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ORIGINAL ARTICLE

Impact of body mass index in liver transplantation for nonalcoholic fatty liver disease and alcoholic liver disease

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Abstract

Background: This study evaluates long-term outcomes and body mass index (BMI) following liver transplantation (LT) for non-alcoholic fatty liver disease (NAFLD) in comparison with alcoholic liver disease (ALD).

Methods: Patient and graft survival were compared using Kaplan Meier curves and log rank test. Multivariable analysis of recipient and donor characteristics was performed as determinants of patient survival. BMI at listing was compared with BMI post-LT.

Results: Patient survival at 1-, 3-, 5- and 10 years post-LT was similar in the ALD group (n = 195) compared with the NAFLD group (n = 84) (93% vs. 93%, 91% vs. 89%, 86% vs. 77%, 64% vs. 66% respectively, p = 0.21). One patient in the NAFLD group was re-transplanted and none in the ALD group therefore graft survival was also similar (p = 0.20). Multivariable analysis didn't identify any significant predictors of reduced survival. In comparison with the ALD group, BMI was significantly higher in the NAFLD group at listing (31 vs. 27, p < 0.001), 3-months post-LT (28 vs. 26, p < 0.05) and 6-months post-LT (29 vs. 27, p < 0.05) but was equivalent by 5-years post-LT (29 vs. 30, p = 0.80).

Conclusions: NAFLD patients had similar patient and graft survival post-LT compared to ALD. NAFLD patients returned to listing BMI by one-year post-LT but by 5-years post-LT there was no difference in BMI between the groups.

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Introduction

Due to the obesity epidemic non-alcoholic fatty liver disease (NAFLD) is increasing in prevalence worldwide and is now the second leading cause of liver transplantation (LT) in the United States.[1] In the United Kingdom, 12% of patients placed on the LT waiting list are categorised as having NAFLD.[2] Currently 25% of LTs performed per year in the Scottish Liver transplant Unit are for NAFLD and it is now the second most common indication for LT in Scotland. Due to the increasing prevalence of obesity and diabetes worldwide it is likely that in the future NAFLD will become the leading indication for LT both in Europe and in United States.[3] The increase in NAFLD related LTs is anticipated to have a significant impact on liver transplantation workload, and raises difficult questions regarding the optimal allocation of scarce organ resources.

Given the relatively recent increase in the proportion of LTs performed for NAFLD, there is very little evidence of long-term outcomes following LT including 10-year graft and patient survival. Indeed, there have been recent calls for comprehensive follow-up studies to be conducted in NAFLD patients following LT to better understand long-term outcomes and disease recurrence in this group.[3] Alcoholic liver disease (ALD) is an established indication for LT, and similar to NAFLD, lifestyle choices play an important role in the pathogenesis of ALD. Therefore to better appreciate the long-term outcomes of LT in NAFLD patients, the ALD population is a rational comparator group.[4]

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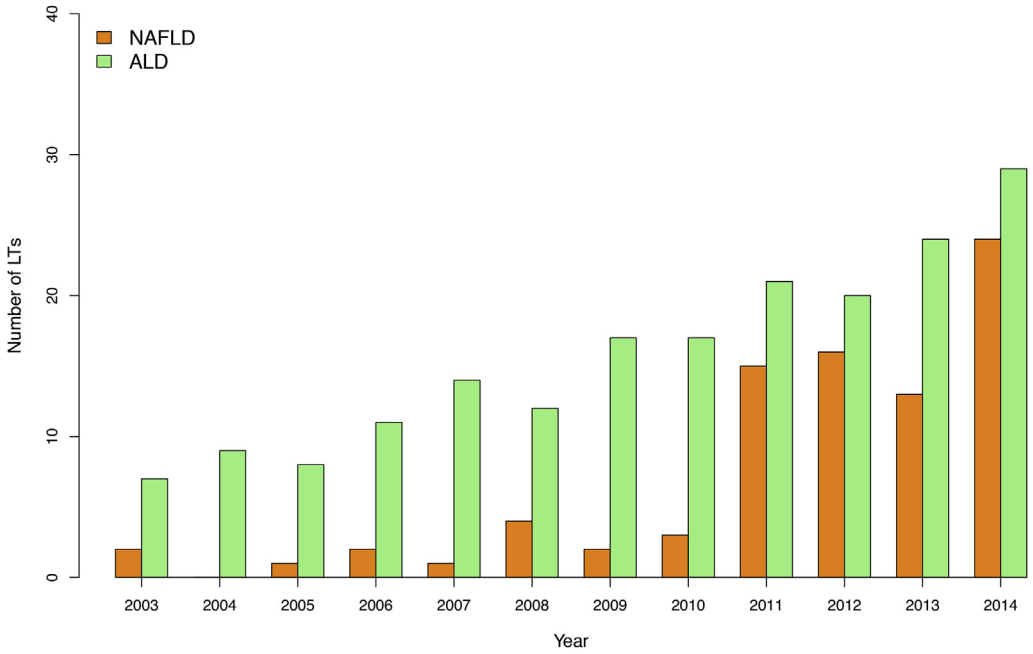

