Inverse probability weighting for oncological outcomes of liver transplantation for hepatocellular carcinoma

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Introduction

Hepatocellular carcinoma recurrence after liver transplantation is reported in 15-20% of cases. The techniques for recipient hepatectomy can be performed with either a caval-sparing (CS) or a total caval-replacement approach (TCR). These two techniques are quite different, and in most cases the patients undergoing these surgeries have different characteristics. Furthermore, there is limited literature concerning the impact of recipient hepatectomy technique on tumor recurrence risk. An interesting task would be comparing the risk of post-transplant HCC recurrence after liver transplantation in patients undergoing a CS or TCR approach.

Objective

Evaluate the impact of CS and TCR approach on HCC recurrence, using inverse probability weighting (IPW) to standardize the differences between these two groups.

Methods

The study is retrospective and multicentre and it includes 1851 patients with a viable tumor. Their demographic and clinical information were collected and compared between the CS and TCR group. Factors resulting significantly different were: recipient age, alcohol abuse, viral hepatitis, Child-Pugh class C, MELD score, cold ischemia time, clinical HCC stage with Milan criteria, number and max diameter of tumor nodules, microvascular invasion, G3/G4 tumor grading. In order to standardize the difference in the unbalanced variables between the two groups, a IPW was applied. This method creates a pseudo-population in which probabilities of receiving one of the two techniques do not depend on these covariates. The standardized mean difference (SSMD) was calculated to evaluate the unbalanced variables before and after applying IPW. Lastly a univariate and multivariate competing-risk regression were applied to investigate factor associated with HCC recurrence.

Results

IPW shows a good ability in balancing variables between the two groups. SSMDs before and after IPW for some of the variables were the following: recipient age (-0.113; -0.003), alchol abuse (-0.209; -0.010), viral hepatitis (0.136; -0.006), Child-Pugh class C (-0.218; 0.008), MELD score (-0.306; 0.019), cold ischemia time (0.077; 0.004), clinical HCC stage with Milan criteria (0.139; 0.000), number (-0.162; -0.024) and max diameter of tumor nodules (0.096; 0.013), microvascular invasion (0.193; 0.006), G3/G4 tumor grading (-0.115; -0.013). In multivariable competing-risk regression, adjusting for these balanced variables and other relevant factors, the CS hepatectomy technique results to be significantly risk factor for HCC recurrence ($p < 0.05$).

Conclusion

IPW results to be a useful tool to better help the understanding of the association of the TCR and CS technique to HCC recurrence, showing a good ability in balancing variables between the two groups.

Bibliography

1. Verna EC, Patel YA, Aggarwal A, Desai AP, Frenette C, Pillai AA, Salgia R, Seetharam A, Sharma P, Sherman C, Tsoulfas G, Yao FY. Liver transplantation for hepatocellular carcinoma: Management after the transplant. Am J Transplant., 2020;20(2):333-347.