

Handbook for **TRANSPLANT COORDINATORS**

A Study Guide for Healthcare Professionals



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Forewords

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INTRODUCTION

The liver is the largest solid organ in the human body. It is located in the upper right side quadrant of the abdominal cavity and lies below the diaphragm (**Fig. 6.1**). The liver is helpful in activating enzymes and also acts as a storehouse for vitamins, minerals and glycogen.

The liver consists of four lobes—the larger right lobe and left lobe, and the smaller caudate lobe and quadrate lobe. The left and right lobes are divided by the falciform ligament, which connects the liver to the abdominal wall. The liver lobes can be further divided into eight segments, which are made up of thousands of lobules. Each of these lobules has a duct flowing toward the common hepatic duct, which drains bile from the liver.

- **Functions of liver:** It is a metabolically active organ that is involved in some vital functions:
 - Metabolism of proteins, fats and carbohydrates occurs in the liver.
 - Liver produces bile

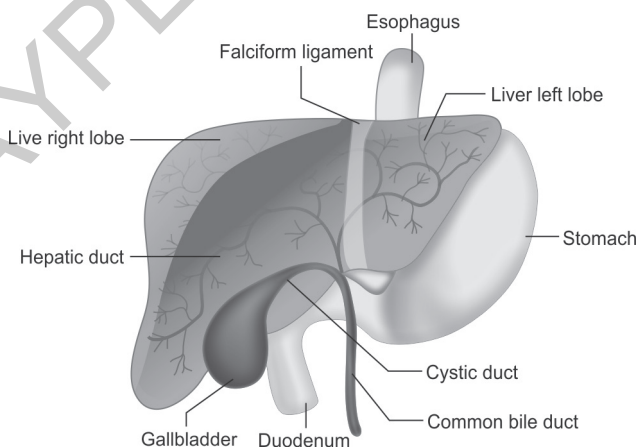


Fig. 6.1: Anatomy of liver.

- Excretion of bilirubin, cholesterol, drugs and hormones occurs through the liver.
- **Disorders of liver:** Many conditions can affect the liver, such as consumption of too many toxins, such as alcohol, inherited diseases, the immune system disorders and viral infections that can attack the liver. Some of the disorders of the liver are:
 - Alcohol-related liver disease
 - Fatty liver
 - Wilson disease
 - Liver cancer
 - Autoimmune hepatitis
 - Hepatitis A, B and C

Many of these conditions can lead to cirrhosis of the liver.

- **Sign and symptoms of liver disorders:** Some of the common signs and symptoms of the liver disorders are:
 - Ascites
 - Jaundice
 - Bruising
 - Itchy skin
 - Pain in abdomen
 - Swelling in legs or feet.
 - Tremors
 - Weakness, loss of balance or constant fatigue
 - Confusion or loss of orientation.
- **Diagnosis of liver disorders:** Tests and procedures used for diagnosis of the liver disorders are:
 - Blood tests
 - Imaging tests, such as ultrasound, abdominal computerized tomography (CT) scanning, magnetic resonance imaging (MRI)
 - Biopsy
- **Treatment of liver diseases:** Treatment for liver diseases varies as per the diagnosis. Some liver problems required lifestyle modifications, such as stopping alcohol use or losing weight. Other liver problems may be treated with medications or may require surgery. Liver diseases that have led to liver failure or cirrhosis may ultimately require a liver transplant.
- **Liver transplant:** A liver transplant is a surgical procedure that involves the removal of a liver that no longer functions properly and replaces it with a healthy liver from a deceased donor or a portion of a healthy liver from a living donor. There are three main types of liver transplants:

1. Deceased donor liver transplant—involves transplanting a liver that has been retrieved from a cadaver donor.
 2. Living donor liver transplant—in a living donation, a section of liver is removed from a living donor, because the liver can regenerate itself. The part of liver transplanted in the recipient and the remaining section of the donor's liver are able to regrow into a normal-sized liver.
 3. Split transplant—in a split transplant, liver is retrieved from a cadaver donor and is split into two pieces; each piece is transplanted into two persons. In most of the cases, one recipient will be an adult, and the second will be pediatric transplant, where they will grow to a normal size.
- The Model for End Stage Liver disease (MELD) score, which can range from 6 to 40, is used to determine the urgency of liver transplant among patients aged 12 and above. This score estimates the risk of death within 90 days without a transplant.
 - Blood group and body size are the two main criteria used for selection of a cadaver liver for a recipient.
 - **Problems associated after liver transplant:**
 - Rejection
 - Hemorrhage
 - Primary non-function
 - Increased risk of infections
 - Loss of kidney function
 - An increased risk of certain types of cancer, particularly skin cancer.

MULTIPLE CHOICE QUESTIONS (MCQs)

1. **Where is the liver located in the human body?**
 - a. Besides pancreas
 - b. Besides heart
 - c. Besides kidneys
 - d. Above the abdominal cavity
2. **What is the primary function of the liver?**
 - a. Digestion
 - b. Filtration of waste products from the blood
 - c. Production of bile and metabolism
 - d. Hormone production
3. **Which of the following is a function of the human liver?**
 - a. Production of bile
 - b. Metabolism of fats
 - c. Metabolism of carbohydrates
 - d. All of the above

4. The vitamin that is stored in the liver:
- Vitamin K
 - Vitamin D
 - Vitamin E
 - All of the above
5. The most important protein of blood serum, i.e., albumin is produced by:
- Heart
 - Lungs
 - Liver
 - Endocrine glands
6. Which of the following statement is true regarding the human liver?
- The liver is triangular in shape
 - The liver is the only visceral organ that can regenerate
 - The liver is the largest internal organ of the human body
 - All of the above
7. Which is the largest gland in the human body?
- Hypothalamus
 - Liver
 - Thyroid
 - Pancreas
8. How many lobes are there in the human liver?
- 2
 - 4
 - 6
 - 8
9. The largest lobe of human liver is:
- Right lobe
 - Left lobe
 - Quadrate lobe
 - Caudate lobe
10. Glucose is stored in liver as:
- Starch
 - Cellulose
 - Glycogen
 - Cellulose
11. Which of the following is not a function of the liver?
- Production of insulin
 - Detoxification
 - Storing of glycogen
 - Production of bile
12. Kupffer cells are found in:
- Pancreas
 - Liver
 - Kidney
 - Spleen
13. Which of the following structures is not part of the portal trial in liver?
- Portal vein
 - Portal artery
 - Hepatic artery
 - Bile duct
14. Which of the following has the weakest association with hepatocellular carcinoma?
- Hepatitis B
 - Hepatitis C
 - Oral contraceptives
 - Smoking
15. Which of the following statements is incorrect regarding effects of shock on the liver?
- Centrilobular necrosis is present
 - Liver enzymes are not elevated
 - Hypoperfusion of liver occurs
 - All the statements are correct

- 16. Liver cirrhosis, characterized by the abnormal structure and functioning of the liver, is mainly diagnosed by:**
- Blood test
 - Liver biopsy
 - Physical examination
 - All of the above
- 17. Liver disease can result in problems of:**
- Blood clotting
 - Production of blood proteins
 - Elimination of water, drugs, and toxins from the body
 - All of the above
- 18. Which of the following conditions is not likely to cause fatty liver?**
- Obesity
 - Starvation
 - Pregnancy
 - Diabetes mellitus
- 19. Which of the following samples is usually taken for the liver function test?**
- Blood sample
 - Urine sample
 - Biopsy sample
 - Sputum sample
- 20. The confirmatory sign of liver disease:**
- Hair loss
 - Increased urination
 - Insomnia
 - Jaundice
- 21. Late stage chronic liver disease is called:**
- Liver failure
 - Cirrhosis
 - Liver cancer
 - Fatty liver disease
- 22. Which of the following is a common cause of the liver failure?**
- Hypertension
 - Diabetes
 - Cirrhosis
 - Kidney stones
- 23. Cirrhosis of the liver can be caused by the chronic intake of:**
- Opium
 - Alcohol
 - Tobacco
 - Cocaine
- 24. The most specific indicator of liver cirrhosis is an increase in the level of:**
- LDH
 - HDL
 - CPK
 - SGPT
- 25. Clinical features of cirrhosis include all, except:**
- Osteoporosis
 - Atrophy of spleen
 - Anorexia
 - Esophageal varices
- 26. What is a liver transplant?**
- Removal of a liver
 - Implantation of a healthy liver from a donor
 - Liver biopsy
 - Hepatic resection

