CASE REPORT

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A clinical case of successful treatment of surgical site infection in a kidney and pancreas recipient

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Abstract

Background. *Surgical site infections (SSIs) following solid organ transplantation pose grave risks, including the potential loss of the transplanted organ and mortality of the recipient. The management of*

these infections is highly intricate and necessitates ongoing research and the refinement of treatment protocols to enhance outcomes.

Object. *The aim of this study is to illustrate a successful treatment approach for retroperitoneal infection in the surgical area following combined kidney and pancreas transplantation, with a particular focus on the region where the pancreas graft is located.*

Material and methods. *A 31-year-old female recipient of a kidney and pancreas transplant was diagnosed with type 1 diabetes mellitus, complicated by diabetic nephropathy, which had progressed to a 5th-stage of chronic kidney disease. The clinical case was described using data from the recipient's medical history, observation card, and organ passport, along with the results of general clinical and instrumental investigations.*

Results. *The clinical picture of the course of bacterial infection of the retroperitoneal space in the area of pancreas graft location and its successful treatment in a recipient after simultaneous pancreas and kidney transplantation is presented. Due to the choice of optimal treatment tactics, it was possible not only to avoid the development of sepsis, but also to preserve the function of both grafts.*

Conclusion. *The development of SSIs in the form of retroperitoneal infection in a recipient without primary infection of the pancreas graft, in the context of adequate surgical intervention, in conjunction with etiotropic antimicrobial therapy and a reduction in immunosuppression, is a condition that can be effectively treated, resulting in a positive outcome for the recipient.*

Keywords: surgical site infection, infectious complications, kidney and pancreas transplantation

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AMD, antimicrobial drug
CKD S5, stage 5 chronic kidney disease, +D, patient on dialysis
CPKT, combined pancreas and kidney transplantation
T1DM, Type 1 diabetes mellitus
MDR, multiple-drug resistance
PG, pancreas graft
SSI, surgical site infection

Introduction

Despite the available treatment options for type 1 diabetes mellitus (T1DM), this progressive disease inevitably causes microvascular damage to patient's kidneys, gradually leading to the end-stage diabetic nephropathy, which is accompanied by a significant decrease in the quality of life, an increase in treatment costs and mortality [1, 2]. Combined pancreas and kidney transplantation (CPKT) is a promising treatment option for patients with type 1 diabetes mellitus (T1DM) who also have chronic kidney disease in stage 5 (CKD-5). It has the potential to cure both diseases at once. However, this surgery does have some challenges [3]. Compared to patients who have undergone only transplantation of kidneys, the CPKT recipients typically experience more severe and frequent complications within the first year following transplantation [4]. Thus, postoperative complications in CPKT recipients occur in 37.5-58% of cases and are a major concern for clinicians. [5–7]. This incidence of complications is due to the extreme sensitivity of the pancreas, the technical difficulty of surgery, and the immunosuppression in the recipient. [8]. The most common surgical complication in pancreas transplantation is asymptomatic collection of parapancreatic fluid

followed by superior mesenteric artery thrombosis. Surgical site infections (SSIs) after pancreas transplants (PTs) are observed in 14% of patients [9] and pose a threat to the graft function and recipient's life. SSIs are classified into superficial, where the skin and subcutaneous tissue are involved, and deep, where muscles and fascia are involved. Visceral organ and space infections differ from the soft tissue infections [10], and they are classified separately and considered as a part of SSIs. These infections can affect any organ or anatomical cavity/space beyond the surgical incision site, but deeper that fascial or muscular layers, including implantation-associated infections [11].

Organ transplant recipients constitute a specific group of patients susceptible to the risk of nosocomial infections and displaying multiple-drug resistance (MDR), especially in the early post-transplant period, because they often have repeated hospitalizations and are subject to multiple courses of antimicrobial drugs (AMDs), invasive procedures, receive immunosuppressive treatment, which represent well-known and proven risk factors of MDR-associated infection development [12]. Thus, organ recipients are typically infected with non-fermenting gram-negative bacilli (Pseudomonas aeruginosa, Burkholderia spp., Stenotrophomonas spp., Acinetobacter baumannii), carbapenem-resistant enterobacteria, especially *Klebsiella pneumoniae*, as well as gram-positive microorganisms, vancomycin-resistant enterococci and methicillin-resistant Staphylococcus aureus [13–15].

