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CASE REPORT

Therapeutic experience of an 89-year-old high-risk patient with incarcerated cholecystolithiasis: A case report and literature review

Zong-Ming Zhang, Chong Zhang, Zhuo Liu, Li-Min Liu, Ming-Wen Zhu, Yue Zhao, Bai-Jiang Wan, Hai Deng, Hai-Yan Yang, Jia-Hong Liao, Hong-Yan Zhu, Xue Wen, Li-Li Liu, Man Wang, Xiao-Ting Ma, Miao-Miao Zhang, Jiao-Jiao Liu, Tian-Tian Liu, Niu-Niu Huang, Pei-Ying Yuan, Yu-Jiao Gao, Jing Zhao, Xi-Ai Guo, Fang Liao, Feng-Yuan Li, Xue-Ting Wang, Rui-Jiao Yuan, Fang Wu

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Abstract

BACKGROUND

The global pandemic of coronavirus disease 2019 pneumonia poses a particular challenge to the emergency surgical treatment of elderly patients with high-risk acute abdominal diseases. Elderly patients are a high-risk group for surgical treatment. If the incarceration of gallstones cannot be relieved, emergency surgery is unavoidable.

CASE SUMMARY

We report an 89-year-old male patient with acute gangrenous cholecystitis and septic shock induced by incarcerated cholecystolithiasis. He had several coexisting, high-risk underlying diseases, had a history of radical gastrectomy for gastric cancer, and was taking aspirin before the operation. Nevertheless, he underwent emergency laparoscopic cholecystectomy, with maintenance of postoperative heart and lung function, successfully recovered, and was discharged on day 8 after the operation.

CONCLUSION

Emergency surgery for elderly patients with acute abdominal disease is safe and feasible during the coronavirus disease 2019 pandemic, the key is to abide strictly

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by the hospital's epidemic prevention regulations, fully implement the epidemic prevention procedure for emergency surgery, fully prepare before the operation, accurately perform the operation, and carefully manage the patient postoperatively.

Key Words: Extremely elderly patient; Cholecystolithiasis incarceration; Acute gangrenous cholecystitis; Acute abdominal diseases; COVID-19; Case report

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Core Tip: We report the therapeutic experience of an 89-year-old high-risk patient with acute gangrenous cholecystitis and septic shock induced by incarcerated cholecystolithiasis. This paper explores the indication for emergency surgery, selection of surgical procedure, and maintenance of postoperative cardiopulmonary function, so as to provide beneficial reference for emergency surgery in elderly patients with high-risk acute abdominal diseases.

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INTRODUCTION

The global pandemic of coronavirus disease 2019 (COVID-19) pneumonia is posing a great threat to people's health and life and has seriously affected people's daily life and diagnosis and treatment of other diseases. Biliary diseases in elderly patients are mostly accompanied by coronary heart disease, hypertension, cerebral infarction, chronic bronchopulmonary emphysema, diabetes, and other basic diseases, so the risk of surgery is high[1,2]. If the incarceration of gallstones cannot be relieved timeously, it can induce acute gangrenous cholecystitis[3], septic shock, and even death. The traditional view is that laparoscopic cholecystectomy is not suitable for patients with a history of upper abdominal surgery[4]. In theory, patients who are taking single (aspirin) or dual (aspirin + clopidogrel) antiplatelet therapy for prevention of thrombosis need to stop medication for 7 d before surgery[5].

Recently, we treated an 89-year-old male patient with acute gangrenous cholecystitis and septic shock induced by incarcerated cholecystolithiasis. He had several coexisting high-risk underlying diseases, such as coronary heart disease, hypertension, cerebral infarction, and chronic bronchitis, had a history of radical gastrectomy for gastric cancer, and took aspirin for a long time until the day of admission. We here report the experience of diagnosis and treatment along with a literature review so as to provide a reference for emergency surgery and effective epidemic prevention in elderly patients with high-risk acute abdominal diseases during the COVID-19 pandemic.

CASE PRESENTATION

Chief complaints

An 89-year-old male patient (born on January 18, 1931) was admitted to our hospital on March 19, 2020, because of right upper abdominal pain and fever for 2 d.

