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Case Report

# Case report on nutrition management in liver transplant

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ABSTRACT

**Background:** Liver transplantation or hepatic transplantation is a procedure of replacing diseased liver with a healthy liver. It needs cautious post-operative care including nutritional intervention.
**Case Study/Methods:** We present a 65 year old patient underwent a liver transplant due to acute liver failure. The patient's diet history revealed a daily intake of carbohydrates and fats but inadequate protein intake.
**Results:** The patient's nutritional interventions were analyzed and evaluated through hospital recalls and proper follow up visits. In studies, hospital recall on $7^{th}$ day of post-surgery showed a great improvement in calorie and protein intake. The discharge diet plan included a well-balanced diet with protein, carbohydrates and fat intake to ensure nutritional care for the patient's recovery.
**Conclusion:** Nutritional intervention plays a vital role in post-operative care of liver transplant patients. This case study signifies the importance of personalized dietary intervention to resolve PEM, improve nutritional intake while supporting successful surgical outcome and recovery .



## 1. Introduction

Liver transplantation or hepatic transplantation is gold standard where a diseased liver is replaced with the healthy liver from another person (allograft). Liver transplantation is a treatment option for end-stage liver disease and acute liver failure, the most common technique is orthotopic transplantation, where in the native liver is removed and replaced by the donor organ in the same anatomic position as the original liver.

Virtually all liver transplants are done in an orthotopic fashion; that is, the native liver is removed and the new liver is placed in the same anatomic location.[1] The transplant operation can be conceptualized as consisting of the hepatectomy (liver removal) phase, the anhepatic (no liver) phase, and the post implantation phase. The operation is done through a large incision in the upper abdomen. The hepatectomy involves division of all ligamentous attachments to the liver, as well as the common bile duct, hepatic artery, hepatic vein and portal vein.

The donor's blood in the liver will be replaced by an ice-cold organ storage solution until the allograft liver is implanted. Implantation involves anastomoses (connections) of the inferior vena cava, portal vein, and hepatic artery. After blood flow is restored to the new liver, the biliary (bile duct) anastomosis is constructed, either to the recipient's own bile duct or to the small intestine. The surgery usually takes between five and six hours, but may be longer or shorter due to the difficulty of the operation and the experience of the surgeon.

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### 1.1. Indication

Three underlying principles dictate which patients should be referred for and potentially undergo transplant. First, the recipient should have irreversible liver disease that is expected to be fatal without transplantation. This disease may be acute or chronic in nature like acute liver failure, liver cirrhosis, MELD>15, primary hepatic neoplasms and inborn metabolic conditions like cystic fibrosis. Second, the patient should have sufficient reserve to survive the operative and perioperative period. Finally, the candidate should be expected to have significant survival and quality of life benefit from LT(These indications are largely consistent with the most recent practice guidelines as detailed by the American Association for the Study of Liver Disease (AASLD).[2,3]

## 2. Recovery and Prognosis

The prognosis following liver transplant is variable, depending on overall health, technical success of the surgery, and the underlying disease process affecting the liver.[4] There is no exact model to predict survival rates; those with transplant have a 58% chance of surviving 15 years.[5] Failure of the new liver occurs in 10% to 15% of all cases. These percentages are contributed to by many complications.

Early graft failure is probably due to pre-existing disease of the donated organ. Others include technical flaws during surgery such as revascularization that may lead to a non functioning graft.

### 2.1. Complications

After a liver transplantation, immune-mediated rejection (also known as rejection) of the allograft may happen at any time. Physical findings may include encephalopathy, jaundice, bruising and bleeding tendency. Other nonspecific presentation may include malaise, anorexia, muscle ache, low fever, slight increase in white blood count and graft-site tenderness.[6,7] Rejection may present with lab findings: elevated AST, ALT, GGT; abnormal liver function values such as prothrombin time, ammonia level, bilirubin level, albumin concentration; and abnormal blood glucose.[8]

1. Hyperacute rejection is caused by preformed anti-donor antibodies.
2. Acute rejection is mediated by T cells (versus B-cell-mediated hyperacute rejection.
3. Chronic rejection is the presence of any sign and symptom of rejection after one year.