The treatment of deep SSIs and cavital infections after pancreas transplantation is complex and requires a multidisciplinary approach that includes a significant surgical intervention with drainage and debridement, antibacterial therapy, local pharmacological therapy, and intensive care to ensure the recipient survival and detoxification [16]. Perioperative antibiotic prophylaxis is critical to minimize the risk of SSI

in pancreas transplantation. Studies have shown that antibiotic prophylaxis against *Enterococcus species* can significantly reduce the risk of SSI within 30 days after transplantation. This approach is particularly effective when using combinations of beta-lactamase and beta-lactamase inhibitors, which provide better activity compared to cephalosporins against enteric microorganisms and anaerobes [17]. Important preventive measures for SSI include adequate antibiotic prevention for the donor and recipient, minimization of transplantation time with timely removal of drains and catheters, avoidance of prolonged co-stay with intensive care unit patients and general surgical patients, and infection control in the department. Despite advances in prevention measures and surgical techniques, the severity of SSI in transplant recipients requires ongoing research and adaptation of treatment protocols to improve outcomes.

The objective was to describe a Case Report of effective treatment for retroperitoneal surgical infection after simultaneous pancreas and kidney transplantation in the pancreas graft area.

Case Report

Patient Zh., 31 years old, having a clinical diagnosis: “Type 1 diabetes mellitus, subcompensated phase, target HbA1 level < 8.0%, unsatisfactory glycemic control. Diabetic microangiopathies: Nephropathy. CKD S5+D, renal replacement therapy with programmed hemodialysis since 2018. Proliferative diabetic retinopathy occurring in both eyes (OU). Diabetic polyneuropathy. Nephrogenic anemia, subcompensated. Mineral and bone disorders in CKD: Secondary hyperparathyroidism. Diabetic arthropathy (Charcot foot). Severe osteoporosis of the right and left feet bones. Arterial hypertension, stage 3, a risk factor score of 4 for major adverse cardiac events.

From patient previous history it was known that the disease manifested itself at the age of 13 years old, insulin therapy was started immediately. Since February 2017, at the age of 27, the patient had noted an increase in blood pressure to 160/90 mm Hg, at the same time, diabetic nephropathy was detected during examination. In May 2018, despite the therapy, the patient developed CKD5. She had an arteriovenous (AV) fistula surgically created on her left forearm; and renal replacement therapy with program hemodialysis was started. After examining the patient to assess the possibility of transplantation, the indications for CPKT were considered.

In October 2021, the patient underwent CPKT surgery. Due to the need for access to the left and right iliac vessels, the patient underwent a midline laparotomy. The first stage was a kidney transplant, using the standard technique, to the left iliac vessels, placing the graft retroperitoneally. The second stage involved pancreas transplantation using a modified technique. Vascular anastomoses were formed between the Y-graft of the donor pancreas (splenic and superior mesenteric arteries connected by a vascular prosthesis from the bifurcation of the common iliac artery) and the recipient's common iliac artery on the right, then an anastomosis was formed between the portal vein of the pancreas and the site of the recipient's inferior vena cava. Roux-en-Y small intestine exclusion was performed at a distance of 40 cm from the Treitz ligament using a mechanic suturing device. A duodenojejunal anastomosis was formed in the retroperitoneal space between the graft's duodenum and the loop of the recipient's small intestine. The bed of the pancreas allograft was drained with three drainage tubes (medially, laterally, and to the interintestinal anastomosis). Additionally, one drainage tube was placed in the small pelvis and to the kidney graft. The

surgery duration was 6 hours 10 minutes. The cold ischemia time was 5 hours for the renal allograft, 7 hours for PG.

Delayed renal graft function was observed, requiring 8 hemodialysis sessions with diuresis restored on day 21. Nitrogen excretion function was restored on day 27. Meanwhile, the PG function was immediate, euglycemia was noted from the first day without exogenous insulin administration.

