

Current Status of Surgical Treatment of Biliary Diseases in Elderly Patients in China

Zong-Ming Zhang¹, Jia-Hong Dong², Fang-Cai Lin¹, Qiu-Sheng Wang³, Zhi Xu⁴, Xiao-Dong He⁵, Chong Zhang¹, Zhuo Liu¹, Li-Min Liu¹, Hai Deng¹, Hong-Wei Yu¹, Bai-Jiang Wan¹, Ming-Wen Zhu¹, Hai-Yan Yang¹, Meng-Meng Song¹, Yue Zhao¹

¹Department of General Surgery, Beijing Electric Power Hospital, State Grid Corporation of China, Capital Medical University, Beijing 100073, China

²Department of Hepatopancreatobiliary Surgery, Beijing Tsinghua Changgung Hospital, Tsinghua University, Beijing 102218, China

³Department of General Surgery, Peking University People's Hospital, Beijing 100044, China

⁴Department of General Surgery, Peking University Third Hospital, Beijing 100191, China

⁵Department of General Surgery, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing 100730, China

To the Editor: According to the Chinese National Bureau of Statistics in October 1999, the population aged ≥ 60 years reached 10% of the total population, indicating that China was entering into an aging society. By the end of 2017, the population aged ≥ 60 years was 240,900,000, accounting for 17.3% of the total population. With the rapidly aging population, biliary diseases in elderly patients have become frequent in China, with a morbidity rate of 8–11%. Due to lowered stress response, defense ability, and immunity, biliary diseases in elderly patients are characterized by an increase in coexisting diseases, rapid progression, poor surgical tolerance, high surgical risk, frequent postoperative complications, and high mortality. Thus, it is important to explore effective treatment methods in elderly patients with biliary diseases. Based on our clinical experience in the treatment of elderly patients with biliary diseases,^[1] along with previous studies, this report presented the current status of surgical treatment of elderly patients with biliary diseases in China.^[2]

With the rapid advance of biomedical science and information technology, precision hepatobiliary surgery has developed with new concepts and techniques to achieve complete resection of the lesion while maintaining the structural integrity of the residual hepatobiliary system and maximum hepatic functional volume and to control intraoperative bleeding and systemic traumatic invasion, thus leading to an optimal outcome. The establishment of the techniques for precision biliary surgery has resolved the key technical problems in the surgical treatment of intrahepatic bile duct diseases and has enabled biliary surgery from the extrahepatic and hepatic portal to intrahepatic bile ducts. Precision treatment of intrahepatic bile duct lesions can be carried out at the level of the hepatic segment. This marks the beginning of a “segment” era in biliary surgery.^[3]

Compared with traditional biliary surgery, precision biliary surgery in the segment era was safer, more efficient, and minimally invasive. The strategy for modern precision biliary surgery is to maximize the resection of target lesions, protection of the remaining liver, and reduction of surgical trauma. The technical features of precision

biliary surgery are fully visible, quantifiable, and controllable. Visualization makes the internal physiological structure of the intrahepatic bile duct visible and thus greatly improves the success rate of the operation. Quantifiable techniques can be used to quantify the boundary of the lesion, so as to precisely excise the lesions. Controllable techniques can remove the lesion completely, while protecting the normal tissue, without damage. A study retrospectively analyzed the intraoperative and postoperative indexes in 132 patients undergoing precise hepatectomy and 52 patients undergoing irregular hepatectomy and concluded that precise hepatectomy was better than irregular hepatectomy for the treatment of hepatolithiasis. Another study compared the surgical data of hilar cholangiocarcinoma in 18 cases with preoperative three-dimensional (3D) reconstruction and 20 patients without preoperative 3D reconstruction and found that 3D visualization could accurately complete the preoperative assessment of hilar cholangiocarcinoma. It was reported that the liver 3D visualization model clearly showed intrahepatic ducts, size and location of tumors, and relationship between tumor and intrahepatic pipeline. The 3D printing model accomplished real-time intraoperative navigation with a strong stereoscopic visualization and concluded that 3D visualization was valuable for optimizing the surgical strategy preoperatively and navigating the operation accurately in real time, which might improve the precision of the maneuvers and success rate.

Cholelithiasis is a common and frequently occurring disease in China. The incidence of simple cholecystolithiasis is 7–10%.

