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CASE REPORT

ABOUT COVER

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AIM AND SCOPE

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CASE REPORT

Robotic-assisted surgery for pediatric choledochal cyst: Case report and literature review

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Author contributions: Wang XQ and Xu SJ contributed equally to this work, and should be considered as co-first author; Wang Z and Chen DX designed the research; Xiao YH, Wang ZD, Xu J, Wang XQ and Chen DX performed the research; Wang XQ and Xu SJ analyzed the data; Wang XQ, Xu J and Chen DX wrote the manuscript.

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Abstract

Our paper describes the key surgical points of pediatric choledochocystectomy performed completely by Da Vinci robotic system. A choledochocystectomy was safely carried out for a girl at our hospital, and without any complication. Then systematic literature review was done to discuss the methods of intestine surgery and intestinal anastomosis, the use of 3rd robotic arm, the surgical safety and advantages comparing open and laparoscopic surgery. We systematically reviewed choledochocystectomy for children performed by robotic surgery. We included a total of eight domestic and foreign reports and included a total of 86 patients, whose average age was 6.3 (0.3-15.9) years; the male-to-female ratio was 1:3.5 (19:67). Seven patients experienced conversion to open surgery, and the surgery success rate was 91.9% (79/86). The average total operation time was 426 (180-520) min, the operation time on the machine was 302 (120-418) min, 11 cases used the number 3 arm, and the remaining mainly used the hitch-stitch technique to suspend the stomach wall and liver. Forty-seven patients underwent pull-through intestine and intestinal anastomosis, and 39 patients underwent complete robotic intestine surgery and intestinal anastomosis. The hospitalization time of robotic-assisted choledochocystectomy was 8.8 d. Eight patients

had biliary fistula and were all cured by conservative treatment and continuous observation. One patient had anastomotic stenosis, and one patient had wound dehiscence, both cured by surgery. Choledochocystectomy for children performed by completely robotic surgery and Roux-en-Y hepaticojejunostomy is safe and feasible. The initial experience shows that this surgical approach has a clearer field than the traditional endoscopy, and its operation is more flexible, the surgery is more accurate, and the injury is smaller. With the advancement of technology and the accumulation of surgeons' experience, robotic surgery may become a new trend in this surgical procedure.

Key words: Choledochocystectomy; Robotic surgery; Pediatrics; Congenital choledochal cysts

Core tip: Our paper describes the key surgical points of pediatric choledochocystectomy performed completely by Da Vinci robotic system. A choledochocystectomy was carried out for a girl at our hospital, then systematic literature review was done to discuss the methods of intestine surgery and intestinal anastomosis, the use of 3rd robotic arm, the surgical safety and advantages comparing open and laparoscopic surgery.

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INTRODUCTION

Congenital choledochal cysts (CCs) are disease of cystic dilatations of the bile duct. Its incidence in European countries and in the United States is 5-15 cases per million people[1-5], while it is more common in Asian countries, with an incidence up to 1000 cases per million people[6-8]. The main treatment is the complete resection of the cyst, hepaticojejunostomy and Roux-en Y anastomosis[9]. Minimally invasive treatment of CCs in children is currently the mainstream of treatment at home and abroad, including laparoscope-assisted and robotic treatment methods.

In 2006, Woo *et al*[10] reported the first robotic laparoscope-assisted type I choledochocystectomy for a 5-year-old child patient in the world. Subsequently, there were related reports[11-15]. In 2013, Geyuan Huang *et al*[16] of the Queen Mary Hospital of the University of Hong Kong of China completed the first treatment of a case of CCs with a robotic surgical system in China. In 2015, Kim *et al*[17] reported 36 cases of children's CCst treated by robotic surgery, the largest number so far. In 2016, Dr. Shaotao Tang first reported the treatment of three cases of CCs by robotic surgery in the mainland area[18].

In this paper, we report the application of the Da Vinci surgical system to treat one case of type IVa CCs completely with a robotic system. We also conduct a literature review, aiming at exploring the feasibility of adopting complete robotic surgery for the treatment of children's CCs and summarizing the key points of using this technology.

CASE REPORT

Clinical information

A 7-year-old female experienced abdominal pain without an obvious cause in May 2011, showing continuous dull pains, most of which could be self-relieved. Subsequently, the patient underwent imaging examination at our hospital, which indicated multiple intrahepatic and extrahepatic cystic dilatation of bile duct (Figure 1). It was clearly diagnosed as type IVa CCs. After the preoperative examinations, we decided to carry out robotic-assisted laparoscopic choledochocystectomy and biliary-intestinal anastomosis.

Trocar placement

With the patient in the supine position, the operation bed was in the reverse Trendelenburg position. After the anesthesia was successful, the anesthesiologists conducted internal jugular vein intubation and radial artery catheterization and placed a gastric tube and urinary catheter. Direct trocar puncture was done on the abdominal wall between the umbilicus and pubic symphysis to establish pneumoperitoneum. The pressure was 12 cmH_2O, and a 12-mm trocar and robotic lens were inserted.

Being monitored under the lens, at about the level of umbilicus, the 8-mm-diameter trocars of arm 1 and arm 2 of the robotic instrument were inserted into the left and right abdomen, respectively, and the arm 3 trocar was inserted into the right upper abdomen at the level of the axillary line (Figure 2). A 12-mm auxiliary hole was created between arm 1 and the lens. The robotic arms were placed from the end of the head and were connected.

Surgical methods

No significant ascites was detected in the abdominal cavity. The gallbladder volume was approximately 7.0 cm × 3.0 cm. The common bile duct was dilated with a diameter of 5.5 cm. Its surface showed hyperemia and edema. An electric hook was used to separate the adhesion between the gallbladder and liver. The gallbladder arteries were ligated, and the gallbladder neck was dissected all the way to the common hepatic duct. The adhesions between the outer serosal membrane of the choledochal cyst and the duodenum and the portal vein were separated. The common hepatic duct was cut transversely. The diameter of the common hepatic duct was approximately 3.2 cm. The