- 27. Which of the following is most commonly associated with non-viral acute liver failure?**
- a. Amoxicillin
 - b. Acetaminophen
 - c. Topiramate
 - d. Naproxen
- 28. Which of the following is the most common disorder leading to liver transplantation in children?**
- a. Wilson disease
 - b. Biliary atresia
 - c. Alcohol cirrhosis
 - d. Autoimmune hepatitis
- 29. Among following the absolute contraindication for liver transplantation is:**
- a. Previous breast cancer
 - b. Active tuberculosis
 - c. Cystic fibrosis
 - d. Portal thrombosis
- 30. Liver donation is possible from:**
- a. Living donor only
 - b. Cadaver donor only
 - c. Both living and cadaver can be the donor
 - d. None of these
- 31. What is the liver transplant survival benefit?**
- a. The amount of time a recipient lives after liver transplant
 - b. The improvement in quality of life after liver transplant
 - c. An insurance policy for patients who survive liver transplantation
 - d. The difference between survival with and survival without a liver transplant
- 32. What is the most important blood group compatibility for liver transplantation?**
- a. ABO blood group
 - b. Rh factor
 - c. HLA typing
 - d. All of the above
- 33. Which test is essential before liver transplantation to check for donor-recipient compatibility?**
- a. ECG
 - b. Chest X-ray
 - c. Crossmatch test
 - d. MRI
- 34. Which organ transplant is most commonly performed in children?**
- a. Heart transplant
 - b. Liver transplant
 - c. Lung transplant
 - d. Kidney transplant
- 35. What is the most common cause of liver failure in children requiring transplantation?**
- a. Hypertension
 - b. Diabetes
 - c. Biliary atresia
 - d. Polycystic liver disease
- 36. What is a common challenge in managing pediatric liver transplant recipients?**
- a. Lack of available organs
 - b. Medication non-adherence
 - c. Increased risk of cancer
 - d. Higher incidence of cardiovascular disease

- 37. Which factor is crucial for the successful transition of pediatric liver transplant recipients to adult care?**
- Avoiding immunosuppressive therapy
 - Early education about transplant management
 - Frequent changes in medical teams
 - Isolation from peers
- 38. What is the main reason for liver transplantation in adults?**
- Hepatitis B infection
 - Liver cancer
 - Liver cirrhosis
 - Autoimmune hepatitis
- 39. What is the main advantage of living donor liver transplantation?**
- Shorter recovery time
 - Reduced waiting time
 - Better organ quality
 - Lower cost
- 40. What is the primary ethical concern in living donor liver transplantation?**
- Cost of the procedure
 - Potential harm to the donor
 - Length of hospital stay
 - Immunosuppressive side effects
- 41. Which imaging technique is commonly used to evaluate the liver before transplantation?**
- CT scan
 - PET scan
 - Ultrasound
 - Mammography
- 42. Which organ transplant can be performed using a split organ technique?**
- Kidney
 - Liver
 - Heart
 - Lung
- 43. Which of the following is not a contraindication for liver transplantation?**
- Active infection
 - Metastatic cancer
 - Controlled hypertension
 - Severe cardiovascular disease
- 44. Which criteria is considered as extended criteria for liver allograft?**
- Cold ischemia time >12 hours
 - Liver steatosis <20%
 - Donor age over 40 years
 - Split graft
- 45. The most common cause of death after pediatric liver transplantation is:**
- Malignancy
 - Cardiovascular disease
 - Infection
 - All of the above
- 46. After retrieval of liver from living donor, remaining liver in donor will:**
- Grow back
 - Remain of the same size for whole life
 - Depends upon donor to donor
 - None of the above

