Regulations, technology, and multivisual content.
Multivisceral transplantation is the simultaneous transplantation of abdominal organs such as the stomach, pancreas, spleen, and intestine; it frequently also includes the liver, kidneys, and abdominal wall. Multivisceral transplantation is not common; in 2006, 51 adults underwent the procedure. It’s reserved for patients who experience organ failure involving the liver, pancreas, and intestine, or for patients with diffuse diseases of their intestines associated with liver disease.

Indications
Most candidates for multivisceral transplant suffer from intestinal failure, a potentially life-threatening malabsorptive condition. The need for transplant may also be associated with intestinal failure resulting in liver damage due to chronic use of total parenteral nutrition (TPN).

Intestinal failure is the “inability of the gastrointestinal (GI) system to maintain nutrition or adequate fluid and electrolyte balance without special support, due to the impairment of the primary enteric digestive, absorptive, neuroendocrine and/or motor function.” The most common cause of intestinal failure is short-bowel syndrome (SBS), and functional abnormalities secondary to a variety of diseases or conditions. Patients with SBS have insufficient small-bowel length to support their daily caloric needs. SBS in children is often caused by surgical resection due to volvulus, atresias, necrotizing enterocolitis, Crohn’s disease, gastrochisis, thrombosis of the superior mesenteric artery, desmoid tumors, or trauma. Other causes of intestinal failure include motility disorders (Hirschsprung’s disease, visceral neuropathy, and chronic pseudo-obstruction), malabsorptive disorders (microvillus inclusion), and intestinal secretory disorders.

The treatment of choice to maintain nutrition in these patients is TPN. Early dependence and chronic use of TPN usually causes liver failure, which often leads to death. Although early identification of TPN-induced liver failure is often reversible with discontinuation of TPN; advanced TPN-induced liver disease is irreversible. Cavicchi reported that progressive and irreversible liver disease develops in 2% to 42% of children and adults with intestinal failure due to SBS.

Progressive liver disease is more common in young children on TPN, and is often associated with a history of multiple resections and recurrent infection. GI failure is considered irreversible when currently available, and medical and surgical treatments fail to enhance intestinal adaptation and gut function. A multivisceral transplant is indicated when anatomic or other medical problems prevent a small bowel/liver transplant alone.

The transplant process
The decision to perform intestinal/multivisceral transplantation starts with referral to a transplant team that specializes in this type of procedure.

The patient undergoes a comprehensive multidisciplinary evaluation for transplantation. The primary goal of patient evaluation for intestinal transplantation is to establish the primary diagnosis and determine the degree of the affected organ’s dysfunction. During this assessment, any comorbid conditions that may impact outcome and recovery as well as possible complications are identified. It’s also during this time that patients and families are evaluated for their ability to endure the stress of transplantation and their ability to comply with the complex posttransplant regimens. The psychosocial assessment of the patient and the patient’s support system are also important as they’re incorporated into the evaluation.

The evaluation also provides a comprehensive assessment of a patient’s medical condition using a multidisciplinary approach that includes surgeons, a gastroenterologist, hepatologist, nutritionist, TPN specialists, and transplant nurse coordinators, as well as many other sub-specialists. Patients are assessed for
the degree of organ failure, including intestinal and liver disease. A complete assessment of the potential for bowel adaptation and the current nutritional status of the patient is performed. A detailed analysis of the TPN formulation and feeding regimen is then made. Radiographic examination of the abdomen and vascular access sites, and Doppler ultrasonography to assess venous access and to determine the patency of the central veins are completed. Educational sessions are arranged with the patient and family to review the patient’s medical condition.

The results of the evaluation are discussed with the patient, family, and referring providers. The final decision regarding the candidacy for transplantation is made by a multidisciplinary patient selection committee. If transplantation is recommended, the exact types and special issues are addressed.

Listing, matching, and allocation
Once the patient is cleared, he is listed for the appropriate organs through the United Network for Organ Sharing (UNOS). Each organ requires a separate listing and status. UNOS lists each organ separately for a patient that requires a new liver, pancreas, and intestine. The listing status is based on the organ’s level of disease, and organs are distributed according to the scoring systems in place.

