

Case Report

Total laparoscopic pancreaticoduodenectomy for uncomplicated type B aortic dissection complicated with ARDS during surgery: a case report

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Abstract: Background: Patients with uncomplicated type B aortic dissection are generally treated with conservative medical management. Case presentation: In this case report, we describe a patient with chronic uncomplicated type B aortic dissection who underwent a total laparoscopic pancreaticoduodenectomy under general anaesthesia. The patient presented with acute respiratory distress syndrome during the surgery. The patient was placed on machine ventilation for 5 days, underwent a series of therapies, and was discharged on the 32nd postoperative day without exacerbation of the aortic dissection. We speculate that long-term pancreatic hypo-perfusion induced a pancreatitis-like reaction and acute respiratory distress syndrome during the surgery. Conclusion: Based on this case, prophylactic thoracic endovascular aortic repair may be necessary for patients with uncomplicated chronic type B aortic dissection undergoing a long laparoscopic surgery. By taking this approach, we were able to maintain a higher mean blood pressure to ensure abdominal organ perfusion while minimizing the risk of aortic dissection rupture.

Keywords: Uncomplicated type B aortic dissection, laparoscopic pancreaticoduodenectomy, thoracic endovascular aortic repair

Introduction

Acute or chronic type B aortic dissection is a life-threatening disease that is classified as either uncomplicated or complicated [1]. Most patients with chronic uncomplicated type B dissection are treated using conservative medical management, including monitoring of blood pressure and aortic diameter. It remains controversial whether patients with chronic uncomplicated type B dissection who are comorbid for other diseases require surgery for prophylactic thoracic endovascular aortic repair (TEVAR), particularly in the case of abdominal surgery.

The first laparoscopic pancreaticoduodenectomy (LPD) was reported in 1994 by Gagner [2]. A comparison of total LPD with open pancreaticoduodenectomy showed that the former was associated with reduced intraoperative blood loss and shorter hospital stays but comparable overall morbidity and mortality [3]. However, the complication rate for LPD is still high, with

the major complications being pancreatic fistula, bile leakage, delayed gastric emptying, reoperation, and intraoperative or postoperative death [4].

No data are available regarding the management of patients with uncomplicated chronic type B aortic dissection using total LPD, and methods for avoiding aortic rupture are a key concern. In particular, maintaining a low blood pressure in patients with pneumoperitoneum may induce abdominal organ hypo-perfusion. In the presented case report, we describe a patient with uncomplicated type B aortic dissection who underwent total LPD and experienced the complication of moderate acute respiratory distress syndrome (ARDS) during surgery.

Case presentation

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A 62-year-old

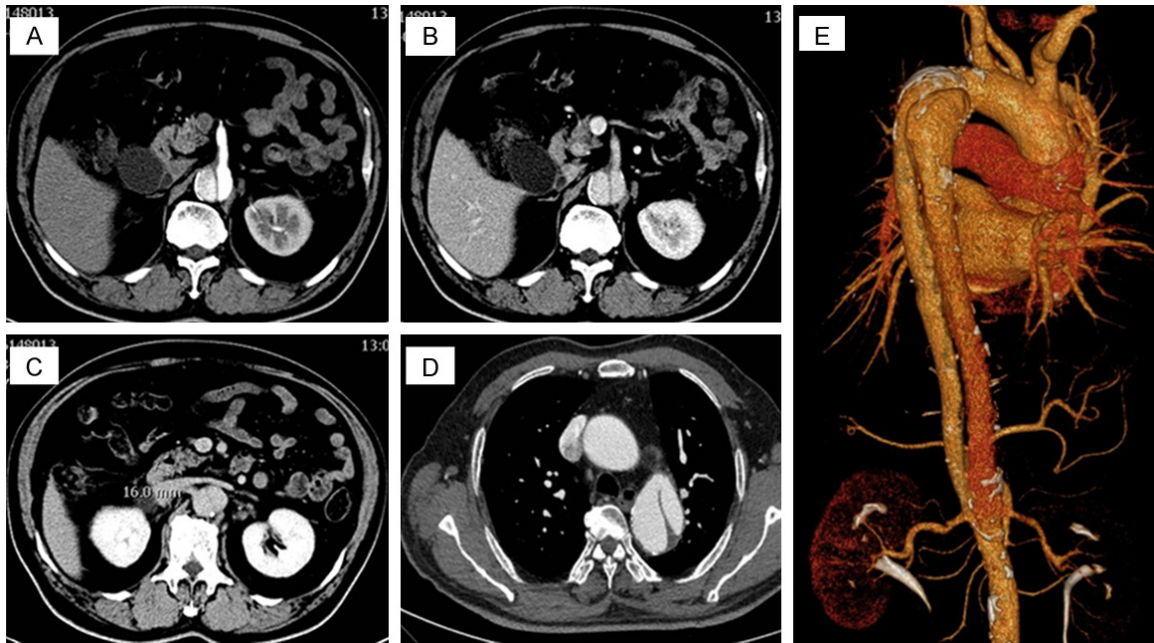


Figure 1. Abdominal enhanced CT and CTA. Aortic dissection is indicated in (A (arterial phase) and B (venous phase)). (C (balanced phase)) shows cholangiocarcinoma. (D) indicates the location of the entry point, and (E) shows the whole aortic dissection.