Address for correspondence: Prof. Zong-Ming Zhang,

Department of General Surgery, Beijing Electric Power Hospital, State Grid Corporation of China, Capital Medical University, No. 1, Taipingqiaoxili, Fengtai, Beijing 100073, China
E-Mail: zhangzongming@mail.tsinghua.edu.cn

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

© 2018 Chinese Medical Journal | Produced by Wolters Kluwer - Medknow

Access this article online

Quick Response Code:



Website:
www.cmj.org

DOI:
10.4103/0366-6999.237405

Received: 09-04-2018 Edited by: Xin Chen

How to cite this article: Zhang ZM, Dong JH, Lin FC, Wang QS, Xu Z, He XD, Zhang C, Liu Z, Liu LM, Deng H, Yu HW, Wan BJ, Zhu MW, Yang HY, Song MM, Zhao Y. Current Status of Surgical Treatment of Biliary Diseases in Elderly Patients in China. Chin Med J 2018;131:1873-6.

Cholelithiasis is encountered in 10–15% of patients with cholelithiasis. Although hepatolithiasis has significantly decreased in incidence, the absolute number and rate of complications are high, which are still the key issues in biliary surgery and the main causes of death in benign biliary disease in China. The strategies for minimally invasive treatment for intrahepatic and extrahepatic bile duct stones can be summarized as follows:^[4] (1) For intrahepatic bile duct stones, according to the distribution of the stones, stenosis of the biliary tract, or whether hepatic fibrosis and atrophy are combined, laparoscopic liver resection, laparoscopic common bile duct exploration (LCBDE), or percutaneous transhepatic cholangioscopy may be chosen. (2) For concomitant gallstones and common bile duct stones, if the common bile duct is not expanded (diameter <0.8 cm), and the common bile duct stones are small (diameter <1.5 cm), laparoscopic cholecystectomy (LC) combined with endoscopic sphincterotomy (EST) or endoscopic papillary balloon dilatation and LC plus laparoscopic transcystic common bile duct exploration (LTCBDE) can be used. If the common bile duct is expanded (diameter >0.8 cm) and common bile duct stones are large (diameter >1.5 cm), LC plus LCBDE and T tube drainage or primary suture should be selected. (3) For concomitant intrahepatic and extrahepatic bile duct stones, laparoscopic liver resection, choledochoscopy through the hepatic duct orifice on the hepatectomy cross-section, LCBDE, EST, or percutaneous transhepatic cholangioscopic lithotripsy could be used.

It was reported that for patients with choledocholithiasis and gallstones who underwent single-step treatment combining LTCBDE and LC, there was no significant difference in the success rate of LTCBDE in the elderly group (age ≥70 years) compared with the younger group (<70 years), and the rates of postoperative complications at discharge were similar between the groups, which indicated that LTCBDE in elderly patients was as effective and safe as in younger patients. A study found that LCBDE with primary suture was safe and feasible, reduced the cost of treatment, shortened hospitalization, and improved quality of life, with improved recovery of digestive and liver function, which reflected the superiority of minimally invasive surgery. For choledocholithiasis in patients with abdominal adhesions, LCBDE was safe and feasible for patients with choledocholithiasis with mild and moderate abdominal adhesions.

Although most researchers believe that elderly patients with acute calculous cholecystitis (ACC) should undergo LC at an early stage and suggest that the best operative opportunity is within 72 h of symptom onset, there is no unified standard for this. Beyond 72 h from symptom onset, if the operation indication is definite, and there are no surgical contraindications, in order to avoid gallbladder gangrene, perforation, toxic shock, and even death, the only effective life-saving measure is to remove the gallbladder and eradicate the cause of the disease.

If ACC in elderly patients is diagnosed definitively, coexistent disease is actively controlled, and infection of other organs such as the lungs and urinary system is excluded, the following six parameters are proposed as operative indications: (1) body temperature ≥38.5°C; (2) peripheral blood leukocyte count ≥15 × 10⁹/L; (3) neutrophil ratio ≥85%; (4) highly sensitive C-reactive protein ≥100 mg/L; (5) B-ultrasonography shows the double-layer structure of the gallbladder wall; and (6) computed tomography or magnetic resonance imaging shows pericholecystic or perihepatic fluid. As long as one of the six parameters is present, regardless of whether the onset time is early (within 72 h) or late (>72 h), and if there is no history of upper abdominal surgery,

and contraindications of coexisting cardiac, cerebral, or pulmonary diseases are excluded, LC should be performed.

