Robot-assisted minimally invasive common bile duct exploration: a Canadian first

Shiva Jayaraman, MD; Ward Davies, MD; Christopher M. Schlachta, MD CM

The first published report of a robot-assisted common bile duct exploration appeared in 2003. According to Intuitive Surgical, Inc., the manufacturer of the da Vinci system, a total of 3 robot-assisted common bile duct explorations have since been performed worldwide. As far as we can ascertain, this case constitutes the second published report and the first Canadian case.

Case report

An 84-year-old woman with significant medical comorbidities presented with obstructive jaundice and radiographic evidence of choledocholithiasis. Endoscopic retrograde cholangiopancreatography (ERCP) was attempted but was unsuccessful owing to a duodenal diverticulum. The patient was referred for laparoscopic common bile duct exploration. After consultation by the Minimally Invasive and Robotic Surgery service, it was determined that, with a common duct stone measuring 2 cm in greatest dimension, a laparoscopic transcystic approach would not be feasible. A pilot experience of 18 robot-assisted cholecystectomies had been completed, so we obtained consent for a da Vinci-assisted common bile duct exploration.

The surgical procedure was performed successfully. Five operating ports were used: a 12-mm camera port, two 8-mm da Vinci ports, a 12-mm accessory and retracting port and a 5-mm port for cholangiography and choledochoscopy. After dissecting the Triangle of Calot, we carried out a transcystic cholangiography under fluoroscopy. This demonstrated several biliary calculi. The porta hepatis was exposed, and a 2-cm anterior choledochotomy was performed. Choledochoscopy and basket extraction of the multiple calculi and sludge were required (Fig. 1). We performed a full choledochotomy from the ampulla of Vater to

FIG. 1. Choledochoscopy basket extraction of common-bile-duct stones. The insertion of the scope into the common bile duct was greatly facilitated by the dexterity provided by the robot.

FIG. 2. Suture closure of the choledochotomy and insertion of a T-tube.
the secondary bile ducts. We inserted a T-tube and closed the choledochotomy around it with 5–0 polydioxanone sutures (Fig. 2). A postplacement T-tube cholangiogram demonstrated no residual stones and free flow of contrast into the duodenum. The patient was discharged on the first postoperative day. T-tube cholangiography and tube removal were scheduled for 4 weeks later.

**Discussion**

There are several published reports of successful abdominal operations using robotic devices. The robot eliminates surgeon tremor and allows 3-dimensional visualization of the operative environment. However, the main advantage of the da Vinci surgical system is the dexterity afforded by the Endowrist design, which allows precise control of technically challenging tasks such as fine suturing. These benefits were realized by the relative ease with which we could dissect around the bile duct, perform the choledochotomy and suture the bile duct. Similarly, choledochoscopy was greatly facilitated by robot-guided introduction and manipulation in the duct.

The role of robot assistance in general surgery continues to increase as computer assistance in the form of mechatronics and image guidance evolves. This case highlights the advantages of robot-assisted minimally invasive surgery. An elderly patient with multiple comorbidities was discharged home 1 day after a major operation and experienced no complications. The place of robot assistance will continue to be studied because it may pose a viable alternative treatment of choledocholithiasis for patients with contraindications to ERCP. Similarly, the technical advantages and control conferred by the da Vinci system make common bile duct exploration more facile than standard laparoscopic techniques. We are performing a series of cases to further study the efficacy and role of this novel approach.

**Competing interests:** None declared.

**References**