

**LETTER TO THE EDITOR**

# The authors' reply: Indispensable discrepancy between predicted graft "volume" and actual graft "weight" in clinical practice in living-donor liver transplantation

We would like to thank Haruki et al<sup>1</sup> for their interest and constructive comments regarding our manuscript "Which is better to use 'body weight' or 'standard liver weight (SLW),' for predicting small-for-size graft syndrome (SFSS) after living-donor liver transplantation?" We have noted their perception of a discrepancy between graft volume (GV) and graft weight (GW).

In our study, we concluded that the calculation for graft size cut-off values should be changed according to the recipient body mass index (BMI). Graft-to-recipient body weight ratio (GRWR) <0.7% was demonstrated as a better predictor for SFSS than GW/SLW <35% among obese patients; the analysis was based on the procured GW to eliminate bias from discrepancy between predicted preoperative and actual postoperative GW. Haruki et al pointed out the problem regarding the formula for standard liver volume (SLV).<sup>2</sup> Indeed, Urata's formula, commonly used and proposed in 1995, was based on an analysis of 96 patients whose average height and weight were 164 cm and 56 kg (BMI 20.8 kg/m<sup>2</sup>), respectively. The 694 patients in our study have similar physiques with BMI ≤30% (160.5 cm, 60.9 kg, and BMI 23.2 kg/m<sup>2</sup>). Patients with BMI >30% have much larger physiques (157.1 cm, 79.8 kg, and BMI 32.4). Accurate calculation of SLV is important for the application of GV/SLV to predict SFSS, which is different when using GRWR. To eliminate the discrepancy due to differences in physique, it is necessary to develop a more precise formula for SLV by physique (based on BMI). GRWR, which is not affected by SLV, can be feasibly applied, in theory, to obese patients, as our study showed.

Second, the point that plagues transplant surgeons is that estimated liver volume (EGV) by computed tomography (CT) volumetry software is provided in milliliters, whereas procured graft size is measured in grams. This problem mainly contributed to the discrepancy in values between EGV and actual GW, which should be addressed. Of course, the decrease of GW on dehydration with the University of Wisconsin solution is inescapable<sup>3</sup>; the effect of age on over- and under-estimation of GW is also unavoidable.<sup>3,4</sup> Chan et al<sup>5</sup> have reported that SLV is attained by a conversion factor of 1.19 mL/g using SLW, by analyzing 159 living donors. This was supported by Addeo

et al.<sup>4</sup> In our cohort of 694 patients, the value of EGV (536.8 mL) was larger than that of the actual GW (481.9 g), and the conversion factor from GW to liver volume was 1.13 (mL/g). Upon subsequent analysis using the derived conversion factor of 1.13, a novel finding arises where the predicted GRWR <0.8% was a significant cutoff for SFSS ( $P < .028$ , OR 1.94), considering preoperative EGV among obese patients.

In conclusion, diligent selection between GRWR and GW/SLW according to recipient physique is important. Indeed, transplant surgeons should carefully consider the discrepancy between EGV and GW in evaluating the risk for SFSS. Furthermore, studies to evaluate the optimal coefficient values for this discrepancy must be done to improve donor shortage.

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**Ethical statements:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional review board of our ethics committee, national research committee, as well as with the 1964 Helsinki Declaration and its later amendments. The study protocol was approved by the Institutional Review Board (No. 2019-186).

**Informed consent:** Informed consent was obtained from all individual participants included in the study.



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