For the choice of surgical approach for elderly ACC patients, it is necessary to avoid a long postoperative course, reoperation after conservative surgery, and radical surgery; all of which increase the risk of surgery. Taking acute gangrenous cholecystitis as an example, conservative surgery such as cholecystostomy is theoretically suitable for patients with poor general condition, critical illness, and abnormal intraoperative blood pressure. However, cholecystostomy should be avoided, although percutaneous cholecystostomy tube (PCT) placement is considered a safe alternative to cholecystectomy for the treatment of ACC. Data regarding long-term outcomes following PCT are limited because the high rate of tube dysfunction requiring frequent re-intervention and interval cholecystectomy is associated with a decreased likelihood of recurrent biliary events and increased likelihood of successful laparoscopic completion. Radical surgery such as LC should be selected with caution, if the patients have poor heart and lung function, especially emphysema. Even if LC is performed, intraoperative pneumoperitoneum pressure should also be controlled at <10 mmHg, to reduce the influence of high pressure on heart and lung function. When necessary, open or laparoscopic subtotal cholecystectomy and the residual gallbladder mucosa cauterization should be performed in order to prevent the excessive bleeding of gallbladder bed and avoid the prolonged operation time.

Our clinical practice has proved that LC in elderly ACC patients is safe and feasible. The key is to determine reasonable operative indications, proficiency of surgical skills for LC, and improvement of perioperative treatment, so as to improve the therapeutic efficacy of LC in elderly ACC patients. As for the upper age limit for LC, there is no definite consensus. It is reported that the oldest patient to undergo LC was 96 years abroad and 102 years in China. We had an ACC patient aged 96 years who successfully completed LC and recovered smoothly.

Although various traditional methods of biliary surgery are being widely used in clinical practice, less importance has been attached to protecting the function of the sphincter of Oddi. Frequent reflux cholangitis after choledochojunostomy, high postoperative recurrence of intrahepatic bile duct stones, frequent postoperative complications after hepatic pancreateoduodenectomy, and other pertinent problems have not yet been resolved. Therefore, it is necessary to improve operative methods, especially for elderly patients with biliary diseases, to improve the long-term efficacy of biliary surgery. For this reason, the following attempts have been made in China in recent years.

As is well known, for the treatment of choledocholithiasis, although EST and lithotomy may achieve good therapeutic effects, function of the sphincter of Oddi is damaged, resulting in postoperative reflux of duodenal fluid and bacterial contamination in bile, increasing the risks of recurrent common bile duct stones, reflux cholangitis, and even cholangiocarcinoma. Therefore, physicians should pay more attention to protecting the structure and function of the sphincter of Oddi. It was reported that prophylactic EST is not recommended in patients with transient common bile duct obstruction. Some studies suggested that patients with iatrogenic injury of the sphincter of Oddi should be treated with transduodenal sphincteroplasty to restore the structural integrity of the sphincter and reduce biliopancreatic duct complications secondary to loss of function.

Iatrogenic bile duct injury, to some extent, is a perpetual subject. It can occur in hospitals at all levels and in patients of all ages,

in 80% of cholecystectomies, especially LC. In addition to operative mistakes, it can be caused by anatomical variations, local pathological factors, and is related to heat and ischemic injury. Heat injury is usually caused by the anatomical or electrocoagulation hemostasis with an electric knife in the trigonometric area of the gallbladder, leading to thermal injury and inflammation of the bile duct wall caused by electrothermal conduction, resulting in bile duct stricture. Ischemic injury results from excessive surgical dissection of tissue around the bile duct, leading to injury of the vascular plexus around the bile duct, resulting in biliary stricture. Therefore, the repair of iatrogenic bile duct injury is important. At present, the most commonly used repair operation is biliary-enteric Roux-en-Y anastomosis, which is also recognized as the most effective method for repairing the bile duct, but the incidence of postoperative reflux cholangitis or other complications is high and difficult to avoid. In 1986, repairing traumatic bile duct stricture using an autologous, vascularized pedicled flap was proposed to preserve the function of the sphincter of Oddi. Many repair methods were attempted, such as peritoneal wall, umbilical vein valve, jejunal valve, gallbladder flap, and stomach flap, but there have been few clinical applications, and the long-term efficacy needs to be verified. Recently, a study reported that 38 patients with traumatic bile duct strictures underwent repair using an autologous, vascularized pedicled flap of stomach tissue and concluded that an autologous, vascularized pedicled flap of stomach tissue was safe and reliable for repair of traumatic bile duct strictures, and good long-term outcomes were achieved.