## 3. Nutritional Scope

Malnutrition is an important factor in determining the progression of liver disease as it contributes to hypoalbuminemia and intensifies the hydro electrolytic imbalance caused by renal changes.[9] Protein-energy malnutrition is a common problem in end-stage liver disease patients awaiting liver transplantation.[10] This is true for nearly all early stage liver disease etiologies, with the exception of liver failure. Therefore, the possible impact of malnutrition on the outcome of liver transplant and the need for nutritional counselling and nutritional supplementation in patients with liver disease have been the subject of increasing interest.[11] PEM is common in advanced cirrhosis. Diagnosis in early -stage liver disease may be easy due to muscle wasting and fat loss. Prevalence of PEM can be as high 100% in patients undergoing transplant.[12,13] In chronic liver disease, malnutrition has been estimated to be present in 65-100% of the patients.[14] Poor nutritional status is associated with poor outcome in cirrhotic patients.[15] Poor quality of life and shorter life expectancy have all been observed in cirrhotics with poor nutritional status when compared with well-nourished patients.[16] Due to fluid retention and a lack of appropriate evaluation techniques, it is challenging and fairly difficult to assess malnutrition in routine medical treatments. Dietary assessment is crucial since malnutrition affects cirrhotics so frequently. The most used nutrition status assessment technique for LT patients is SGA. Patients are characterised as having adequate nutrition, mild malnutrition, or severe malnutrition. SGA has demonstrated relatively poor sensitivity and good specificity when used to identify under nutrition in ESLD patients. According to the European society for clinical nutrition and metabolism the SGA is straightforward device that can be used in conjunction with straightforward anthropometric measurements to assess the degree of malnutrition.[17] A rapid, easy, and reliable method for detecting under nutrition in ESLD patients is HGS examination with a dynamo meter, along with MUAC, MAMC and TST parameters. In ESLD patients, nutritional assessment is crucial because nutritional therapy enhances survival, improves nutritional status, and lowers morbidity.[18] The goal of our study was to evaluate the nutritional status of ESLD subject using clinical parameters, SGA, and other nutrition screening parameters. We also looked at the correlation between nutritional status as measured by SGA and Child-Pugh classification, clinical characteristics, and liver function parameters. We chose to employ SGA as a malnutrition evaluation technique for this investigation due to the challenges associated with determining the level of nutrition in individuals with liver cirrhosis.

## 4. Physical Examination

Patients with cirrhosis usually present with signs of jaundice, palmar erythema, spider angiomata, gynaecomastia and alteration of mental status arising due to complications of cirrhosis. Abdominal examination may show signs of abdominal distension, caput

medusae, splenomegaly and flank dullness on percussion. Other findings on examination include nail changes, presence of clubbing, dupuytren's contracture(flexion deformities of the fingers) and asterixis in cases with hepatic encephalopathy.

Patients with cirrhosis usually appear weak due to constitutional symptoms such as weight loss, anorexia and muscle atrophy. Yellowish discoloration of skin and abdominal distension may also be present due to ascites.

## 5. Methodology and Case Review

### *5.1. Patient profile*

A 65 year old male with a known case of cirrhosis of liver and chronic liver failure was admitted to Aster CMI hospital on $29^{th}$ of March, 2022 with complaints of abdominal distension. However there was no history of fever, pain abdomen, nausea or vomiting, gastrointestinal bleed or altered sensorium. Patient has a history of hypertension.

A DDLT (Diseased Donor Liver Transplant) was performed on $30^{th}$ March, 2022. Patient received a treatment course for around 23 days and was discharged on $24^{st}$ April, 2022.Upon admission nutritional screening of patient was done using SGA form and standard anthropometric measurements along with MUAC (Mid upper arm circumference) and HGS (Hand grip strength) test. The nutritional score obtained and HGS values were recorded both pre and post transplant inorder to have a quantitative measurement of patients progress based on their nutritional intake.