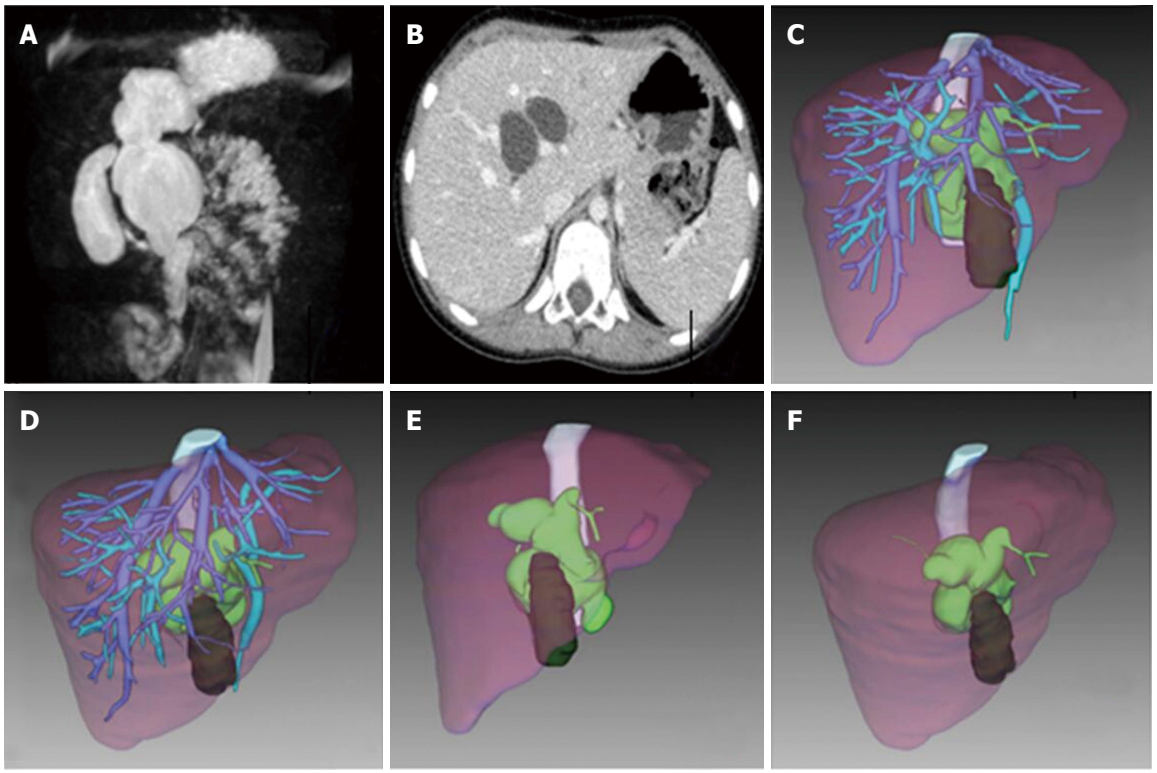

Figure 1 Preoperation images. Magnetic resonance cholangiopancreatography, euglycemic hyperinsulinemic clamp technique and 3D reconstruction. A: Preoperation MRCP shows type IVa CCs; B: Preoperation EHCT shows CCs involves intrahepatic bile duct; C: Liver and CCs 3D view from front; D: Liver and CCs 3D view from middle hepatic vein (MHV); E: Liver and CCs 3D view from front without vessels; F: Liver and CCs 3D view from middle hepatic vein (MHV) without vessels. CCS: Congenital choledochal cysts.

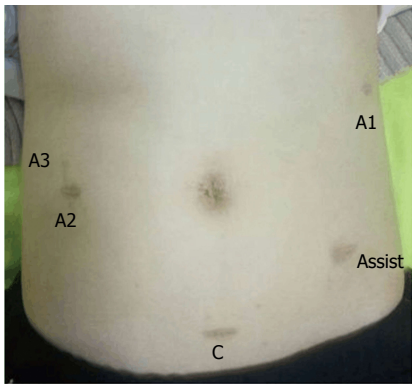

Figure 2 Postoperation images. C: Camera port; A1/2/3: Arm 1/2/3 port; Assist: Assistant/accessory port.

left and right hepatic duct openings were visible at the proximal end, and the flow of bile was unobstructed. There was no obvious stenosis. The gallbladder and the choledochal cyst to be removed were turned upside down, the common bile duct was dissected till near the head of the pancreas, and the end of the cyst was significantly narrowed with a diameter of approximately 1 cm and was sutured twice.

A stapler (EC-60) was used to cut the jejunum transversely at 15 cm from the duodenojejunal flexure, and 35 cm of the proximal end towards the hilus was saved as ascending arm. After joining the jejunum and the ascending branch by three stitches, we used a stapler to perform end-to-side anastomosis between the ascending arm and the proximal jejunum. The 3-0 absorbable suture was used for full-thickness interrupted suture of the intestinal wall, which was reinforced by interrupted suture. The ascending arm of the distal jejunum was lifted from the front of the colon to the common hepatic duct location to perform anastomosis. A 4-0 absorbable suture was used for full-thickness continuous suture of the posterior wall. Then the anterior wall was sutured, and interrupted suturing was done for seromuscular layer for reinforcement.

Physiological saline was used for rinsing. One abdominal drainage tube was placed on the lateral posterior side of the gallbladder-intestine anastomosis, which came out of the body through the puncture hole of the arm 2 trocar and was connected to a negative-pressure drainage ball. The abdominal cavity was confirmed to have no active bleeding, and the devices and gauzes were all counted. No. 3 absorbable suture was used to suture the muscular layer at each trocar location, 4-0 absorbable suture was used for interrupted suturing of subcutaneous tissue. Biological fibrin glue was used to bond the edges of the skin, and the drainage tube was properly fixed. Tissue aid was applied to the wound.

Surgical results

The surgery went smoothly. The operation time was 420 min, of which the robot operation time was 370 min. The bleeding was approximately 100 mL. There

was no perioperative blood transfusion. Two days after the operation, the gastric tube was removed, and fluid and semi-fluid food were given gradually. Two antibiotics were administered for 3 d. Seven days after operation the abdominal drainage tube was removed. The patient was discharged 9 d after the operation. No serious complications occurred. Routine pathological examination further confirmed the diagnosis of cystic dilatation of the common bile duct.

DISCUSSION

The Da Vinci Surgical System (Intuitive Surgical, Inc., Mountain View, CA, United States) was approved by the FDA in 2000 for clinical use and is currently the most widely used robotic surgical system. The Da Vinci system has a unique 3D high-definition and 10 × magnification imaging system, the separation process is more accurate, and the secondary injury can be effectively avoided. The simulation wrist with a shaking filtration function of the mechanical arm of the robot has a better dexterity and greater range of activities than the traditional laparoscopic instruments, making the anastomosis process easier and more sophisticated.

The classification of CCs

The Alonso-lej classification revised by Todani is the most widely used classification method of CCs. It divides bile duct cysts into five types. More than 90% of the bile duct cyst cases reported in the literature belong to types Ⅰ and Ⅳa (50% to 80% type Ⅰ). Type IVa bile duct cysts are more common in adult patients, and it is the nodus of the current treatment. This bile duct dilatation patient has intrahepatic and extrahepatic bile duct dilatation, belonging to type IVa of Todani's classification and type D2 of Jiahong Dong's classification. Its treatment method is still controversial. After considering the safety of the surgery, we chose complete resection of the dilated extrahepatic bile duct and had a high-position anastomosis to the greatest extent possible. According to Jiahong Dong, this type of patient should undergo perihilar resection to remove the primary bile duct, and if necessary, biliary duct plasty can be performed, followed by biliary-intestinal anastomosis. To complete this type of surgery by robotic surgery requires the accumulation of case practice, and it has a higher technical requirement.

In most type Ⅳa patients, it is more difficult to completely remove the cyst, and there is a greater chance of postoperative cholangioenterostomy stenosis. When a type Ⅳa cyst involves the left or right hepatic duct or its secondary branches, the number of secondary and tertiary bile ducts that join the cyst is higher. The diameter of the bile duct is smaller, and if gallbladder-intestine anastomosis is done individually, not only is intraoperative anastomosis difficult, but the chance of having postoperative gallbladder-intestine anastomotic stenosis is also higher, which affects the prognosis. At this time, part of the cyst wall can be kept above the cyst, and the remaining cyst wall and the jejunum can undergo large-diameter gallbladder-intestine anastomosis to reduce the occurrence of postoperative anastomotic stenosis.

In recent years, reports on cases of CCs involving intrahepatic bile ducts and the resection of the involved liver while conducting choledochocystectomy are increasing[19,20]. For patients with type Ⅳa CCs, simultaneous extrahepatic bile duct resection and partial liver resection has lower reoperation rates and stenosis rates in adults compared with children[21]. In the meantime, for adults, simultaneous liver resection can reduce the risk of postoperative canceration[22]. If hepatectomy is safe, simultaneous extrahepatic bile duct resection and partial hepatectomy may be considered. However, for child patients, considering the huge damage caused by liver resection, usually only choledochocystectomy is carried out[23]. Of course, this issue still needs in-depth research and discussion. For the type Ⅳa and Ⅴ patients with more diffuse intssrahepatic lesions and lesions involving the left and right liver, the treatment is difficult. The optimal treatment for such patients is liver transplantation.