History of present illness

The patient experienced a postprandial sudden right upper abdominal pain 2 d prior, which was a persistent blunt pain, paroxysmal colic, accompanied by radiating pain in

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the right shoulder and back, and fever (maximum temperature 38.2 °C).

History of past illness

He had a history of coronary heart disease, hypertension, cerebral infarction, open radical gastrectomy for gastric cancer for 30 years, and took aspirin for a long time until the day of admission. He had a history of chronic bronchitis for 5 years.

Personal and family history

He had no history of smoking, drinking, or familial disease. He had no contact with COVID-19 pneumonia.

Physical examination

Physical examination revealed right upper abdominal tenderness, rebound pain, positive Murphy's sign, negative ascites sign, blood pressure 86/56 mmHg, pulse 110 beats/min, and respiratory rate 28 breaths/min.

Laboratory examinations

Peripheral white blood cell count (WBC) was 16.2 × 10^9/L, and neutrophils were 92.4%. High-sensitivity C-reactive protein (Hs-CRP) was 178.01 mg/L, and serum procalcitonin was 1.31 ng/mL. Regarding liver function, alanine aminotransferase was 19 U/mL, albumin was 38.1 g/L, total bilirubin was 36.76 μmol/L, and direct bilirubin was 10.53 μmol/L. Regarding cardiac function, high-sensitivity troponin I was 0.009 ng/mL, creatine kinase isoenzyme MB was 1.6 ng/mL, myoglobin was > 1200 ng/mL, and B-type natriuretic peptide (BNP) was 348.9 pg/mL. Regarding blood gas analysis, partial pressure of oxygen was 85.1 mmHg, oxygen saturation was 96.7%, and partial pressure of carbon dioxide was 25.3 mmHg.

Imaging examinations

Chest computed tomography (CT) showed pulmonary infection. Abdominal magnetic resonance imaging (MRI) showed a thickened gallbladder wall and surrounding fluid (Figure 1A), and a high-signal shadow of about 2 cm in diameter was seen in the gallbladder neck (Figure 1B). Magnetic resonance cholangiopancreatography showed filling defect of the gallbladder neck (Figure 1C).

Pathological findings

A large amount of neutrophil infiltration, abscess, and necrosis were formed in the gallbladder wall. The mucosal epithelium of the gallbladder was necrotic and shed (Figure 1I).

FINAL DIAGNOSIS

Incarcerated cholecystolithiasis and acute gangrenous cholecystitis.

TREATMENT

After the patient was excluded by COVID-19 pneumonia screening, a single isolation ward was arranged. The major therapeutic measures included antispasmodic (anisodamine 10 mg, intravenous injection), analgesic (pethidine hydrochloride 50 mg, intramuscular injection), anti-infective (meropenem), and antishock (dopamine) medication. After 16 h, routine blood examination showed WBC 15.5 × 10^9/L, neutrophils 90.4%, Hs-CRP 190.92 mg/L, and serum procalcitonin 2.47 ng/mL.

Through active preoperative preparation, after the patient signed the "Surgical Screening Form for Hospital Response to COVID-19 Epidemic Situation"; under the premise of taking secondary level protective measures for the operating room, supplies and personnel; on the basis of the emergency plan (fibrinogen, prothrombin complex, and plasma) to deal with intraoperative hemostasis and postoperative wound bleeding caused by taking aspirin preoperatively; and according to the specified protective route, the patient was transported to the specific independent negative pressure operating room, and underwent emergency laparoscopic exploration (Figure 1D).

The patient had abdominal purulent effusion (Figure 1E), severe right upper abdominal adhesions (Figure 1F), gallbladder wall gangrene (Figure 1G), purulent bile