Medications prescribed to the patient post transplant were inj meropnem, targocid, clexane, tab methylpred, vingraf and keygraf. Drug nutrient reaction especially for immunosuppressant drugs were carefully considered while planning diet for patient.

### *5.2. Anthropometric measurements*

1. Height- 167cm
2. Weight-67kg
3. BMI-24kg/m2
4. Preop
5. HGS-(RH)- 36.7kg (LH)-40.4kg
6. MUAC-31.5cm
7. NFPE: Mild muscle wasting+, ascites+; Impression: E44.0 Moderate PCM(ICD-10)

## 6. Post-Operative Progression

1. *Post Operative Day (POD)-0-* The patient was shifted to Transplant ICU for continuous monitoring and observation. Here the patient was kept NPO for 24 hours with IV fluids.He was also infused with medications like Piptaz 4.5gm 2 Doses; Teicoplanin 400mg 1 Dose; Forcan 400mg 1 Dose and Methylpred 20mg.
2. *POD-1*–A continued medical support, NAC along with Teriplessin 2MG/24HRS(1ML/HR) along with Ionotropes Norad (4MG/50-1.5ML/HR) Infusion, Vingraf (2 mg)-BD was provided to the patient.
3. *POD-2 &3-* Patient was started on sips of water and gradually progressed to liquid diet by the end of POD-3.However IV fluids 50ml /hr was continued to maintain fluid and electrolyte balance.
4. *POD-5* –Patient was eventually started on soft diet, tolerance was satisfactory. However appetite dropped gradually due to altered taste and frequent episodes of nausea attributed to the antibiotics and corticosteroid medications. Here the patient was suggested a high protein nutritional supplement thrice a day along with small frequent meals inorder to support nutritional intake.
5. Intake was very poor until POD 6-8, where inclusion of probiotics and dietary zinc sources supported the patients appetite and overall nutritional intake.
6. *POD-10-15* Patient's vitals stable, no graft site infection, wounds clean, reduction in GI discomfort and bowel movements were stabilised. He was shifted to ward where his weight and nutrition intake were regularly monitored. Careful assessment and examination of the anthropometric parameters were carried out to analyse the quality of nutritional intake which further had a direct impact on patient recovery.
7. *POD 15-18-* Patient's vitals were carefully monitored, GRBS was fluctuating with regular administration of immunosuppresants .In this phase patient was counselled the significance of high calorie -high protein and also advised to follow a low GI therapy diet.
8. An oral personalised diet plan provided to the patient during the hospital stay to cater to the metabolic and nutritional demands of the patient in the post operative phase.
9. *POD-23-* Patient was planned for discharge, during this time the patient was counselled regarding the medications and plan of care to be provided at home. A customized therapeutic diet plan native to the patient's region and cultural preferences was meticulously designed and handed over to him and the family was also counselled regarding the post-op nutritive care. Significance of dietary supplement was explained to address patient nutrient depletion and prevent further deficiencies.Patient was further asked to be reviewed on OPD basis.

**Table 1:** Vitals

| Parameter | 29.03.22 (Pre-op) | 31.03.22 (POD -1) | 4 .04.22 (POD-5) | 9.04.22 (POD-10) | 17.04.22 (POD-18) |
|---|---|---|---|---|---|
| HR | 80 | 105 | 86 | 86 | 96 |
| BP | 120/70 | 105/70 | 102/90 | 110/80 | 109/78 |
| RR | 20 | 18 | 18 | 22 | 18 |
| Spo2 | 98 | - | - | - | 99 |
| GRBS(mg/dL) | 145 | 225 | 210 | 200 | 214 |

