To Our Readers

The current issue of the Update Series (24) of the Centre for Research on Nutrition Support Systems (CRNSS) is the last issue for the year 2004.

The first article in the current issue is an update on small intestinal transplantation in the form of a review article which also discusses the factors influencing the approach to nutritional management.

This is followed by a brief case report regarding small intestinal transplantation in a female patient with short-gut syndrome, which was performed in a hospital in India, describing how nutritional management was a challenge.

The second article is a review on "Enteral Nutrition in the Critically-ill Patient", which discusses the principles governing enteral nutrition support in this clinical setting and drawing the reader's attention to the practical issues to be kept in mind during the nutritional management of such a patient.

The topics being presented in the Parallel Session on Nutrition in Liver Diseases at the 14th Biennial Conference of the Asian Pacific Association for the Study of the Liver (APASL) being held on December 13, 2004 at New Delhi, are also listed in this issue.

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Small Intestinal Transplantation: An Update

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Organ transplantation is indeed a revolution in management of end-stage organ failure. The one year graft survival rates for solid organs now routinely exceed 85 per cent for the kidney, liver and heart. The enhanced success rate is due to better immunosuppression, improvement in surgical techniques, organ preservation and better understanding of the immunology of rejection. The small intestine has been more difficult to transplant than other organs due to its strong expression of HLA antigens, large amount of lymphoid tissue and presence of micro-organisms. Early attempts to transplant the small bowel failed due to severe rejection and sepsis. The early 1990s witnessed improvements in graft survival, however, survival rates were still inferior to other organ transplants. In recent years, individual centres have reported improved outcomes with better long-term graft survival.

Short-gut syndrome due to anatomical or functional reasons is difficult to manage. Most patients with less than 100 cm of functioning intestine require some form of artificial nutrition support. The majority of these patients require Total Parenteral Nutrition (TPN) to maintain adequate health and function. Long-term TPN is expensive and leads to metabolic problems with liver dysfunction, catheterrelated sepsis and thrombosis of venous access. Small intestinal transplantation has become the definitive treatment for these patients who cannot afford or develop complications when receiving TPN.

The causes of intestinal failure leading to transplantation are different in adult and paediatric patients with the short-gut syndrome being the commonest indication. In children, gastroschisis, volvulus and
necrotising enterocolitis are the indications in approximately half the cases (Figure 1). Ischemia, Crohn’s disease and trauma are the major indications for intestinal transplant action in adults (Figure 2). Data from the Intestinal Transplant Registry show 989 intestinal transplants in 923 patients in the last 18 years performed in 61 centres around the world. A significant proportion of intestinal transplants (61 per cent) have been performed in patients less than 18 years of age.

Most paediatric patients require liver and multi-visceral grafts in addition to small intestine for anatomic and functional reasons (Figure 3). Most adults require isolated intestinal transplantation except those with liver failure secondary to longterm TPN. Isolated intestinal grafts have better graft and patient survival compared to multi-visceral or liver/ small intestine grafts. Living donor small intestinal transplantation has been increasingly performed in recent years and is associated with an excellent outcome, largely owing to the fact that the surgery can be performed electively after meticulous planning.

Immunosuppressive protocols for intestinal transplantation have undergone major improvements in recent years with the availability of drugs acting at various stages of the immune cascade. Most patients are now managed with monoclonal (IL 2 blockers) or polyclonal antibodies (ATG) for induction therapy followed by tacrolimus-based immunosuppression. One year patient and graft survival of nearly 80 per cent is being achieved by modern immunosuppressive protocols. Most intestinal recipients (>90 per cent) are able to discontinue parenteral nutrition, initiate oral feeding and resume normal daily activity.
Patient survival has steadily improved over time (Figure 4). Intestinal Transplant Registry data reveal that 439 of the 923 recipients died (47.6 per cent). Causes of death included: sepsis (n=202; 46.0 per cent); multi-organ system failure (n=11; 2.5 per cent); graft thrombosis (n=14; 3.2 per cent); graft rejection (n=49; 11.2 per cent); post-transplant lymphomas (n=27; 6.2 per cent); respiratory causes (n=29, 6.6 per cent); technical reasons (n=27, 6.2 per cent) and other causes (n=76; 17.3 per cent). There were 484 patients alive after intestinal transplantation of which 328 (81 per cent) were off TPN; 16 (3.9 per cent) required IV fluids only, 26 (6.4 per cent) required partial TPN with their graft in-place, 32 (7.9 per cent) were on TPN after graft enterectomy (Figure 5A). The longest survivor had been fed orally for 14.2 years after receiving an intestinal transplant for a volvulus.
Early referral and assessment are very important for a successful outcome following intestinal transplantation. Patients who are stable and not critically-ill before intestinal transplant have significantly higher survival rates, irrespective of the type of transplant that is performed. The trend to transplant proportionately more patients who are waiting at home in recent years appears to be a major factor contributing to the recently improved graft and patient survival rates.