Literature review

We systematically reviewed choledochocystectomy for children performed by robotic surgery. A total of eight domestic and foreign reports were included. A total of 86 patients were included, with an average age of 6.3 (0.3-15.9) years, and the male-to-female ratio was 1:3.5 (19:67). Seven patients underwent conversion to open surgery, and the success rate of the surgeries was 91.9% (79/86). The average total operation time was 426 (180-520) min, the operation time on the machine was 302 (120-418) minutes, 11 cases used the number 3 arm, and the remaining mainly used the hitch-stitch technique to suspend the stomach wall and liver.

Forty-seven patients used pull-through intestine and intestinal anastomosis, and 39 patients underwent complete robotic intestinal surgery and intestinal anastomosis. The hospitalization time of robotic-assisted choledochocystectomy was 8.8 d.

The complications that had clear records in the reports were biliary fistula, anastomotic stenosis, and wound dehiscence. Eight patients had biliary fistula and were all cured by conservative treatment and continuous observation. One patient had anastomotic stenosis, and one patient had wound dehiscence, both of them cured by surgery.

Some 86.1% of patients with CCs have obvious symptoms, which are mainly abdominal pain (78%), vomiting (36%), jaundice (22%), and fever (22%)[19]. Their pathophysiological basis is pancreaticobiliary malunion. Abdominal ultrasound examination and imaging examination, such as CT, MRI, and MRCP, shows a significant expansion of the extrahepatic bile duct, which is of cystic or fusiform shape. Among children with co-

ngenital dilatation of the common bile duct, the main symptoms of those with cystic dilatation of the common bile duct are jaundice and abdominal mass, while the most common manifestation of patients with fusiform dilatation of the common bile duct is abdominal pain[20].

Surgical system Choledochocystectomy performed by a robot is one of the more challenging operations in the field of pediatric surgery. This is mainly because the child's abdominal space is small, the exposure of the operation field is difficult and the distance between the operation centers of the two anastomoses is great. Therefore, each center has different choices for the child's body position, the use of the No.3 mechanical arm, and *in vivo/in vitro* intestinal anastomosis. We used the reverse Trendelenburg supine position for this child patient undergoing robotic choledochocystectomy, and some centers suggest that the overall elevation of the child can achieve a better surgical field[14].

The key point of robotic choledochocystectomy is to expose the hilar region, which can be done by five main methods: (1) Hitch-stitch suspension technique[11]: 2-0 sutures are passed through the abdominal wall under the left and right ribs, respectively. The left suture suspends the distal end of the gallbladder, while the right suture suspends the round ligament of the liver near the edge of the liver. Then the suture passes through the abdominal wall. The sutures are pulled to sufficiently expose the hilus and then are fixed outside the body; (2) Liver retractor (Nathanson retractor)[15]: An incision is made on the right upper abdomen, and a liver retractor is inserted to fully expose the surgical region; (3) Internal suspension method[14]: This refers to the suture and suspension of the round ligament of the liver, the gallbladder, and the stomach wall on the abdominal wall; (4) Double auxiliary holes method: Meehan *et al*[11] reported that a 12-mm auxiliary hole was made on the left and a 5-mm auxiliary hole was made on the right; and (5) Three-arm method: The third robotic operation arm is inserted into the right upper abdomen[14,17].

The robotic operation method used at our center is that using three operation arms. The main role of the No. 3 robot arm is to pull the liver and stomach wall and to pull the intestine while performing intestine-intestine anastomosis to achieve a better tissue exposure. Our experience has shown that it is safe and feasible to use three robotic operation arms for children, and previous studies also reached the same conclusion. A child's abdominal wall is relatively weak, and sometimes the trocar of the mechanical arm will be close to the target area. Under this situation, some centers use a suture to fix the trocar. Our experience shows that trocar fixation can be achieved without external fixation by adjusting the position of the trocar's remote center. The rule is that, when inserting the trocar that is close to the operation region (< 10 cm), the remote center at least needs to reach the width indication line to prevent the device from frequently falling out during operation and to shorten the operation time. A distant trocar only needs to reach the proximal fine indication band.

In vitro anastomosis or *in vivo* anastomosis can be used for the intestine and intestinal anastomosis. The literature review included 86 patients: 47 underwent *In vitro* anastomosis, while 39 underwent *in vivo* anastomosis. In theory, the docking process by the robotic system is more difficult and time-consuming. *In vitro* jejunum–jejunum end-to-end anastomosis can be performed first, and then robotic separation and resection of the cyst can be done to shorten the operation time. Which anastomosis method is used mainly depends on the experience of the surgeon. In a study in Korea, we found that among the cases of robotic choledochocystectomy, 13 of the first 14 patients underwent *in vitro* anastomosis, while one underwent *in vivo* anastomosis. With the accumulation of experience, they used *in vivo* anastomosis for all of their next 36 cases. When compared with the patients who underwent *in vitro* anastomosis, the total operation time did not have a significant difference. This suggests that with the accumulation of experience, the use of *in vivo* anastomosis is feasible and effective.

By reviewing the literature and summarizing our experience, we are drawn to the following conclusions regarding robotic choledochocystectomy: (1) Body position should be in the supine position and adjusted to the reverse Trendelenburg position. Based on personal preferences, the surgeon should decide whether the body is lifted; (2) *In vitro* intestine-intestine anastomosis through the umbilical incision is a relatively safe and simple method; (3) Choose the appropriate method to fully expose the hilus, common bile duct, and intestine; and (4) Making full use of the third operation arm of the robot can improve surgical efficiency and reduce operation difficulty.

Advantages and challenges of robotic surgery

As an emerging method, robotic surgery provides undoubted technical advantages over conventional laparoscopy[24]. It has 3D imaging, tremor filter, and articulated instruments[25]. With this advanced equipment, robotic surgery is superior to conventional laparoscopic surgery due to its significant improvements in visibility and manipulation[26-28]. A systematic review demonstrated robotic *vs* laparoscopic Roux-en-Y gastric bypass in morbidly obese patients identified seven relevant studies of 1686 patients[29]. There was a significantly reduced incidence of anastomotic stricture in the robotic group (POR = 0.43; 95%CI: 0.19-0.98; P = 0.04). No significant difference between robotic and laparoscopic groups for anastomotic leak, post-operative complications, operative time, and length of hospital stay is found.

Robotic surgery also faces many challenges: (1) Cost is higher. For instance, an extra 20-30 thousand RMB is needed; (2) Currently, it is still controversial how old children need to be to undergo robotic-assisted surgery; (3) The tactile feedback needs to be improved. For beginners, making knots and tissue pulling are prone to excessive force, causing adverse consequences; and (4) Indications: if the surgical effect is similar, the surgical

Table 1 Literature review of robotic-assisted pediatric surgery for congenital choledochal cysts

No.	Ref.	Year	Cases number	Age	Male/female	Total OPT (min)	Robotic time (min)	3rd arm	Roux limb	LOH (d)	Complications
1	Woo *et al*[10]	2006	1	5	0/1	440	390	Yes	Extracorporeal	4	No
2	Meehan *et al*[11]	2007	2	5.5 (2-9)	1/1	458	418	Yes	Intracorporeal	4	No
3	Akaraviputh *et al*[12]	2010	1	14	0/1	180	120	Yes	Extracorporeal	20	Bile leakage
4	Chang *et al*[14]	2012	14	5.3	2/12	570	324	Yes No	Extracorporeal 13 Intracorporeal 1	9	Conversion to open surgery 1, biliary fistula 1, stenosis 1
5	Huang *et al*[16]	2013	2	6	2/0	396	NA	NA	Extracorporeal	NA	Conversion to open surgery 1
6	Dawrant *et al*[13] and Alizai *et al*[15]	2014	27	5.4 (0.3-15.9)	7/20	479	302	NA	Extracorporeal	7	Conversion to open surgery 5, wound dehiscence 1, bile leak
7	Kim *et al*[17]	2015	36	4.8	6/30	520	300	Yes	Intracorporeal	9.2	5

NA: Not available.

difficulty is not high, and the cosmetic effect is worse than that of laparoscopy, there is some controversy about using robotic surgery for this treatment (Table 1).

