Case Reports

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A Report of Three Cases of Anesthesia in Patients Undergoing Simultaneous Kidney-Pancreas Transplantation

S. Ebrahimnia Milani (MD)[1], S. Moazami (BSc)[2], M. Jafari (MD)[3], A. Ebrahimi (MSc)[4], N. Samiei (MSc)[5], M. Sadeghi (MSc)*[6]

1.Surgical Oncology Research Center, Mashhad University of Medical Sciences, Mashhad, I.R.Iran

2.Student Research Committee, Jiroft University of Medical Science, Jiroft, I.R.Iran

3.Department of Anesthesiology, School of Medicine, Mashhad University of Medical Sciences, Mashhad, I.R.Iran

4.Department of Operating Room, School of Allied Medical Sciences, Bushehr University of Medical Sciences, Bushehr, I.R.Iran

5.Imam Reza Hospital. Mashhad University of Medical Sciences, Mashhad, I.R.Iran

6.Montaserie Organ Transplantation Hospital, Mashhad University of Medical Sciences, Mashhad, I.R.Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: Induction of anesthesia and surgery lead to metabolic changes and make it difficult for diabetic patients to control their blood sugar. Complications of kidney failure may also affect the management of anesthesia in these people. The present study was conducted to report three cases of anesthesia in patients undergoing simultaneous kidney-pancreas transplantation.

CASE REPORTS: The first patient was a 33-year-old woman, the second patient was a 28-year-old woman, and the third patient was a 27-year-old woman, all of whom had diabetes mellitus and diabetic nephropathy and were under hemodialysis treatment. All patients underwent general anesthesia. Drugs used for anesthesia included midazolam, fentanyl, cisatracurium, and propofol. All patients underwent simultaneous kidney-pancreas transplantation. Postoperative condition of transplanted patients was favorable and they are still under the supervision of a physician.

CONCLUSION: Based on the results of this study, good management of anesthesia and the use of appropriate anesthetic drugs and control of hemodynamic conditions and pain management can improve the outcome of kidney-pancreas transplantation.

KEY WORDS: *Anesthesia, Kidney Transplant, Pancreas Transplant.*

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***Corresonding Author: M. Sadeghi (MSc)**

Address: Montaserie organ transplantation hospital, Mashhad University of Medical Sciences, Mashhad, I.R.Iran

Tel: +98 77 33450089

E-mail: Abed.or90@gmail.com

Introduction

Transplantation is an effective treatment for some life-limiting diseases. Two of the most effective transplants are kidney transplantation for the treatment of end-stage renal disease and pancreatic transplantation, which is often performed along with kidney transplantation (1). Treatment of people with type 1 diabetes is associated with poor blood sugar control and severe complications of secondary diabetes (2). Surgical treatment for diabetes includes pancreas transplant alone (PTA). In addition, in patients with diabetes mellitus with end-stage renal disease (ESRD), pancreas transplantation is performed after kidney transplantation (pancreas after kidney [PAK]) or simultaneous pancreas-kidney (SPK) transplantation. By the end of 2010, the International Registry had reported more than 35,000 pancreatic transplants, 75% of which were simultaneous pancreas-kidney transplantation (3).

Evidence suggests that simultaneous pancreas-kidney transplantation is a life-prolonging procedure (4). Simultaneous pancreas-kidney transplantation normalizes blood sugar without the need for insulin injections, improves quality of life, and protects against the long-term effects of type 1 diabetes (5). In the management of pancreas transplantation anesthesia, general anesthesia with endotracheal intubation is generally the preferred method. A report stated that in a 32-year-old man with diabetes and end-stage renal disease, simultaneous pancreas-kidney transplantation was successfully performed with good management of anesthesia (5). Moreover, in a review article on 40 kidney transplant recipients, it was found that good management of anesthesia, the selected anesthesia drugs, maintaining renal blood flow and hemodynamic stability of the patient will lead to successful transplantation (6).

One report recommends the use of propofol for temporary relief instead of narcotics in the early postoperative period after simultaneous pancreas-kidney transplantation (7). It is important to note that pancreatic transplant recipients usually have severe diabetes and have many systemic complications associated with the disease. However, with careful preoperative, intraoperative, and postoperative evaluation and management of anesthesia, most patients can successfully have a pancreas transplant alone, simultaneous transplantation or after kidney transplant. Anesthesiologists can ensure maximum transplant function by optimizing the metabolic and hemodynamic status of patients undergoing the procedure. The aim of this study was to report three cases of anesthesia in patients undergoing simultaneous pancreas-kidney transplantation.

Case Reports

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The first patient: The patient is a 33-year-old woman who has had diabetes mellitus and diabetic nephropathy since the age of 13 and has been under hemodialysis for the past two years. Her preoperative medications include Atorvastatin, Lantus, NovoRapid, Calcium, and ASA. Her medical records include angiography, blood transfusions, and surgical arteriovenous fistulas. The patient received 5500 cc of crystalloid fluid (normal saline) and 30 g of albumin during surgery (for 8 hours and 30 minutes). Blood glucose was checked during the operation; two hours after surgery, the patient's blood sugar was 262 mg/dl, after 3 hours was 246 mg/dl, after 5 hours was 222 mg/dl, after 6 hours was 206 mg/dl, after 7 hours was 207 mg/dl, and after 8 hours was 153 mg/dl. Thirty days after surgery, the transplanted kidney and pancreas were checked by ultrasound. The dimensions and echocardiography of viscera were normal. The patient was discharged from the hospital under normal conditions after 67 days. Preoperative and postoperative tests were repeated on the seventh and fourteenth days and one month later. Test results showed that postoperative blood glucose improved compared to preoperative blood glucose (Table 1).

