



Introduction

Over the past 50 years, the rising average Body Mass Index (BMI) has increased the number of clinically obese potential organ donors,¹ resulting in a higher prevalence of donor steatosis in liver grafts. While macrosteatotic livers were once considered unsuitable for transplantation, recent studies indicate 30-60% macrosteatosis has comparable graft survival to those with less than 30% macrosteatosis, challenging previous contraindications.²⁻⁴

Methods and Materials

Between 2021 and 2023, the University of Maryland Medical Center introduced a protocol for transplanting liver grafts with $\geq 50\%$ macrosteatosis. Criteria included donor age (≤ 45), donation after brain death (DBD), and acceptable liver function (AST/ALT $\leq 500/300$). The protocol aimed for a CIT ≤ 4 hours, targeting recipients with a MELD ≤ 30 . Patient profiles integrated UNOS and center data, encompassing key parameters.

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Results

Five patients, mean age 60 ± 12 y, underwent our liver transplant protocol for cirrhosis due to chronic hepatitis C (2), NASH (2), and alcohol-related cirrhosis (1), including one HCC. Donors, aged 43 ± 9 y with a BMI of 35 ± 3 kg/m², had varied causes of death. CIT averaged 4.2 ± 1.3 h, and anastomosis duration was 43 ± 8 min. Patients received an average of 6.6 RBC units. Two patients required reoperation. Prothrombotic conditions (1 PVT, 1 HAT) were surgically managed. All patients were discharged after a stay of 13.8 ± 7.5 days. At the latest follow-up (median 7.1 months, 2-25 months), all patients are alive with functioning grafts.