Taken together, choledochocystectomy for children completely by robotic surgery and Roux-en-Y hepaticojejunostomy is safe and feasible. Our initial experience shows that this surgical approach has a clearer field than the traditional endoscopy, and its operation is more flexible, the surgery is more accurate, and the injury is smaller. With the advancement of technology and the accumulation of surgeons' experience, robotic surgery may become a new trend in this surgical procedure.

ARTICLE HIGHLIGHTS

Case characteristics

A 7-year-old female experienced abdominal pain without an obvious cause which could be self-relieved. The patient underwent imaging examination at our hospital, which indicated multiple intrahepatic and extrahepatic cystic dilatation of bile duct. It was diagnosed as type IVa congenital choledochal cysts (CCs).

Clinical diagnosis

It was clearly diagnosed as type IVa CCs.

Laboratory diagnosis

The patient underwent imaging examination at our hospital, which indicated multiple intrahepatic and extrahepatic cystic dilatation of bile duct.

Imaging diagnosis

Patient underwent an imaging examination at our hospital, which indicated multiple intrahepatic and extrahepatic cystic dilatation of bile duct.

Pathological diagnosis

The pathological examination confirmed the diagnosis of cystic dilatation of the common bile duct.

Treatment

We carried out robotic-assisted laparoscopic choledochocystectomy and biliary-intestinal anastomosis after the preoperative examinations.

Related reports

The first robotic laparoscope-assisted type I choledochocystectomy for a 5-year-old child patient in the world was reported in 2006. Subsequently, there were some related reports fellows. The Queen Mary Hospital of the University of Hong Kong in China completed the first treatment of a case of CCs with a robotic surgical system in 2013. 36 cases of children's CCs treated by robotic surgery were reported in 2015, the largest number so far. Dr. Shaotao Tang first reported the treatment of three cases of CCs by robotic surgery in the mainland area in 2016.

Term explanation

CCs are disease of cystic dilatations of the bile duct. Its incidence in European countries and United States is 5-15 cases per million people. It is more common in Asian countries with an incidence of 1000 cases per million people.

Experiences and lessons

Choledochocystectomy for children completely by robotic surgery is safe and feasible. Our initial experience shows that this surgical approach has a clearer field than traditional endoscopy, and a more flexible operation. The surgery is more accurate and the injury is smaller. Robotic surgery may become a new trend in this surgical procedure with the advancement of technology and the accumulation of surgeons' experience.

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CASE REPORT

Achievable complete remission of advanced non-small-cell lung cancer: Case report and review of the literature

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Author contributions: Yang NN, Xiong F and He Q performed the operation and collected clinical data; Guan YS helped to design, write and revise the paper.

Informed consent statement: Witten informed consent was obtained from the patient and his family before all procedures described in the report as well as for the use of the patient's clinical information and images for publication.

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Abstract

Surgery is the first choice of treatment for patients with non-small-cell lung cancer (NSCLC), but few patients can be treated surgically because of either advanced disease or poor pulmonary function. Other therapies include radiotherapy and chemotherapy, as well as complementary and alternative therapies, usually with disappointing results. Bronchial artery infusion (BAI) is a manageable and effective method for treating advanced NSCLC. Outcome is good by BAI due to its repeatability and low toxicity. Icotinib hydrochloride is a newly developed and highly specific epidermal growth factor receptor (EGFR) tyrosine kinase inhibitor and has been safely and efficiently used to treat advanced NSCLC. We herein report a 73-year-old patient with chronic cough, who was diagnosed with advanced NSCLC with the EGFR mutation of L858R substitution in exon 21, and treated with the combination of oral icotinib and BAI chemotherapy as the first-line therapy, which resulted in a satisfactory clinical outcome. Complete remission of advanced NSCLC can be achieved using the combination of oral icotinib and BAI chemotherapy.

Key words: Tyrosine kinase inhibitor; Bronchial artery infusion; Icotinib hydrochloride; Epidermal growth factor receptor; Advanced non-small-cell lung cancer

Core tip: Few patients can undergo surgery for treatment of non-small-cell lung cancer because of advanced disease or poor pulmonary function. Combin-

ation of bronchial artery infusion of anti-cancer agents and oral targeted drug is safe, tolerable, and effective for patients with epidermal growth factor receptor mutation-positive non-small-cell lung cancer (NSCLC). Complete remission of advanced NSCLC can be achieved by this combination therapy.

Yang NN, Xiong F, He Q, Guan YS. Achievable complete remission of advanced non-small-cell lung cancer: Case report and review of the literature. *World J Clin Cases* 2018; 6(7): 150-155 Available from: URL: http://www.wjgnet.com/2307-8960/full/v6/i7/150.htm DOI: http://dx.doi.org/10.12998/wjcc.v6.i7.150

INTRODUCTION

Advanced lung cancer is inoperable, and systemic chemotherapy, radiotherapy, or complementary and alternative therapies are usually unsatisfactory. Bronchial artery infusion (BAI) has become an effective treatment for patients with unresectable non-small-cell lung cancer (NSCLC). During this procedure, chemotherapeutic drugs at high concentrations are injected directly into the bronchial arteries which provide blood supply to the tumors, thus the symptoms and adverse effects caused by the anti-cancer drugs are greatly reduced. Treatment with oral targeted drug is very convenient and has been proposed as a novel therapy for patients with advanced NSCLC. As a novel targeted drug and highly specific epidermal growth factor receptor tyrosine kinase inhibitor (EGFR-TKI), icotinib hydrochloride (BPI-2009H, ConMana) has been shown to be potent and provide a survival benefit in selected patients with advanced NSCLC[1]. And it has been approved as the first-line therapy in patients with advanced NSCLC with sensitive mutation on February 22, 2011, by China Food and Drug Administration (CFDA)[2]. Oral icotinib combined with BAI chemotherapy can yield a synergetic and complementary effect in patients with advanced NSCLC. We herein describe an elderly patient with advanced NSCLC who was treated with oral icotinib hydrochloride combined with BAI chemotherapy as the first-line therapy, which resulted in a very good clinical outcome.

CASE REPORT

A 73-year-old man, who had never smoked and no relevant medical and family history, was admitted to our institution on February 24, 2014 with a 2-mo history of cough. After a series of medical examinations including laboratory examinations, Transverse computed tomography (CT) scan, percutaneous lung biopsy and genetic testing, he was diagnosed with advanced NSCLC (left lower lobe, peripheral type, $pT_4cN_0M_0$, stage ⅢA adenocarcinoma, moderate differentiation), and EGFR mutation was found with the L858R substitution in exon 21. He was not a candidate for surgical treatment because of his poor lung function and the grade 3 physical performance evaluated by Eastern Cooperative Oncology Group performance score. The patient denied radiotherapy or systemic chemotherapy, but opted for transarterial infusion chemotherapy and oral targeted drugs.

