



# Chapter-20

## ENDOSCOPY RETROGRADE CHOLANGIOPANCREATOGRAPHY

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**DOI: <https://doi.org/10.52458/9789388996846.nsp2023.eb.ch-20>**

**Ch.Id:-GU/NSP/EB/CMDT/2023/Ch-20**

## **ABSTRACT**

*The minimally invasive diagnostic and therapeutic procedure known as endoscopic retrograde cholangiopancreatography (ERCP) is crucial in the treatment of pancreaticobiliary diseases. This chapter gives a general review of ERCP while emphasizing its indications, specifics of the operation, related hazards, and most current developments in the field. In order to access and observe the biliary and pancreatic ducts, ERCP combines endoscopy and fluoroscopy. This enables the treatment of disorders like choledocholithiasis, strictures, and pancreatitis. This review examines the ERCP landscape as it changes, highlighting its significance in the age of sophisticated endoscopic methods and imaging modalities.*

**Keywords:** ERCP, Indications and contraindications, Anatomy of the biliary and pancreatic system, Patient preparation, Complications and risks, Post ERCP cares.

## **20.1 INTRODUCTION**

Endoscopic Retrograde Cholangiopancreatography (ERCP) is a cornerstone of interventional endoscopy and provides a critical link between pancreaticobiliary disease diagnosis and treatment. This book explores the complexities of ERCP and acts as a thorough reference for professionals, students, and those with an interest in the field of gastroenterology and endoscopy.

Since its inception in the 1960s, ERCP has evolved dramatically thanks to a convergence of technology developments and procedural improvements. This chapter sets out on a tour through the ERCP canon, from its historical origins to its contemporary applications.

The core ideas of ERCP will be covered in the pages that follow, along with information on its indications, contraindications, and pre-procedural steps. The chapter's main body explains the procedural steps in detail, with the use of eye-catching visuals and helpful hints to improve the practitioner's skill set.

However, ERCP involves more than just technique; it is a dynamic discipline that is always developing thanks to advancements in imaging, technology, and therapeutic approaches. We will also discuss the most recent advancements in ERCP, including applications for artificial intelligence, improved stenting, and digital cholangioscopy.

## **20.2 HISTORICAL PERSPECTIVE**

Midway through the 20th century is when ERCP first emerged. The procedure was developed in part by the eminent Japanese gastroenterologist Dr. Hiromi Shinya in

1968. His ground-breaking research concentrated on using a side-viewing endoscope to maneuver through the intricate anatomy of the biliary and pancreatic ducts. This represented a substantial shift from conventional surgical techniques and created new opportunities for minimally invasive operations. The endoscopic retrograde cholangiopancreatography (ERCP) procedure was first created as a diagnostic tool in 1968. Patients would receive an injection of a dye and be directed, as needed, to a surgeon or an interventional radiologist for additional care. The first successful ERCP was carried out by obstetrician Dr. William S. McCune utilizing a fiber duodenoscope with an external auxiliary channel taped to the scope shaft and a balloon to cannulate. Dr. Peter Cotton reported about cannulation in 60 individuals in 1972. The first biliary sphincterotomy was performed the next year by Drs. Meinhard Classen in Germany and Keiichi Kawai in Japan at the same time. ERCP has since changed from being a diagnostic to a therapeutic tool (Richard A. Kozarek, 2017).

## **20.3 MILESTONES**

- ✚ **Fiber-optic endoscope development:** Flexible fiber-optic endoscopes were first made available in the 1970s, considerably enhancing ERCP visibility. The surgery was performed with greater accuracy and safety thanks to this technical development.
- ✚ **Contrast Media and Radiographic Imaging:** The biliary and pancreatic ducts may be seen in great detail because to the use of fluoroscopy and contrast agents. Scottish gastroenterologist Dr. Douglas Howden made a key contribution to this advancement in the early 1970s.
- ✚ **Therapeutic Applications:** The main purpose of ERCP has changed from diagnostic to therapeutic. Sphincterotomy, stent implantation, and stone removal are just a few of the innovations that have helped it become a versatile surgery that can treat a variety of problems.

