

# Robotic-Assisted, Laparoscopic Gall Bladder Surgery

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## What is a Robotic-Assisted Laparoscopic Cholecystectomy?

A robotic-assisted laparoscopic cholecystectomy is a minimally invasive surgical procedure to remove the gallbladder using advanced robotic technology. The surgeon controls robotic instruments through small incisions, allowing for precise movements and enhanced visualization.

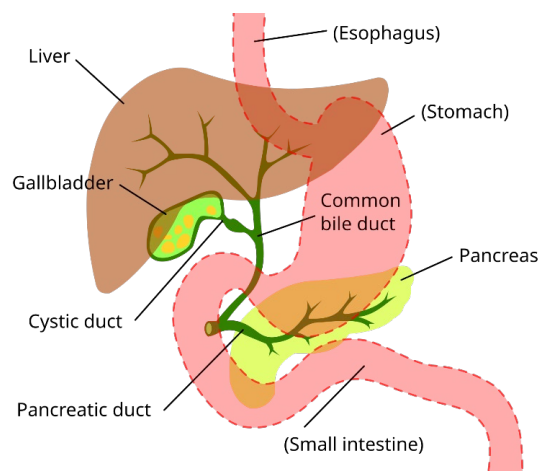
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## Anatomy and Physiology of the Biliary Tract

The biliary tract is a system of ducts that transports bile from the liver to the small intestine. The main components include:

- **Liver:** Produces bile, which aids in digestion of fats.
- **Common Hepatic Duct:** Formed by the joining of the right and left hepatic ducts from the liver (pictured but not labeled below).
- **Gallbladder:** Stores and concentrates bile, releasing it when needed for digestion.
- **Cystic Duct:** Connects the gallbladder to the common bile duct.
- **Common Bile Duct:** Formed at the junction of common hepatic duct and cystic duct. It carries bile from the liver and gallbladder to the small intestine (duodenum). Bile is mixed with pancreatic juices prior to entering the duodenum.

Proper function of the biliary tract is essential for digestion and absorption of dietary fats. Blockages or inflammation can cause pain, infection, and other complications.



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## Function of Bile and Its Role in Digestion

Bile is a digestive fluid produced by the liver and stored in the gallbladder. Its primary function is to help digest fats in the food you eat. When you consume a meal, especially one containing fat, the gallbladder squeezes and releases bile into the small intestine.

Bile contains bile acids, cholesterol, bilirubin, and other substances. Bile acids act as natural detergents, breaking down large fat molecules into smaller ones. Without bile, the digestion and absorption of dietary fats and fat-soluble vitamins (A, D, E, and K) would be very difficult.

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## How Gallstones Are Formed

Gallstones are solid particles that develop in the gallbladder from components of bile. Gallstones form when there is an imbalance in these components:

- **Cholesterol Stones:** These are the most common type, occurring when excess cholesterol in bile cannot be dissolved by insufficient bile salts. The excess cholesterol crystallizes and forms stones.
  - **Pigment Stones:** These are made of bilirubin, a substance produced from the breakdown of red blood cells. Conditions that increase bilirubin production (such as certain blood disorders or liver disease) can lead to pigment stone formation.
  - **Mixed Stones:** Contain both cholesterol and pigment components.
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## Why Rapid Weight Loss Is Associated with Gallstone Formation

Rapid weight loss, whether from very low-calorie diets, bariatric surgery, or other causes, increases the risk of gallstone formation. When the body breaks down fat quickly, the liver secretes extra cholesterol into the bile. This excess cholesterol can overwhelm the body's ability to keep it dissolved, leading to the formation of cholesterol crystals and, eventually, gallstones. Additionally, during rapid weight loss, the gallbladder may not empty as frequently or completely, allowing bile to become more concentrated and further promoting stone formation.

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## GLP-1 Medications and Gallstone Formation

Glucagon-like peptide-1 (GLP-1) receptor agonists are medications commonly used for the treatment of type 2 diabetes and for weight loss (examples include Semaglutide). These medications can increase the risk of gallstone formation. The risk is thought to be related to the rapid weight loss that often occurs with these medications and possible effects on gallbladder motility. GLP-1 agonists may slow gallbladder emptying, leading to concentrated bile and gallstone development.

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## How Gallstones Cause Pain

Gallstones can cause pain when they block the normal flow of bile out of the gallbladder. After eating a fatty meal, the gallbladder squeezes to release bile. If a stone temporarily lodges in the cystic duct, the blockage increases pressure within the gallbladder, leading to a type of pain called biliary colic. This pain is usually felt in the right upper abdomen and may radiate to the back or right shoulder. If the blockage persists, it can cause inflammation or infection of the gallbladder (cholecystitis), or the stone may move into the common bile duct, leading to more serious complications such as jaundice, cholangitis, or pancreatitis.

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## Biliary Dyskinesia

Biliary dyskinesia is a condition in which the gallbladder does not squeeze properly or empty bile efficiently- leading to episodes of right upper abdominal pain, nausea, and sometimes indigestion. This pain can mimic that caused by gallstones, but imaging studies do not show stones. Diagnosis is often made with a specialized test called a HIDA scan, which measures gallbladder emptying (ejection fraction). If the gallbladder is not emptying well and symptoms are significant, removal of the gallbladder may be recommended.