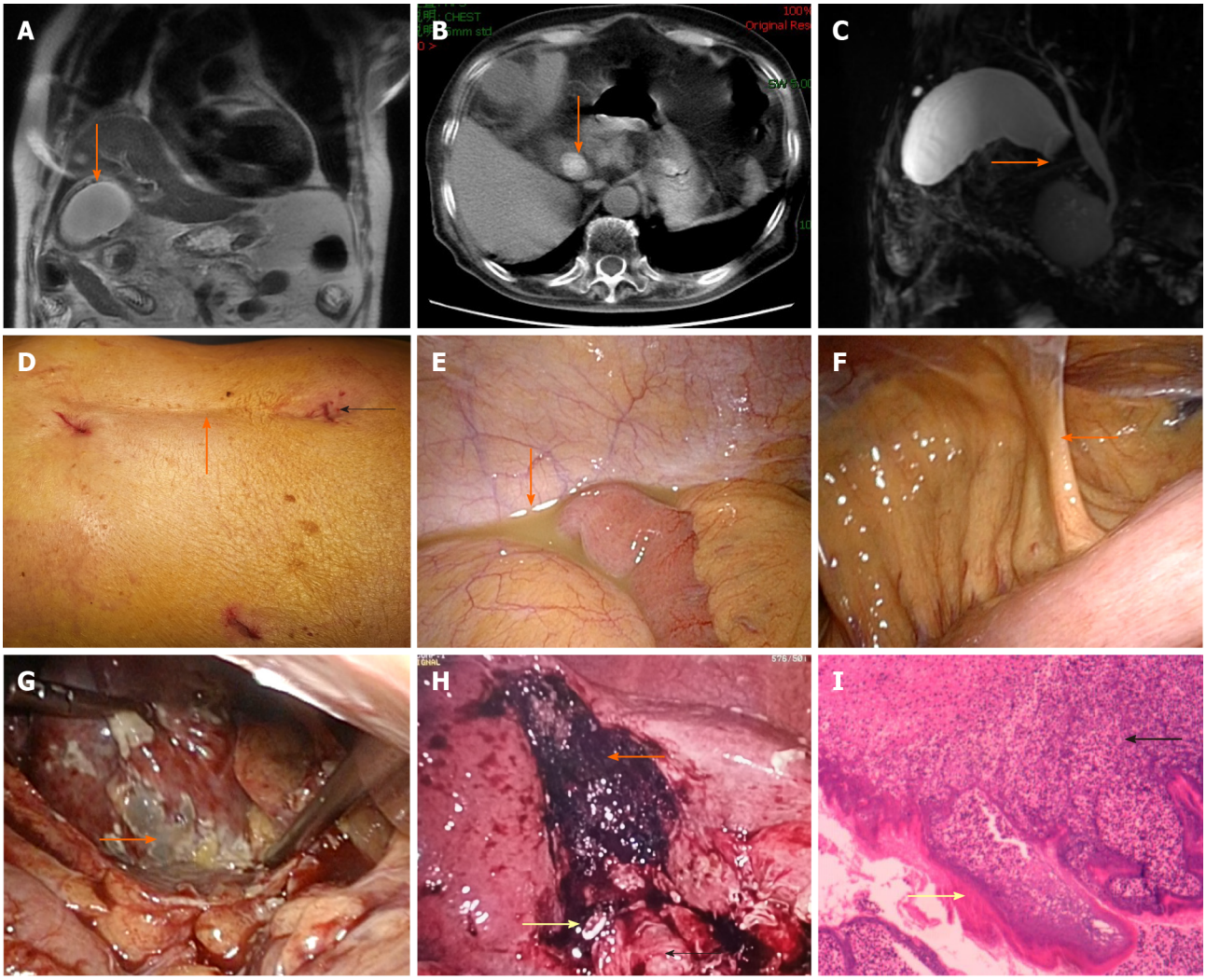

Figure 1 Preoperative abdominal magnetic resonance imaging, intraoperative findings, and postoperative pathological examination. A: Magnetic resonance imaging showed gallbladder wall thickness and pericholecystic fluid (orange arrow); B: A high-signal shadow of about 2 cm in diameter was seen in the gallbladder neck (orange arrow); C: Magnetic resonance cholangiopancreatography showed filling defect of the gallbladder neck (orange arrow); D: Laparoscopic port (black arrow), upper abdominal incision scar (orange arrow); E: Abdominal purulent effusion (orange arrow); F: Severe right upper abdominal adhesions (orange arrow); G: Gallbladder wall gangrene; H: Gallbladder bed wound (orange arrow), cystic duct clamp (yellow arrow), common bile duct (black arrow); I: Massive neutrophil infiltration, abscess and necrosis formation in the gallbladder wall (black arrow), gallbladder mucosal epithelial necrosis and shedding (yellow arrow), hematoxylin and eosin staining, × 200.

in the gallbladder cavity, and incarcerated stones in the gallbladder neck. Laparoscopic cholecystectomy was performed successfully (Figure 1H). The operation lasted 110 min with intraoperative bleeding of 100 mL. After the operation, the pathological specimens were placed in a double-layer specimen bag and sealed for inspection, and the medical waste was put into the double-layer medical waste bag for sealing and then disposed.

