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Incidental Finding of an Appendicular Mass During Surgery In a Living Donor Kidney Recipient: A Case Report

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ABSTRACT

An appendicular mass was discovered in a 44-year-old female recipient of a living donor kidney at the beginning of the transplant surgery. The donor nephrectomy was put on hold while the mass was explored. A perforated appendix was found and an appendectomy was completed with suture ligation of its stump. Because all infected tissue was eliminated, we proceeded with the kidney transplant. Immunosuppression treatment was tailored to the special circumstances. Only antithymocyte globulin was used until the patient had return of bowel function. She was discharged home on regular triple immunosuppression and doing well at the 6-month follow-up examination. The incidental discovery of an appendicular mass at the time of transplant surgery may not be an absolute contraindication to immediate kidney transplantation, if the patient meets specific selection criteria.

KEYWORDS: Live donor kidney transplantation; Immunosuppression; Appendicular mass; Appendectomy

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Abbreviations and Acronyms

ATG, antithymocyte globulin
DSA, donor-specific antibodies
IG, immune globulin
IV, intravenous
MMF, mycophenolate mofetil
MP, methylprednisone
PE, plasma exchange
WBC, white blood cell

INTRODUCTION

Symptoms of appendicitis vary from the typical central abdominal pain with nausea and vomiting that is present in about 60% of cases to a less common mild passing ache that occurs in around 40% [1]. Abdominal signs differ with the lie of the appendix. Severe signs such as right lower abdominal guarding and rigidity may appear early if the appendix is in an anterior position; peritoneal signs may be absent if the appendix is in a pelvic or retrocecal position [1].

The inflamed and/or necrotic appendix may become contained in an appendicular mass that excludes the inflammatory contents from the peritoneal cavity and prevents generalized peritonitis. This condition is generally treated conservatively with bowel rest, intravenous fluids, and antibiotics [2]. Alternative treatment is removal of the appendix, which some surgeons consider a better option because it eliminates the source of infection and hastens recovery [3]. If an appendicular mass is discovered at the time of surgery, we recommend appendectomy because the adhesions are generally of the "bread and butter" type and separate easily.

We describe a patient whose appendicular mass was discovered at the beginning of surgery to receive a living donor kidney transplant. Appropriate decisions had to be made, considering

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case report
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the possibility of systemic sepsis and complications due to immunosuppression [4]. The treatment challenges and protocol are discussed.

CASE REPORT

The patient was a 44-year-old mother of 6 children. She had end-stage renal disease of unknown etiology and had been on regular hemodialysis for 2 years. She was prepared for a living unrelated renal transplant.

The patient had received 2 units of packed red cells at the time of the last C-section 4 years ago. She was crossmatch negative with the donor (5 antigen mismatch). However, she had a low titer of donor-specific antibodies (DSA) with a mean fluorescence intensity (MFI) of 3,700-B51. She underwent protocol-driven desensitization therapy to eliminate the DSA. The plan was to schedule her transplant in the first available slot as soon as the DSA became negative. This occurred after 2 sessions of plasma exchange (PE) and 3 daily doses of intravenous (IV) immune globulin (IG) at 0.5 g/kg/day (Octagam; Octa Pharma, Switzerland). Mycophenolate mofetil (MMF) was started at 1 g twice daily the day before the scheduled procedure. However, the same day she complained of mild vague abdominal pain and a low-grade fever. She had no anorexia, nausea, vomiting, or diarrhea. This pain and fever were attributed to the PE and IVIG, which resolved with acetaminophen. A colonoscopy was not performed because the mandatory age in our hospital protocol is 50 years. In the absence of any further abdominal complaints or findings, she was scheduled for surgery.

Surgical Procedure

The donor left kidney was intended to be placed on the right side of the recipient. The donor and recipient procedures were started simultaneously and the recipient received induction with antithymocyte globulin (ATG; Thymoglobulin; Genzyme Corp, Cambridge MA, USA) infusion (1.5 mg/kg) and 500 mg IV methylprednisone (MP) at the start of the procedure. As the retroperitoneal space was being developed by mobilizing the peritoneum medially, a mass with surrounding induration became palpable. With further blunt dissection, it became evident that the mass was intraperitoneal. It was deemed to be either an appendicular mass or a cecal tumor. We discussed the findings with the donor team and decided not to proceed further with the donor until we had more information about the mass.

