

## **Nursing care of patients undergoing live donor liver transplantation: A review**

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### **Abstract**

Liver transplantation is undoubtedly one of the most successful innovations in the medical field over the last 50 years. Transplantation, as a specialty requires full time professionals working with multi-disciplinary team with great emphasis on the importance of team work. Preparation of the patient is essential in the peri operative period, and the role of the nursing team is determinant for treatment success. Nurses are responsible for the planning and implementation of care delivered to patients and families during the liver transplantation process. Apart from giving direct care, Nurses perform learning activities for patients and their relatives concerning long-term measures to ensure and thereby promote health.

**Keywords:** live donor liver transplantation, nursing care, liver transplantation

### **Introduction**

Liver transplantation has evolved into an accepted treatment for many suffering from end-stage liver failure. The complex nature of the liver results in every organ system being impacted by either the failing or the transplanted liver. The clinical care and condition of the patient before transplant can impact the outcome after transplant [1]. Preparation of the patient is essential in the perioperative period, and the role of the nursing team is determinant for treatment success. Nurses can play an integral role in early identification of graft dysfunction, rejection, or infection. Nurses are responsible for the planning and implementation of care delivered to patients and families during the liver transplantation process [2].

### **Care during pre-operative phase**

Patients with end-stage liver disease undergo extensive workups before getting listed for liver transplant procedure. The preoperative condition, nature and severity of the liver disease, and comorbid conditions are assessed during the evaluation process. Patients are presented and discussed in a multidisciplinary committee to be approved for final listing [3].

In the Pre-Operative period, Nurses must do following activities:

- Take a complete nursing history and physical examination. A complete preoperative nursing assessment provides baseline data for comparison after surgery.
- Provide routine preoperative care as ordered.
- Provide preoperative instruction which helps in relieving the anxiety of client and family members. Discuss preoperative and postoperative prospects with the client and family. Familiarize them to the intensive care unit, as clients return from surgery to an intensive

care or specialized care unit. Discuss anticipated drainage tubes and supportive measures in the immediate postoperative period. Provide information regarding visiting policies and family accommodations at nearby location. Also explain about the restrictions on the number of visitors and the time with reasons behind [4].

- Pre-transplant infections disease screening (dental, ophthalmic and otorhinolaryngological and urogenital) of both donors and recipients is done to avoid post-operative complications. A psychosocial assessment of the transplant recipient will help in identifying the negative factors affecting the outcome and to develop interventions to prevent it.
- Apart from this, cardiac, pulmonary and renal evaluation must be done for the patients waiting for liver transplantation.

### **Cardiac evaluation**

- A trans thoracic echocardiography (TTE) is performed on all patients undergoing evaluation for liver transplantation. It assesses the structural and functional status of the heart.
- Exercise stress tests are difficult to perform in patients with chronic liver disease due to the patient's limited functional capacity. Dobutamine stress myocardial perfusion imaging and dobutamine stress echocardiography can be done for detecting myocardial ischemia in liver disease patients [5].

### **Pulmonary evaluation**

- Hepatopulmonary syndrome (HPS) exists in about 8–24% of patients with liver disease. This is characterized by a decreased systemic arterial oxygenation (PaO<sub>2</sub> less than 80 mmHg or an alveolar arterial gradient of more

than 15 mmHg on room air), pulmonary vascular dilation [contrast-enhanced echocardiography or abnormal uptake in the brain (more than 6%) with radioactive lung perfusion scanning] and liver disease.

- Portopulmonary hypertension: Among patients awaiting liver transplantation, the incidence of POPH is 2–10%. Portopulmonary hypertension (POPH) is characterized by increased mean pulmonary artery pressure (mPAP) greater than 25 mmHg at rest or greater than 30 mmHg with exercise, elevated pulmonary vascular resistance greater than 240 dyne/s/ cm<sup>-5</sup> and normal or decreased pulmonary artery wedge pressure less than 15 mmHg.

**Renal evaluation**

- Renal function is a significant predictor of survival with chronic liver failure and liver transplantation.
- Hepatorenal syndrome (incidence 18–40%) is characterized by liver disease, serum creatinine concentration more than 1.5 mg/dL (133 mmol/L) that is not reduced with the administration of albumin after discontinuation of diuretics for 2 days, absence of nephrotoxic drugs, shock and absence of findings suggestive of renal parenchymal disease (urinary protein greater than 500 mg/day, more than 50 red cells/high-power field or abnormal kidneys on ultrasonography).

