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Successful Kidney Transplantation Under Combined Spinal-Epidural Anesthesia in a Patient With a History of Left Pneumonectomy Due to Bronchiectasis

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Data Collection B
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Data Interpretation D
Manuscript Preparation E
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Patient: Male, 33-year-old
Final Diagnosis: Kidney transplantation
Symptoms: End stage renal disease
Clinical Procedure: —
Specialty: Nephrology
Objective: Unusual clinical course
Background: Kidney transplantation offers clear survival and quality-of-life advantages over dialysis, but severe pulmonary disease can complicate perioperative planning. In patients with substantially reduced respiratory reserve after pneumonectomy, general anesthesia may be considered high risk, creating uncertainty about transplant feasibility.
Case Report: A 33-year-old man with end-stage kidney disease secondary to biopsy-proven AA amyloidosis was evaluated for preemptive living-donor kidney transplantation. He had undergone left pneumonectomy in 2015 because of bronchiectasis. Pulmonary function testing showed a mixed restrictive-obstructive pattern, with a forced vital capacity of 1.6 L (33% predicted), a forced expiratory volume in 1 second of 1.05 L (30% predicted), and a forced expiratory volume in 1 second/forced vital capacity ratio of 65%, indicating severe pulmonary impairment. Thoracic computed tomography demonstrated leftward mediastinal shift and diffuse bronchiectatic changes in the remaining right lung. Given the anticipated risk associated with general anesthesia, combined spinal-epidural anesthesia was selected. The transplant was successfully performed using a kidney from the patient's human leukocyte antigen (HLA)-identical sister. No intraoperative respiratory or hemodynamic instability occurred. Renal function rapidly improved after surgery: serum creatinine decreased from 6.6 mg/dL preoperatively to 0.63 mg/dL on postoperative day 3. Heavy proteinuria also greatly improved during follow-up.
Conclusions: This case demonstrates that kidney transplantation can be successfully performed under combined spinal-epidural anesthesia in carefully selected patients with severely limited pulmonary reserve after pneumonectomy. It also highlights the importance of individualized anesthetic planning and close multidisciplinary coordination for complex transplant candidates with major pulmonary comorbidities.
Keywords: Anesthesia, Epidural • Anesthesia, Local • Bronchiectasis • Kidney Transplantation
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Introduction

Kidney transplantation remains the preferred treatment for end-stage kidney disease because it offers better long-term survival and quality of life than dialysis [1,2]. In patients with major pulmonary comorbidities, however, perioperative planning becomes substantially more complex. After pneumonectomy, reduced pulmonary reserve, mediastinal shift, and altered cardiopulmonary physiology may increase the risks associated with airway manipulation, mechanical ventilation, and perioperative fluid management [3,4]. Consequently, general anesthesia may be particularly challenging in selected transplant candidates with a single functioning lung.

Regional anesthesia has been explored as an alternative to general anesthesia for kidney transplantation, especially in patients considered vulnerable to respiratory complications [5-8]. To date, reports involving patients with a single lung remain limited. This report presents a feasibility-oriented case demonstrating that living-donor kidney transplantation under combined spinal-epidural anesthesia can be successfully performed in a carefully selected patient with prior pneumonectomy, severe pulmonary impairment, and preserved eligibility for pre-emptive transplantation.

Case Report

A 33-year-old man was referred to our transplant program for preemptive living-donor kidney transplantation. He had undergone left pneumonectomy in 2015 because of bronchiectasis. In 2018, kidney and bone marrow biopsies established the diagnosis of secondary AA amyloidosis. At the time of transplant evaluation, he had not yet started dialysis and maintained a urine output of 1500 to 2000 mL/day.

Preoperative laboratory testing showed a serum creatinine level of 6.6 mg/dL, estimated glomerular filtration rate of 10.63 mL/min/1.73 m², hemoglobin level of 8.3 g/dL, serum albumin level of 1.9 g/dL, and spot urine protein-to-creatinine ratio of 10.1 g/g. Daily proteinuria was approximately 10 g. Pulmonary function tests demonstrated severe impairment with a mixed restrictive-obstructive pattern: forced vital capacity of 1.6 L (33% predicted), forced expiratory volume in 1 second of 1.05 L (30% predicted), and forced expiratory volume in 1 second/forced vital capacity ratio of 65%. Preoperative thoracic computed tomography showed the expected leftward mediastinal shift after pneumonectomy, along with diffuse cystic and saccular bronchiectatic changes in the remaining right lung (**Figure 1**).