Immunosuppressive therapy consisted of induction with basiliximab at a dose of 20 mg by intravenous drip infusion on postoperative days 0 and 4, tacrolimus at a dose of 7 mg once a day per os with subsequent correction for the drug blood level, mofetil mycophenolate at a dose of 1 g 2 times a day per os and methylprednisolone at a dose of 16 mg once a day per os. Antibiotic prevention therapy was performed with intravenous cefoperazone at a dose of 1 g twice a day for 7 days in combination with vancomycin for 5 days and metronidazole for 12 days intravenously by drip infusions in daily doses taking into account the glomerular filtration rate. Antisecretory therapy was also performed using octreotide at a dose of 1200 mcg per day with a gradual reduction in the dose over 20 days. Low molecular weight heparins were administered from the 3rd postoperative day in order to prevent thrombosis.

In the first week after transplantation, the patient was treated in intensive care due to the severity of her condition: a constant administration of dopamine and norepinephrine was required for 2 days due to severe arterial hypotension, the 3rd day was complicated by an episode of atrial fibrillation, which was controlled by intravenous administration of amiodarone. On the 4^{th} day, the patient was noted to have coffee-ground colored fluid coming through the nasogastric tube. The most likely cause of gastrointestinal bleeding was bleeding from the

area of the interintestinal anastomosis. Conservative therapy was performed with administering the erythrocyte suspension, fresh frozen plasma, and tranexamic acid. Bleeding was stopped thanks to the hemostatic therapy. On day 5, a repeated hemostatic therapy was required due to profuse bloody discharge from the genital tract. Due to the increased blood level of tacrolimus, the patient experienced delirium.

The drainage tube from the kidney graft was removed on the first postoperative day. The drainage tubes from the small pelvis and from the PG (medial drain) were removed on postoperative days 3 and 4, respectively. The lateral drainage from the PG was removed on day 7.

In blood parameters in the first week, procalcitonin decreased from 15.2 ng/mL to 8.5 ng/mL, C-reactive protein decreased from 111 mg/L to 97 mg/L, the level of leukocytes decreased from $16x10^9$/L to $3.3x10^9$/L, band neutrophils decreased from 20% to 14%.

On day 8, the patient developed a fever, meropenem was given at a dose of 1 g intravenously twice a day, and metronidazole administration was continued. Suppuration of parapancreatic fluid collections with their spread to the small pelvis and development of localized peritonitis was diagnosed. In this regard, three Pigtail drains were placed (two to the pancreatic graft and one to the small pelvis). Bacteriological culture of the contents obtained from the wound revealed the presence of *Klebsiella pneumonia*, sensitive to tigecycline. Antimicrobial therapy was changed: tigecycline was added at a dose of 100 mg per day by intravenous drip infusion, the dose of meropenem was increased to 3 g per day. Correction of immunosuppressive therapy was undertaken: the tacrolimus dose was reduced to the minimum possible so that its blood level was within 4-5 ng/mL, mycophenolates were replaced with everolimus. Discharge through the drains was up to 200 mL per day. Flushing the drainage tubes was performed with 50-100 mL of hydroxymethylquinoxaline dioxide solution 2 times a day, with positive

dynamics. Bacteriological culture of the patient's blood did not reveal any growth of microorganisms, markers of acute inflammation decreased: C-reactive protein was 61.8 g/L, procalcitonin 0.13 ng/mL, however, moderate subfebrile condition persisted.

Considering the discharge through the drains, and a large size of the cavity containing purulent exudate, according to the X-ray examination data, the patient was operated on under X-ray guidance in order to ensure adequate drainage of the retroperitoneal space (Fig. 1).