- 47. During a liver transplant surgery, where is the donor liver placed in recipient?**
- In the abdominal cavity
 - In the chest cavity
 - In the original liver location
 - In the bladder
- 48. Which artery is typically connected to the donor liver during transplant surgery?**
- Aorta
 - Hepatic artery
 - Renal artery
 - Femoral artery
- 49. What is an anastomosis in the context of liver transplantation?**
- A type of infection
 - Surgical connection between two structures
 - A rejection episode
 - A type of immunosuppressive drug
- 50. What is the main purpose of connecting the donor liver's bile duct to the recipient's bile duct?**
- To supply blood to the liver
 - To allow bile to flow from the liver to the intestine
 - To provide nutrients to the liver
 - To stabilize the liver in the abdomen
- 51. Which among the following conditions recipients is kept in super urgent listing for cadaver liver transplant?**
- Primary non-function of liver allograft
 - Living liver donor who develops life-threatening liver failure
 - Early hepatic artery thrombosis needing re-transplant
 - All of the above
- 52. Which condition is characterized by high levels of bilirubin in the blood and is a potential complication after liver transplantation?**
- Hyperkalemia
 - Hyperbilirubinemia
 - Hypocalcemia
 - Hypertension
- 53. Which among the following is contraindication to getting registered as a cadaver liver recipient?**
- MELD <15
 - HIV infection
 - Hepatocellular carcinoma beyond UCSF criteria
 - All of the above
- 54. Which among the following is contraindication to getting registered as a cadaver liver recipient?**
- Severe cardiac or pulmonary disease, who is unfit for general anesthesia
 - Uncontrolled sepsis
 - Extrahepatic malignancy
 - All of the above

- 55. Can a liver recipient waiting for a living donor can register for a deceased donor also?**
- Yes, patients can register in both categories
 - No, patients can register in one category only
 - It depends on the state policy
 - It depends on the hospital policy
- 56. The donor risk index for liver is directly related to:**
- Post-transplant complication rates
 - Graft survival
 - Rejection rate
 - Post-transplant disease transmission
- 57. Which viral infection is a common concern for liver transplant recipients?**
- Influenza
 - Hepatitis B
 - Cytomegalovirus (CMV)
 - HIV
- 58. The current most commonly used preservation solution for liver preservation before transplantation is?**
- UW solution
 - Eurocollins solution
 - RL solution
 - Celsior solution
- 59. Compared to the general population, what is the overall risk for solid organ malignancies in liver transplant recipients?**
- 2 to 3 times greater
 - 10 time greater
 - It is same
 - 20% less
- 60. Which medication is commonly used to prevent rejection after a liver transplant?**
- Antibiotics
 - Immunosuppressants
 - Diuretics
 - Analgesics
- 61. Which complication involves the immune system attacking the transplanted liver?**
- Infection
 - Rejection
 - Thrombosis
 - Hemorrhage
- 62. What is the primary cause of chronic allograft dysfunction in liver transplantation?**
- Recurrent infections
 - Immunosuppressive drug toxicity
 - Chronic rejection
 - Surgical complications
- 63. What is the purpose of monitoring liver function tests after a liver transplant?**
- To check for infection
 - To assess liver function
 - To measure blood pressure
 - To evaluate kidney function

- 64. What is the main purpose of performing a liver biopsy on a transplanted liver?**
- To measure liver size
 - To assess liver function
 - To detect rejection or other pathology
 - To determine blood type
- 65. What is the most common cause of late (after 1 year) liver graft loss in pediatrics?**
- Chronic rejection
 - Hepatitis B
 - Hepatitis C
 - Biliary atresia
- 66. What is the typical time frame for acute rejection to occur after a liver transplant?**
- Within the first 24 hours
 - Within the first 3 months
 - After 1 year
 - After 5 years
- 67. Which lifestyle change is recommended to improve the long-term success of a liver transplant?**
- High sodium diet
 - Regular physical activity
 - Avoiding all fruits
 - Increasing alcohol intake
- 68. Which of the following is the most common technical complication after liver transplantation?**
- Portal vein thrombosis
 - Hepatic arterial stenosis
 - Bile duct leak or stricture
 - Inferior vena caval stenosis
- 69. Which of the following immunizations would be contraindicated in patients after liver transplantation?**
- Hepatitis B
 - Hepatitis A
 - MMR
 - Oral polio vaccine
- 70. Which factor causes adverse effect in long-term outcomes after liver transplantation?**
- Good blood pressure control
 - Adherence to immunosuppressive therapy
 - Smoking
 - Regular follow up visits
- 71. Which of the following is an absolute contraindication for liver transplant?**
- Acute alcoholism
 - Smoking
 - Substance abuse
 - All of the above