After proper placement of the retractors, the peritoneum was opened to expose the mass and it was considered to be appendicular. We isolated the mass from the rest of the peritoneal cavity with moist swabs and administered 2.25 g IV piperacillin/tazobactum. The mass was peeled back with gentle finger dissection. Unraveling it confirmed a perforated appendix with a small amount of pus (Figure 1). Culture specimens were taken. The perforation was 1.5 cm from the base of the appendix. The base and the adjacent cecal wall were healthy. A retrograde appendectomy was carried out. The appendicular stump and mesentery were secured with sutures and the appendix was sent for histopathology. The site was generously irrigated with normal saline and the peritoneum was closed. We excluded a malignancy and eliminated the inflammatory lesion. We were also confident of the viability of the cecum and the appendicular stump. Therefore, we decided to proceed with the transplant. The donor team was advised to proceed with the nephrectomy and the kidney implantation was completed uneventfully with immediate graft function.

Postoperative Care and Follow-up

Postoperatively, only ATG was continued; the patient received a total of 4.5 mg/kg in 4 doses (1st dose 1.5 mg/kg; remainder 1 mg/kg). No further MP or MMF was administered. MMF was restarted at 500 mg twice daily along with oral steroids only after return of bowel function on postoperative day 3. The patient remained afebrile with stable vital signs throughout the postoperative period. She had a brisk urine output and improving renal parameters. The abdominal exam was negative

Figure 1. Section of the appendicular tip (hematoxylin and eosin stain; 20x).
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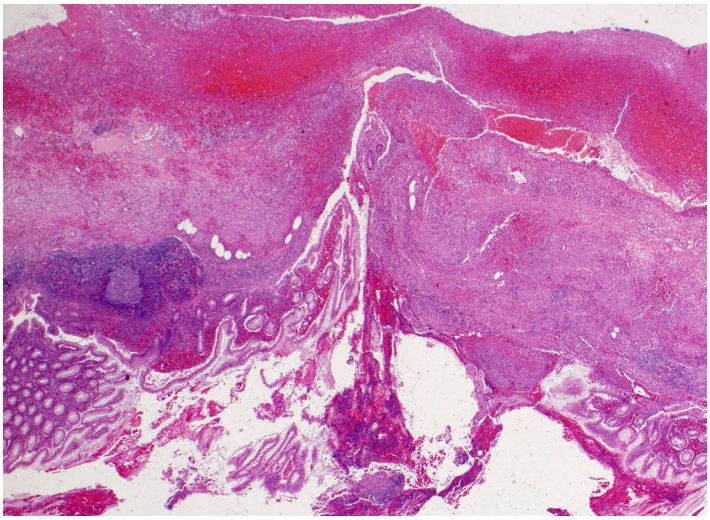

The image shows a tongue of mucosal epithelium going vertically upward through the inflamed muscularis propria. This is overlaid by a thick layer of inflammatory exudate on the serosal surface while the lumen (lower third of picture) is virtually free of exudate.

for tenderness or presence of a mass. Bowel sounds were present and the incision showed no erythema. The white blood cell (WBC) count remained within normal range. A routine Doppler ultrasound on day 2 showed good perfusion; no collection was documented. She was started on oral fluids and tolerated a normal diet by day 5. ATG was discontinued after 4 doses. Tacrolimus (2 mg twice daily) was started on day 4 and increased to 3 mg on day 6. On day 5, DSA was negative, serum creatinine was 89 mmol/L, WBC count was $7.4x10^9$/L, neutrophil count was $6.8x10^9$/L. All cultures were negative and tazobactum was discontinued on day 5. The incision was dry and pale.

The patient was discharged from the hospital following removal of the drain on day 7 with a serum creatinine of 72 mmol/L and a WBC count of 7.2 10^9/L. At this time she was on full immunosupression, which included tacrolimus 3 mg twice daily (level 7.4 µg/L), MMF 1 g twice daily, and prednisolone 20 mg daily. She also received viral and pneumocystis prophylaxis with valgancyclovir and septrin, respectively. At the 6-month follow-up evaluation, she was doing well on regular triple immunosuppression. She had no detectable DSA, a serum creatinine of 85 mmol/L, and a WBC count of $4.6x10^9$/L.

