World J Surg (2010) 34:870
DOI 10.1007/s00268-010-0423-6

World Journal of Surgery

# "State of the Art" in Liver Resection and Living Donor Liver Transplantation: A Worldwide Survey of 100 Liver Centers—Reply to Letter

**Stefan Breitenstein · Pierre-Alain Clavien**

Published online: 12 February 2010


We thank the Amsterdam group for the interest and comments on our article. We highly appreciate their contribution and investigation in the field of quantification of liver function. However, in our survey we did not correlate the impact of remnant liver volume on liver function in patients with different underlying liver diseases. We provided an overview of current practices of liver surgery in normal and cirrhotic livers. The critical size of 25% of remnant liver volume was related to patients with normal parenchyma [1].

Impaired function of the remaining liver is of major concern for the hepatopancreatobiliary surgeon, particularly in patients with an underlying liver disease. We completely agree that in addition to the volume of remnant liver the preoperative application of liver function tests may have a relevant impact on the assessment of liver function after resection in patients with underlying liver disease. However, none of the metabolic tests available that target hepatic physiology is currently widely accepted [2]. Metabolic tests are most often used in Asia, where most of the patients undergoing liver surgery have hepatocellular carcinoma related to hepatitis B or C cirrhosis. The most commonly used test is intravenous injection of indocyanine green (ICG). However, ICG results are not completely reproducible because the rate of retention of indocyanine is influenced by several factors, especially portal flow [3, 4]. According to our knowledge, there has been no convincing evaluation of the impact of the ICG test in patients after noncirrhotic liver resection. A recent publication by the Amsterdam group on $^{99m}$Tc-mebrofenin hepatobiliary scintigraphy as an alternative metabolic liver function test has produced promising results regarding the prediction of postoperative liver failure [5]. Even so, reproducibility of the accuracy of this examination needs to be confirmed by other centers. In addition, its use requires a Department of Nuclear Medicine to dispose of the radioisotope, and such departments are not available everywhere in the world.

Certainly, further investigations are required to assess the mechanism and the degree of liver disease that negatively affect postoperative outcome. Functional liver tests may play an increasing role in the future regarding preoperative risk assessment in patients undergoing liver surgery.

## References

1. Breitenstein S, Apestegui C, Petrowsky H et al (2009) "State of the art" in liver resection and living donor liver transplantation: a worldwide survey of 100 liver centers. World J Surg 33:797–803
2. Clavien PA, Petrowsky H, DeOliveira ML et al (2007) Strategies for safer liver surgery and partial liver transplantation. N Engl J Med 356:1545–1559
3. Imamura H, Seyama Y, Kokudo N et al (2003) One thousand fifty-six hepatectomies without mortality in 8 years. Arch Surg 138:1198–1206 (discussion 1206)
4. Mullin EJ, Metcalfe MS, Maddern GJ (2005) How much liver resection is too much? Am J Surg 190:87–97
5. De Graaf W, van Lienden KP, Dinant S, et al (2009) Assessment of future remnant liver function using hepatobiliary scintigraphy in patients undergoing major liver resection. J Gastrointest Surg Nov 24 [Epub ahead of print]

S. Breitenstein · P.-A. Clavien (✉)
Department of Surgery, Swiss HPB (Hepato-Pancreato-Biliary) Center, University Hospital Zurich, Zurich, Switzerland
e-mail: clavien@chir.uzh.ch