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## Indications for Cholecystectomy

This procedure is recommended for patients with:

- Symptomatic gallstones (cholelithiasis)
- Gallbladder inflammation (cholecystitis)

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- Gallbladder polyps that are > 1 cm or increasing in size over successive ultrasound evaluations.
  - Biliary dyskinesia (abnormal gallbladder emptying, which can cause pain even without gallstones)
  - Gallbladder infection or other related conditions
  - Choledocholithiasis (gallstones in the common bile duct)
  - Biliary pancreatitis (inflammation of the pancreas caused by gallstones blocking the bile duct)
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## Surgery

1. **Anesthesia:** You will receive general anesthesia, so you will be asleep during the surgery.
  2. **Incisions:** Several small incisions (usually 4) are made in the abdomen.
  3. **Robotic System Setup:** The surgeon connects robotic arms to the instruments placed through the incisions.
  4. **Gallbladder Removal:** The surgeon uses the robotic system to carefully free and remove the gallbladder.
  5. **Closure:** The instruments are removed, and the incisions are closed with sutures and surgical glue.
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## Risks

As with any surgical procedure, there are potential risks, including:

- Bleeding
- Infection
- Injury to nearby structures (liver, intestines, blood vessels)
- Injury to the biliary system (including the common bile, hepatic, or cystic ducts)
- Bile leak
- Blood clots
- Adverse reaction to anesthesia
- Conversion to open surgery if necessary
- Pain at the gallbladder extraction site (usually at the largest incision- to the left of the belly button)
- Diarrhea after surgery

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## Steps Taken to Reduce Risk

- **Preoperative Assessment:** Thorough evaluation to ensure you are a suitable candidate.
- **Sterile Technique:** Strict infection control measures are followed.
- **Abdominal Entry:** The surgical team enters the abdomen by utilizing a device that can be seen through. Each layer of the abdominal wall is identified. Once entry into the abdomen is achieved, the abdomen is filled with air. The surgical team inspects the area directly below entry to ensure the colon, small intestine, and stomach are free from injury.
- **Advanced Visualization:** The robotic system provides high-definition 3D visualization for precise surgery- special attention is given to identifying and protecting nearby structures.
- **Critical View of Safety:** The surgeon carefully exposes and identifies the cystic duct and cystic artery and clears these structures of connective tissue before dividing them- thereby reducing the risk of bile duct injury.
- **Fluorescent Cholangiography:** A special green dye is injected into a vein in the preoperative area. This green dye leaves the body through the bile system. During surgery, the surgeon utilizes near-infrared light to make the green dye glow, helping the surgical team visualize the biliary anatomy in real time.
- **Intraoperative Cholangiogram:** A contrast dye may be injected into the gallbladder (or cystic duct) during surgery, and X-ray images are taken to confirm the anatomy and check for stones or blockages.
- **Intraoperative Monitoring:** Continuous monitoring of vital signs and organ function.
- **Experienced Surgical Team:** The procedure is performed by a skilled surgeon and team trained in robotic surgery.

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## Why Diarrhea Can Occur After Cholecystectomy

- After the gallbladder is removed, bile produced by the liver no longer gets stored. Instead, bile flows continuously from the liver through the bile ducts into the small intestine. This constant trickle of bile can sometimes act as a mild laxative, leading to more frequent or looser stools (diarrhea) in some patients. This side effect is usually mild and often improves over time as the digestive system adjusts. If diarrhea persists, dietary modifications or medications may help manage symptoms.

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## What to Expect After Surgery

- **Recovery Room:** You will be monitored as you wake up from anesthesia.
- **Hospital Stay:** Most patients go home the same day as surgery.
- **Pain Management:** Mild to moderate pain is expected and managed with medications. Some discomfort at the gallbladder removal site is common and usually improves over several days.
  - **Tylenol (acetaminophen), 1000 mg, every 6 hours x 3 days**
  - **Celebrex (celecoxib), 200 mg, twice daily, x 3 days**
  - **Robaxin (methocarbamol), 500 mg, x 3 days**
  - **Tramadol or oxycodone as needed**
- **Diet:** You will start with clear liquids and gradually return to a normal diet as tolerated. As you no longer will have a reservoir of bile to aid in digestion, it is recommended to gradually re-introduce fatty foods into your diet.
- **Activity:** Light activity is encouraged soon after surgery. Avoid heavy lifting for a few weeks.
- **Follow-Up:** You will have a follow-up appointment to check your recovery and incision sites.
- **Wound care:** It is OK to shower day of surgery. Your wounds are covered with Dermabond (a type of surgical glue). Just keep wounds as dry as possible and pat with a towel when getting out of the shower. Do not submerge. No baths or swimming. Keep wounds out of direct sunlight for 6 months. The incisions may discolor if sunburned during the healing process.
- **Return to Normal Activities:** Most patients return to work and normal activities within 1-2 weeks.

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## When to Contact Your Surgeon

Call your surgeon if you experience:

- Fever or chills
  - Redness, swelling, or drainage from incisions
  - Severe abdominal pain
  - Persistent nausea or vomiting
  - Jaundice (yellowing of the skin or eyes)
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*This handout is intended for patient education. Surgical technique, pain management, mesh selection, and recovery are individualized based on anatomy and clinical findings.*



This QR Code takes you to a site that has this guide in electronic (pdf) format for ease of use / reference. The site also contains additional information on scheduling surgery, what to expect on day of surgery, etc.

**If you have any questions or concerns, please contact our office at 817-250-7030.**