



Case Report

Bowel Perforation due to Complicated Meckel's Diverticulum in an Adult Living Donor Liver Transplant Recipient

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Abstract

Meckel's diverticulum is a rare cause of bowel perforation in liver transplant recipients. The aim of the present study is to discuss our management protocol in a 57-year old male liver transplant recipient with intestinal perforation due to complicated Meckel's diverticulum.

We report a case of 57 years old male liver transplant recipient who had abdominal sepsis on posttransplant 13th day. He was operated on and found to have Meckel's diverticulum that caused intestinal perforation due to volvulus around fibrous bands extending to the anterior abdominal wall. Segmental bowel resection with end-jejunostomy was performed. The patient had sepsis on the postoperative period and is followed in intensive care unit and treated with a combination of antibiotics.

Meckel's diverticulum is a rare cause of bowel perforation and this is the first case presenting with perforation in early post-transplant period. Stoma is beneficial for reduction of abdominal sepsis related symptoms. Preemptive diverticulectomy should be considered for prevention of serious complications such as perforation.

Keywords: Bowel perforation, Liver Transplantation, Meckel's Diverticulum

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Liver transplantation (LT) is a major abdominal procedure. In addition, living donor liver transplantation (LDLT) is a technically demanding procedure where liver ischemia and reperfusion injury plays a critical role.^[1] Meticulous tissue dissection during recipient hepatectomy, prolonged portal clamping, hepatic ischemia, and reperfusion in addition to the turmoil of inflammatory response that is induced during all these processes results in a hostile environment that is prone to gastrointestinal and hepatic complications. For these reasons, gastrointestinal complications ranging from mild nausea/vomiting to major issues such as gastrointestinal perforations can be observed in LT recipients.^[2] Prolonged portal vein clamping, gastrointestinal mucosal

injury, prolonged operative times, previous abdominal surgeries and need for post-transplant revisional surgeries are major risk factors for gastrointestinal system perforations.^[3–6] The incidence of gastrointestinal system perforation ranges between 1 to 5% in adults and 8 to 15% in pediatric liver transplant recipients.^[2,3,7]

Meckel's diverticulum was first described by Wilhelm Fabry in 1598. In 1700, Alexis Littre defined the presence of Meckel's diverticulum in strangulated inguinal hernia sack. However, a detailed embryologic and anatomic explanation of the origins of this anomaly was done by Johann Friedrich Meckel in 1809 and thus this congenital malformation is named after this German anatomist.^[8] It is the most com-

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mon congenital defect of the gastrointestinal tract, it results from the persistence of the vitello-intestinal tract.^[9] "The rule of the two" is defined for Meckel's diverticulum; i) it is present in 2% of the population, ii) it is seen within 2 feet from the ileocecal valve, iii) it is usually 2 inches in diameter, iv) it usually contains two kinds of ectopic mucosae (gastric and pancreatic).^[10,11] The lifetime risk for Meckel's diverticulum to develop complications is nearly 7%.^[12,13] The defined risk factors for occurrence of complications are male gender, age less than 40-50 years of age, diverticulum length longer than 2 cm and presence of ectopic mucosa.^[14,15] The complications are complications are obstruction, bleeding, diverticulitis and perforation. Obstruction can occur either by volvulus around the fibrous bands or intussusception.^[9] Bleeding occurs if the diverticulum contains ectopic mucosae such as gastric and pancreatic tissue. Bleeding can occur by erosion of the diverticular mucosa or the adjacent enteric mucosa by irritation of the secretions of the ectopic pancreatic or gastric tissue. Bleeding is more common in children and obstruction is more common in adults.^[11,16] Perforation due to diverticulitis is a very rare event in all age groups and in all populations and it is not only specific for liver transplant recipients.

Meckel's diverticulum as the etiology of gastrointestinal perforation and abdominal sepsis is a rare event. Our litera-

ture search has shown that there is only one case that has been reported so far.^[17] This was a case of 20 years of male patient who developed acute abdomen due to Meckel's diverticulum perforation three years after the transplant procedure. The cause was a migrated biliary stent that dislodged and perforated the diverticular wall far.^[17]

In the present case report, we present a case of a 57 male liver transplant recipient that was operated for abdominal sepsis 13 following the transplant procedure. The cause of perforation was local intestinal volvulus due to Meckel's diverticulum. The aim of the present study was to discuss our approach for the management of the patient who is the first case in literature that presented with an early post-operative gastrointestinal perforation due to complicated Meckel's diverticulum.

Case Report

Fifty-seven years old male liver transplant recipient was in his post-transplant 13th day when lethargy, hypotension, tachycardia and a fever of 38°C developed. He was transplanted for autoimmune hepatitis and in the last year he was hospitalized for the suspicion of mesenteric ischemia or acute pancreatitis and he underwent right lower limb amputation for peripheral vascular disease. The laboratory values are summarized in Table 1.

