

# Assessing patients before and after a liver transplant

*Michelle Clayton discusses the assessment and preparation of patients for liver transplant, and how to offer care in the years after the operation*

Survival rates in the UK for liver transplantation are 91% for 1 year, 77% for 5 years and 59% at 10 years, with some patients living for 15–20 years after transplant (NHS Blood and Transplant (NHSBT), 2011a). Despite liver transplantation being the preferred treatment option for a number of end-stage liver diseases, such as primary biliary cirrhosis, primary sclerosing cholangitis, alcohol-related liver disease and hepatitis C, there is a shortage of donor organs available.

## Liver transplant background

Livers come from three main donor sources: individuals who are donors from brain stem death (DBD), donors after cardiac death (DCD), and live donors. However, the family refusal rate to donate organs of a relative in an intensive care unit (ICU) is 37%, thus limiting the amount of organs available for transplant (Murphy and Counter, 2009).

As a result of this, the Organ Donation Taskforce set an ambitious target to increase organ donation by 50% within 5 years (Department of Health, 2008). To facilitate this, there are now senior nurses in organ donation embedded in most ICUs, and all patients who are dying in intensive care facilities are referred to these nurses who approach the family about organ donation.

From April 2010 to March 2011, 567 DBD livers and 146 DCD livers were donated. There were 1039 patients registered as requiring a liver transplant, and 645 adult and paediatric liver transplants took place.

Of these 645 transplants, 94 livers were for patients registered as super urgent (NHSBT, 2011b). This group included those with acute liver failure, where their native liver could not regenerate, and those with primary nonfunction of a liver recently transplanted.

Patients with acute liver failure are critically ill and many will die without a liver transplant. For individuals with chronic liver disease, 8% will die waiting for a liver to become available, and 9% are removed either because they become too ill to receive a transplant or on some occasions their condition improves (NHSBT, 2011c). This can occur in patients

with alcohol-related liver disease where, with abstinence, some patients will improve so that transplantation is no longer indicated due to the regenerative properties of the liver (Liver Advisory Group, 2005).

## Assessment for liver transplantation

Patients with chronic liver disease have a gradual deterioration of liver function and develop a number of symptoms that affect their health and wellbeing. Assessment of suitability for liver transplantation involves rigorous assessment of the functionality of the heart, lungs, liver and kidneys, as liver transplantation is a complex procedure with a potentially long anaesthesia time.

In depth discussions of social circumstances and psychological wellbeing are just as important to identify and understand factors that might impinge on recovery or adherence to medication or lifestyle changes. For those with alcohol-related liver disease, a period of abstinence of at least 6 months is recommended and, if found suitable for transplant, an alcohol contract must be signed with the agreement never to drink again before or after liver transplant.

These patients are also required to agree to random alcohol testing in primary care, and if found to have a positive result, or fail to attend for testing, they may be permanently removed from the list (Liver Advisory Group, 2005).

In addition, for patients who have the hepatitis C virus through intravenous drug use, measures are taken to ensure there is no further use. Patients will not be assessed for transplant if they are currently using illicit drugs; however, an assessment can be made for patients who are stable on methadone or buprenorphine.

It is advisable that patients taking buprenorphine are converted to methadone before transplant to assist with pain management after transplant (Liver Advisory Group, 2007).

## Multidisciplinary approach

Once all investigations are completed, patients are presented at a multidisciplinary

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meeting where hepatologists, transplant surgeons, anaesthetists, specialist nurses, dietitians, social workers and substance misuse practitioners can discuss the suitability of the individual for transplant.

Selection criteria for elective adult transplant waiting lists include the recipient having an expected 1-year mortality of >9% without a liver transplant, and a projected 5-year survival of >50% (Neuberger et al, 2008). If liver transplantation is recommended, then patients and their family and/or friends are invited back to the liver transplant centre for a full discussion of the costs and benefits of liver transplantation. This is also an opportunity for informed consent to take place.

### **Keeping 'well' while waiting**

Once placed on the waiting list, patients need to keep as healthy as possible. Yearly influenza vaccination (including H1N1 or 'swine flu') is important for those with chronic liver disease. It is also recommended that patients with chronic liver disease have a pneumococcal vaccination if they have not already had it (Department of Health, 2007).