DISCUSSION

Immunosuppression in transplant recipients prevents acute rejection, but it places the patient at risk for infective complications and needs to be reduced if there is established sepsis [4]. Both ATG and MMF selectively target lymphocytes [5,6], reducing protection from viruses but sparing neutrophils that are important in cases of bacterial infection. Although MMF causes lymphopenia (unlike ATG), it may also cause neutropenia and is the reason we continued with ATG and withheld MMF. The other reason for continuing ATG and not MMF was to acquire immediate and profound T-cell lymphopenia to provide adequate protection from acute rejection in the early period [6]. Additionally, ATG would not adversely affect the neutrophilic response to the bacterial infection that may result from the perforated appendix. The leukopenia caused by MMF usually becomes evident in 3-4 days. By that time, if there was no residual infection in the appendicular stump, continuing MMF would not have mattered. Steroids are well established anti-inflammatory agents that reduce and blunt the immune response and adversely affect chemotaxis and wound healing [7]. Had the appendicular mass been discovered before the MP dose was administered, we would have chosen to omit it to prevent the possibility of infection [7]. No further doses of MP were given. Oral steroids were only started once bowel function returned because this suggested the absence of any significant intra-abdominal sepsis. In cases of sepsis [4], MMF is generally withheld and reintroduced once the sepsis is eliminated. In our recipient, it was resumed at 500 mg twice daily only after return of bowel function. At this time, the patient was afebrile, all cultures were negative, the WBC count was normal, and there was no incision erythema. With no evidence of infection, the focus shifted to increasing immunosuppression to provide adequate levels by the time of hospital discharge.

This appears to be the first case in the literature where an incidental appendicular mass was discovered in a recipient at the time of the kidney transplant procedure. Indeed, we were surprised. Our first concern was to exclude bowel malignancy, which would have eliminated all possibility of transplantation. Traditionally, the transplant procedure would also be aborted if an appendicular mass was found and rescheduled following recovery. We decided to proceed with the transplant following appendectomy based on the minimal degree of contamination, quality of the appendicular stump and bowel, and absence of any residual necrotic tissue. We were able to use limited and customized immunosuppression. This case must be differentiated from those with abscesses and generalized peritonitis resulting from perforations due to inflammatory bowel disease or diverticulitis. Under these circumstances, the degree of contamination and quality of the adjacent bowel is unfavorable to transplantation. This would also apply to localized diverticular abscesses because (unlike appendectomy) drainage and antibiotics are not definitive. Liver abscesses would be in the same category because there is a high likelihood of the presence of drainage catheters and systemic sepsis.

We invite criticism and expect to generate debate because this procedure challenges the concept of transplantation in the presence of infection. In fact, we feel that this should be considered a landmark case, because it challenges traditional teaching. It is the first report in the literature of a kidney being successfully transplanted in a recipient immediately after an appendectomy for an appendicular mass. It is reminiscent of earlier days when appendectomy was not considered the treatment of choice for an appendicular mass until it was discovered that, based on favorable local conditions, appendectomy was not only possible but also definitive. Because the appendectomy in our recipient was definitive, it did not adversely affect graft function or outcome. The risk of infection was a concern but, in the absence of any residual necrotic tissue and a healthy appendicular stump, it was deemed unlikely. Appendicular abscesses are also different from appendicular masses because of the presence of greater necrotic and friable tissue, which would increase the risk of infection. It must be cautioned that this is a single case report and it does not mean that transplantation is now possible in all recipients with appendicular masses; each situation must be

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considered separately.

We conduct simultaneous donor and recipient procedures. As soon as the mass was discovered, we asked the donor team to put the procedure on hold until a definite decision could be made. Once we had decided to proceed with the transplant, we asked the donor team to complete the recovery procedure. In situations where 1 team does both the recovery and implantation, it would be a serious problem to discover a bowel malignancy or an appendicular mass in the recipient after the donor kidney has been recovered. This 1-team policy is not ideal and should be discouraged to avoid such a situation or any other unexpected problem in the recipient that may necessitate aborting the procedure [8]. In our center, as in other centers with 2 teams, both teams are in communication and no structure is divided in the donor unless both teams agree. If the transplant is canceled for any reason, the donor team would just abort the procedure. Simultaneous donor and recipient procedures would appear labor intensive and expensive but are safe for both donor and recipient and help to prevent such difficult situations.

In hindsight, the abdominal pain and fever that the recipient had the day before surgery were due to the ongoing appendicitis. At the time, they were attributed to PE and IVIG because these adverse events are not unknown with this form of treatment [9,10]. The adverse event theory appeared the most plausible because the pain and fever were resolved with acetaminophen and did not recur. Additionally, there were no abdominal findings on examination.
In summary, this is the first report where an appendicular mass was discovered in the recipient at the time of kidney transplantation and the transplant was completed immediately following appendectomy, with customized minimal immunosuppression. Our experience suggests that the incidental discovery of an appendicular mass at surgery may not necessarily be an absolute contraindication to kidney transplantation.

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