



## Case Report

# High-priority liver transplantation and simultaneous sleeve gastrectomy in MELD 32 end-stage liver disease: a case report with long-term follow-up

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## ABSTRACT

**Background:** Morbid obesity is a worldwide epidemic closely linked to Non-Alcoholic Fatty Liver Disease (NAFLD), an ever more relevant indication for Liver Transplantation (LT). Obesity affects an increasing number of LT recipients, but the ideal management of these patients remain unclear. Bariatric surgery (BS) in LT setting is challenging but feasible, although the debate is still open about the best timing of bariatric surgery. Herein we report a case of high-priority LT and simultaneous sleeve gastrectomy (SG) in an obese young adult.

**Case report:** A 45 years old man with morbid obesity (BMI 46 kg/m<sup>2</sup>) and severe NAFLD-related end-stage liver disease (ESLD) underwent simultaneous LT and sleeve gastrectomy (SG) in an emergency setting, due to a MELD score of 32. He had substantial weight loss during long-term follow-up and enjoyed resolution of diabetes and hypertension. At 4 years follow-up, he has normal allograft function with appropriate immunosuppressant blood levels and no ultrasound evidence of steatosis.

**Conclusion:** In selected patients, combined LT and SG present several advantages in terms of transplant outcomes, weight loss and resolution of obesity-related comorbidities. In addition, it can be performed in the high-priority setting in case of severe ESLD with good results in the short- and long-term.

## Introduction

The World Health Organization (WHO) has defined obesity as the XXI century epidemic [1]. Its prevalence is constantly increasing: in 2019 more than half of European adults were reported to be overweight, 17% of which obese [2].

Obesity and its related comorbidities are a major risk factor for non-alcoholic fatty liver disease (NAFLD) and, due to this close association, NAFLD is now considered a hepatic manifestation of the metabolic syndrome [3]. The severity of NAFLD can range from simple steatosis to steatohepatitis (NASH), end-stage liver disease (ESLD) and hepatocellular carcinoma (HCC), which may represent indications for liver transplantation (LT).

Though obesity management in ESLD is quite complex, after preliminary resistance, bariatric surgery has been demonstrated to be feasible also in LT recipients [4].

As NAFLD is predicted to become the most frequent indication for LT,

it is mandatory to define the correct timing of bariatric surgery in the ESLD setting [5]. For instance, in 2019, 37.7% of USA transplant recipients had a BMI > 30 kg/m<sup>2</sup> [6].

BS prior to LT is associated with high surgical risk, especially in patients with decompensated cirrhosis and portal hypertension [7]. On other hand, BS post LT can be technically challenging due to adhesions and immunosuppression-related complications after surgery. In 2013, Heimbach et al. at the Mayo Clinic in the US first described simultaneous sleeve gastrectomy (SG) and LT, followed by European, Indian and Asian centers [8–11]. This procedure was proved to be feasible and associated with acceptable results at long-term follow-up [12].

Hence, we report the first case of combined LT and SG in high-priority setting in a morbidly obese patient with NASH-related ESLD and MELD (Model for End Stage Liver Disease) score >30.

**Abbreviations:** LT, Liver Transplantation; BS, bariatric surgery; SG, sleeve gastrectomy; BMI, Body Mass Index; MELD, Model End-Stage Liver Disease; NAFLD, non-alcoholic fatty liver disease; NASH, non-alcoholic steatohepatitis; ESLD, end-stage liver disease.

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**Case report**

A 45 years old Caucasian man was referred to our Liver Unit with NAFLD-related ESLD, severe morbid obesity (BMI 46 kg/m<sup>2</sup>), hypertension and type 2 diabetes. He had a previous non-replicating HBV infection and no history of major alcohol intake.

The patient had severe portal hypertension with grade I–II esophageal varices at endoscopy and a partial portal vein thrombosis with several peri-splenic porto-systemic shunts.

A multidisciplinary team (including dietician, psychiatrist, bariatric surgeon, hepatologist and transplant team) assessed the patient and he was listed for combined LT + SG, in consideration of the low chance of spontaneous post-LT weight loss and consequent risk of disease recurrence in the graft.

Shortly after his first evaluation, his clinical conditions worsened with MELD score reaching 32 and MELD-Na score reaching 34, so that urgent was indicated with regional priority according to our national transplant centre policy.