After the operation, the patient with tracheal intubation was sent back to the original isolation ward along the designated protective route. After 16 h of ventilator-assisted therapy, he was successfully weaned from the ventilator. After 24 h, because of pulmonary insufficiency, he underwent tracheal intubation and ventilator-assisted breathing again. He received intensive treatment and specialist bedside care for 97 h, with successful prevention and treatment of heart and lung dysfunction. He was successfully weaned from the ventilator again, and gradually resumed eating. At 8 d after surgery, he successfully recovered and was discharged.

OUTCOME AND FOLLOW-UP

At the 2-mo follow-up, the patient had no abdominal pain, fever, or other discomfort. Liver, heart, and lung functions were normal.

DISCUSSION

On March 11, 2020, the World Health Organization announced the global pandemic of COVID-19 pneumonia. As of 11:00 on May 25, Beijing time, the number of confirmed cases of global COVID-19 had reached 5.4077 million, with 345060 deaths. Therefore, there is an urgent need to strengthen protection against the global COVID-19 pandemic[6,7].

A serious challenge is how to prevent effectively nosocomial infection and avoid the occurrence of clustered epidemic events and to carry out actively emergency surgical treatment for critically-ill patients[8,9]. Special attention should be paid especially to elderly patients undergoing emergency surgery, due to the higher risk of infection during the perioperative period. Based on our experience of successful emergency surgery of elderly high-risk patients, the full process of epidemic protection of emergency surgery during the COVID-19 pandemic is summarized as follows. COVID-19 pneumonia has the characteristics of strong infectivity, high susceptibility of the population, long incubation period, and diverse clinical manifestations. Elderly patients with diabetes, hypertension, and cardiovascular and cerebrovascular diseases are more susceptible than younger patients[10]. When the current COVID-19 epidemic situation is still severe, during patient admission, strict screening and careful admission must be carried out. This is to diagnose specific diseases and their degree of critical severity. It is also to investigate fully the epidemic situation and contact history with the epidemic area; strictly abide by the epidemic prevention regulations of the hospital; improve the relevant epidemic investigation and inspection (such as routine blood examination, C-reactive protein, chest CT, novel coronavirus nucleic acids and antibodies); and arrange a single ward for isolation and protection. For the present case, chest CT before admission suggested pulmonary infection, so differential diagnosis of COVID-19 pneumonia was important.

Many elderly patients with acute abdominal disease often have coexisting underlying diseases. This patient had pulmonary infection, as well as a long history of coronary heart disease, hypertension, cerebral infarction, chronic bronchitis, and emphysema. Adequate preoperative examination and preparation should be carried out in such cases.

On the basis of strict inspection of indications and contraindications of acute abdominal disease, once emergency surgery is decided, heart, lung, liver and kidney function, and the coagulation system related to perioperative safety must be thoroughly investigated. Before surgery, patients sign the "Surgical Screening Form for Hospital Response to COVID-19 Epidemic Situation" and confirm that they have had no contact with COVID-19 pneumonia. Emergency surgery can only be carried out under strict isolation of the operating room, supplies, and personnel.

During patient transportation and operation, the requirements for COVID-19 epidemic prevention and control should be strictly followed. For emergency surgery for non COVID-19 pneumonia patients, operators should take secondary level protective measures (protective clothing, surgical masks, goggles, work caps, and shoe covers). For patients with COVID-19 pneumonia who have to be treated surgically, they should be prepared in a specific independent negative pressure operating room. The operating staff should strictly carry out third level protective measures (protective clothing, medical respirator, protective surface screen, goggles, work cap, and shoe covers)[11]. During the operation, it is necessary to avoid splashing of body fluids and injury from sharp devices. After the operation, the surgical instruments and medical waste should be marked, classified, and isolated in a unified way, and the operating room should be thoroughly disinfected.