Figure 1 LTs for NAFLD per year (2003–2014). Note the study period was November 2002–May 2015. Therefore this graph excludes one ALD case from 2002, seven ALD cases from 2015 and one NAFLD case from 2015

A recent systematic review and meta-analysis that examined 9 studies and 717 patients after LT for NAFLD found similar 1-, 3-, and 5-year survival between NAFLD and other causes of liver failure.[5] In a review of the United Network for Organ Sharing a superior survival of patients undergoing LT for NAFLD was identified when compared with patients undergoing LT for ALD.[6] In a single centre study, however, a non-significant trend toward lower survival post-LT was identified in the NAFLD group when compared with ALD patients.[4]

In a further single centre analysis, obese and overweight patients did not have reduced patient or graft survival following LT but had increased morbidity with longer lengths of intensive care and hospitalisation.[7] A body mass index (BMI) of >35 kg/m^2 was identified as a significant risk factor for mortality following LT,[8] whilst patients with a BMI > 40 kg/m^2 had significantly worse 5-year graft and patient survival.[9] In a further study patients with BMI of 35.1–40 kg/m^2 also had lower patient and graft survival.[10] A recent meta-analysis has found that BMI does not reduce patient survival overall post-LT but that obese patients have reduced survival when compared with non-obese patients with similar causes of liver disease.[11]

This study aims to evaluate long-term outcomes including patient and graft survival and BMI changes following LT for NAFLD, and compare these outcomes with patients undergoing a LT for ALD.

Methods

This study retrospectively reviewed a prospectively collected database of patients undergoing LT in the Scottish Liver transplant Unit between November 2002 and May 2015. The demographics of patients and outcome measures including patient and graft survival, and body mass index (BMI) throughout the post-LT period were compared between patients undergoing LT for a primary indication of NAFLD and patients undergoing LT for a primary indication of ALD. Graft survival was defined as death or re-transplantation and BMI as weight (kg)/height (meters)^2. In the Scottish Liver Transplant Unit there is no upper limit of BMI beyond which patients are not considered for LT. Patients were also not excluded if they had evidence of ascites or sarcopenia. Histologically proven recurrences of NAFLD on liver biopsy are described in patients that had selective liver biopsies performed.

In this study, parametric data are presented as mean ± standard deviation and non-parametric data as median and range. Statistical comparisons of continuous parametric data and non-parametric data were performed using student's t-test and Mann–Whitney U test respectively. Statistical comparisons of categorical data were performed using Pearson's Chi-square test. Kaplan–Meier curves were constructed to evaluate patient survival probabilities with differences compared using the log-rank test. Survival percentages are given with 95% confidence intervals in parentheses. Multivariable survival analysis was performed using a Cox proportional hazard regression model. All comparisons were performed on R v3.1.3 (R Foundation for Statistical Computing) with $p < 0.05$ considered statistically significant.

Results

During the study period 866 LTs were undertaken. As the study progressed the number of LTs performed for ALD and NAFLD

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