Nutritional status is imperative in those waiting for liver transplant, as many patients with chronic liver disease are malnourished due to poor dietary intake, malabsorption and maldigestion of nutrients and metabolic abnormalities relating to glucose, protein and fat. These patients also taste disturbances, mainly presenting as metallic taste.

Patients with end-stage liver disease benefit from six small meals per day, including a 50 g carbohydrate late evening snack to counteract protein energy malnutrition (Hamlin and Leaper, 2009).

### **Waiting times**

Average waiting times for a liver transplant vary for a number of reasons, including what blood group the patient is and their Model for End Stage Liver Disease (MELD) score (*Table 1*). Once a suitable donor has been accepted by the consultant transplant surgeon, the liver is allocated to a patient by blood group. The average waiting time is longer for blood group A and O recipients (*Table 2*).

The size of the donor is important to ensure that the liver is large enough to function in the recipient, or not too large that closure of the abdomen or respiratory function is compromised. MELD scores are an objective measurement of certain blood

results which are calculated and converted into a score. The higher the MELD score, the greater the disease severity, and the higher the estimated mortality (Kamath et al, 2001; Wiesner et al, 2003). Results of serum bilirubin, serum creatinine and international normalised ratio (INR) are put into an online MELD calculator, and the score obtained estimates 3-month mortality.

### The role of the practice nurse

Practice nurses are a valuable resource for patients and specialist practitioners in the transplant centre, as they tend to see patients on a more regular basis and may pick up earlier patient deterioration.

Undertaking blood profiles of liver function tests, urea and electrolytes, full blood count and a clotting screen, including an INR, can help specialist practitioners to review liver function and recalculate MELD scores. Further research into predictive models has led to the creation of the UK Model for End Stage Liver Disease (UKELD) score, which also includes serum sodium measurements. At present, UKELD scores are being used to assess suitability for entry onto the UK liver transplant waiting list as a score of 49 predicts 1-year mortality greater than 9% (Neuberger et al 2008).

### Preventing further deterioration

As well as undertaking blood tests for MELD scoring or random alcohol tests, practice nurses will be involved in preventing or identifying further deterioration of the individual while waiting for a liver transplant. Two main symptoms of end-stage chronic liver disease are ascites (*Figure 1*) and hepatic encephalopathy. Both of these can be extremely debilitating for patients, however supportive measures can ameliorate symptoms to a degree.

The development of ascites is an important event in chronic liver disease, as half of cirrhotic patients with ascites die within 2 years (Krige and Beckingham, 2001). Ascites can be controlled by no added salt diets, diuretics and, if required, larger volume paracentesis. Review of the patient's diet for foods high in sodium, such as convenience foods, crisps and cured meats can be invaluable to alter the sodium ingested/excreted balance.

The diuretic of choice for ascites is spironolactone, an aldosterone antagonist. Spironolactone enables the renin angiotensin

aldosterone system to activate, leading to retention of serum sodium and water. Spironolactone of 100–400mg daily helps to increase natriuresis and conserve potassium (Moore and Aithal, 2006).

However, it is not without side effects, which include painful gynaecomastia in men

**Table 1. Model for End Stage Liver Disease (MELD) scores: estimated 3-month mortality**

Score	Mortality
>40	71.3%
30–39	52.6%
20–29	19.6%
10–19	6%
<9	1.9%

From: Wiesner et al, 2003

**Table 2. Median waiting time to liver transplant in the UK from 1 April 2007 to 31 March 2010**

Blood group	No. of transplants	Waiting time (median days; 95% confidence interval)
O	806	162; 143–181
B	708	102; 88–116
A	245	207; 161–253
AB	84	90; 57–123

From: NHS Blood and Transplant, 2011 d

(Joint Formulary Committee, 2011). Large volume paracentesis may be required if dietary and diuretic therapy are unable to control ascites. Many patients require paracentesis as a comfort measure due to tense ascites causing abdominal pain, and to help to relieve breathing problems, as ascites can splint the diaphragm affecting the ability



**Figure 1. Patient with tense ascites with an umbilical hernia (From: Sargent, 2009)**

**KEY POINTS**

- Liver transplantation is an increasingly used treatment modality for chronic liver disease
- Keeping patients “well” whilst they wait for a liver transplant is essential
- The role of the practice nurse is integral to managing the patient in a primary care setting
- Post liver transplant patients can live many years and encounter increasing problems due to immunosuppressive medication

to breathe deeply or lay down.