Elderly patients undergoing emergency surgery, in addition to strengthening preoperative and intraoperative cardiopulmonary monitoring, maintenance of postoperative cardiopulmonary function should be paid particular attention. After the operation, electrocardiography monitoring, central venous pressure measurement, and urine monitoring should be provided. If necessary, the urine volume per hour should be recorded to guide the volume and speed of postoperative infusion, so as to prevent heart failure and pulmonary edema caused by excessive and rapid infusion. To strengthen postoperative ward management, the single ward should be isolated and protected, and no escort personnel should be retained. If necessary, the accompanying personnel should be fixed, so as to prevent nosocomial infection and avoid the occurrence of clustered epidemic events.

Biliary diseases in elderly patients have many clinical characteristics, such as multiple coexisting diseases, poor surgical tolerance, high surgical risk, many postoperative complications, and high mortality[12]. In the present 89-year-old patient, incarcerated gallstones induced acute gangrenous cholecystitis and septic shock.

Although surgery may be the only effective measure to save the patient's life, it is important to determine the surgical indications of acute calculous cholecystitis in elderly patients because of the combination of multiple high-risk underlying diseases and their risk for surgery.

Up to now, there is no unified standard or guideline for the surgical indications for acute calculous cholecystitis in elderly patients[13,14]. Based on years of clinical experience, we have developed and reported the following indicators[2,15,16]: (1) Body temperature ≥ 38.5 °C; (2) Peripheral WBC ≥ 15 × 10^9/L; (3) Neutrophils ≥ 85%; (4) Hs-CRP ≥ 100 mg/L; (5) B ultrasonography shows double layer structure of the gallbladder wall; and (6) CT or MRI shows pericholecystic or perihepatic fluid. In this case, the preoperative examination showed WBC 15.5 × 10^9/L, neutrophils 90.4%, Hs-CRP 190.92 mg/L, and pericholecystic fluid in MRI; all of which were in accordance with the above-mentioned surgical indications. Intraoperative examination showed purulent effusion in the abdominal cavity, lamellar gangrene of the gallbladder wall, purulent bile in the gallbladder cavity, and incarcerated stones in the neck of the gallbladder; thus suggesting that the indication and timing of the operation were correct.

The traditional view is that a history of upper abdominal surgery is a contraindication for laparoscopic surgery because of the possibility of abdominal adhesions[17] leading abdominal organ damage[18,19]. However, with the development of laparoscopic instruments, technical progress, and accumulation of experience, the indications for laparoscopic surgery have gradually expanded, and there are more reports on successful biliary surgery for patients with a history of upper abdominal surgery[20-22].

Our experience of laparoscopic surgery is as follows: (1) The first puncture site should be at least 2 cm away from the original open incision, because the original surgical incision generally has intestinal or omental adhesions, which often exceed the incision length by 2-5 cm; (2) When the laparoscope enters the abdominal cavity, if it is difficult to insert the laparoscope in the case of wrapped adhesions, we should carefully look for looser adhesive tissue voids or avascular areas; use the lens to penetrate the adhesion; and assist separation of the adhesion through the auxiliary puncture hole, until the surgical site is fully exposed; and (3) When separating important organ adhesions, the adhesion level should be clearly identified, and blunt and sharp separation should be used to prevent direct loss of adhesive organs or delayed electrical damage. The present case had a history of radical gastrectomy, and although abdominal adhesions were serious, laparoscopic cholecystectomy was still successful following the above principles without any side effects.

In elderly patients with biliary tract disease, postoperative pulmonary function should be strengthened, by encouraging them to take deep breaths and expectoration, regularly changing their body position, keeping the respiratory tract unobstructed, preventing respiratory tract infection, and reducing postoperative atelectasis and pneumonia[23-25].

To prevent and control postoperative pulmonary infection, physical methods and expectorant drugs should be used to assist expectoration, such as conventional atomization and oxygen inhalation. Early ambulation is encouraged, oral care is given regularly, and sputum bacterial culture should be performed to find mold. At the same time, postoperative esophageal sphincter tone hypotension should be prevented, as this can cause vomiting and inhalation of lung infectious agents. In case of shortness of breath and difficulty in expectoration, a ventilator should be used as early as possible, the airway secretion should be cleared, and adequate ventilation volume should be maintained. The ventilator should not be used until respiratory failure occurs.