Witten informed consent was obtained from the patient before the BAI. On February 28, 2014 after sufficient preoperative preparation, the patient received left bronchial artery chemical infusion (Figure 1) with 60 mg cisplatin, 40 mg hydroxycamptothecine, and 1000 mg 5-fluorouracil, respectively. On March 4, 2014, the patient started to take icotinib hydrochloride orally (125 mg, every eight hours).

A follow-up CT scan was performed 39 d after the BAI and 34 d after the beginning of oral icotinib hydrochloride. It revealed that the tumor regressed significantly compared with that in the early image (Figure 2A and B). No adverse reaction was observed, and the objective response was evaluated to be partial response according to Response Evaluation Criteria in Solid Tumors 1.1 criteria (RECIST 1.1)[3], and the physical conditions and the quality of life of the patient were markedly improved. His physical performance was scored as grade 1.

Seven months later, another transverse CT scan showed that the tumor further regressed (Figure 2A and C), and the objective response was evaluated to be approximately complete regression (CR) as a biopsy of the lesion showed no tumor cells, but fiber scar tissue. His physical performance was scored as grade 1.

Up till now, the patient has taken oral icotinib hydrochloride for more than 48 mo, and the latest transverse CT scan on December 17, 2017 showed that the tumor tissue almost disappeared (Figure 2C and D). The objective response was evaluated to be approximately CR, and his physical performance was scored as grade 1.

DISCUSSION

Intra-arterial infusion chemotherapy has been introduced to medical treatment of tumors for more than 50 years[4]. This therapy has the potential to reduce the tumor size and to relieve symptoms, with low toxicity and good repeatability. It is especially suitable for the patients with advanced lung cancer who are intolerable to systemic chemotherapy or radiotherapy[5-8]. Therefore, it is a treatment option for advanced NSCLC patients.

The feeding arteries of locally advanced lung cancer include not only the bronchial arteries, but also various other feeding arteries, which need to be detected precisely by arterial angiography[5]. Precise and extensive angiographic examinations to detect feeding arteries are crucial, and a prerequisite for achieving positive results. A study reported that, among the feeding arteries of lung cancer, bronchial arteries showed the best response to BAI[6]. This method employs direct injection of chemotherapeutics at high concentrations into local lesions of lung cancer and only needs half of

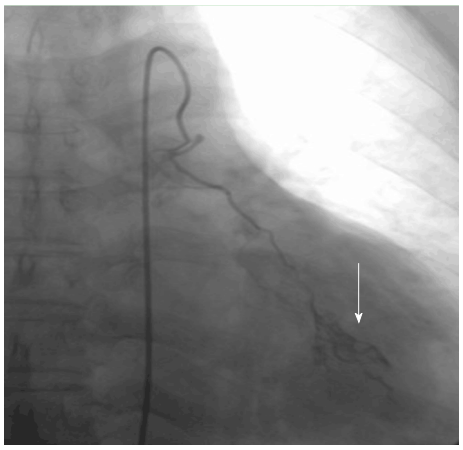

Figure 1 Selective arterial angiography showing notable contrast agent diffusion in the left lower lung, indicating blood supply to the tumor (white arrow).

the dosage required for systemic chemotherapy[9,10]. The local potency of the anti-cancer drugs administered *via* BAI to the lesion area is 2-6 times that of the same drugs administered *via* the intra-venous route[11]. Another study reported that the overall effective rate of BAI was 55.3% in patients with stage Ⅲ hilar lung cancer[9]. One study demonstrated that the BAI therapy not only reduced the tumor size but also extended patient survival, and improved quality of life of the patients[5].

BAI therapy has the following advantages: allowing doctors to utilize small dosage of anti-cancer agents, but deliver relatively large dosage of the agents into the tumor in situ with minimal systemic side effects to achieve high efficiency of local control, and this therapy is safe and feasible because the side effects are mild[5,8].

However, the efficacy of this therapy for lung cancer has not been sufficiently verified, and BAI is an invasive treatment which may lead to some severe adverse effects, such as spinal paralysis, bronchial ulcers, esophageal ulcers, hemoptysis, pulmonary toxicity and renal injury[12]. We used cisplatin, hydroxycamptothecine and 5-fluorouracil as arterial infusion chemotherapy agents. However, it is necessary to determine the appropriate dosages of the chemotherapeutic drugs for selected patients[5]. During this treatment, just like for systemic chemotherapy, the patients need to be hospitalized repeatedly, which consumes more time on taking care of the patients and increases the economic burden of the patients. These limitations prevent the wide application of BAI as a standard clinical therapy for lung cancer[5,6]. Nevertheless, in our case, the patient was hospitalized only once and received only one procedure of BAI to control rapid growth of the tumor, and the total hospitalization expense was 1728.3 US Dollar, which was markedly lower compared to the expenses for other therapeutic methods.

A current single-center retrospective study which enrolled 40 consecutive patients with advanced NSCLC who underwent transcatheter arterial chemical infusion showed that the total response rate was 32.5%, the disease control rate was 92.5%, and the mean time to tumor progression (TTP) and overall survival (OS) was 9.2 ± 1.4 and 13.1 ± 2.0 mo, respectively[13]. However, the long-term outcome and overall survival are still unclear. The beneficial effect of regional therapy on survival or disease control is usually limited when used alone.

NSCLC with mutations in the EGFR gene is a distinct subgroup of NSCLCs which is particularly sensitive to EGFR-TKIs[14,15]. The most common EGFR mutations in NSCLC were the L858R substitution in exon 21 and the deletions in exon 19. EGFR-TKI is the most effective therapy for patients with advanced EGFR-mutant NSCLC[16].

Icotinib hydrochloride is the first self-developed small molecular drug in China, and was approved by the State Food and Drug Administration of China for the treatment of locally advanced or metastatic NSCLC[1,17]. It was demonstrated that icotinib is inferior to gefitinib in terms of median progression free survival (PFS)[18]. A single-center study evaluated the efficacy of icotinib after its approval as a monotherapy for advanced NSCLC patients with EGFR mutation and patients with wild-type EGFR. The results showed that in the 36 patients with EGFR mutation, the overall response rate (ORR) and disease control rate (DCR) were 58.3% and 88.9%, respectively; while in the 13 patients with wild-type EGFR, the ORR and DCR were 7.7% and 53.8%, respectively[19]. Another study evaluated the efficacy of icotinib as the first-line treatment of pulmonary adenocarcinoma and showed that among a total of 56 patients with lung adenocarcinoma, the ORR and DCR were 46.4% (26/56) and 78.6% (46/56), respectively. In the patients with EGFR mutation, the ORR and DCR were 66.7% (12/18) and 94.4% (17/18), respectively[20].

After long-term treatment with oral targeted drugs, however, nearly all the patients will inevitably develop drug resistance with disease progression after 6-12 mo of treatment[21,22]. Therefore, more in-depth studies on optimizing combination strategies and overcoming drug resistance to icotinib are warranted[22]. One study reported that combination of EGFR-TKI therapy and systemic chemotherapy yielded disappointing results after disease progression using the first-line EGFR-TKI therapy[23]. But an ASPIRATION trial (Asian Pacific trial of Tarceva as first-line therapy in EGFR mutation) showed that, when the first disease progression occurred, continuing with EGFR-TKI therapy might be beneficial in patients with asymptomatic and slow progression[24].