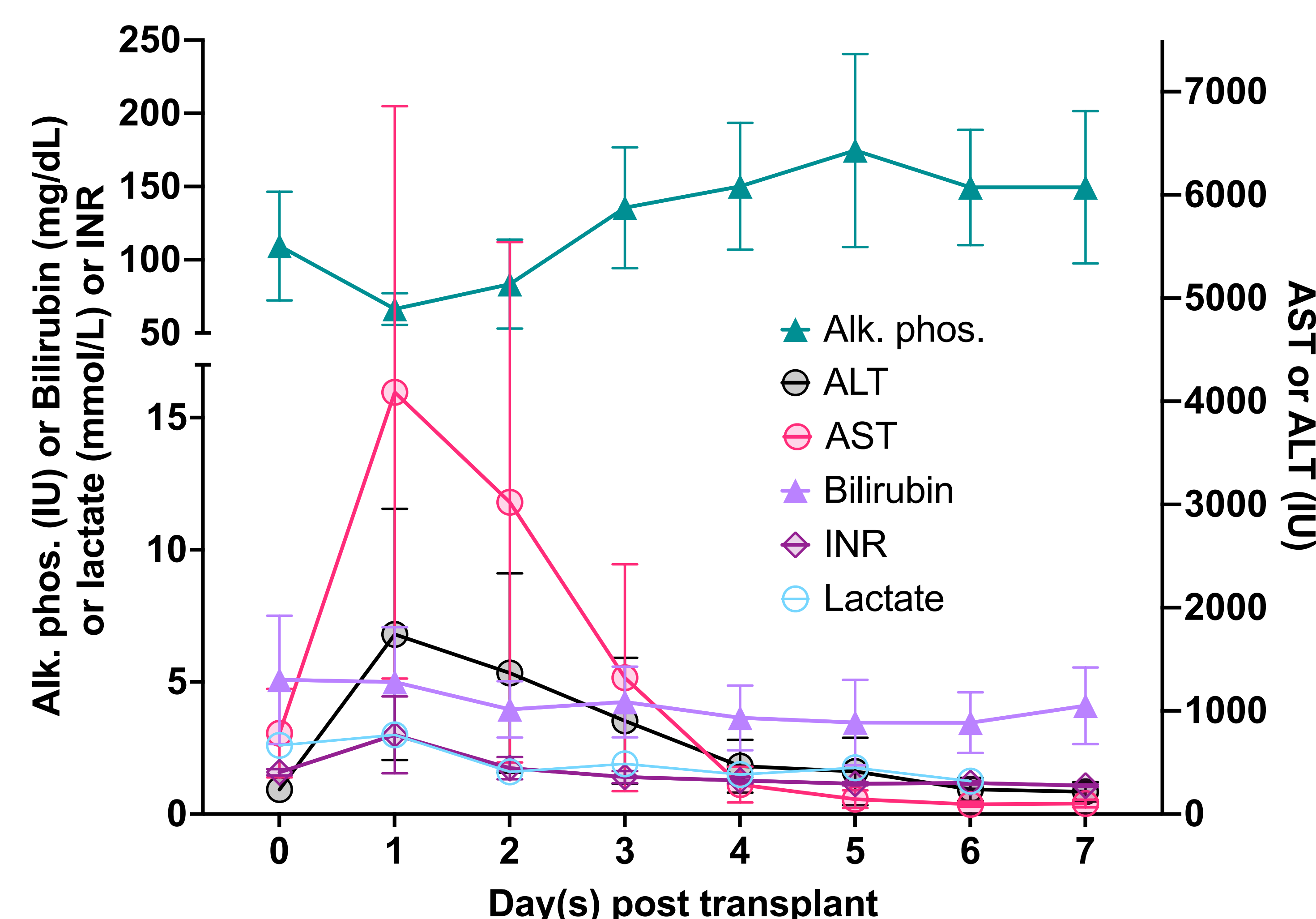


Figure 1. Recipient postoperative labs from day 0 to 7.

Discussion

Our center aimed to establish a dedicated protocol for transplanting macrosteatotic livers, focusing on low-risk patients with low CIT, low to intermediate MELD scores, and donors with low terminal values. Despite previous variability in outcomes,⁵⁻⁷ our protocol demonstrated success over a 7-month average follow-up, with macrosteatosis levels ranging from 50% to 90%. Although recipients of macrosteatotic grafts received a similar number of intraoperative RBC units compared to patients with non-steatotic allografts,⁸ post-transplant complications, especially vascular issues, were more prevalent in our cases, leading to extended hospital stays. Caution is warranted in interpreting our findings due to the limited sample size.

Conclusions

In summary, our protocol allowed successful transplantation of high macrosteatosis livers into low-risk recipients with low or intermediate MELD scores. Despite the increased risk for postoperative complications, all patients are alive with functioning grafts, showcasing the potential of high-steatosis livers for those with intermediate MELD scores. Future use of machine perfusion techniques is expected to enhance their application in transplantation, offering improved options for patients in need.

References

- Kranjac AW, Kranjac D. Explaining adult obesity, severe obesity, and BMI: Five decades of change. *Heliyon*. May 2023;9(5):e16210. doi:10.1016/j.heliyon.2023.e16210
- Croome KP, Lee DD, Taner CB. The "Skinny" on Assessment and Utilization of Steatotic Liver Grafts: A Systematic Review. *Liver Transplantation*. 2019;25(3):488-499. doi:https://doi.org/10.1002/lt.25408
- Linares I, Hamar M, Selzner N, Selzner M. Steatosis in Liver Transplantation: Current Limitations and Future Strategies. *Transplantation*. Jan 2019;103(1):78-90. doi:10.1097/tp.0000000000002466
- Dutkowski P, Schlegel A, Slankamenac K, et al. The use of fatty liver grafts in modern allocation systems: risk assessment by the balance of risk (BAR) score. *Ann Surg*. Nov 2012;256(5):861-8; discussion 868-9. doi:10.1097/SLA.0b013e318272dea2
- Doyle MB, Vachharajani N, Wellen JR, et al. Short- and long-term outcomes after steatotic liver transplantation. *Arch Surg*. Jul 2010;145(7):653-60. doi:10.1001/archsurg.2010.119
- Angele MK, Rentsch M, Hartl WH, et al. Effect of graft steatosis on liver function and organ survival after liver transplantation. *Am J Surg*. Feb 2008;195(2):214-20. doi:10.1016/j.amjsurg.2007.02.023
- Verran D, Kusyk T, Painter D, et al. Clinical experience gained from the use of 120 steatotic donor livers for orthotopic liver transplantation. *Liver Transpl*. May 2003;9(5):500-5. doi:10.1053/jlts.2003.50099
- Massicotte L, Capitano U, Beaulieu D, Roy JD, Roy A, Karakiewicz PI. Independent validation of a model predicting the need for packed red blood cell transfusion at liver transplantation. *Transplantation*. Aug 15 2009;88(3):386-91. doi:10.1097/TP.0b013e3181a1aed477