Hepatic encephalopathy (HE) is the result of impaired detoxification of substances by the liver as its function deteriorates. A number of factors can precipitate HE, including constipation, infection, disturbances in fluid and electrolyte balance and gastrointestinal bleeding (Houlston and O’Neal, 2009).

HE can also cause patients to be mildly confused or even become comatose. Resolution of the cause usually rectifies the HE, such as treating infection or ensuring regular blood tests to check urea and electrolytes in patients prescribed diuretics. In patients with constipation, it is advisable that lactulose is taken on a daily basis to prevent this. Therapeutic doses of lactulose for HE are up to 120–150ml daily in divided doses, which are titrated to obtain 2–3 soft stools per day (Joint Formulary Committee, 2011).

**After liver transplant**

For liver transplantation to be successful, patients must adhere to a strict regimen of immunosuppressive drugs every day for the rest of their lives. These drugs are taken to help prevent rejection of the liver by the body. However, many of them have side effects such as hypertension, nephrotoxicity and gastrointestinal disturbances.

As post-transplant patients are generally living longer, the need to treat some of these side effects is becoming apparent, and the role of the practice nurse is central to monitoring patients’ long-term health and wellbeing. Watt et al’s (2010) study of risk factors for death after transplant revealed that, apart from recurrence of hepatic disease such as primary biliary cirrhosis and hepatitis C virus, malignancy and cardiovascular disease are important factors in post-liver transplant deaths (>5 years after transplant).

Surveillance for malignancy is essential, and post-transplant patients need to be educated to be ‘sun smart’ with protection from the sun at all times of the year. Patients are also advised to regularly check for changes to their skin that might indicate the development of basal cell carcinoma, squamous cell carcinoma or melanoma. Half of all transplant patients will have a skin cancer within 20 years of transplant (British Association of Dermatologists, 2010).

Patients should be taught self-examination for regular breast and testicular checking, and cervical smears should be undertaken on a yearly basis in women.

**Metabolic syndrome**

There is evidence to suggest that metabolic syndrome in post-liver transplant patients is common (Watt and Charlton, 2010). Components of metabolic syndrome such as dyslipidaemia are magnified by the administration of ciclosporin and tacrolimus, which increase the patient’s lipid and cholesterol profile (Humar and Matas, 2001).

A controlled diet is advocated as first-line treatment, with statins as an adjunct therapy (Watt and Charlton, 2010). Hypertension may occur because of the immunosuppressive drugs given post-transplant, as both tacrolimus and ciclosporin are calcineurin inhibitors and are known to cause renal vasoconstriction and nephrotoxicity due to their action on the renal microvascular beds (Rossetto et al, 2010).

Renal insufficiency is an important risk factor for late death in this patient group, with 68% experiencing renal insufficiency or failure (Watt et al, 2010).

In addition, cirrhotic patients can have glucose intolerance, which can lead to the development of diabetes after transplant. Tacrolimus is known to increase the incidence of diabetes owing to beta cell damage in the pancreas, which results in diminished insulin synthesis or release (Marchetti, 2005).

Despite many pre-transplant patients being malnourished, both appetite and taste initially return post-transplant due to corticosteroids prescribed in the post-transplant phase, and then through improving health. Obesity is becoming more common in the post-transplant population and requires the same principles of healthy eating, reduction in portion sizes and calories, and increase in physical activity to promote weight loss.

All the above issues related to metabolic syndrome require lifestyle modifications as a first line of treatment, and the use of medication if control cannot be achieved through these adaptations. The practice nurse is in a good position to support and monitor the effectiveness of interventions for patients who need to make changes to their lifestyle.

**Conclusions**

As the effectiveness of liver transplantation as a treatment modality has increased, there are more patients with chronic liver disease being assessed to gauge their suitability for the procedure and being listed for liver transplantation.

Organ donation rates preclude many patients receiving a liver transplant within a

short waiting time, but many patients are waiting up to a year or more for a liver to become available.

The role of the practice nurse is integral to keeping patients who are waiting for a liver transplant as well as possible in this interim period. Once patients have had a transplant, the effects of immunosuppressive drugs lead to a number of potential complications. Surveillance and support is needed from the practice nurse to encourage and maintain a healthy lifestyle or offer help for patients who need to modify their lifestyle to prevent complications.