Small intestinal transplantation has become the definitive treatment for patients with chronic intestinal failure who cannot be maintained on parenteral nutrition and as a result, a greater number of patients are able to resume their normal daily activity.

A well-functioning intestinal transplant provides an excellent quality of life and is feasible in comparison to the cost of long-term parenteral nutrition.

**RECOMMENDED READING**


Nutritional Intervention in a Patient with Short-gut Syndrome Undergoing Small Intestinal Transplantation: A Case Report

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A 31-year-old lady, with severe malnutrition weighing 23 kg presented to us at the Chennai Transplant Centre, Madras Medical Mission, Chennai, India in August 2003 with vomiting and loose stools, intermittently, for a total duration of 15 months (since May 2002). Two years earlier, she had undergone laparotomy for a suspected ovarian tumour but was found to have a low grade stromal tumour of the small intestine which was resected. Unfortunately, she had developed multiple complications which resulted in repeated laparotomies and resection of bowel over a period of six weeks in May 2002. Over the next 15 months, she received partial parenteral nutrition, but there was no improvement in her clinical condition and she presented to us at admission with features of short-gut syndrome.

An oral gastrograffin study showed about six inches of jejunum from the duodenojejunal flexure anastomosed to the distal transverse colon. She was able to take oral liquids and a soft diet but continued to have an increased frequency of stools resulting in malabsorption. She underwent a port-a-cath placement and parenteral nutrition was again initiated, this time with trace elements and minerals added separately to the infusate. Her weight increased steadily during the six week duration of hospital stay to 27 kg, at which point she was discharged to continue home parenteral nutrition.

Discussions were held with the family regarding small intestine transplant and she was placed on the waiting list. Unfortunately, infection of the port occurred during the period of receiving home parenteral nutrition and she had to be readmitted five months later when her weight had dropped to 23 kg. The port infection was treated with antibiotics administered through the port and she continued to receive parenteral nutrition without any complications. As she was being stabilised, we received an offer from a brain dead donor of the same blood type. The entire small intestine was harvested from a 27-year-old male road traffic victim who had developed brain death. The entire small intestine was transplanted on March 9, 2004 in the patient with an end ileostomy in place. The superior mesenteric artery was anastomosed to the infra renal aorta, end-to-side and the donor portal vein was anastomosed end-to-side to the recipient portal vein with an extension by the donor iliac vein. The proximal end of the intestine was anastomosed to the recipient’s jejunum, end-to-end.

On reperfusion, the bowel functioned well immediately. The cold ischemia time was six hours. Immunosuppression was commenced with Cyclosporine, Mycophenolate and Prednisolone. She was extubated after 36 hours and was started on sips of water. She developed pancytopenia on the first post-operative day (probably antibiotic-induced). The ileostomy output was about 1 litre/day for the first three days. She was continued on parenteral nutrition. On the fifth post-operative day, the ileostomy became dusky with blood-stained discharge resulting in a fall in blood pressure and hemoglobin. She was transfused packed red blood cells, but despite these efforts, the haemodynamic instability persisted and progressively worsened. An exploratory laparotomy performed on the sixth post-operative day, revealed a very ischemic small intestine, this was removed completely. Her hemodynamic status improved transiently, but she subsequently developed severe sepsis and multi-organ failure and died on the
seventh post-operative day. Histopathological examination showed features of neutropenic enterocolitis with severe ischemic areas.

The purpose of presenting this case is to draw the reader’s attention to the importance of nutritional status as a crucial factor influencing the post-operative outcome in patients with short-gut syndrome being assessed and taken up for small intestinal transplantation.