Hepatolithiasis is a common disease in Southeast Asia and is particularly prevalent in China. It is usually complicated by recurrent cholangitis, pancreatitis, and liver abscess, and it even leads to secondary biliary cirrhosis and cholangiocarcinoma. The major difficulties of traditional therapies are serious trauma and high incidence of residual and recurrent stones. In China, many investigators and surgeons have been exploring this issue for more than half a century. The famous basic principle of hepatolithiasis management, "clearance of stones, correction of strictures, removal of hepatobiliary lesions, and restoration of bile drainage", has been widely acknowledged in China and around the world. Minimally invasive therapy of hepatolithiasis is currently a hot research topic. However, because of division of the stone lesions, number of affected bile ducts, damage of the liver parenchyma, and different stages and complications of the disease, minimally invasive therapy of hepatolithiasis has always been a difficult clinical problem. In recent years, preservation of the sphincter of Oddi using hepatico-subcutaneous stoma (OSPCHS) has been proposed as an optional technique for hepatolithiasis. This procedure keeps the sphincter of Oddi intact and reduces postoperative reflux cholangitis and provides recurrent patients with minimally invasive treatment to avoid major surgery. One study, involving 202 consecutive patients with hepatolithiasis who underwent OSPCHS, concluded that OSPCHS achieved excellent long-term outcomes in selected patients with hepatolithiasis. Another study reported that six patients with hepatolithiasis were treated by laparoscopic hepaticoplasty using the gallbladder as a subcutaneous tunnel. The procedures included common hepatic duct exploration, stone clearance by fiber-optic choledochoscopy, hilar bile duct hepaticoplasty with preservation of the sphincter of Oddi, anastomosis between the hilar bile duct and neck of the gallbladder, and establishment of a subcutaneous tunnel with the gallbladder. The results showed that the immediate stone clearance rate was 100%, and there was no stone recurrence or cholangitis during follow-up. They concluded that laparoscopic hepaticoplasty using the gallbladder as a subcutaneous tunnel and

preserving the sphincter of Oddi was feasible, safe, and effective for hepatolithiasis.

Gallbladder cancer (GBC) is the most common cancer of the biliary tract, comprising 80–95% of malignant biliary tract tumors. It is characterized by rapid progression, difficult early diagnosis, low R0 resection rate, and poor prognosis. In recent years, in many large medical centers in China, extended radical resection, including hepatopancreatoduodenectomy (HPD), has been performed for patients with advanced gallbladder carcinoma that invades the common bile duct, duodenum, and portal vein, but with no distant metastasis. However, because of the high rate of complications and mortality in patients treated with HPD, many surgeons still have little confidence in this procedure. The indications for HPD in patients with advanced GBC were suggested as follows: the tumor is in the late stage, but its location is limited and can be separated from the surrounding tissue; the tumor invades and involves the liver, lower part of the common bile duct, pancreas, and duodenum; and lymph node metastasis of the head of the pancreas. For those with lymph nodes metastases around the abdominal aorta, even if there is no direct invasion of the head of pancreas or duodenum, HPD can also be considered. Liver failure, pancreatic leakage, and sepsis are the most catastrophic complications after HPD. At present, the focus of HPD is its high rate of complications and morbidity, and how to reduce the trauma of the procedure and achieve the optimal clinical outcomes is still challenging for surgeons. HPD is recognized as the only cure for middle and late GBC. Although its surgical trauma, complications, and mortality rate are high, it can improve the R0 resection rate, prolong survival time, and improve quality of life, so it can be selected for use under strict surgical indications. It was suggested that, if the depth of invasion of GBC to the liver is >2 cm, and lymph node metastases in the rear of the pancreas head (13th groups) invade the descending duodenum, but without metastasis of the abdominal aorta and mesenteric lymph nodes, HPD is feasible on the premise that R0 resection may be achieved by hemihepatectomy or enlarged hemihepatectomy combined with PD. However, the palliative R1 or R2 excision, even HPD, cannot improve the prognosis of GBC patients. Preoperative biliary drainage, portal vein embolization, rational selection of pancreatic duct drainage, and intensive postoperative management are all effective measures to reduce perioperative mortality. The strict surgical indications and strict R0 resection are the key to improve the curative effect of HPD in patients with advanced GBC. Recently, a modified surgical approach of HPD, which is PD with microwave ablation of adjacent liver tissues and intraductal cooling of major bile ducts, was proposed.^[5] Two patients (including one aged 60 years) with advanced GBC who underwent this modified surgical approach had a rapid recovery with postoperative hospital stay of 14 days, with no serious complications. It was suggested that application of this approach eliminated tumor infiltration of adjacent tissues and maximally reduced postoperative morbidity and mortality. They concluded that this modified surgical method was safe and efficacious for the treatment of locally advanced GBC.