Waiting times vary depending on the UNOS score, which considers the organs required and the patient’s size, blood type, and degree of illness. In general, most patients on the transplant list may wait from 3 months to 1 year for organs. UNOS lists the different medical and logistical characteristics considered for an organ to be distributed to the best-matched potential recipient. These generally include:

- blood type and size of the organ(s) needed
- time the recipient has been waiting for a transplant
- the distance between donor and recipient
- the medical urgency of the recipient
- the degree of immune system match between donor and recipient
- recipient’s age (child or adult).

UNOS also lists the six steps of the matching process:

1. An organ is donated.
2. The donor’s information is put into the UNOS transplant information database, UNet.
3. UNet provides the lists of the patients who match that organ.
4. The hospital where the patient is to receive the transplant is notified of an available organ.
5. The transplant team considers whether to accept the organ for the patient.
6. The patient receiving the organ is notified that an organ is available.

An appropriate donor should be stable and have no evidence of significant metabolic acidosis. Listing for transplant doesn’t guarantee that the appropriate organs can be found in a timely manner. During the wait for organs, patients must be available at all times and be prepared to travel to the hospital. In general, patients have 1 to 4 hours to arrive at the medical center once they’re contacted that an organ(s) is available. Families of patients already in the hospital at the time the organ is offered are notified immediately.

Transplantation
When an organ(s) becomes available and an offer is obtained, a rapid medical assessment is performed to ensure that there are no major changes in the patient’s medical condition that might temporarily prevent transplantation. Once completed, the surgical team assesses the donor organ quality. If the donor organs are deemed unsuitable, the transplant is cancelled. If the organs are suitable, the patient proceeds to the OR.

Typically, transplantation involving the intestine requires at least 6 hours or more. A multivisceral transplant can last as long as 12 hours depending on the number of organs to be transplanted.
into the patient’s stomach and small intestine to provide medications and feedings.

**Postoperative care**
Postoperative care varies depending on the patient’s medical condition at the time of transplantation. In general, patients may stay in the ICU approximately 3 days to 4 weeks after the transplant. They may require respiratory support on a ventilator during this interval. On postoperative day 1, vessel patency is assessed using Doppler ultrasonography. Biopsies of the transplanted organs are obtained at regular intervals after the transplant. TPN is gradually weaned off as the intestine recovers function after the transplant procedure.

**Medications**
The standard immunosuppression drugs following intestinal transplantation are tacrolimus (Prograf) and corticosteroids. Because of the high rate of infection postprocedure, broad-spectrum antibacterial and antifungal prophylaxis is administered for 1 to 2 weeks after transplantation. Antiviral prophylaxis with ganciclovir (Cytovene) has been recommended to decrease the incidence of posttransplant cytomegalovirus (CMV).

Medication is administered primarily through a central venous catheter to prevent infections and rejections. Patients are monitored closely for infection and treated appropriately. The combination of drugs used to suppress the immune system to prevent organ transplant rejection is important.

All drugs have potential benefits and side-effects so it’s important that they’re dosed to achieve the greatest benefit with minimal side effects.

**Nutrition**
Enteral feedings are started once intestinal function returns, which is usually between 3 to 5 days postoperatively, provided no clinical complications have developed. The concentration and type of enteral feedings are based on the patient’s clinical response. Enteral feedings are generally discontinued by the fourth week postoperatively and a low-fat diet is begun in the early posttransplant period. An unrestricted diet is permitted after 4 to 6 weeks posttransplant.

**Complications**
A study by Guaraldi et al, showed that infectious complications represent a major cause of morbidity and mortality in organ transplant patients as a result of immunosuppressive therapy and exposure to community-acquired and nosocomial infection. The study further reported that small-bowel and multivisceral transplantations are particularly hampered by graft/patient loss secondary to infectious complications including sepsis. This may be due to the high level of immunosuppression medications required in this specific transplant population and the altered graft mucosal permeability, which may be responsible for enhanced bacterial translocation.