Therefore, we propose the use of arterial infusion chemotherapy in combination with EGFR-TKI therapy as the first-line therapy for disease control in patients with EGFR-mutant advanced NSCLC to achieve better therapeutic effects, extend the progression-free survival (PFS) and OS, and improve quality of life of the patients. A study on EGFR-TKI therapy in combination with arterial infusion chemotherapy reported that the median

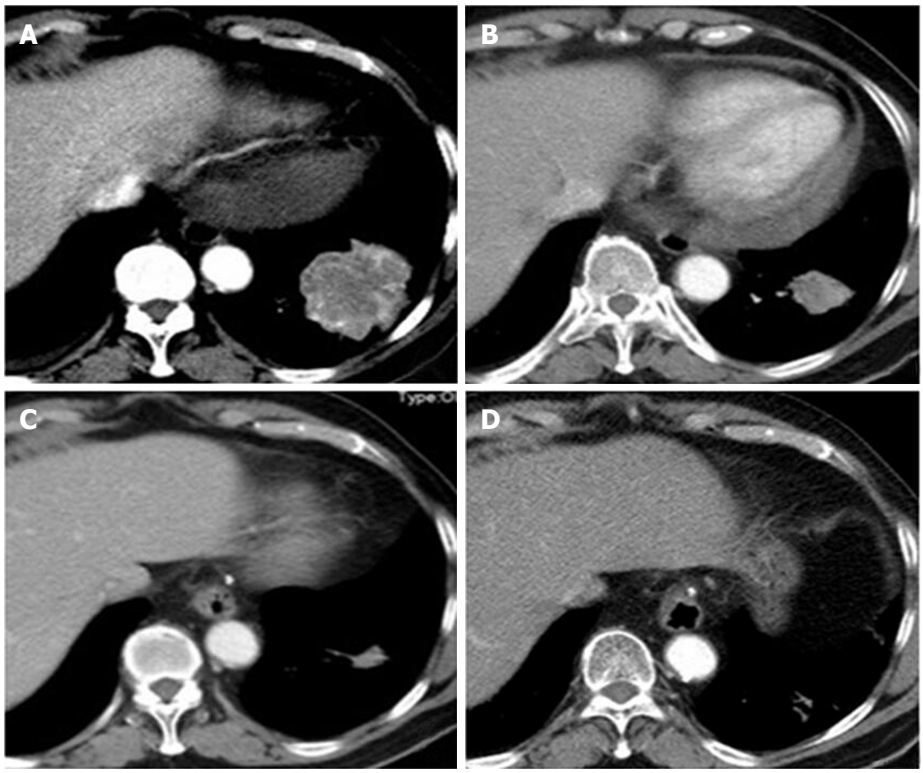

Figure 2 Transverse computed tomography scan findings of patients before and during treatment. A: Pre-treatment transverse computed tomography (CT) scan showing the tumor mass in the basal segment of the left lower lobe. The greatest dimension of the tumor measured 5.7 cm; B: One month after treatment, transverse CT scan showed significant reduction in tumor size. The greatest dimension measured 3.5 cm; C: Seven months after treatment, CT scan showed further significant reduction in tumor size. Greatest dimension was reduced to 1.8 cm; D: CT scan 45 mo after treatment showed that tumor almost disappeared (only fiber scar tissue was found by puncture biopsy).

OS was 28.6 mo (range, 24.1-32.9 mo)[25]. In our case, the patient received arterial infusion chemotherapy combined with oral icotinib therapy as the first-line therapy and no apparent adverse effects were observed during the treatment for more than 48 mo. After the first cycle of icotinib (30 d), objective tumor response was evaluated to be partial remission without any adverse effects such as diarrhoea, acneiform skin rash, paronychia, and so on[26], and physical conditions and the quality of life were markedly improved. The objective tumor response was evaluated to be almost CR, and further puncture biopsy will be obtained to confirm the therapeutic results at an appropriate time. The patient remained in good physical condition and the quality of life. Nevertheless, if possible, percutaneous ablation or minimally invasive thoracoscopic surgery may be performed to eliminate the residual fibrous scar tissue for radical cure.

Although BAI chemotherapy has the advantage of short treatment time and mild toxicity, its wide application is limited because of the requirements for sophisticated physician skills and specialized equipment. These two methods have been separately used in the treatment of NSCLC and resulted in relatively positive clinical efficacy. The combination of the two therapies is considered to generate synergetic and complementary effect in advanced NSCLC. However, the clinical efficacy of BAI chemotherapy combined with targeted therapy for the treatment of advanced NSCLC remains to be further investigated, and results from statistical analysis about the benefit of the treatment based on large-scale clinical trials are needed.

This case report suggests that the combination of oral icotinib hydrochloride and BAI chemotherapy is safe, well-tolerated and effective in Chinese patients suffering from advanced NSCLC with EGFR gene mutations. This strategy can be attempted for complete tumor remission.

ARTICLE HIGHLIGHTS

Case characteristics

A 73-year-old man who was diagnosed with advanced non-small-cell lung cancer (NSCLC), received the combination therapy of bronchial artery infusion chemotherapy and oral icotinib hydrochloride, and the objective response was evaluated to be approximately complete regression.

Clinical diagnosis

The patient was admitted to our institution with a 2-mo history of cough.

Differential diagnosis

The differential diagnosis included pulmonary tuberculosis, lobular pneunonia, or benign lung tumors.

Laboratory diagnosis

Blood test was normal. Genetic testing revealed that epidermal growth factor receptor (EGFR) mutation was found with the L858R substitution in exon 21.

Imaging diagnosis

Transverse computed tomography scan showed the tumor mass in the basal segment of the left lower lobe and the greatest dimension of the tumor measured 5.7 cm.

Pathological diagnosis

Examination of the pathologic specimen after percutaneous lung biopsy, confirmed a moderate differentiated adenocarcinoma.

Treatment

The patient received left bronchial artery chemical infusion (60 mg cisplatin, 40 mg hydroxycamptothecine, and 1000 mg 5-fluorouracil, respectively) and oral icotinib hydrochloride (125 mg, every eight hours) was initiated on postoperative day 4.

Related reports

Other studies on EGFR-TKI therapy in combination with arterial infusion chemotherapy reported that the median OS was 28.6 mo, and in our case, the patient received the treatment for more than 48 mo without apparent adverse effects.

Term explanation

Bronchial artery chemical infusion employs direct injection of chemotherapeutics at high concentrations into local lesions of lung cancer, with the potential to reduce the tumor size and to relieve symptoms, with low toxicity and good repeatability.

Experiences and lessons

This case report suggests that the combination of oral icotinib hydrochloride and BAI chemotherapy is safe, well-tolerated and effective in Chinese patients suffering from advanced NSCLC with EGFR gene mutations.

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CASE REPORT

Massive hemorrhagic ascites: A rare presentation of eosinophilic gastroenteritis

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Author contributions: Shi L conceived and coordinated the study, and participated in data collection, and manuscript writing; Jia QH participated in the study design, data collection, production of histopathological figures, and manuscript writing; Liu FJ, Guan H and Jiang ZY participated in data collection and manuscript writing.

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Abstract

According to Klein's classification system, the symptomatology of eosinophilic gastroenteritis (EG), a rare disease, differs based on the affected tissue layer. Patients with subserosal EG often have peritoneal effusion. Hemorrhagic ascites due to EG is extremely rare and has not been reported in the literature. Here, we report a 57-year-old woman with EG and massive hemorrhagic ascites. Laboratory investigations showed elevated peripheral eosinophils with significant eosinophilia (65.6%). Ultrasonography showed massive abdominal ascites. Abdominal paracentesis revealed hemorrhagic peritoneal fluid and microscopy showed predominant eosinophils. Upper gastrointestinal endoscopy revealed erosions, exudates, and mucosal rings in the duodenal mucosa; histological examination indicated eosinophilic infiltration. EG presenting with hemorrhagic ascites was diagnosed by histologic examination of eosinophilic infiltration. She was empirically treated with ketotifen 1 mg bid po with rapid resolution of ascites and a remarkable decline in peripheral eosinophil counts. Clinicians should consider the differential diagnosis of unexplained hemorrhagic ascites.