The investigations considered in the transplant period consists of following.

Blood investigations	Complete blood count, blood sugar, LFT, RFT, prothrombin time, activated partial thromboplastin time, fibrinogen and factor levels, ABG, blood grouping and cross match, viral markers, antinuclear antibodies, liver biopsy, iron studies
Radiology	X- ray chest Abdominal USG with Doppler Computed tomography Magnetic resonance imaging of the abdomen
Electrocardiography	12 lead ECG
Endoscopy	Upper and lower GI
Pre-transplant infectious disease screening	Blood and urine culture
Other	Pulmonary Function test

**Donor**

The approval of a potential donor requires the following:

- ABO compatibility
- Normal or only slight alterations in the liver function tests
- Hemodynamic stability

**Intraoperative monitoring and management**

**Hemodynamic monitoring**

Hemodynamic monitoring is important for an effective liver transplantation. In addition to the standard cardiovascular monitors (electrocardiogram, pulse oximetry, invasive and non-invasive blood pressure), cardiac output is also required for monitoring. There are numerous invasive and non-invasive cardiac output monitors available to monitor the

hemodynamic change associated with liver transplantation. Flo-trac is the most commonly used device used for monitoring Cardiac output.

Pulmonary artery catheter (PAC) is the gold standard used in hemodynamic monitoring during liver transplant.

**Fluid management**

Liver transplant is associated with massive fluid shifts both from the outlook of intravascular volume depletion and large surgical blood loss. Albumin can be used in liver transplants as the patients are often hypoalbuminaemic and hypovolaemic.

**Monitoring of Coagulation Profile**

Prothrombin time (PT) and activated partial thromboplastin time (aPTT) have been found to have a limited role in liver transplant patients as they measure only the procoagulant pathway without considerations for platelets function or fibrinolysis. Thromboelastogram (TEG) measures the viscoelastic properties of blood during all stages of thrombus formation, tests stability, firmness of the clot and fibrinolysis. Hence, they provide a detailed assessment of both pro- and anti-coagulant status of the blood.

**Neurological monitoring**

Patients undergoing transplantation are at risk of a wide range of neurological complications, including cerebral oedema, encephalopathy, seizures and hypoxia. Patients with elevated ICP should be placed with head elevated by 30°. Osmotic diuresis with IV mannitol is effective in reducing cerebral oedema, but runs the risk of fluid overload and pulmonary oedema in patients with hepatorenal syndrome.

**Care during post operative phase**

The Postoperative care actually initiates prior to the surgery in terms of education, discharge planning, nutrition, pulmonary rehabilitation i.e. deep breathing exercises and patient/family education. A multidisciplinary approach plays a vital role and combined team effort is necessary to ensure that all the team members are working at a same pace.

**General principles**

- Arterial blood pressure (ABP), electrocardiogram (ECG), peripheral oxygen saturation (SpO<sub>2</sub>), central venous pressure (CVP) and/or pulmonary artery pressure/capillary wedge pressure (PAP/PCPW) depending on the intra operative choice and body temperature are continuously monitored and urinary output is checked hourly.
- Patients are usually hypothermic so heat loss should be prevented and patients should be actively warmed immediately. After checking for vital functions and monitoring, all drains as well as catheters (nasogastric, bladder, intra-abdominal, biliary etc.) should be emptied and recorded.
- 12-lead ECG and chest X-ray are performed in all patients and are repeated as required.
- Laboratory workup include arterial blood gases (ABG), complete blood count (Hb, leukocyte and thrombocyte count), coagulation panel (prothrombin time, INR,

aPTT, fibrinogen), electrolytes (Na, K, Ca, Cl, Mg, P), metabolic panel (blood glucose, urea, creatinine, AST, ALT, bilirubin, ALP, GGT, LDH, albumin, ammonia, lactate), these are repeated every 6-12 hours depending on patient's condition. Samples for cultures of blood, urine, tracheal secretions and drain fluid are obtained as required.