**Infection and sepsis.** Sepsis is the most frequent cause of death following any transplantation, especially intestinal/multivisceral procedures. Common factors include intra-abdominal infection or abscess, bowel perforation, invasive line infection, wound infection, pulmonary infection, urinary tract infection, and viral enteritis. Sepsis commonly occurs with acute rejection, and should always be considered when evaluating a patient with sepsis. Advances in immunosuppressive therapy have led to a significant reduction in the incidence of rejection; however, the therapy also increases the patient’s susceptibility to severe and varied complications from bacterial, viral, and fungal infections. Approximately 40% of small-bowel transplant recipients require further surgery, usually the result of infectious complications during their original inpatient stay, which can prolong hospitalization.

Infection is the main cause of mortality after intestinal transplantation due to immunosuppressive therapy and the unique nature of the intestinal graft (for example, its potential for bacterial translocation during periods of stress, such as ischemia, reperfusion, and rejection). The major types of infection for solid-organ transplantations can be categorized according to the posttransplantation period in which they occur—post-surgical bacterial infections in the first month after transplantation; opportunistic infections such as cytomegalovirus (CMV) that may occur in the period 1 to 6 months posttransplantation; and invasive fungal infections, particularly Candida and invasive aspergillo-
Rejection. Rejection episodes occur in 70% to 90% of recipients following intestinal transplantation, although hyperacute rejection is rare. The median number of rejection episodes per patient is 2.5 and doesn’t differ with the type of allograft.

Early diagnosis of allograft rejection will help reduce the risk of mortality associated with rejection. Because there are no serological or biochemical tests that are diagnostic for intestinal rejection, diagnosis is confirmed by endoscopic intestinal biopsy. Clinical signs and symptoms of intestinal transplant rejection and abdominal perforation include unexplained fever, diarrhea, or GI bleeding.

With newer immunosuppressive therapy protocols, the incidence of rejection in intestinal transplant recipients has declined significantly in the past few years.

Newer drug therapies and protocols have shown positive results in decreasing rejection. Recent data, reported at the International Small Bowel Transplant Symposium in Stockholm, Sweden, indicated that newer immunosuppressive therapy protocols, including sirolimus (Rapamune), may lower the frequency of rejection and may reduce immunosuppression-related adverse effects while improving survival.

CMV infection. CMV continues to be a cause of substantial morbidity and death after solid-organ transplantation. The onset can range from 2 weeks to several months after transplantation, occurs in 30% to 75% of the transplant recipients at risk, with a mortality rate of approximately 5%. The incidence of CMV disease is 8% to 35% in kidney, heart, and liver transplant recipients.

Lymphoproliferative disease. Posttransplant lymphoproliferative disease (PTLD) is a complication of overimmunosuppression. PTLD occurs in 7% to 29% of intestinal transplant recipients, and children appear to have an increased frequency of PTLD compared with adults. Ongoing graft monitoring for PTLD is essential during therapy because graft rejection may occur on a background of reduced immunosuppression, with the potential for graft loss.

Graft-versus-host disease (GVHD). GVHD following intestinal transplantation has been far less common than one might expect considering the substantial volume of lymphoid tissue present in both the mesentery and the Peyer’s patches of the intestinal allograft. The rate of GVHD after intestinal transplantation is 0% to 16%.

Quality of life

The International Transplant Registry and several large centers have shown that 77% to 93% of surviving recipients remain independent of parenteral nutrition 6 to 12 months after transplantation. Rovera and colleagues examined 10 adult recipients of successful intestinal transplantation and 10 adult patients who were stable on home parenteral nutrition. They reported that quality of life was similar between the groups. The major difference was that further improvement over time was observed in the group that received intestinal transplants.

Another study on quality of life examined 30 recipients in whom graft function was maintained beyond 1 year. Rehabilitation potential was excellent, and 92% of recipients returned to school or work. On the other hand, the prolonged need for intense immunosuppression was associated with rehospitalization in 50% of patients during the preceding year, and poor linear growth in 25% of pediatric transplant recipients occurred despite seemingly adequate allograft function.