Given the anticipated risk associated with general anesthesia in the setting of greatly impaired pulmonary function, the

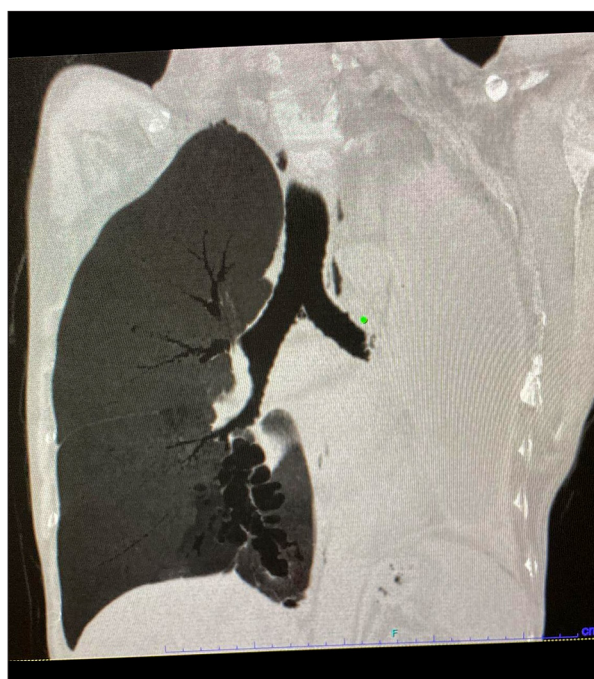


Figure 1. Preoperative thoracic computed tomography showing leftward mediastinal shift after pneumonectomy and bronchiectatic changes in the remaining right lung.

anesthesia and surgical teams elected to proceed with combined spinal-epidural anesthesia. In the operating room, electrocardiography, pulse oximetry, and noninvasive blood pressure monitoring were initiated. With the patient in the lateral position, the epidural space was identified at the L2 to L3 interspace using a needle-through-needle technique. After confirmation of cerebrospinal fluid flow through the spinal needle, the intrathecal block was verified as adequate for the right lower quadrant incision before proceeding; the exact dermatomal level was not formally documented in the anesthesia record. Fifteen milligrams of hyperbaric bupivacaine (0.5%, 3 mL) and 20 mcg of fentanyl were administered intrathecally; an epidural catheter was placed. The patient was then positioned supine, and invasive arterial monitoring was established through the left radial artery under local anesthesia. Supplemental oxygen was administered via face mask throughout the procedure, as shown in the surgical field photograph (**Figure 2**).

The transplant was performed using a kidney from the patient's human leukocyte antigen (HLA)-identical sister through a standard right lower quadrant incision. After the incision, the patient reported localized pain at the superior aspect of the surgical field. This was managed with 100 mg of lidocaine and 25 mg of bupivacaine administered through the epidural catheter, along with intravenous ketamine at 1 mg/kg. The procedure was completed without conversion to general anesthesia. No clinically significant intraoperative respiratory compromise, desaturation, or hemodynamic instability occurred. The total

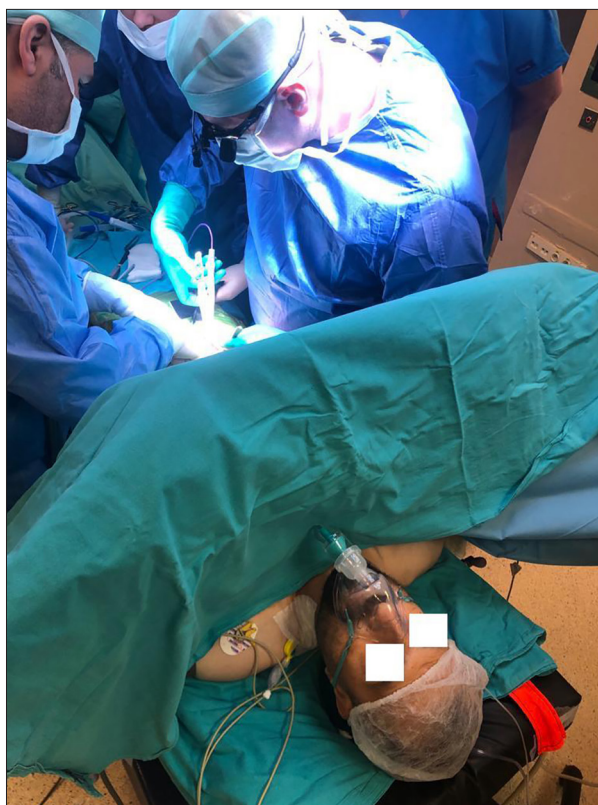


Figure 2. Intraoperative view of the surgical field during kidney transplantation performed under combined spinal-epidural anesthesia.

operative time was approximately 2 hours. No blood transfusion was required. Urine output was observed from the beginning of the procedure. Intraoperative blood pressure ranged from 160/70 to 170/57 mm Hg, heart rate ranged from 65 to 84 beats/min, and oxygen saturation remained between 95% and 99%. Intravenous fluid administration was guided by a mean arterial pressure target of greater than 70 mm Hg; no vasopressors were required. The exact volume of intraoperative fluid administered was not recorded in the available anesthesia documentation.