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## References

- British Association of Dermatologists (2010) Information about skin cancer for patients with an organ transplant. <http://tiny.cc/4v0s0> (accessed 12 April 2011)
- Department of Health (2007) Immunisation Against Infectious Disease: 'The Green Book'. <http://tiny.cc/79n9z> (accessed 12 April 2011)
- Department of Health (2008) *Organs for Transplant: A Report from the Organ Donation Taskforce*. The Stationery Office, London
- Hamlin S, Leaper J (2009) Nutrition in Liver Disease. In: Sargent S, ed *Liver Diseases: An Essential Guide for Nurses and Health Care Professionals*. Wiley-Blackwell, London
- Houlston C, O'Neal H (2009) Hepatic encephalopathy. In: Sargent S, ed *Liver Diseases: An Essential Guide for Nurses and Health Care Professionals* Wiley-Blackwell, London
- Humar A, Matas A (2001) Immunosuppression: Use in Transplantation. *Encyclopedia of Life Sciences*, John Wiley and Sons Ltd
- Joint Formulary Committee (2011) *British National Formulary 61*. March. Pharmaceutical Press
- Kamath P, Wiesner R, Malinchoc M et al (2001) A model to predict survival in patients with end-stage liver disease. *Hepatology* 33: 464–70
- Krige J, Beckingham I (2001) ABC of diseases of liver, pancreas, and biliary system. Portal hypertension–2. Ascites, encephalopathy, and other conditions. *BMJ* 322(7283): 416–41
- Liver Advisory Group (2005) *UK Liver Transplant Group Recommendations for Liver Transplant Assessment in the Context of Alcohol-related Liver Disease*. <http://tiny.cc/bfjz3> (accessed 6 April 2011)
- Liver Advisory Group (2007) *UK Liver Transplant Group Recommendations for Liver Transplant Assessment in the Context of Illicit Drug Use*. <http://tiny.cc/x5mhj> (accessed 6 April 2011)
- Marchetti P (2005) New-onset diabetes after liver transplantation: from pathogenesis to management. *Liver Transpl* 11(6): 612–20
- Moore K, Aithal G (2006) Guidelines on the management of ascites in cirrhosis. *Gut* 55(Suppl 6): vi1–12
- Murphy C, Counter C (2009) Potential Donor Audit. Summary Report for the 24-month period 1 April 2007–31 March 2009. <http://tiny.cc/v13qj> (accessed 12 April 2011)
- Neuberger J, Gimson A, Davies M et al (2008) Selection of patients for liver transplantation and allocation of donated livers in the UK. *Gut* 57(2): 252–7
- NHS Blood and Transplant (2011a) Activity report 2009–10 Section 9 Survival rates following transplantation. [http://www.organdonation.nhs.uk/ukt/statistics/transplant\\_activity\\_report/transplant\\_activity\\_report.jsp](http://www.organdonation.nhs.uk/ukt/statistics/transplant_activity_report/transplant_activity_report.jsp) (accessed 11th April 2011)
- NHS Blood and Transplant (2011b) Liver Activity 2010–2011. (in press)
- NHS Blood and Transplant (2011c) Liver transplant list and new registration in the UK. 1 April 2010– 31 March 2011. (in press)
- NHS Blood and Transplant (2011d) Median waiting time to liver transplant in the UK 1 April 2007–31 March 2010. (in press)
- Rossetto A, Bitetto D, Bresadola V et al (2010) Cardiovascular risk factors and immunosuppressive regimen after liver transplantation. *Transplantation Proc* 42(7): 2576–8
- Sargent S (2009) *Liver Diseases: An Essential Guide for Nurses and Healthcare Professionals*. Wiley-Blackwell, Oxford
- Watt KDS, Charlton MR (2010) Metabolic syndrome and liver transplantation: A review and guide to management. *J Hepatol* 53(1): 199–206
- Watt KDS, Pedersen RA, Kremers WK, Heimbach JK, Charlton MR (2010) Evolution of causes and risk factors for mortality post-liver transplant: Results of the NIDDK long-term follow-up study. *American Journal of Transplantation* 10(6): 1420–7