



## ORIGINAL RESEARCH

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# Anesthesia management in kidney transplantation patients: Retrospective evaluation

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### Abstract

Kidney transplantation comes first for treating and improving living standards in patients with end-stage renal disease. The developments in surgical techniques on kidney transplantation and the specific immunosuppressive agents contributed to improving the function of graft for more extended periods. In addition, developments of anesthesia also contributed to this success. The purpose of the study was to present anesthesia management applied on 40 kidney transplant recipients who were carried out from live and cadaver donors with a current literature review. The ages, genders, accompanying systemic diseases, whether or not the graft was received from live donor or a cadaver, hot/cold ischemia times, anesthesia and surgery times of the participants were recorded. In addition, postoperative analgesia management, postoperative complications and hospital stays of the patients were also recorded. We believe that graft preservation and patient comfort will be increased with good analgesia management, graft protection, by using selected anesthetics and protecting the kidney blood flow, and by close hemodynamic follow-up in kidney transplant patients.

**Keywords:** Anesthesia management, kidney transplantation, evaluation

### Introduction

Kidney transplantation comes first for treating and improving living standards in patients with end-stage renal disease. Kidney transplantation is the most common solid organ transplantation in Turkey as well as in the whole world and carried out mostly from live donors [1]. The developments in surgical techniques on kidney transplantation and the specific immunosuppressive agents contributed to improving the function of graft for more extended periods [2]. In addition, developments of anesthesia also contributed to this success.

Good anesthetic management and analgesia in kidney transplant recipient are essential for graft function and patient comfort [3,4]. The number of kidney transplantations increases with each passing year. In our study, the purpose was to present anesthesia management performed on 40 kidney transplant recipients who were carried out from live and cadaver donors with a current literature review.

### Material and Methods

Following the approval of Inonu University, Clinical Trials Ethics Committee (2019/46-01) was received; anesthesia records of 40 patients, who were admitted to Inonu University Medical Faculty Hospital, General Surgery Operating Room (between January 2018 and December 2018) were evaluated retrospectively.

The patients whose informed consents were received for anesthesia before the surgery were taken to the operation room without applying premedication. For standard monitoring, 3-channel electrocardiography, noninvasive blood pressure, and pulse oximetry were employed. Following the achieving peripheral intravenous (IV) access in the non-fistula arm, 1 mcg/kg fentanyl was applied. General anesthesia induction was achieved with propofol, fentanyl, lidocaine, rocuronium or cisatracurium. Anesthesia maintenance was carried out with desflurane and 50% oxygen-50% nitrous oxide. After the intubation, the patients were ventilated mechanically by using a volume-controlled mode. An invasive blood pressure monitorization was ensured by applying radial artery catheterization in the non-fistular arm. A central pressure monitorization was achieved by inserting a 3-way central venous catheter or dialysis catheter in the right jugular

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vein accompanied by USG. For body temperature monitoring, an esophageal heat probe was placed. Immune suppression infusion (ATG or simulect) was performed through a central route. Antibiotic prophylaxis, low molecular weight heparin 70 units/kg, methylprednisolone 15 mg/kg, and proton pump inhibitor were carried out.

Intraoperative fluid management was performed with a conventional fluid management regimen. Isolyte-S was given 0.5 mL/kg/h infusion and intermittent bolus for maintain CVP 12-15 mmHg and MAP 60-80 mmHg. When the graft was inserted, it was infused with 20% mannitol 1.5 mL/kg and furosemide 2 mg/kg. To keep the mean arterial pressure above 60 mmHg, noradrenaline infusion was used; and for those who were hypertensive and had coronary artery disease, nitroglycerin infusion was used by changing the actual dose.

The ages, genders, accompanying systemic diseases, whether or not the graft was received from live donor or a cadaver, hot/cold ischemia times, anesthesia and surgery times of the participants were recorded. In addition, postoperative analgesia management, postoperative complications and hospital stays of the patients were also recorded.