Technology has advanced rapidly in the twenty-first century. ERCP has become more safer and more efficient with the addition of digital imaging, high-definition endoscopes, and computer-assisted navigation systems.

## **20.4 INDICATIONS AND CONTRAINDICATIONS**

### **i. Indications:**

1. **Diagnostic Purposes:** An ERCP is performed to examine diseases including unexplained stomach pain, jaundice, or abnormal liver function tests.

2. **Therapeutic Procedures:** It can be used for therapeutic procedures such the removal of bile duct stones, the implantation of stents to unclog clogged ducts, or the treatment of gallstone-related problems.
3. **Evaluation of Pancreatic Diseases:** ERCP is helpful in identifying and treating pancreatic conditions such pseudo cysts and chronic pancreatitis.
4. **Tumor Evaluation:** It can be utilized to identify and classify tumors in the bile ducts or pancreas.
5. **Sphincter of Oddi Dysfunction:** Sphincter of Oddi dysfunction, which results in recurrent pancreatitis, can be identified and treated via ERCP. (Ahmad Malas, MD, 2023).

ii. **Contraindications**

1. **Allergies or Hypersensitivity:** Patients with known allergies or hypersensitivity to the contrast dye used during the procedure or to drugs utilized during the procedure should not receive this treatment.
2. **Acute Pancreatitis:** Due to the possibility of aggravating the condition, it is typically avoided during the acute phase of pancreatitis.
3. **Severe Coagulopathy:** Due to the danger of bleeding problems, patients with severe coagulopathies or bleeding disorders may not be good candidates for ERCP.
4. **Unstable Cardiovascular or Respiratory Conditions:** Patients with serious heart or lung issues that make sedation or anesthesia risky should not have ERCP.
5. **Pregnancy:** Although it is occasionally possible to conduct it on pregnant women, it should typically be avoided if at all possible because to the potential hazards to the fetus (Ahmad Malas, MD, 2023).

## **20.5 ANATOMY OF THE BILIARY AND PANCREATIC SYSTEM**

The biliary and pancreatic systems are significant parts of the digestive system and are crucial to nutrition absorption and digesting. Knowing the structures and regions seen during endoscopic retrograde cholangiopancreatography (ERCP) is necessary to comprehend the anatomy of the biliary and pancreatic systems in particular. The biliary and pancreatic ducts are examined and treated during ERCP, a

diagnostic and therapeutic technique that uses an endoscope and contrast dye. Here is a summary of the pertinent anatomy for ERCP.

## **20.6 BILIARY SYSTEM**

Bile, which is necessary for the breakdown and absorption of fats, is produced and transported through the biliary system. It consists of the following elements:

1. **Liver:** Bile is created in the liver from a variety of compounds, such as bilirubin and cholesterol. For the purpose of diagnosing or treating problems like strictures or stones, ERCP may include accessing the intrahepatic ducts within the liver.
2. **Gallbladder:** The gallbladder is a tiny, oblong organ that is situated underneath the liver. Its main job is to concentrate and store the bile that the liver produces. The gallbladder contracts and discharges bile into the small intestine when the body requires it for digestion. Although the gallbladder is related to the biliary system and cannot be seen directly during ERCP, gallbladder stones may be a cause for the procedure.
3. **Common Bile Ducts (CBD):** The common bile duct is a tube that delivers bile from the liver and gallbladder to the duodenum, which is the small intestine. Before going into the duodenum, it frequently joins forces with the major pancreatic duct. They combine to form the ampulla of VATER. This is an important structure for ERCP. To see the biliary tree, the contrast dye is injected here.
4. **Sphincter of Oddi:** The sphincter of Oddi is a muscular structure that controls the flow of bile and pancreatic juices into the duodenum. It's an important area of focus during ERCP (Meseeha & Attia, 2023).

