2] · Flavio Milana, MD[1] · Guido Torzilli, MD, PhD, FACS[1,2]

Received: 4 February 2026 / Accepted: 4 February 2026 / Published online: 20 February 2026
© Society of Surgical Oncology 2026

Past

Over the past two decades, the concept of tumor-vessel detachment (R1 vascular, R1v) has challenged the traditional paradigm that considers a R0 margin, although still the gold standard, as mandatory for oncological adequacy in liver surgery.[1] Initially introduced in open surgery for hepatocellular carcinoma (HCC) and later extended to colorectal liver metastases (CLM), the R1v demonstrated acceptable oncological outcomes while improving resectability in patients with advanced tumor burden.[2,3] More recently, the feasibility of R1v has been reported in the minimally invasive (MI) setting. However, evidence remains limited, leaving the oncological value of MI-R1v uncertain.

Present

Our meta-analysis provides the first quantitative synthesis of outcomes following MI-R1v resections.[4] The results reveal a clinically relevant dichotomy. In HCC, MI-R1v achieved local recurrence rates and overall survival comparable to R0. Conversely, in CLM, MI-R1v was associated with a higher local recurrence rate compared with R0, although without a negative impact on overall survival. These findings suggest that MI-R1v represents a valid alternative to major hepatectomy in selected HCC patients when R0 margins are not achievable, while greater caution is warranted in CLM.

Future

Future research should prioritize prospective multicenter studies to better define the oncological role of MI-R1v. Standardized reporting of margins, recurrence patterns, and survival outcomes will be essential. Integration of advanced imaging and navigation technologies may further improve procedural safety and reproducibility. Refining patient selection criteria will be crucial to support the safe implementation of a "radical but conservative" strategy in MI setting.

Disclosure The authors declare no conflict of interest.

References

1. Torzilli G, Montorsi M, Donadon M, et al. Radical but conservative is the main goal for ultrasonography-guided liver resection: prospective validation of this approach. *J Am Coll Surg*. 2005;201:517–28.
2. Donadon M, Terrone A, Procopio F, et al. Is R1 vascular hepatectomy for hepatocellular carcinoma oncologically adequate? Analysis of 327 consecutive patients. *Surgery*. 2019;165:897–904.
3. Viganò L, Procopio F, Cimino MM, et al. Is tumor detachment from vascular structures equivalent to R0 resection in surgery for colorectal liver metastases? An observational cohort. *Ann Surg Oncol*. 2016;23:1352–60.
4. Procopio F, Memeo R, Del Fabbro D, et al. Oncological adequacy of R1 vascular margin in minimally invasive liver surgery for hepatocellular carcinoma and colorectal liver metastases: a meta-analysis. *Ann Surg Oncol*. 2026. https://doi.org/10.1245/s10434-025-18922-1.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This article refers to: Procopio F, Memeo R, Del Fabbro D, et al. Oncological Adequacy of R1 Vascular Margin in Minimally Invasive Liver Surgery for Hepatocellular Carcinoma and Colorectal Liver Metastases: A Meta-analysis. *Ann Surg Oncol*. 2026. (https://doi.org/10.1245/s10434-025-18922-1).

✉ Guido Torzilli, MD, PhD, FACS
guido.torzilli@hunimed.eu

[1] Department of Biomedical Sciences, Humanitas University, Via Rita Levi Montalcini 4, 20072 Pieve Emanuele, Milan, Italy

[2] Division of Hepatobiliary & General Surgery, Department of Surgery - IRCCS, Humanitas Research Hospital, via Manzoni 56, 20089 Rozzano, Milan, Italy