For postoperative analgesia, the wound area infiltration block was performed with bupivacaine as 0.5 mg/kg at the end of the surgery. In addition tramadol 0.5 mg/kg and paracetamol 15 mg/kg combination were used. The patients whose postoperative VAS scores (0: no pain, 10: intolerable pain) were  $\geq 40$  were given 0.5 mg/kg IV pethidine. The patients were taken to the general surgery transplant service after at least one hour of monitoring in the recovery unit.

## Results

Forty patients were included in the study. Demographic and clinical data of the patients were presented in Table 1.

Procedures during anesthesia management were presented in Table 2. The duration of cold ischemia of cadaveric donors was measured longer than living donors and maximal time was 1116 min.

The fluid management was carried out Isolyte-S on all patients, colloid, blood, and blood products were not used. Some patients had comorbidities included that hypertension 12 (30%), hypertension and diabetes 3 (7.5%), diabetes 2 (5%), and one patient had sleep apnea 1 (2.5%).

In a patient who had factor VII deficiency developed intraoperative renal artery thrombosis during surgery. In a patient, hemorrhage occurred on the 3rd day. In another patient was developed nasal mucor infection on the 30th day and the patient died.

Eight patients were administered additional analgesic which was pethidine.

The duration of hospital stay on living recipients was shorter, and the shortest was 5 days. It was found that there was prolonged hospital stay in cadaveric recipients up to 35 days.

**Table 1.** Demographic and Clinical Characteristics

	Range	Mean $\pm$ std	n
Age (years)	7 – 61	38.90 $\pm$ 13.75	
Sex (male/female)	-	-	29/11
Weight (kg)	23 – 104	64.80 $\pm$ 17.25	
Cadaveric/living live	-	-	8/32
ASA III/IV	21 – 30	24.95 $\pm$ 2.85	38/2
Hemoglobin(mg/dL)	6.3 – 10.3	8.02 $\pm$ 1.06	
Need for additional analgesics	-	-	8
Comorbidity			
None	-	-	22
Hypertension	-	-	12
Diabetes +Hypertension	-	-	3
Diabetes	-	-	2
FVII Deficiency	-	-	1
Sleep Apnea	-	-	1
Complications			
none	-	-	36
hemorrhage	-	-	1
thrombosis	-	-	1
mortality	-	-	1

American Society of Anesthesiology, n: number of cases, Values are expressed as means  $\pm$  SD and range( min-max)

**Table 2.** Procedure datas

	Range	Mean $\pm$ std
Duration of anesthesia (min)	180-360	298.50 $\pm$ 32.22
Duration of surgery (min)	170-320	253.50 $\pm$ 30.93
Total crystalloid (mL)	600-4000	3062.50 $\pm$ 833.80
Mannitol (mL)	30-150	93.75 $\pm$ 26.57
Furocemid (mg)	80-180	131.50 $\pm$ 18.05
Bupivacain (mg)	15-25	24.5 $\pm$ 0.44
Blood Transfusions	-	-
Duration of cold ischemia (min)	67-1116	275.82 $\pm$ 379.14
Duration of hot ischemia (min)	1.11-4	2.27 $\pm$ 0.78
Duration of urinary flow (min)	3-34	7.96 $\pm$ 8.81
Length of hospital stay (day)	5-35	10.95 $\pm$ 10.38

Values are expressed as means  $\pm$  SD and range( min-max)

## Discussion

When compared with dialysis in patients who have chronic kidney failure, kidney transplantation decreases costs by increasing both survival and patient comfort.

Kidney transplantation is one of the most frequently-applied solid organ transplants, and there are cases for whom simultaneous pancreatic transplantations were carried out in the same session. In our center, simultaneous pancreatic transplantation has not been performed because no suitable cadavers were found.