Key words: Hemorrhagic ascites; Eosinophilic infiltration; Eosinophilic gastroenteritis

Core tip: Eosinophilic gastroenteritis (EG) with ascites is extremely rare. We report a 57-year-old woman with EG and massive hemorrhagic ascites who underwent endoscopy and abdominal paracentesis. Differential dia-

gnoses included other causes of tissue eosinophilia. The patient was in good condition 1 year after drug therapy with no recurrence of ascites and gastrointestinal symptoms. To our knowledge, this is the first report of a rare case of massive hemorrhagic ascites in EG. Clinicians should consider the differential diagnosis of unexplained hemorrhagic ascites, especially in patients with gastrointestinal mucosa lesion, peripheral eosinophilia, and ascites.

Shi L, Jia QH, Liu FJ, Guan H, Jiang ZY. Massive hemorrhagic ascites: A rare presentation of eosinophilic gastroenteritis. *World J Clin Cases* 2018; 6(7): 156-160 Available from: URL: http://www.wjgnet.com/2307-8960/full/v6/i7/156.htm DOI: http://dx.doi.org/10.12998/wjcc.v6.i7.156

INTRODUCTION

Eosinophilic gastroenteritis (EG) is a rare gastrointestinal disorder characterized by eosinophilic infiltration of the gastrointestinal tract wall with various gastrointestinal manifestations[1]. Ascites due to EG is an exceedingly uncommon diagnosis in the medical literature[2]. Currently, there are no reports of massive hemorrhagic ascites due to EG in the literature. Here, we present a rare case of EG with hemorrhagic ascites and discuss the clinical characteristics and differential diagnosis.

CASE REPORT

A 57-year-old woman presented with a history of upper abdominal pain and distention for 5 mo. She had no parasitic infestations, allergic diseases, signs and symptoms of eosinophil-mediated tissue injury, and personal or family history of gynecologic malignancy. Various treatment modalities including proton pump inhibitor, antibiotics, and antispasmodics could not relieve her symptoms. The patient was transferred to our hospital for further evaluation and treatment. On physical examination, the abdomen was distended and tender with diffusely shifting dullness present and slight upper abdominal tenderness; there was no sign of rebound tenderness. Laboratory investigations showed the following values: Hgb, 119 g/dL; PLT, 343 k/mL; WBC, 12.8 k/mL; differential: segmentonuclear neutrophils, 10.0%; lymphocytes, 21.2%; monocytes, 2.7%; eosinophils, 65.6%. Serum electrolytes, coagulation studies, and thyroid tests were normal. Parasitic infestation was excluded by repeated negative stool examinations. Chest X-ray examination and ECG were negative. Abdominal ultrasonography showed massive ascites without any organ abnormalities, including the uterus and ovaries. Abdominal paracentesis revealed 1.8 L of hemorrhagic peritoneal fluid with a low serum albumin-ascitic gradient. Microscopy showed abundant white cell counts in the fluid, which were predominantly eosinophils. The ascitic fluid cytology was negative for malignancy, and cultures were negative for acid-fast bacilli, and bacterial and fungal infections. For diagnostic purposes, endoscopy of the upper gastrointestinal tract was performed, which showed erosions, exudates, and mucosal rings in the duodenal mucosa (Figure 1A). Simultaneously, the rectal mucosal exhibited erosions, hyperemia, and swelling on colonoscopy (Figure 1B). Colonoscopy examination revealed no lesions in the proximal colon and the ileum. Biopsies were taken from the duodenal lesion. Histological examination demonstrated characteristic histological findings of eosinophilic infiltrate at approximately 25 eosinophils per high power field in the duodenal mucosa (Figure 2). The patient was negative for *Helicobacter pylori* determined using 13C-urea breath testing. Unfortunately, there was no pathological examination of the rectal lesions. Computed tomography (CT) imaging also showed peritoneal fluid, but, more importantly, an accompanying local mild thickening of the right rear rectum wall (Figure 3).

Based on our findings and taking into account possible differential diagnoses, we diagnosed the patient with EG characterized by simultaneous mucosal involvement of the duodenum and serosal involvement of the rectum, which rarely presents with massive hemorrhagic ascites. Since the patient refused steroid treatment, ketotifen 1 mg bid po was administered for 1 mo and the patients rapidly responded with a complete resolution of ascites after 2 wk. Moreover, there was a remarkable decline in peripheral eosinophil counts. The patient recovered well and was free from gastrointestinal symptoms and had no recurrence of ascites during the 1-year follow-up period.

DISCUSSION

EG is a rare gastrointestinal disorder that can present with varying abdominal symptoms such as protein-losing enteropathy, luminal obstruction, and eosinophilic ascites, depending on eosinophilic infiltration into one or more layers and the affected site of the gastrointestinal tract[3]. This disorder was originally described in 1937 by Kaijser[4]. The Klein classification is widely used to classify patients with EG into three clinical forms based on the affected tissue layer: mucosal, muscle, and subserosal[5]. The mucosal form is the most common and presents with abdominal pain, nausea, and protein-losing enteropathy. The muscle form is the second most common and presents with typical symptoms of obstruction. The serosal form is the rarest of the types. Eosinophilic ascites, a high peripheral eosinophil count, and prompt response to steroid therapy are the hallmarks of the serosal form[6]. Rarely, patients can be diagnosed simultaneously with mucosal and subserosal EG.

EG diagnosis is based on the following three clinical criteria: The presence of nonspecific gastrointestinal symptoms; the presence of gastrointestinal eosinophilic infiltrates; and the exclusion of other causes of tissue eosinophilia[7]. Endoscopic findings may also include various manifestations, such as mild erythema, thickened

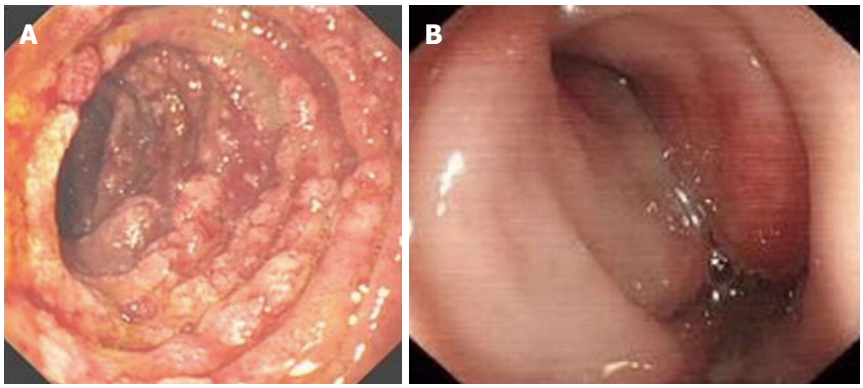

Figure 1 Endoscopic examination. A: Endoscopic view of the duodenal mucosa shows erosions, exudates, and mucosal rings; B: Endoscopic examination revealed erosions, hyperemia, and swelling of the rectal mucosal.