The second patient: The patient is a 28-year-old woman who has had diabetes mellitus since the age of 14 and has had ESRD for 2 years and has been under hemodialysis for the past two years. Her preoperative medications include calcium, Lasix, nephrovit, amlodipine, levothyroxine, L-carnitine, carvedilol, Lantus, and norepinephrine. Her medical history included reports of kidney biopsies, blood transfusions, and hypothyroidism. Hypersensitivity to broad-spectrum antibiotics of cefixime and hypothyroidism has been reported.

The patient received 5050 cc of crystalloid fluid (normal saline) and 40 g of albumin during anesthesia (for 9 hours and 30 minutes). Blood sugar (BS) was checked during surgery, the values of which were 200 mg/dl one hour after surgery, 210 mg/dl after 4 hours, 68 mg/dl after 7 hours and 177 mg/dl after 10 hours. In postoperative care for the first 24 hours, vital signs were normal. Doppler ultrasound of transplanted kidney and pancreas was performed on the first day after surgery.

The transplanted kidney had normal longitudinal dimensions and the intraparenchymal vascular pattern was normal. The tests were repeated in the first 48 hours after surgery as well as on the fourth day. Test results showed that postoperative blood sugar improved compared to preoperative blood sugar (Table 2). 38 days after surgery, longitudinal dimensions and parenchyma thickness were normal in LLQ based on the ultrasound of the transplanted kidney. Parenchymal echo of the transplanted kidney was normal and renal corticomedullary differentiation was appropriate. There was no hydronephrosis. Transplanted pancreas had normal dimensions. Its parenchymal echo was briefly heterogeneous. The patient was discharged from the hospital under normal conditions after 40 days of hospitalization.

The third patient: The patient is a 27-year-old woman with diabetes mellitus who has developed ESRD due to diabetes. She was treated with insulin and calcitriol and had been under hemodialysis for 2 years. Her preoperative medications include calcium, calcitriol, insulin, vitamins E and C, folic acid, and ferrous sulfate. The patient had oliguria at the time of admission to the hospital and a history of arteriovenous fistula implantation. During the anesthesia (8 hours and 30 minutes), the patient received 4500 cc of crystalloid fluid (normal saline), 450 cc of mannitol and 40 gr of albumin. BS was checked during surgery. Results were 289 mg/dl one hour after surgery, 249 mg/dl after 3 hours, 170 mg/dl after 4 hours, 99 mg/dl after 5 hours and 105 mg/dl after 6 hours. Preoperative and postoperative tests were performed. The results of the tests showed that postoperative blood sugar improved compared to preoperative blood sugar (Table 3). Furthermore, radiographs performed at this time showed that the location of the transplanted pancreas was in the midline area and inclined to the right and the patient did not have hydronephrosis. The patient was discharged from the hospital in stable condition and 62 days after transplant surgery.

All three patients were admitted to the hospital 24 hours before surgery for necessary tests and preoperative preparations, and then underwent simultaneous pancreas-kidney transplantation. All patients underwent general anesthesia; midazolam, the fast-acting fentanyl, the nondepolarizing muscle relaxant cisatracurium besilate, and propofol were used to induce anesthesia. For anesthetic maintenance, propofol, remifentanil and muscle relaxant cisatracurium besilate were administered via bolus injection (0.03 mg/kg IV) every 45 minutes. A radial artery catheter was implanted for invasive monitoring to assess arterial blood pressure, as well as a way to achieve arterial blood gas analysis and blood glucose monitoring. An internal jugular vein catheter was inserted on the right side (opposite the arteriovenous fistula) to monitor central venous pressure and drug infusion. After the operation, the condition of the transplant recipient was good. The prescribed medications were taken according to the doctor's instructions and the graft function was acceptable. Patients are still under the care of a physician.

Table 1. Preoperative and postoperative test results in the first patient

Variable	WBC	RBC	Hb	Hct	MCHC	Plt	FBS/BS	Urea	Cr	Alb	K	Ca
Before surgery	6.29	4.09	11.4^{*L}	35.7^{*L}	31.9^{*L}	238	203^{*H}	125^{*H}	7.62^{*H}	4.6	4.8	9.7
7 days after surgery	4.16^{*H}	3.47	9.4^{*L}	29.7^{*L}	31.6^{*L}	224	97	49	1.72^{*H}	2.8^{*L}	-	9
14 days after surgery	13^{*H}	3.02	8.5^{*L}	26^{*L}	32.7	227	-	36	1.3	-	4.2	9.4
30 days after surgery	3.9^{*L}	3	8.1^{*L}	25.7^{*L}	31.5^{*L}	349	-	40	1.23	3^{*L}	5.1	9.3
The reference values	10^9 4-10	10^3 µl	11-16 g/dl	37-54%	32-36 g/dl	×10^3 µl	Mg/dl	17-43 mg/dl	Up to 1.4	3.5-5.2 g/dl	3.5-5.3 mEq/dl	8.5-10.5 g/dl