## **20.7 PANCREATIC SYSTEM**

The main pancreatic duct, also known as the Wirsung duct, transports bicarbonate and pancreatic enzymes to the duodenum to aid with digesting. There are certain people who have an extra duct that can carry pancreatic secretions, known as the accessory pancreatic duct (Duct of Santorini). Either it merges with the primary pancreatic duct or it empties right into the duodenum.

The main pancreatic duct (Duct of Wirsung) and its branches can be seen during an ERCP. During the procedure, the CBD and the main pancreatic duct are frequently seen side by side.

The CBD and main pancreatic duct converge in the Ampulla of Vater before emptying into the duodenum. During ERCP, it serves as the main location for therapeutic treatments and contrast injection (Meseeha & Attia, 2023).

## **20.8 PATIENT PREPARATION**

**Patient preparation for ERCP may include the following steps:**

- **Fasting:** To ensure that the stomach and duodenum are empty before the procedure, patients are typically urged to fast for at least 6 hours. This lowers the danger of aspiration and aids in gaining a good view during the surgery.
- **Medical History:** Give your healthcare practitioner a thorough medical history, mentioning any allergies, prior adverse reactions to anaesthesia or contrast materials, and current medications. Mention your pregnancy and any underlying medical issues, if applicable.
- **Consent:** You will be required to sign a consent form stating that you are aware of the procedure's dangers and advantages.
- **Medication Modifications:** Prior to the treatment, your doctor may give you the go-ahead to temporarily stop taking a number of medications, including blood thinners.
- **Anesthesia:** Sedation or general anesthesia are usually used to perform ERCP. After the procedure, you should make arrangements for someone to drive you home because the sedation will prevent you from doing so.

**Other patient preparation may include:**

- Prohibition from smoking and chewing gum
- Removal of dentures and jewelry
- Bascopan is given prior to the examination

## **20.9 PROCEDURE AND STEPS**

The patient will undergo the ERCP procedure after receiving preparation for the ERCP exam. The patient is first instructed to lie down on the fluoroscopy machine in a relaxed position. As a result, the patient is given local anaesthesia that can be sprayed on the throat's back. Then this certain procedure can be followed

- **Endoscope Insertion:** The procedure for inserting an endoscope involves passing a short, flexible tube with a camera into your mouth, down to your oesophagus, into the stomach, then passes through the pylorus into the duodenum (the first section of

the small intestine), where the ampulla of VATER (common opening of the bile duct and pancreatic duct) is situated.

- **Visualization:** The endoscope's camera enables the physician to see the region where the pancreatic and bile ducts enter the duodenum.
- **Contrast Injection:** A tiny tube is used to inject a contrast dye into the ducts. These ducts are imaged with X-rays, which also highlight any anomalies.
- **Biopsy Or Treatment:** During the ERCP, the doctor or radiologist may, take tissue samples (biopsy) or administer therapies if necessary. They could undertake therapeutic treatments like inserting stents or removing gallstones.
- **Monitoring:** Your vital signs, such as heart rate, blood pressure, and oxygen levels, will be continuously monitored during the procedure.
- **Completion:** The endoscope is carefully removed after the relevant diagnostic or therapeutic steps have been performed (John Hopkins University, 2023).

## 20.10 POST ERCP CARE

There are some unique post-procedure care and precautions after having an ERCP. The patient is monitored every 1-2 hours until the sedative effect wears off, and vital signs are also checked every half hour.

## 20.11 CONCLUSION

Endoscopic Retrograde Cholangiopancreatography, in conclusion, is a vital procedure that is at the vanguard of modern medicine's diagnostic and therapeutic arsenal. It provides a thorough view of the biliary and pancreatic systems, allowing for prompt treatments and the management of a wide range of disorders. The value of ERCP resides in its capacity to diagnose and treat at the same time, enhancing the quality of life for countless people and providing hope to those suffering by these complicated conditions. Its ongoing refining and technological advancements ensure that it remains a light of hope in the field of medical science.

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