- Following initiation of immunosuppressive treatment, therapeutic drug monitoring is performed and adjustments are made as necessary.
- Head of the bed is raised 30°- 45° in normotensive patients.
- Prophylactic antibiotic therapy (usually 3rd generation cephalosporins and oral nystatin) and immunosuppressive therapy are initiated in the early postoperative period according to institutional protocol, observing renal functions.
- Anticoagulation therapy is started particularly in patients at risk who have previously known hypercoagulopathies (Budd-Chiari, Protein C and S deficiency) and pediatric cases with low dose unfractionated heparin (100-200 U/kg/d, IV infusion in 24 hours), while in others anticoagulation is prophylactically administered in all patients.
- Blood flow in hepatic artery and portal vein is examined daily with Doppler ultrasonography (USG) especially during the first three days, and should be repeated as required.
- Following the acute phase after liver transplant, the most important problems encountered in ICU are infectious complications, renal failure, prolonged mechanical ventilation due to pulmonary problems and graft dysfunction.
- Immunosuppressive agents, based on protocols and on the patient's renal function, are started early after Liver transplant. Doses are adjusted according to blood levels and functional status of the transplanted liver and renal function.

Usually, in an uneventful recovery, the patient is discharged within 10 to 14 days after liver transplant and followed as an outpatient.

### Nursing care

- Provide routine postoperative care.
- Maintain airway and ventilatory support until awake and alert.
- Monitor temperature and implement rewarming measures (such as warming blankets, heating lamps, and head covers) as indicated. The client often is hypothermic after liver transplant, necessitating careful rewarming while maintaining hemodynamic stability.
- Frequently monitor hemodynamic pressures, including arterial blood pressure, central venous pressure, and pulmonary artery pressures. Postoperative fluid volume status may be difficult to determine without careful pressure measurements. The rate and type of fluids administered are determined by hemodynamic status.
- Monitor urine output hourly; maintain careful intake and output records. Weigh daily. Urine output and weight provide additional information about fluid volume status. In addition, renal function may be

altered after liver transplant; acute renal failure is a significant risk.

- Monitor for signs of active bleeding, including excess drainage, increasing abdominal girth, bloody nasogastric drainage, black tarry stools, tachypnea, tachycardia, diminished peripheral pulses, or pallor. Report immediately. Altered coagulation in the early postoperative period increases the risk for bleeding. Blood products to replace volume and clotting factors may be necessary.
- Monitor serum electrolytes and laboratory values related to blood coagulation, liver function, and renal function. Report abnormal results or significant changes immediately.
- Monitor neurologic status. With good function of the transplanted organ, mental status should clear within days of the transplant.

### Complications

- Common postoperative complications include graft dysfunction, vascular thrombosis, biliary tract complications, infection, rejection, neurologic injury, electrolyte imbalances, and drug interactions [6].

### Discharge teaching

During the shift to an outpatient setting, the patient meets with the liver transplant coordinator and goes through extensive teaching regarding his or her medications and immunosuppressive agents and their potential side effects.

The patient receives after-discharge instructions or guidelines, including

- When and how to notify the transplant team if he or she feels that there is something wrong, such as abnormal pain, fever, diarrhoea and headache.
- Advices are given regarding the schedule for blood test and follow-up clinic visits.
- The recipient is also educated about the physical activities, infection control (more prone due to immunosuppression), diet and general health maintenance, such as vaccinations, avoidance of sun/UV rays and screening for cancer.

### Care of donor

- Donor needs to be carefully monitored for vital signs, incision site and pain.
- Administer the medications to the donor as per the prescription.
- Once pain is well controlled, donor is eating and drinking well, is up and walking around without too much difficulty, he/she might be discharged from the hospital.
- After discharge, advise the donor not to lift anything heavier than 20 pounds for at least six weeks.
- Instruct not to drive while on sedating medications, which are used at least two to three weeks after discharge.
- Encourage to walk several times a day.
- Depending on the type of work he/she does, donor may be able to return to work six to eight weeks after surgery.
- Explain his/her that your liver will begin to regenerate immediately after surgery and will be back to normal

size in six to eight weeks.

- Monitor the recovery of donor closely after discharge and advise for follow up visits and laboratory tests as planned [7].

### Conclusion

A multidisciplinary approach to care the patient is necessary for successful long-term outcomes after liver transplantation. Care of the patient before, during and after liver transplantation is intense, complex and rewarding. Nurses play a significant role in managing the patient undergoing liver transplantation. They are responsible for the planning and implementation of care delivered to patients and families during the liver transplantation process along with counselling of patients, donors and their families.

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