In the present case, the preoperative oxygen partial pressure was low (85.1 mmHg). After 16 h of postoperative ventilator-assisted treatment, arterial blood gas analysis showed that oxygen partial pressure was 107.1 mmHg, and the ventilator was successfully separated.

After 24 h, the partial pressure of oxygen gradually decreased to 44.4 mmHg, suggesting pulmonary insufficiency, and tracheal intubation and ventilator-assisted breathing was restarted. He was treated with anti-infective agent (meropenem 2 g, intravenous drip, q8h), mucolytic agent (ambroxol 60 mg, intravenous injection, q8h), atomization (budesonide respirable suspension 2 mL, ipratropium 500 g, q8h), and immune enhancement (immunoglobulin 10 g, qd), fresh plasma (200 mL, qd, 3 d continuously). After 97 h of intensive treatment and specialist bedside care, he was successfully separated from the ventilator again. After 24 h of oxygen therapy through the oxygen storage mask, his respiratory function returned to normal.

In elderly patients with biliary tract disease, we should strengthen postoperative

maintenance of cardiac function and perform electrocardiography monitoring, central venous pressure measurement, and urine monitoring (if necessary, urine volume per hour) to guide the volume and speed of postoperative infusion, in order to prevent heart failure or even heart failure caused by excessively rapid infusion.

For patients with coronary heart disease, BNP, high-sensitivity troponin I, creatine kinase isoenzyme MB, and myoglobin should be examined postoperatively to determine whether heart failure or myocardial injury have occurred and their severity[26-29]. If the above are significantly increased, it suggests that acute myocardial infarction should be treated by thrombolysis, anticoagulation, and lipid-lowering and symptomatic therapy. If necessary, percutaneous coronary intervention should be performed.

For patients with heart failure, positive inotropic drugs such as digitalis should be selected, and diuretics should be used to promote discharge of interstitial fluid. At the same time, low-dose dopamine (0.5-2 g/kg/min) should be used to promote expansion of renal and mesenteric blood vessels, increase renal blood flow and glomerular filtration rate, and increase urine volume. Medium dose dopamine (2-10 g/kg/min) should be used to induce heart muscle contractility and increase heart beat volume.

In the present case, BNP was 348.9 pg/mL before surgery, 156.7 pg/mL at the end of the operation, and gradually increased after surgery (506.9 pg/mL at 24 h, up to 2275.4 pg/mL 5 d). This suggested cardiac insufficiency, which was treated by controlling the infusion volume and speed, isosorbide nitrate injection, and furosemide. BNP gradually decreased to 179.3 pg/mL at discharge.

Most elderly patients have a long history of taking single (aspirin) or dual (aspirin + clopidogrel) antiplatelet therapy for prevention of thrombosis. The antiplatelet effect can cause perioperative coagulation dysfunction. Although it is still controversial whether it is necessary to stop taking aspirin and clopidogrel before surgery[30,31], our experience is to stop them as much as possible for 7 d before surgery (platelet life span 7-10 d) to avoid intraoperative and postoperative bleeding. When anticoagulants are necessary, such as patients after coronary artery bypass surgery, they can be replaced with low molecular weight heparin. If aspirin and clopidogrel are stopped for < 7 d, and emergency surgery is required, an emergency plan should be prepared to deal with potential intraoperative and postoperative hemorrhage. This can include fibrinogen, prothrombin complex, and plasma, to prevent and control possible intraoperative and postoperative coagulopathy.

CONCLUSION

In summary, in the current global COVID-19 pandemic, we should correctly assess the severity of acute abdomen in elderly patients, and the indications for emergency surgery. It is important to abide strictly by the hospital's epidemic prevention regulations, fully implement the epidemic prevention procedure for emergency surgery, fully prepare before the operation, accurately perform the operation, and carefully manage the patient postoperatively. This will provide a reference for emergency surgery and effective epidemic prevention in the elderly patients with high-risk acute abdominal diseases during the COVID-19 pandemic.

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