Answer Key

- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 1. d | 2. c | 3. d | 4. d | 5. c | 6. d |
| 7. b | 8. b | 9. a | 10. c | 11. a | 12. b |
| 13. b | 14. c | 15. b | 16. b | 17. d | 18. b |
| 19. a | 20. d | 21. b | 22. c | 23. b | 24. d |
| 25. b | 26. b | 27. b | 28. b | 29. b | 30. c |
| 31. d | 32. a | 33. c | 34. b | 35. c | 36. b |
| 37. b | 38. b | 39. c | 40. b | 41. b | 42. c |
| 43. c | 44. a | 45. b | 46. a | 47. c | 48. b |
| 49. b | 50. b | 51. d | 52. b | 53. d | 54. d |
| 55. a | 56. b | 57. b | 58. d | 59. a | 60. b |
| 61. b | 62. c | 63. b | 64. c | 65. a | 66. b |
| 67. b | 68. c | 69. d | 70. c | 71. d | |

Handbook for **TRANSPLANT COORDINATORS** *A Study Guide for Healthcare Professionals*

Salient Features

- Current concept of organ donation and transplantation
- Brief summary about each chapter before the MCQs
- More than 1,000 MCQs
- Useful for every person working/interested in the field of organ donation and transplant
- MCQs arranged from basic to complex for better understanding
- Best book for medical and paramedical students who wants to pursue their career as transplant coordinators

Navdeep Bansal started his journey as a transplant coordinator in the year 2015 at PGIMER, Chandigarh. He completed his training from the National Organ and Tissue Transplant Organisation (NOTTO). With his persuasive communication skills and empathetic demeanor, he has converted and coordinated more than 250 cadaver organ donations, including the youngest donor, who was barely 72 hours old. He has published papers regarding organ donation and transplantation in various national and international journals as well as presented many papers in many conferences. He is the youngest recipient of Swamy Naryan Best Transplant Coordinator Award in 2016. In 2020, he received the best transplant coordinator award for his contribution to the promotion of cadaver organ donation by NOTTO, on 11th Indian Organ Donation Day. Dr Bansal has conducted awareness talks and didactic lectures in many hospitals regarding organ donation and transplantation processes. He has imparted hands-on training to many transplant coordinators in the field of cadaver organ donation.

Vijay Tadia is an accomplished hospital administrator with over two decades of diverse experience in healthcare delivery across India. A medical graduate (MBBS) from the University of Jammu, he has pursued advanced education in healthcare management, earning dual master's degree in Hospital Administration from the All India Institute of Medical Sciences (AIIMS), New Delhi, and the Tata Institute of Social Sciences (TISS), Mumbai. He is a member of the prestigious National Academy of Medical Sciences (NAMS). Dr Vijay Tadia is trained in Medical Law and Ethics from the National Law School, Bengaluru, Karnataka, India. A dedicated advocate for data-driven decision-making in healthcare, he completed the prestigious Health in Numbers certification from Harvard University through EdX. A passionate author and thought leader, Dr Vijay Tadia's work reflects his commitment to advancing healthcare systems and empowering the next generation of healthcare professionals.

Printed in India



Available at all medical bookstores
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JAYPEE BROTHERS
Medical Publishers (P) Ltd.
EMCA House, 23/23-B, Ansari Road,
Daryaganj, New Delhi - 110 002, INDIA
www.jaypeebrothers.com

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ISBN 978-93-6616-935-4



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