The transplantation was performed using a whole liver graft (1790 g) from a 39 years-old brain death donor without steatosis at biopsy. The procedure was carried out using a right subcostal incision, with caval-sparing hepatectomy using a “piggyback” side-to-side cavo-caval anastomosis. Arterial anastomosis was performed between donor and recipient common hepatic arteries; intraoperative ultrasound showed good arterial flow both outside and inside the liver graft. Bile duct reconstruction was performed with an end-to-end anastomosis without T-tube insertion.

SG was performed by an experienced bariatric surgeon. Stomach resection was achieved with a combination of 45-mm and 60-mm Endo-GIA staple loads from the antrum up to the fundus, using as a guide a 32 Fr orogastric tube placed along lesser curvature and after mobilization of the greater curvature from diaphragmatic crura and gastro-colic ligament. At the end, methylene blue test showed no leakage of the staple line.

The whole combined procedure lasted a total of 8 h and 30 min, including 45 min of SG. The procedure required transfusion of 5 units of packed red blood cells and 10 units of fresh frozen plasma.

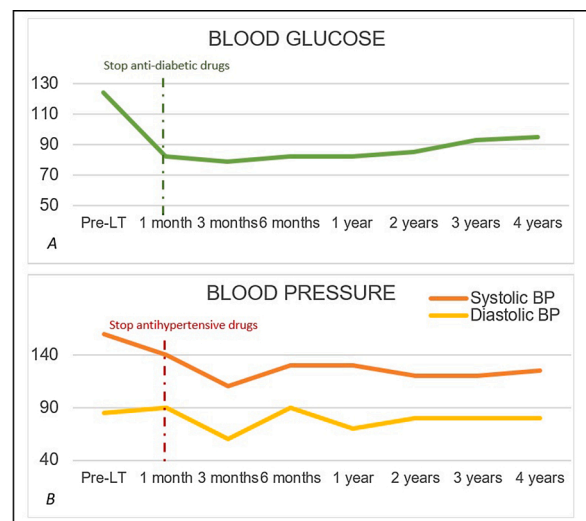
After LT, the patient received an immunosuppression protocol with tacrolimus once daily and everolimus twice daily with target trough-levels of 5–8 ng/mL and 3–5 ng/mL, respectively. On post-operative day two, a Gastrografin X-ray study demonstrated the absence of leakage so that the patient started a refeeding bariatric protocol implying 2 weeks of liquid diet, followed by 2 weeks of semi-liquid diet and a month of semi-solid diet. The patient was discharged on 16th post-operative day.

After one week, he was readmitted for jaundice. A CT-scan with Gastrografin showed an abdominal fluid collection but no signs of leak; the fluid collection was treated by percutaneous drainage with good result. Two months after LT the patient needed stent placement using endoscopic retrograde cholangiopancreatography for bile duct anastomotic stricture, which was later removed after evidence of no bile duct dilatation.

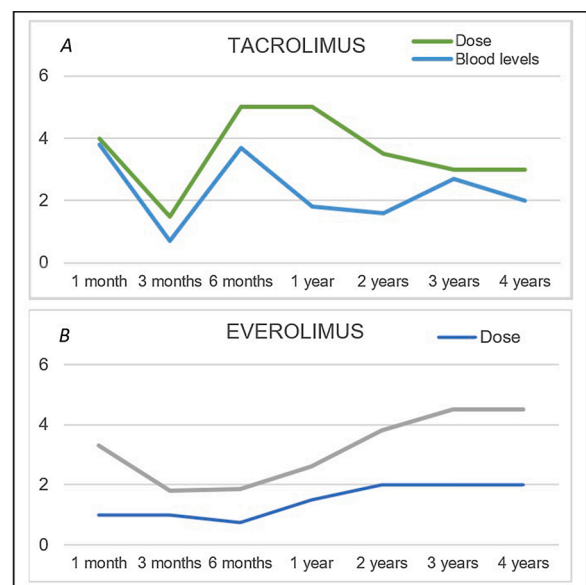
At 4 years follow-up the patient is in good conditions with normal graft function. His bodyweight decreased from 161 kg (BMI 47 kg/m<sup>2</sup>) at the time of LT to 110 kg (BMI 32 kg/m<sup>2</sup>) at 6 months. At last follow up he weighed 137 kg with a BMI of 40 kg/m<sup>2</sup>. He is no longer under anti-diabetic nor anti-hypertensive therapy (Fig. 1). He performed periodically blood tests that confirmed immunosuppressant blood concentrations within desired range (Fig. 2). Abdominal ultrasound performed at last follow-up showed no evidence of steatosis of the transplanted liver.