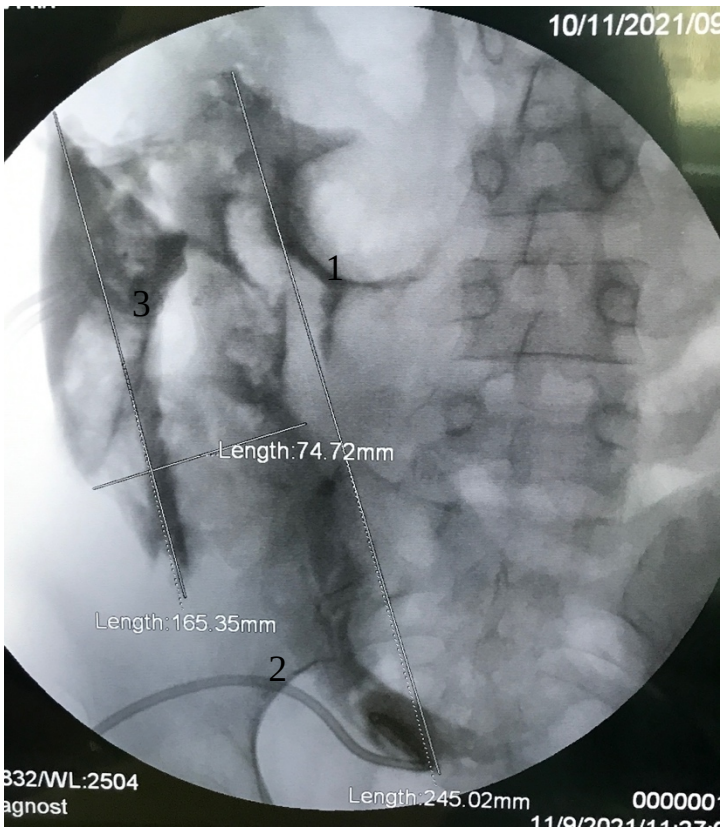

Fig. 1. Radiograph. Parapancreatic fluid collection extending into the small pelvis, drained with Pigtail drainage tubes: 1, parapancreatic fluid collection; 2, pigtail drain in the pelvic cavity; 3, pigtail drain in the parapancreatic region

So, 2 guidewires were inserted into the lateral drainage intraoperatively, the drainage was removed. A 30 Fr bougie was inserted

along one guidewire, after which the wound channel bougienage was performed. A 30 Fr drainage tube was inserted using the Seldinger method. A Pigtail drainage with a caudal (relative to the PG) orientation was inserted along the 2nd guidewire. A guidewire was passed into the upper drainage and it was removed. Using the Seldinger method, the Pigtail drainage was installed. Under X-ray guidance, a contrast agent was administered to assess the adequacy of cavity drainage. The drainage tube was removed from the pelvic cavity. Aspiration was satisfactory (Fig. 2).

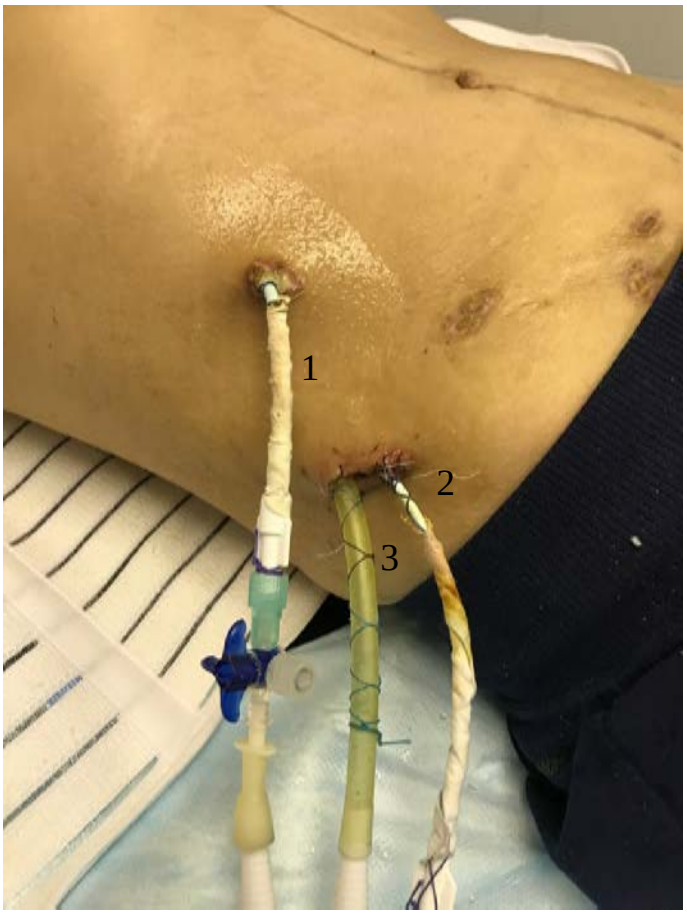

Fig. 2. Drainage tubes placed in the parapancreatic space: 1, pigtail drainage tube (drainage No. 1) inserted into the interintestinal anastomosis in the retroperitoneal space; 2, pigtail drainage tube inserted in the pancreatic graft bed (drainage No. 2); 3, 30Fr drainage tube inserted in the pancreatic graft bed (drainage No. 3)