Table 1. Summary of the course of laboratory values of the patient before, during and after the exploratory surgery

Laboratory Parameters	Before Exploratory Surgery	The Day of The Exploratory Surgery	After The Exploratory Surgery
Leukocyte (cells/mm ³)	8.91	9.2	12.6
Hemoglobin (g/dL)	8.6	10.3	10.1
Hematocrit (%)	24.2	28.1	27
Platelet (x10 ³ corpuscle/mm ³)	155	114	85
INR	1.3	1.4	2.2
Glucose (mg/dL)	164	179	98
BUN (mg/dL)	11.7	14.5	15.4
Creatinine (mg/dl)	0.5	0.4	0.4
Na (mEq/dl)	145	146	148
Potassium (mEq/dL)	3.1	2.81	2.9
Chloride (mEq/dL)	102	106	111
Albumin (mg/dL)	3.1	3.4	2.6
AST (IU/ml)	26	57	190
ALT (IU/ml)	32	49	109
ALP (IU/ml)	90	94	111
GGT (IU/ml)	30	71	31
Total Bilirubin (mg/dL)	11.9	12.8	18.2
Direct Bilirubin (mg/dL)	5.9	7.2	9.6
Ammonia (ug/dL)	51	22	78
Fibrinogen (mg/dL)	205.08	129.4	167.7

ALT: Alanine aminotransferase; ALP: Alkaline Phosphatase; AST: Aspartate aminotransferase; BUN: Blood Urea Nitrogen; GGT: Gamma Glutamyl Transferase; INR: International Normalized Ratio.

We decided to continue with emergency exploratory laparotomy. There was 500 cc of enteric content and profound peritonitis in all quadrants of the abdomen. The peritoneal cavity was irrigated with 10 liters of warm saline. Our exploration revealed a conglomerated intestinal segment 160 cm distal to the Treitz ligament and 190 cm proximal to the ileocecal valve. Further adhesiolysis showed that there was perforated intestinal segment and a diverticular extension from the antimesenteric side that was fixated to the anterior abdominal wall with fibrous bands (Fig. 1). The possible cause the intestinal perforation was a volvulus of the intestinal segment because the perforated site of the intestine had pale ischemic mucosa. We performed a segmental small bowel resection with end jejunostomy. We avoided primary anastomosis because of the profound peritonitis and contamination and of the peritoneal cavity with intestinal content. The surgical specimen is shown in Figure 2.

The postoperative early course was very troublesome and as it can be seen from the laboratory values, patients was septic (Table 1). For this reason we switched his antibiotic treatment to tazobactam and piperacillin, teicoplanin and anidulafungin. He has minor biliary leakage from the bile duct anastomosis, and he is still recovering in the intensive care unit.

Discussion

Gastrointestinal perforations can complicate the postoperative course of liver transplant recipients. Risk factors for occurrence of gastrointestinal system perforations are previous abdominal surgeries, prolonged portal clamping and need for post-transplant revisional surgery. All these factors show that the case is technically demanding and the procedure itself is complicated.^[2,7] The present case is the first case of complicated Meckel's diverticulum causing gastrointestinal perforation in the early post-transplant period.

There have been only few report of complicated Meckel's diverticulum in solid organ transplant recipients.^[17,18] Liu et al.^[18] have reported a 51 years old male patient who received a multi-visceral transplant due to unresectable neuroendocrine tumor. The patient had recurrent gastrointestinal bleeding 3 months after the transplant procedure and ileoscopy revealed active bleeding from Meckel's diverticulum. The patients was treated with bowel resection. Topal et al.^[17] have reported a Meckel diverticulum perforation in a liver transplant recipient in the postoperative third year which was due to a migrated biliary stent. The patient was treated with diverticulectomy. In the present case, our patient was re-operated to abdominal sepsis. We have diagnosed the presence of complicated Meckel's diverticu-

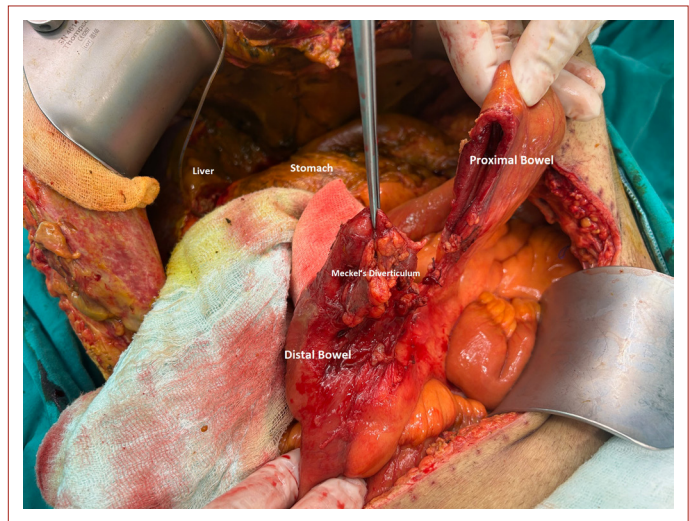


Figure 1. Intraoperative appearance of the of the perforation site showing the Meckel's diverticulum.

