

Minimally Invasive Hepatobiliary Surgery

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KEYWORDS

- Hepatobiliary disease • Laparoscopy • Choledochal cyst excision
- Hepaticoduodenostomy • Hepaticojejunostomy • Kasai procedure
- Cholecystectomy • Hepatic biopsy

KEY POINTS

- Improvements in the available instrumentation and sealing devices, have made pediatric surgeons able to tackle numerous types of demanding procedures laparoscopically.
- Comparative studies and large-scale case series that confirm the advantages of laparoscopy in children with hepatobiliary diseases are scarce.
- Current data indicates that minimally invasive techniques can be recommended for the resection of choledochal cysts and for cholecystectomy.
- More data are required before a recommendation on the use of minimally invasive techniques for biliary atresia and hepatic tumors can be presented.

INTRODUCTION

Two decades ago, surgery for complex biliary conditions in infants and children required an upper abdominal or subcostal incision. In more recent years, as a result of improvements in the instrumentation and sealing devices that are available, pediatric surgeons have been able to tackle numerous types of demanding procedures laparoscopically. These procedures include the resection of choledochal cysts and hepatopertoenterostomy for biliary atresia.

Numerous publications and book chapters have focused on the technical aspects of minimally invasive surgery in infants and children with hepatobiliary diseases. However, comparative studies and large-scale case series that confirm the advantages of laparoscopy in these patients are scarce. As a consequence, there is an ongoing debate as to the advantages and disadvantages of the use of minimally invasive

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techniques for various biliary conditions and an international consensus on the pros and cons of such surgical approaches has yet to be reached. The discussion has become further complicated following the introduction of single-incision laparoscopic surgery and the use of robotics.

This article presents an overview of the current literature that describes laparoscopic and robotic surgery in pediatric patients with choledochal cyst, biliary atresia, gallbladder diseases, and hepatobiliary malignancies. Comparative studies and case series published in the English language in peer-reviewed journals accessible via PubMed were analyzed. Reports on adult patients were excluded. The evidence levels of the publications that met the inclusion criteria were determined using the Oxford Score.¹

CHOLEDOCHAL CYST

Choledochal cysts are diagnosed in infancy and childhood either as an incidental ultrasonographical finding or in the course of investigating abdominal symptoms. Occasionally, the diagnosis is established prenatally.² The first case report of a child undergoing laparoscopic resection of choledochal cyst and hepaticojunostomy was published in 1995.³

In their systematic review and meta-analysis, Zhen and colleagues⁴ recently identified 7 studies that compared children who had undergone laparoscopic choledochal cyst excision ($n = 611$) with those who had undergone open ($n = 797$) choledochal cyst excision. The data included in all 7 studies had been collected retrospectively (Oxford evidence-based medicine level IIA). The review confirmed that laparoscopically operated patients underwent a longer operation (7 studies), stayed in hospital for a shorter period (5 studies), and recovered their bowel function faster (3 studies) than those who had undergone open surgery. There were no cases of pancreatitis in laparoscopically operated patients versus 8 such cases following open surgery. The relative risk of intraoperative bleeding was also higher with higher blood transfusion rates in open surgery than laparoscopic (3 studies), but the rate of bile leaks was similar in both groups. Another recent meta-analysis, by Shen and colleagues,⁵ which included 1016 patients, confirmed these results. Recently, Yu and colleagues⁶ and Ng and colleagues⁷ performed comparative studies that showed the safety and feasibility of laparoscopic choledochal cyst excision and they concluded that it had a low complication rate (**Table 1**).

The authors additionally analyzed case studies that examined the use of laparoscopy for choledochal cysts in infants and children that were published on MEDLINE before February 2017. Only series that dealt with children and involved more than 15 patients were included in this review. Seven reports were identified, 6 of which were retrospective (Oxford evidence-based medicine level IIIB) and 1 prospective case series (Oxford evidence-based medicine level IIB). Altogether, 1266 patients were included (**Table 2**).⁸⁻¹⁴ These studies confirmed that laparoscopic surgery offers excellent feasibility (see **Table 2**). The conversion rate was 5.2% (16 of 310 procedures). Intraoperative complications were reported in 44 out of 275 patients, and there was no mortality. Furthermore, the mean or median operation time was long and, in 1 study, was more than 7 hours.^{6,7}

Note that the level of evidence on the postulated equivalent or better outcomes of laparoscopic versus open surgery is considerably low (Oxford evidence-based medicine level IIIB). Patient and surgeon selection bias cannot be excluded. Therefore, a randomized controlled trial would be required before any general recommendation can be given. In addition, these operations have generally been performed in centers of excellence, and the complication rate associated with general use of the technique remains unclear.

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