Since the cadaveric kidney transplantation may be carried out in a limited number in our country because there are not adequate cadavers, parallel to this, it is also made in a small number in our center. Although the number of kidney transplantation from cadavers is low, the fact that we had the technology needed to grow the graft in the earliest time was to the advantage of the graft.

Live donor kidney transplantation is carried out in many centers as well as in our center in an increasing number [5]. Nowadays, receiving the graft from the live donor with laparoscopy and increasing the comfort of the postoperative period are the advantages.

Although neuraxial and peripheral nerve blocks were used in kidney transplant patients, usually, general anesthesia is preferred. Propofol is the most frequently-preferred general anesthetic because of providing fast induction and recovery; and therefore, we preferred it in all cases. It was reported that pentothal was used as a IV anesthetic in pediatric kidney transplantation in anesthesia management [6]. Fentanyl was preferred by us as the narcotic analgesic. Although cis atracurium is the agent with the lowest renal elimination for the neuromuscular block, rocuronium was preferred mostly to ensure rapid induction and intubation because of gastric emptying being late in renal failure [7]. Although there were several publications that recommended to use sugammadex to reverse the neuromuscular block [8], we reversed it with neostigmine and atropine except for the patients who had difficult intubation as the duration of action was shorter compared to rocuronium. Although using sevoflurane is recommended by claiming that its elimination will not be a problem in maintaining anesthesia after the transplantation, we used desflurane in all of our cases. In a clinical study in which sevoflurane and desflurane were compared, the authors concluded that using it in live kidney transplantation did not differ in terms of early graft function [9].

A total of Isolyte –S was used by us for fluid replacement. The central venous pressure (CVP) was applied as a 12-15 mmHg range. In a study in which low-chloride balanced solutions were compared with normal saline, it was reported that balanced solutions provide a better acid-base balance [10]. In fluid management, traditional methods like CVP and renal vein fullness were used. In a clinical study in which esophageal doppler was used in fluid management, it was concluded that there were no differences in terms of volume differences when compared to the traditional method [11,12].

To keep the average arterial pressure over 60 mmHg is necessary to protect the graft in fluid management. Inotropic agents should be employed when needed to prevent hypotension attacks. In a clinical study in which the effects of inotropic use on graft function was investigated, more inotropic was needed especially in older recipients, and significant increases were determined in hospital stay and morbidity [13].

Analgesia management is essential in kidney transplant patients to maintain the graft function, improve patient comfort, and for early mobilization. The prolonged effects of narcotic analgesics bring together co-morbidity [14]. Peripheral nerve blocks and neuraxial blocks were employed for postoperative analgesia. The recommended issue in kidney recipient is to avoid nephrotoxic agents when multimodal analgesia regimen is chosen.

Blocking of the parietal nociceptive afferent nerves via surgical-site infiltration block by local anesthetics is widely used after major surgery [15,16]. In our cases, we preferred combination the bupivacaine with surgical- site infiltration block, IV tramadol, and paracetamol. The tendency to acidosis increases in kidney failure, and since the free fraction of local anesthetics will increase, the dose must be decreased [17]. For this reason, we used 0.5 mg/kg bupivacaine to infiltrate the wound site. The neuro-axial blockade was avoided in our cases because of the low molecular-weight heparin usage. In a study conducted by Jun et al. which was compared compare intrathecal morphine with ropivacaine injection on wound site in kidney recipients, it was concluded that intrathecal morphine provided better analgesia; however, patient comfort was not good because of respiratory depression and itchiness complaints [18].

### Limitations

There is a limitation on fluid management. Dynamic fluid management strategies were not performed because of lack of technology.

### Conclusion

We believe that graft preservation and patient comfort will be increased with a good analgesia management. Using suitable anesthetics, close hemodynamic monitoring and adequate pain management can improve outcome in kidney transplant recipients.

### Competing interests

*The authors declare that they have no competing interest.*

### Financial Disclosure

*All authors declare no financial support.*

### Ethical approval

*The financial support for this study was provided by the investigators themselves.*

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