**Table 2:** Biochemical parameters

| Clinical parameter | 29.3.22 (Pre-op) | 31.03.22 (POD-1) | 4.04.22 (POD-5) | 9.04.22 (POD-10) | 17.04.22 (POD-18) |
|---|---|---|---|---|---|
| Bilirubin total(mg/dL) | - | 2.0 | 1.17 | - | 2.1 |
| Bilirubin direct(mg/dL) | - | 1.4 | 0.82 | - | 0.9 |
| AST/SGOT (U/L) | - | 166 | 152 | 76 | 70 |
| ALT/SGPT (U/L) | - | 194 | 183 | 134 | 77 |
| Alkaline Phosphatase (IU/L) | - | 114 | 93 | 91 | 86 |
| Protein total(g/dL) | - | 3.9 | 3.5 | 3.8 | 4.5 |
| Albumin(g/dL) | 2.2 | 2.2 | 1.7 | 2 | 2.5 |
| Globulin(g/dL) | - | 1.7 | 1.8 | 1.8 | 1.9 |
| A/G ratio | - | 1.29 | 0.94 | 1.1 | 1.32 |
| GGT(IU/L) | - | 282 | 256 | 287 | 196 |
| Creatinine (mg/dL) | - | 0.28 | 0.30 | 0.34 | 0.24 |
| BUN(mg/dL) | - | 6.86 | - | - | - |
| Bicarbonate (mEq/L) | - | 19.8 | 20.7 | 26.1 | 25.6 |
| Sodium (mEq/L) | 130 | 138 | 131 | 136 | 137 |
| Potassium (mmol/L) | - | 3.93 | 3.91 | 4.6 | 5.12 |
| Chloride (mEq/L) | - | 107.6 | 100.5 | 101.6 | 104.4 |
| Urea(mg/dL) | - | 14.7 | 25.9 | 11.6 | 6.1 |

## 7. Results and Discussion

### *7.1. Medical nutrition therapy*

The normal hepatic innervations and vagus innervation are lost during transplantation. It has been suggested that the isolation of the liver from the autonomic regulatory control may influence not only nutrient absorption and metabolism, glucose and lipids homeostasis but also appetite signaling and eating behaviour.[19] All of these modifications may contribute to the body composition and weight changes observed in liver transplanted patients.[20,21]

Immunusuppressive therapy is known to increase appetite and fat deposition and decrease fat oxidation. They are also responsible for increasing proteolysis and consequent impaired protein synthesis.[22] Immunosuppressants such as cyclosporine, tacrolimus affect energy metabolism and muscle mass. These are also an independent predictor of post-transplant weight gain and has been reported to increase energy expenditure.[23] Both cyclosporine and tacrolimus may contribute to the impairment of muscle growth and muscle regeneration

They also inhibit the mammalian target of rapamycin complex, which is a key regulator of protein synthesis leading to other metabolic changes like hypertriglyceridemia, hyperglycemia, hyponatremia or hypokalemia.[23]

### *7.2. MNT goals for post-transplant*

To establish adequate nutritional intake.

1. To replenish nutrient stores lost during pre and peri operative stages.
2. To heal anastomoses and surgical wounds.
3. To preserve lean body mass.
4. To cater to the metabolic demands

5. To reduce catabolism and induce anabolism-focusing on high calorie and protein intake
6. To treat and prevent micronutrient losses.
7. To ensure food safety and good hygiene practices.

### *7.3. Prescribed diet*

1. High calorie high protein diet
2. Target:
3. Energy-2000kcals, Protein -80g, Carbohydrate- 250g, Fat-55g
4. Nutrient recommendation: [24,25]
5. Energy: 30-35kcals /kg IBW
6. Protein: 1.5-2.0 g /kg IBW
7. Carbohydrates: 50-60% of the energy value
8. Fat: 15-20% of the energy value

**Table 3:** DIET progression

| Date | Pre/Post op Day | Type of Diet |
|---|---|---|
| 29.03.22 | Pre-op | High protein diet, NPO for solids post 8pm |
| 30.03.22 | POD-0 | NPO |
| 31.03.22 | POD-1 | Sips of water |
| 01.04.22 | POD-2 | Sips of water—clear liquids as per tolerance |
| 04.04.22 | POD-3 | Liquid diet |
| 05.04.22 | POD-4 | Semisolid diet |
| 06.04.22-07.04.22 | POD-5,6 | Soft diet |
| 08.04.22-16.04.22 | POD-7-15 | Normal diet |
| 17.04.22-24.04.23 | POD 16-23 | High protein diet |

