# Single-Step Laparoendoscopic Surgical Treatment for Cholecystocholedocholithiasis: A New Classification and Proposed Algorithm

*Manuel E. Moros, MD; David Moros, MD; Leonardo Carrascal, MD; Oscar Guevara, MD; Deivis López, MD; David Figueroa, MD; Oscar G. Villamizar, MD; Ramón Duran, MD.*

*Clínica Gastroquirúrgica, Cúcuta, Colombia*

*Clínica Santa Ana, Cúcuta, Colombia*

*Universidad Nacional de Colombia, Bogotá, Colombia*

## Objective

We present our local proposal of a diagnostic algorithm for cholecystocholedocholithiasis (CC), based on structural characterization with magnetic resonance cholangiopancreatography (MRCP), along with a new classification for a single-step laparoendoscopic surgical management.

## Methods

The diagnostic algorithm proposes an alternative approach to diagnostic evaluation of CC, tailored to local resource availability: **Patients categorized as intermediate and high risk for CC undergo immediate MRCP**.

MRCP offers precise information to the surgeon for confirming or excluding CC. When confirmed, CC is divided into four categories, distinguished by the specific anatomical involvement of the biliary tree.

**Type I:** CC with uncomplicated common bile duct (CBD) stones.

**Type II:** CC with complicated CBD stones.

**Type III:** Hepatobiliary choledocholithiasis characterized by dilation > 2 cm of common hepatic duct, accompanied by distal stenosis that disrupts bile flow.

**Type IV:** Intrahepatic biliary lithiasis with structural damage of the biliary tree.

## Treatment Options Based on Presentation Types

**Type 1:**

- Laparoscopic cholecystectomy (LC) with intraoperative endoscopic retrograde cholangiopancreatography (ERCP): Rendezvous technique.
- LC with transcystic laparoscopic CBD exploration +/- cholangioscopy.
- LC with transductal laparoscopic CBD exploration +/- cholangioscopy.

**Type 2:**

- LC with transcystic laparoscopic CBD exploration +/- cholangioscopy +/- laser lithotripsy.
- LC with transductal laparoscopic CBD exploration, stones instrumentation, and primary closure of the bile duct.

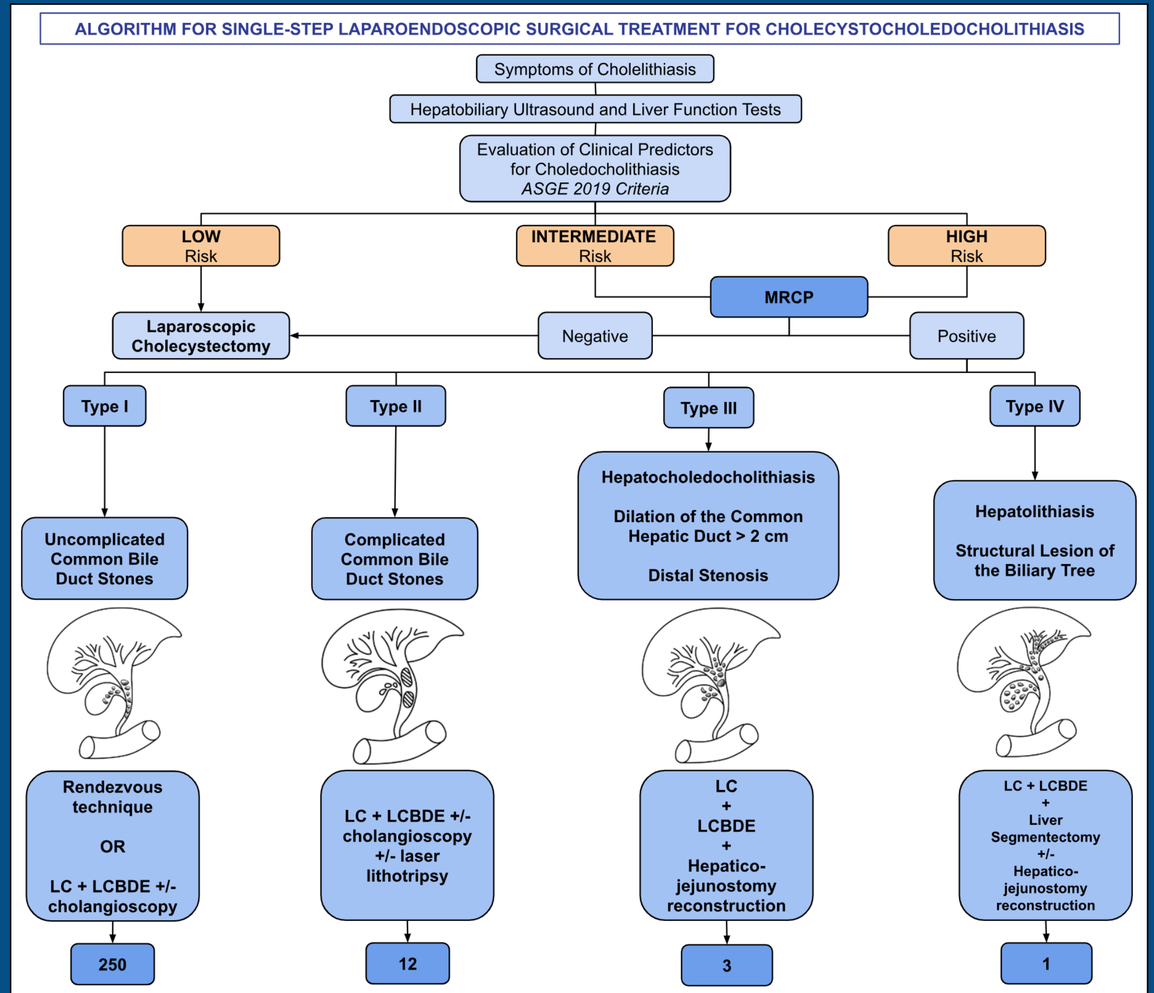



***Figure 1. Algorithm for single-step laparoendoscopic surgical treatment for cholecystocholedocholithiasis***

**Type 3:**

- LC with transcystic or transductal laparoscopic CBD exploration and laparoscopic Roux-en-Y hepaticojejunostomy reconstruction.

**Type 4:**

- LC with transcystic or transductal laparoscopic CBD exploration and laparoscopic segmentectomy of the liver +/- laparoscopic Roux-en-Y hepaticojejunostomy reconstruction.

## Preliminary Results

From 2012 to 2022, 268 patients with CC were included in our study.

Classification based on MRCP findings: Type 1: 250 (93%), Type 2: 12 (5%), Type 3: 3 (1.5%), Type 4: 1 (0.5%)

Mean age was 58 years (SD ± 2.5), median operative time of 115 minutes (IQR: 90, 300), median length of hospital stay of 1.9 days (IQR:1, 7).

Single-step laparoscopic surgery successfully resolved obstruction in 93% of patients, with an overall morbidity of 5.5% and an operative mortality of 0.8%.

## Conclusions and Future Directions

- Local availability of MRCP provides valuable preoperative information, enabling the characterization of intrahepatic and extrahepatic biliary tree involvement. This allows for the planning of a high-precision, single-step laparoendoscopic treatment approach.
- Single-step laparoendoscopic approach for the treatment of CC is feasible, safe, and reproducible, with results comparable to the standard two-stage approach.
- This approach enhances surgeons' capability in managing CC, encouraging the proficiency in endoscopic skills within hybrid operating rooms.
- The algorithm addresses all potential scenarios of biliary tree involvement caused by stones and provides a minimal invasive solution for resolution by surgeons trained in advanced laparoscopic and endoscopic surgery.