Subsequently, regular flushing of the drainage tubes was performed using a hydroxymethylquinoxaline dioxide solution. The patient's body

temperature, inflammation markers, and leukocyte formula returned to normal. Antibiotic prevention therapy was performed with amoxicillin with clavulanic acid, and later on with ceftazidime. Also, given the detection of Candida in the urine, antifungal therapy was performed using fluconazole. After a decrease in the amount of discharge through the drainage tubes, drainage No. 1 (30 Fr) was replaced with a fine drainage tube, which was removed on the 61st day. Drainage No. 2, Pigtail was also removed from the PG bed. Fistulographies and computed tomography of the abdominal organs and retroperitoneal space were performed to monitor the cavity volume and the effectiveness of drainage. The only cavity present at the time of discharge was adequately drained: the cavity volume was about 15 mL. Considering the existing discharge through drainage No. 3 in small quantities, but having *Klebsiella pneumoniae* $<10^3$ as a culture result, a satisfactory condition and no need for inpatient treatment, the decision was taken to discharge the patient on the 84th day with a drainage tube in-site for outpatient follow-up; the patient continued self-administering hydroxymethylquinoxaline dioxide 5 mL 2 times a day. At the time of discharge, the patient had the following results of laboratory blood tests: creatinine 79 μmol/L, urea 6.6 mmol/L, total amylase 79 U/L, pancreatic amylase 39 U/L, C-reactive protein 8.1 mg/L, hemoglobin 78 g/L, leukocytes $5.5x10^9$/L. Glycemic parameters were within normal limits, urinanalysis results were normal.

During outpatient treatment, the inflammation markers remained within reference values, and the patient did not have fever. The drainage tube was removed on an outpatient basis on postoperative day 100, after receiving a negative result of bacteriology culture of its content. During the year of follow-up after CPKT, the patient had no complications, and the transplanted pancreas and kidney functioned satisfactorily [17].

Discussion

CPKT is associated with the highest level of surgical complications compared to other solid organ transplants [18]. Specific surgical methods used in organ transplants, can be closely connected with clinical manifestations of infectious process [19]. The most severe complications are associated with the development of surgical infection in conditions of interintestinal anastomotic incompetence. In our practice, the development of SSI in conditions of interduodenal anastomotic failure led to death in 100% of cases. In this regard, we abandoned duodenal drainage of pancreatic secretions in favor of small intestinal draining into the Roux-en- Y small intestine loop. This enabled us to reduce the number of severe surgical and infectious complications caused by interintestinal anastomotic failure. It is known that SSI caused by multiple-drug resistant microorganisms significantly worsens the treatment prognosis [20, 21]. The presented clinical case with a successful outcome for the recipient and the transplanted organs was conditioned by many factors, of which we consider to be significant the following ones: timely diagnosis and adequate drainage of the infected space, the absence of primary infection of PG, sensitivity of *Klebsiella pneumonia* to AMDs, specific characteristics of the patient's immune system, which, despite a significant decrease in immunosuppression, did not allow the development of acute rejection of transplanted organs.

Conclusion

A timely detection of infections in organ donors, the prevention, diagnosis and treatment of infectious diseases in the recipient are among the main factors affecting the transplantation outcome. In the event of the infection development in site of the surgical intervention, the main surgical action should be the control of the source of infection using all

measures helping to eliminate the infection source: repeated surgical interventions with the drainage of cavities and removal of non-viable organs and tissues. In the event of local pyo-septic complications, the preference should be given to minimally invasive treatment methods, such as percutaneous drainage.

If there is no effect from treatment, it is important to make a timely decision on performing pancreatic transplantectomy for life-saving purposes, since the mortality rate in patients with CPKT when sepsis develops makes over 50%.

Thus, in this clinical case, despite a severe postoperative course with the development of a surgical site infection in the retroperitoneal space after simultaneous organ transplantation, using the described treatment tactics, we were able to avoid the development of sepsis in the patient and achieve a successful outcome with preservation of the function of the transplanted organs.

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