**Discussion**

The increased prevalence of obesity and NAFLD among liver transplant recipients is now a current challenge in transplant surgeon communities. Historically, obesity has been considered a contraindication



**Fig. 1.** Blood glucose (A) and blood pressure (B) trends during long-term follow-up.



**Fig. 2.** Tacrolimus (A) and everolimus (B) trends during long-term follow-up.

for LT due to the increased risk of morbidity and mortality both during the perioperative period and long-term follow-up [13,14].

Currently, the prevalence of obesity in LT recipients is increasing and NASH will probably represent the first cause of LT in the next decade [6]. Moreover, recurrence of NAFLD is common after transplant, depending on various patient’s risk factors including high pre-LT and post-LT BMI [15].

At present, there are no specific recommendations about the management of obese LT recipients. Regarding exercise and dietary modifications, patients compliance is relatively low and they take a long period of time to achieve improvements [16]. Waiting such a long interval before LT is not always possible, especially in high-risk patients: for instance, our case had MELD > 30 with a rapid worsening of liver disease and prior weight loss was not achievable. In addition, weight regain after LT is common [12].

Bariatric surgery is feasible and effective also in the setting of LT: outcomes, such as excess weight loss and remission of obesity-related comorbidity, are comparable to those reported in the general population [13]. About the type of surgery, various approaches have been

studied. Generally, SG and Roux-en-y Gastric Bypass (RYGB) are the most frequent bariatric procedures, with similar outcomes in terms of excess weight loss [17]. In LT recipients, SG may represent the preferred method compared to gastric bypass or biliopancreatic diversion, given its technical ease and comparable results. In fact, this technique has a short operative time, does not require gastro-intestinal anastomosis, produces low impact on immunosuppression absorption and, most importantly, preserves easy endoscopic access to Vater papilla if biliary complication should occur [18].

The debate is still open in the literature about the best timing of the bariatric procedure [19]. BS before LT could be extremely demanding due to portal hypertension and/or coagulopathy, so it is often contraindicated in patients with decompensated cirrhosis. Cirrhotic patients have higher incidence of BS complications than the general population, which may delay LT. Moreover, the patient can develop adhesions, leading to a more complex transplant procedure. On the other hand, BS post-LT might have some drawbacks, such as adhesions due to prior surgery, that could prevent laparoscopic approach, and the increased risk of infection and wound dehiscence due to immunosuppression.

These disadvantages do not involve LT and BS in the simultaneous setting. Other benefits of this procedure are the need of a single hospitalization avoiding re-operation and preventing disease recurrence in the transplanted liver, so it might reduce sanitary costs and decrease hospital stay. Heimbach et al. first published about 7 patients who underwent combined LT and SG in 2012, then they updated their experience and provided the long-term outcome [8,12]. Patients with LT + SG had lower prevalence of hypertension, diabetes and metabolic syndrome, with a greater and more lasting weight loss.

In this case report, this approach has been performed in a patient with severe ESLD who had MELD > 30. The patient had a substantial weight loss after LT, despite the partial weight regain on long-term follow up — main limit of SG as in the general population; still long-term visits can help reducing weight regain [20]. Currently he no longer needs anti-hypertensive or hypoglycaemic treatment.

He had a biliary stricture after transplant but not attributable to SG and the management was not compromised by this procedure (ERCP treatment would not have been possible with other types of BS). So, in this case combined LT and SG treated severe ESLD, reduced morbid obesity and induced remission of its related comorbidities without affecting post-operative management.

The ideal approach to obesity management in LT patients remains unknown but we sustain, together with other reports, that combined SG and LT in selected recipients may offer several advantages, such as preventing recurrence of the disease, maintenance of weight loss, remission of obesity-related comorbidities and in terms of costs [8–12].

## Conclusions

Simultaneous LT and SG is feasible also in urgency setting in selected patient transplanted in centre highly specialized both bariatric and transplant surgery. Prospective clinical trials focusing on obesity and LT are needed in order to establish evidence-based guidelines to manage these recipients.

## Ethics approval and consent to participate

For case report IRB approval is not required by our Centre. Written informed consent on publication was obtained from the patient. A copy of written consent is available for review by the Editor-in-Chief of this journal on request. This work follows the surgical case report guidelines (SCARE).

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This research did not received grants from any founding agency in public, commercial or not-for-profit sectors.

## Conflict of interest

All authors declare no conflict of interest.

## Data availability

Data will be made available on request.

All foci coordinates, activation probability maps, in addition to the supplemental information will be available on ANIMA: a data-sharing initiative for neuro-imaging meta-analyses: [anima.fz-juelich.de](http://anima.fz-juelich.de).

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