Regulations

In 2007, the Centers for Medicare and Medicaid Services (CMS) launched Conditions of Participation (CoPs), which listed regulations and standards to improve outcomes and enhance transplant patient safety. The goals of the new CoPs are to increase the efficient use of donated organs, reduce organ wastage due to transplant failure, and protect transplant candidates and recipients, as well as living donors. Patient management, patient rights, and outcomes data are areas of major focus for transplant center recertification.

CMS wants to ensure that the transplantation process uses a multidisciplinary approach to patient management, and multidisciplinary teams are in place and coor-


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Regulations, technology guide multivisceral transplant success

GENERAL PURPOSE: To familiarize the registered professional nurse with the process, guidelines, and patient care related to multivisceral transplant.

LEARNING OBJECTIVES: After reading this article and taking this test, the reader will be able to: 1. Discuss background information about multivisceral transplants including statistics, regulations, and pathophysiology. 2. Describe activities related to preparation and the surgical procedure. 3. Identify complications of multivisceral transplant and treatment options.

1. The number of adults in the United States who underwent multivisceral transplant in 2006 is
   a. 5. c. 150. b. 51. d. 340.

2. One common cause of intestinal failure is
   a. chronic pseudo-obstruction. b. SBS. c. visceral neuropathy. d. intestinal secretory disorder.

3. A malabsorptive disorder causing intestinal failure is

4. The preferred nutrition route for patients with intestinal failure is
   a. oral. b. duodenal. c. jejunal. d. parenteral.

5. Which age group is most likely to develop TPN-induced progressive liver failure?
   a. young children b. young adults c. middle-age adults d. senior adults

6. The main goal of a transplant evaluation is to
   a. determine the primary diagnosis. b. identify an alternative treatment. c. assess the patient’s support system. d. find a compatible donor.

7. Most patients wait on the transplant list for up to
   a. 12 months. b. 15 months. c. 18 months. d. 24 months.

8. Which characteristic is not included on the UNOS list for organ transplants?
   a. time spent waiting b. cost of transplant c. size of organ d. age of recipient

9. The decision about accepting the organ for the patient is made by
   a. UNOS. b. UNetSM. c. the transplant team. d. the patient and family.

10. Upon notification, patients for transplant should arrive at the hospital in no more than
    a. 2 hours. b. 4 hours. c. 6 hours. d. 8 hours.

11. Intestinal transplant in a patient with functional large bowel requires
    a. no ileostomy. b. temporary ileostomy. c. permanent ileostomy. d. double ileostomy.

12. Postoperatively, enteral feedings are
    a. immediately initiated. b. contraindicated for 2 weeks. c. discontinued 8 weeks after surgery. d. initiated 3 to 5 days after surgery.

13. Which of the following is the most likely complication of tacrolimus therapy?
    a. infection b. rejection c. graft dysfunction d. immunosuppression

14. Each of the following is a sign of possible intestinal transplant rejection and abdominal perforation except
    a. unexplained fever. b. diarrhea. c. gastrointestinal bleeding. d. elevated platelet count.

15. What percentage of small bowel transplant recipients require further surgery during their original inpatient stay?
    a. 20%. b. 30%. c. 40%. d. 50%.

16. Infection from which type of organism is most common within the first month post-transplant?
    a. bacteria c. virus b. fungus d. amoeba

17. Rejection following intestinal transplant occurs at a rate of about
    a. 10%. b. 30%. c. 50%. d. 70%.

18. Which statement about regulations from the CMS is true?
    a. The patient must notify the Organ and Procurement Transplantation Network when removed from the wait list. b. A multidisciplinary transplant team led by a physician is required. c. The CMS maintains a world-wide waitlist in a centralized database. d. The medical records must include a current care plan for each donor.

ENROLLMENT FORM  OR Nurse 2007, November/December, Regulations, technology guide multivisceral transplant success

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