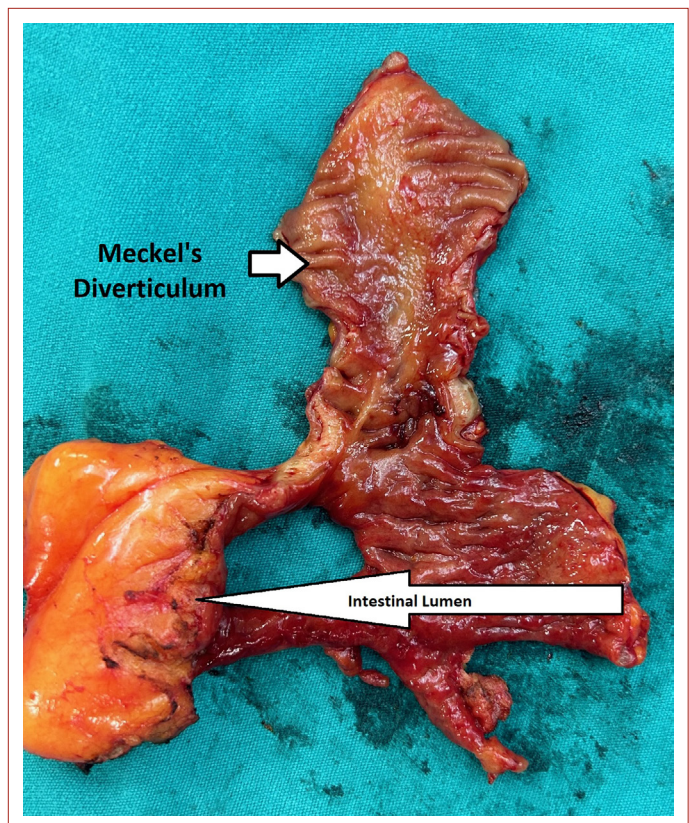


Figure 2. The surgical specimen is opened along the antimesenteric side. The long white arrow shows the intestinal lumen from proximal to distal direction. The white arrowhead shows the longitudinally opened Meckel's diverticulum.

lum intraoperatively. Since there was extensive peritonitis and contamination of the peritoneal cavity we performed resection and diversion end-ileostomy. We have previously published our experiences with gastrointestinal system

perforations in liver transplant recipients.^[2,7] Also, we have shown the survival benefit of creating a stoma in pediatric liver transplant recipients with gastrointestinal system perforation^[7] which, in our opinion, is valid for adult patients as well.

The operation of asymptomatic Meckel's diverticulum has a morbidity rate of 0-6%. However, operating on patients with complicated Meckel's diverticulum has a morbidity rate over 30% with a lifetime complication risk over 15%.^[13-15,19,20] The delay in diagnosis has an adverse effect on the prognosis of the patients. In addition, the accuracy of preoperative diagnosis is as low as 5%.^[21] This is because the low efficacy of computerized tomography and reduced accuracy of radionuclide scans in the diagnosis of Meckel's diverticulum.^[22,23] Therefore, high grade suspicion of the attending physician and a low threshold for performing exploratory surgery has paramount prognostic importance. In our institute, we usually have a low threshold for operative intervention in clinical conditions such as acute abdomen and suspected abdominal sepsis in liver transplant recipients in our clinic. In the present case, we have seen the intestinal content in the drains and from the surgical incisions. Therefore, exploratory surgery was the only option for this patient.

Prevention is the best treatment option for any disease. In our case pre-emptive resection of incidentally discovered Meckel's diverticulum during the transplant procedure would have prevented this complication. However, we have not specifically searched the abdomen for any other gastrointestinal diseases since we have a detailed preoperative work-up for our patients. But since the pre-operative detection of a Meckel's diverticulum is very difficult, this was a didactic case for us and from now on, we intend to check the abdominal cavity for any other conditions during the transplant procedure. The efficacy and safety of pre-emptive diverticulectomy is the main question that should be answered. Unfortunately, the data regarding this subject is not available. However, as we have mentioned above, the intervention for symptomatic or complicated cases is associated with significant morbidity and furthermore, the life-long risk of developing complicated in Meckel's diverticulum is high. Therefore, we believe that these arguments are enough to justify incidental diverticulectomy during the liver transplant procedure.

In summary, the present case has shown that complicated Meckel's diverticulum can be an underlying cause of perforation in liver transplant recipients. Therefore, attending surgeons should have a low threshold for operative intervention in patients and should decide whether to perform diverticulectomy or resection primary anastomosis versus

creating a stoma according to the condition of the patient. In addition, the safety and efficacy of incidental diverticulectomy should be evaluated with further randomized controlled trials.

Disclosures

Informed consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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