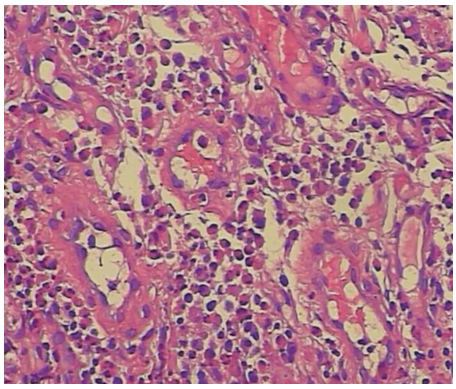

Figure 2 Histological examination demonstrates histological findings of eosinophilic infiltration of the duodenal mucosa (HE × 200).

mucosal, and frank ulceration[8,9]. The definite diagnosis of EG is established by demonstrating eosinophilic infiltration on endoscopic, laparoscopic, or laparotomic biopsies. Laparoscopic or laparotomic biopsies are only required if the disease process is confined to the muscle or subserosal layer. Endoscopic ultrasound, abdominal CT, and barium studies documenting the presence of localized or general thickening of the gastrointestinal wall, and gastric outlet obstruction, or ascites can be significant clues to the differential diagnosis of EG[10]. In the present patient, EG was diagnosed after excluding the possibilities of malignancy, parasitic disease, and autoimmune disease.

To our knowledge, this is the first report of a rare case of massive hemorrhagic ascites in EG. We believed that our patient may have the type of EG characterized by simultaneous mucosal and serosal involvement, based on the following satisfied criteria: (1) presence of gastrointestinal symptoms, such as upper abdominal pain and distention; (2) biopsies demonstrating eosinophilic infiltration of the duodenum and ascites concurrently, and CT findings with ascites and mild thickening of the rectum; and (3) no evidence of parasitic or extra-intestinal disease. Our case is distinguished from other causes of hemorrhagic ascites, such as peritoneal tuberculosis, cirrhosis with ruptured hepatocellular carcinoma (HCC), or pancreatic ascites[11] for the following reasons. There were no symptoms or evidence of tuberculosis poisoning in this patient. The ascitic fluid cultures were negative for acid-fast bacilli. Thus, tuberculous peritonitis was excluded in this case. There was no evidence of chronic liver disease in this patient. Upper gastrointestinal endoscopy did not reveal varices. The ascitic fluid cytology was negative for malignancy. Ultrasonography and CT of the abdomen only showed massive ascites without any organ abnormalities, including the liver. Cirrhosis with ruptured HCC could therefore be excluded. Normal amylase and lipase were observed in this patient. Abdominal CT did not reveal peripancreatic inflammatory changes, necrosis, and pseudocyst bulging. Pancreatic ascites was thus excluded. Finally, the diagnosis of EG presenting with hemorrhagic ascites was confirmed. She was empirically treated with ketotifen 1 mg bid po with rapid resolution of ascites. Moreover, there was a remarkable decline in peripheral eosinophil counts.

The pathophysiology of hemorrhagic ascites of EG is unknown, but the widely held belief is that it is a consequence of EG. With the poor understanding of the etiology and pathogenesis of EG, there is currently no standard treatment. However, prednisone is usually selected for management[12]. While most studies have shown up to 90% response rate to prednisone[13], other recent reports have indicated much lower success, at only 50%[14]. EG is recognized as a chronic inflammatory disorder, and most patients require ongoing treatment. It is difficult to sustain therapy with such medications as there is a risk of serious side effects including growth retardation, diabetes, and osteoporosis[15].

Many therapeutic modalities with better safety profiles have been proposed. Therapeutic options include dietary modification and steroid-sparing agents, such as leukotrienes inhibitors, mast cells stabilizers, and anti-histamines. If specific food allergens are suspected or confirmed based on allergic evaluations, dietary therapy should be considered. Dietary measures were predominantly considered in the setting of mucosal disease. The efficacy of dietary therapy in muscular and serosal EG types showed weaker linkage to food allergy[16].

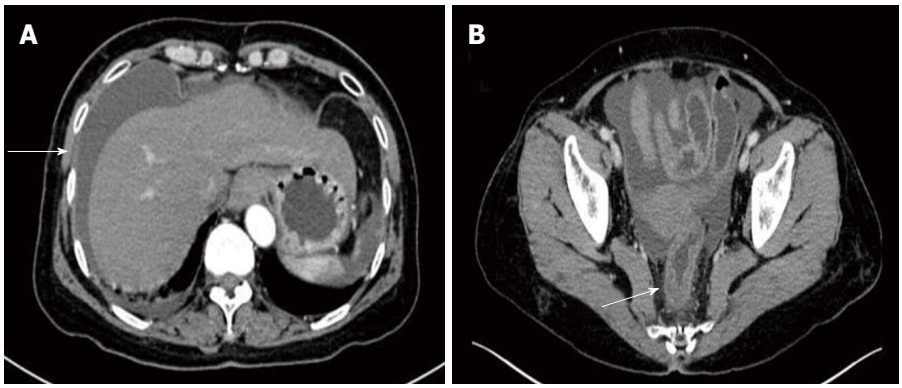

Figure 3 Radiological images of the abdomen. A: Computed tomography (CT) of the abdomen shows massive ascites (arrow); B: Abdominal CT shows accompanied local mild thickening of the right rear rectum wall (arrow).

The efficacy of montelukast is controversial for EG; it has shown success as an alternative therapy for minor diseases and as a long-term maintenance treatment[17], while it showed no efficacy in cases with severe, long-standing complicated EG[18]. The effectiveness of sodium cromoglycate in treating EG is not well established. Some patients with EG have obtained significant benefits from sodium cromoglycate[19]. However, individual reports have shown no efficacy for unknown reasons[20]. Ketotifen is a second-generation H1 class of antihistamine agent that is known to modulate the release of mast cell mediators and possibly impair eosinophil migration to target organs. There are limited evidence-based studies on ketotifen treatment in patients with EG. The few reports in the literature concerning its use in EG have shown significant clinical response in patients[21], but it showed no efficacy in some cases[22]. Individual reports of success with sodium cromoglycate and ketotifen therapy have been published[23]. Surgical treatment should only be considered in patients refractory to medical management, or stenotic lesions[24].

After the diagnosis of EG, we initially recommended steroid therapy. However, the patient refused this therapy. Thus, we chose ketotifen, a safe alternative therapy. Our patient responded satisfactorily to ketotifen. There was a marked improvement with normalization of eosinophil count and rapid decrease in ascitic fluid production. During the follow-up period of 1 year, the patient remained asymptomatic, without ascites or hypereosinophilia. We successfully treated our patient with ketotifen initially. However, the effectiveness of ketotifen in treating EG requires further validation.

In conclusion, despite the rarity of EG with massive hemorrhagic ascites, clinicians should consider the differential diagnosis of unexplained hemorrhagic ascites, especially in patients with gastrointestinal mucosa lesion, peripheral eosinophilia, and ascites.

ARTICLE HIGHLIGHTS

Case characteristics

A 57-year-old woman was admitted for upper abdominal pain and distention.

Clinical diagnosis

Physical examination revealed the abdomen was distended and tender diffusely with shifting dullness present and slight upper abdominal tenderness.

Differential diagnosis

Peritoneal tuberculosis, cirrhosis with ruptured hepatocellular carcinoma, or pancreatic ascites were considered.

Laboratory diagnosis

Laboratory investigations showed elevated peripheral eosinophil with significant eosinophilia (65.6%).

Imaging diagnosis

Ultrasonography showed massive abdominal ascites. Computed tomography imaging also showed peritoneal fluid, but, more importantly, an accompanied local mild thickening of the right rear rectum wall.

Pathological diagnosis

Histological examination demonstrated characteristic histological findings of mild eosinophilic infiltration into the duodenal mucosa.

Treatment

She was empirically treated with ketotifen 1 mg bid po.

Related reports

This is the first report of a rare case of massive hemorrhagic ascites in EG.

Term explanation

Eosinophilic gastroenteritis is a rare gastrointestinal disorder characterized by eosinophilic infiltration of the gastrointestinal tract wall with various gastrointestinal manifestations.

Experiences and lessons

Clinicians should consider the differential diagnosis of unexplained hemorrhagic ascites.

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