The postoperative course was uncomplicated. Immunosuppression consisted of intraoperative methylprednisolone 1000 mg and rabbit antithymocyte globulin (ATG) 100 mg for induction, followed by maintenance therapy with tacrolimus (0.1 mg/kg/day) and mycophenolate mofetil (1000 mg twice daily). Serum creatinine decreased to 2.42 mg/dL on postoperative day 1, 0.76 mg/dL on day 2, and 0.63 mg/dL on day 3. Proteinuria also substantially improved during follow-up, decreasing from nephrotic-range levels preoperatively to 48 mg/day. At the 3-month follow-up visit, BK virus and cytomegalovirus polymerase chain reaction test results were negative; graft function remained stable.

Discussion

This case is notable for 2 reasons. First, it involved preemptive kidney transplantation in a patient with advanced pulmonary impairment after pneumonectomy. Second, the operation was successfully completed under combined spinal-epidural anesthesia without conversion to general anesthesia. Accordingly, this report should be primarily interpreted as a demonstration of feasibility, rather than evidence of comparative efficacy or general safety.

The survival benefit of kidney transplantation over dialysis has long been established [1]. When a living donor is available, preemptive transplantation may offer additional clinical advantages by avoiding dialysis-related morbidity and preserving functional reserve [2]. In patients with severe pulmonary disease, this timing may be particularly important because a prolonged course of dialysis can further compromise cardiopulmonary status, nutritional status, and overall surgical fitness.

After pneumonectomy, anesthetic management becomes more complex because the remaining lung must sustain gas exchange throughout the perioperative period [3,4]. Positive-pressure ventilation, airway instrumentation, and aggressive fluid administration can all contribute to respiratory complications in susceptible patients. Consequently, avoidance of general anesthesia may be desirable when technically feasible and when surgical and anesthesia teams are experienced with neuraxial techniques.

Published experience in this area remains limited but supports the feasibility of regional anesthesia in selected transplant recipients. Hadimioglu et al reported that combined spinal-epidural anesthesia and general anesthesia produced similar intraoperative hemodynamic outcomes during kidney transplantation [6]. Bhosale and Shah described combined spinal-epidural anesthesia as a useful option for kidney transplantation; in their series, it provided satisfactory surgical conditions without epidural hematomas [5]. In a particularly relevant case report, Massoudi et al described spinal anesthesia for kidney transplantation in a patient with a single lung, emphasizing the importance of careful fluid and hemodynamic management [7]. Bellini et al also reported successful combined spinal-epidural anesthesia for kidney transplantation in a high-risk patient with a major pulmonary comorbidity [8]. More recent case reports by Garcia-Tomas et al and Pires et al further support the feasibility of neuraxial techniques in carefully selected high-risk kidney transplant recipients [9,10]. The novelty of the present case lies not only in the use of neuraxial anesthesia but also in its application to a particularly challenging clinical scenario: a preemptive, living-donor, HLA-identical kidney transplant recipient with prior pneumonectomy, severely impaired pulmonary function, preserved urine output, and multidisciplinary perioperative planning.

Our patient's course is consistent with the limited published literature. The operation was completed without respiratory deterioration, graft function immediately improved, and the postoperative course was uneventful. We believe the favorable outcome resulted from careful patient selection, advance multidisciplinary planning, and a willingness to tailor the anesthetic approach to the patient's physiology rather than defaulting to general anesthesia. Additional factors that likely contributed to the successful outcome included preemptive living-donor transplantation, preserved residual renal function, and close multidisciplinary coordination.

Conclusions

Combined spinal-epidural anesthesia may represent a feasible alternative to general anesthesia for kidney transplantation in carefully selected patients with severely reduced pulmonary reserve after pneumonectomy. The favorable outcome in the

present case supports consideration of kidney transplantation in selected patients with major pulmonary comorbidities when thoughtful, individualized perioperative planning is feasible.

Institution Where the Work Was Performed

Istanbul Aydin University VM Medical Park Florya Hospital, Istanbul, Türkiye

Patient Consent

The patient provided written informed consent for publication of this case and accompanying images.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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