With the in-depth application of enhanced recovery after surgery (ERAS) in the perioperative period in biliary surgery, through the optimization of perioperative management based on evidence-based medicine, in order to alleviate the stress reaction of operative trauma and accelerate the recovery after operation, the efficacy of surgery for biliary diseases in elderly patients has improved.

ERAS mainly includes three aspects as follows: preoperative education and preoperative preparation; optimization of anesthesia and treatment measures during the operation; and accelerated

postoperative rehabilitation measures. A study suggested that the application of ERAS could shorten the length of hospital stay, decrease the cost of hospitalization, and reduce the incidence of postoperative complications. It was also reported that application of ERAS and measures in the perioperative period of biliary surgery reduced postoperative pain, accelerated recovery of gastrointestinal function, promoted postoperative early ambulation, reduced the incidence of postoperative complications, shortened hospital stay, decreased the cost of hospitalization, and enhanced early recovery.

Recently, Chinese Committee of Biliary Surgeons, Chinese Medical Doctor Association proposed an Expert Consensus on Enhanced Recovery after Biliary Surgery (2016 edition), to establish the general principles and specific measures to speed up rehabilitation by means of the ERAS concept and measures. This will provide specific guidance for the standardization and specification of ERAS in biliary surgery in China, to relieve stress response, reduce complications, shorten hospitalization time, decrease the risk of rehospitalization, and lower the medical cost. Due to the complexity of biliary diseases and the difficulty of biliary surgery, and low level of standardization of biliary operative methods, implementation of the expert consensus cannot be accomplished in a short time or with a unified approach. Instead, it should be put into effect in stages according to the patients' condition, condition of the medical institution, and technical skills of the biliary surgeon.

Financial support and sponsorship

This work was supported by a grant from Beijing Municipal Science and Technology Commission (No. Z171100000417056).

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Zhang ZM, Liu Z, Liu LM, Zhang C, Yu HW, Wan BJ, *et al*. Therapeutic experience of 289 elderly patients with biliary diseases. *World J Gastroenterol* 2017;23:2424-34. doi: 10.3748/wjg.v23.i13.2424.
2. Zhu JG, Guo W, Han W, Zhang ZT. Laparoscopic transcystic common bile duct exploration in the elderly is as effective and safe as in younger patients. *J Laparoendosc Adv Surg Tech A* 2017;27:48-52. doi: 10.1089/lap.2016.0116.
3. Dong JH, Feng XB, Duan WD. Stepping into the "segment" era of the biliary surgery (in Chinese). *Chin J Dig Surg* 2017;16:341-4. doi: 10.3760/cma.j.issn.1673-9752.2017.04.005.
4. Zhang Z, Liu Z, Liu L, Song M, Zhang C, Yu H, *et al*. Strategies of minimally invasive treatment for intrahepatic and extrahepatic bile duct stones. *Front Med* 2017;11:576-89. doi: 10.1007/s11684-017-0536-5.
5. Wang J, Zhang ZG, Zhang WG. A modified surgical approach of hepatopancreatoduodenectomy for advanced gallbladder cancer: Report of two cases and literature review. *J Huazhong Univ Sci Technol Med Sci* 2017;37:855-60. doi: 10.1007/s11596-017-1817-6.