Table 2. Preoperative and postoperative test results in the second patient

Variable	WBC	RBC	Hb	Hct	MCHC	Plt	FBS/BS	Urea	Cr	Alb	K	Ca
Before surgery	4.47^{*L}	3.68	11^{*L}	34.3^{*L}	32.1	149^{*L}	214^{*H}	76^{*H}	7.74$^{*}_{H}$	4.2	-	-
48 hours after surgery	9.53	2.82	8.4^{*L}	26.4^{*L}	31.8^{*L}	88^{*L}	99	78^{*H}	2.42$^{*}_{H}$	-	4.5	-
4 days after surgery	4.38^{*L}	2.54	7.5^{*L}	23.2^{*L}	32.3	67^{*L}	92	52^{*H}	1.05	-	3.3^{*L}	-
The reference values	10^9 4-10	10^3 µl	11-16 g/dl	37-54%	32-36 g/dl	×10^ 3 µl	Mg/dl	17-43 mg/dl	Up to 1.4	3.5-5.2 g/dl	3.5-5.3 mEq/dl	8.5-10.5 g/dl

Table 3. Preoperative and postoperative test results in the third patient

Variable	WBC	RBC	Hb	Hct	MCHC	Plt	FBS/ BS	Urea	Cr	Alb	K	Ca
Before surgery	4.2	2.1	5.6*L	17.9*L	31.3*L	117*L	215	-	-	-	-	-
24 hours after surgery	6.2	2.9	8*L	24.2*L	33.1*L	122*L	102BS	63*H	2.3*H	-	3.5	7.3
30 days after surgery	10.71*H	3.5	9.7*L	30.3*L	32.0	360	78	27	0.97	-	5	-
The reference values	10^9 4-10	10^3 µl	11-16 g/dl	37-54%	32-36 g/dl	×10^3 µl	Mg/dl	17-43 mg/dl	Up to 1.4	3.5-5.2 g/dl	3.5-5.3 mEq/dl	8.5-10.5 g/dl

Discussion

With careful evaluation of patients before, during and after surgery and management of anesthesia, all three patients had a successful transplant. Anesthesiologists optimized the metabolic and hemodynamic status of patients to ensure maximum transplant function. The main purpose of pancreas transplantation is to prevent long-term complications of diabetes and to maintain normal blood glucose levels (8). In our patients, short-term and medium-term follow-ups showed improvements after transplantation. The presence of comorbidities in patients with ESRD and insulin dependent diabetes mellitus (IDDM) has several problems that can complicate the anesthesia process (9). In these patients, there is a possibility of significant changes in the pharmacokinetics of anesthetic drugs, especially if these drugs are excreted through the kidneys (10).

Extensive evaluation is essential to diagnose preoperative treatments. Evaluation of the cardiovascular and autonomic systems, electrolytes, glucose, hemoglobin, and acid-base status, and in cases of hemodialysis, the type and time of the last hemodialysis, and the risk of aspiration and intubation should always be considered (11). Most complications are related to coronary artery disease. Among these, coronary artery disease has the most complications and in such patients, physical examinations, electrocardiograms and medical records alone do not work (10).

Anemia is common in ESRD and may have many effects on complications and even transplant success (12). During long-term surgery, the patient may develop deep vein thrombosis (13). For prevention, we used an alternating pneumatic pressure test generator for patients. Temperature maintenance during long-term surgery was performed using air warmers as well as hot liquids for patients. Opioids of fentanyl family are recommended as drugs in these patients, because they have relatively inactive metabolites that cause little hemodynamic changes even at higher doses (10). Fentanyl was also used as a sedative in our patients. However, a study has suggested that propofol should be used instead of fentanyl for postoperative sedation due to the issue of opioid addiction (7). In a report of simultaneous pancreas-kidney transplantation presented by Kumar et al., the drugs used for general anesthesia in the patient included fentanyl, midazolam, propofol, and atracurium for endotracheal intubation (5). In our patients, drugs similar to the study of Kumar et al. were used for general anesthesia.

Blood sugar control without insulin, increased quality of life, and prevention of long-term diabetes-related complications in patients with type 1 diabetes are some of the positive consequences of simultaneous pancreas-kidney transplantation. Minimization of cardiovascular function is the main goal in the management of postoperative anesthesia in patients undergoing simultaneous pancreas-kidney transplantation, so that transplant perfusion is desirable and myocardial ischemia is prevented. The postoperative care team must be prepared and vigilant as the duration of surgery and the complexity of comorbidities can lead to problems and loss of the transplanted organ or even the recipient. With good anesthesia management and the use of appropriate anesthetic drugs and control of hemodynamic conditions and pain management, the outcome of simultaneous pancreas-kidney transplantation can be improved.

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