man with jaundice was admitted to our medical center. An abdominal ultrasound examination showed that his biliary duct was obstructed and broadened. Additionally, an abdominal enhanced computed tomography scan confirmed cholangiocarcinoma and identified the abdominal aortic dissection (**Figure 1A-C**). Subsequent computed tomography angiography (CTA) indicated that the aortic dissection extended from the descending aorta to the level of the renal artery (**Figure 1D and 1E**). The patient did not report chest pain, severe hypertension, or any other aortic syndrome in his medical history. At the time of hospital admission, the patient's blood pressure was 147/80 mmHg, and his heart rate was 70 beats per minute (bpm). A chronic uncomplicated type B aortic dissection was confirmed. The majority of the laboratory data were within normal limits, except for the following parameters: total bilirubin 186.9 $\mu\text{mol/l}$, indirect bilirubin 74 $\mu\text{mol/l}$, aspartate transaminase 65.9 u/l, and alanine aminotransferase 118.2 u/l. The treating physicians debated the use of prophylactic TEVAR and decided to perform total LPD first because the chronic uncomplicated type B aortic dissection could subsequently be treated with conservative medical management in consultation with a cardiovascular surgeon. The patient received standard monitoring consisting of pulse oxime-

try, electrocardiography, and invasive blood pressure measurements. His baseline blood pressure was 140/70 mmHg, and his heart rate was 65 bpm with an O_2 saturation of 96%. After general anaesthesia, his mean blood pressure was maintained at 60-70 mmHg, and his heart rate was maintained at 55-65 bpm during surgery. Three and half hours after the operation started, arterial blood gas analysis showed a Pa_{O_2} /fraction of inspired oxygen ($\text{Pa}_{\text{O}_2}/\text{F}_{\text{iO}_2}$) of 137 mmHg. Subsequent blood gas analysis showed no improvement in the oxygenation index, indicating the occurrence of moderate ARDS. The entire procedure lasted for 6 hours and 15 minutes. The fluid infusion volume was 4250 ml, and the blood loss was 700 ml.

The patient awoke after surgery with an O_2 saturation of 92% and spontaneous breathing of room air. The patient was transferred to the ICU on mechanical ventilation. On the 6th postoperative day, his oxygenation index improved until his Pa_{O_2} /fraction of inspired oxygen was over 250 mmHg; at this point, the patient was extubated. In the therapy following the operation, the patient presented infection, pancreatic leakage, and deep vein thrombosis. After receiving the corresponding treatments, he was discharged on the 32nd postoperative day.

Laparoscopic pancreaticoduodenectomy for type B aortic dissection

An aortic CTA scan conducted prior to discharge showed that the dissection did not deteriorate during the therapy process.

Discussion

This is the first reported case of chronic uncomplicated type B dissection managed by total LPD that was complicated with moderate ARDS during surgery. Because few studies have reported the occurrence of ARDS during LPD, we speculated that the pancreatitis-like reaction was induced by pancreatic hypo-perfusion due to the patient's low mean blood pressure. Under normal conditions, maintaining a mean blood pressure over 60 mmHg ensures abdominal organ perfusion. However, in this patient, the abdominal aorta dissection involved the coeliac artery and the mesentery artery, which could have affected his abdominal organ perfusion. Abdominal organ perfusion pressure is based on the difference between the mean blood pressure and the pneumoperitoneum pressure. During the surgery, the patient's pneumoperitoneum pressure was 12-14 mmHg, and the surgery lasted for 6 hours. Therefore, a mean blood pressure of 60-70 mmHg may have been too low for LPD. A lower mean blood pressure and a long pneumoperitoneum may cause pancreatic ischemia, which would further induce a pancreatitis-like reaction.

Acute lung injury (ALI) is a severe complication of pancreatitis and a significant health concern that is associated with considerable mortality [5]. The Pa_{o_2}/F_{iO_2} ratio is utilized to distinguish ALI from ARDS, with ALI being defined as a $Pa_{o_2}/F_{iO_2} \leq 300$ mmHg and ARDS being defined as a $Pa_{o_2}/F_{iO_2} \leq 200$ mmHg. Both ARDS and ALI are significant health problems, with mortality rates ranging from 30-40% [6].

Our medical center has treated more than 50 patients with total LPD. This is our only case that simultaneously presented with ARDS, pancreatic leakage, and deep vein thrombosis. The pancreatic leakage that occurred in this patient during presentation may be further evidence of the occurrence of pancreatic ischemia during surgery.

Conclusion

In this type of patient, prophylactic TEVAR might be necessary for the uncomplicated chronic

type B aortic dissection because the laparoscopic surgery last for a long time. We could maintain a higher mean blood pressure to avoid abdominal organ hypo-perfusion and lower the risk of aortic dissection rupture. Further, especially for LPD, adequate abdominal perfusion may reduce the risk of ALI and ARDS.

Disclosure of conflict of interest

None.

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