**Table 4:** Comparativetable of patient's nutritional intake-during Pre-Op, Post-OP and Follow-UP:

| Day | Energy (kcals) | Protein (g) | Carbohydrate(g | Fat(g) |
|---|---|---|---|---|
| Pre-op | 1200 | 35 | 150 | 40 |
| POD-2 | 500-700 | - | - | - |
| POD-5 | 900 | 25 | 112 | 30 |
| POD-10 | 1200-1500 | 45-50 | 195 | 45 |
| POD-15 | 1600-1700 | 50-55 | 245 | 55 |
| POD-19 | 1700 | 70 | 250 | 55 |
| POD-30 | 1700-1800 | 70-75 | 255 | 60 |

**Table 5:** Comparative table of patient's weight, HGD and Muac Progression

| Indicator | Pre-op | POD-5 | POD-12 | POD-20 |
|---|---|---|---|---|
| Height (cms) | 167 | 167 | 167 | 167 |
| Weight (kgs) | 67 | 71 | 72.5 | 66 |
| Body mass Index (kg/m2) | 24 | 25 | 26 | 23.7 |
| HGD (RH-kg) | 36.7 (Normal) | 32.4 (Normal) | 34.9 (Normal) | 36.2 (Normal) |
| HGD (LH-kg) | 40.3 (Normal) | 39.8 (Normal) | 39 (Normal) | 38.2 (Normal) |
| MUAC(cm) | 31.5 | 30.5 | 32 | 31.7 |

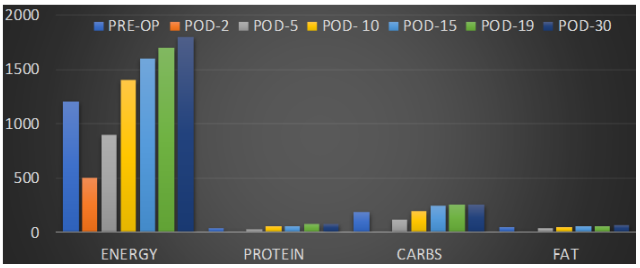


**Fig. 1:** Graphical representation of progression in patient's nutritional intake:

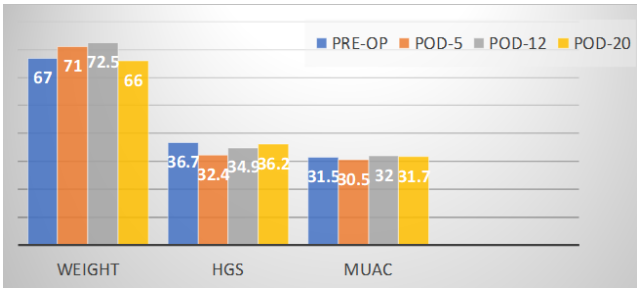


**Fig. 2:** Graphical representation of progression in patient's handgrip strength & muac:

## 8. Conclusion

The clinical intervention performed in hospital setup on a liver transplant subject was successful in elevating the nutritional status of the subject undergoing transplant. Nutritional therapy has always been considered as an essential adjunct to clinical therapies in every phase of LT inorder to prevent PEM and improve nutritional status in the candidate both in pre and post operative phase.

A patient with terminal liver disease suffer from nutritional and metabolic disorders impacting morbidity, mortality and quality of life, all of which can be improved by adopting an interdisciplinary approach including proactive surgical outcome, nutritional counseling, intervention and

follow up. In acute post transplant phase, a personalized nutrition therapy was designed inorder to meet patient's higher metabolic needs and to prevent macro and micro nutrient deficiencies. However, long term management is aimed at preventing metabolic complications following a LT. A consistent and regular follow up with routine LFT's will definitely help in tracking health status while provision of sustainable diet therapy by a clinical nutritionist can further be an essential value addition to patient's nutritional status.

## 9. Source of Funding

None.

## 10. Conflict of Interest

None.

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