Case report

# Combined spinal-epidural anesthesia for renal transplant in a lung transplant recipient: a case report

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**Abstract.** A 67-year-old lung transplant recipient with severe comorbidities was admitted for renal transplant. As anesthesia technique, combined spinal-epidural at the T11-T12 level was chosen, associated with intravenous sedation. Graft's function initially results altered, bringing to pulmonary fluid overload. Beginning from the post-operative day 5 there was a slow but constant gain-of-function of the graft, proven by an improvement of renal function indexes and by the resolution of the pulmonary edema. *Conclusions*: Whereas general anesthesia remains the gold standard anesthesia technique for kidney transplant, a locoregional anesthesia, could be a feasible and effective option in patients at high risk of respiratory complications. (www.actabiomedica.it)

**Key words:** renal transplant, combined spinal-epidural anesthesia, lung transplant, perioperative medicine

## Introduction

Due to increased life expectancy after transplant, a considerable number of lung transplant (LTx) recipients need surgery.(1) General anesthesia (GA) in LTx patients can be challenging. The pathophysiology of LTx patient should be well investigated for correct anesthesia management.(1)

In some subjects graft function is well preserved and invasive surgical procedures are well tolerated; in others, the most frequent complication is represented by post-LTx bronchiolitis obliterans, that affects up to 50%-60% of patients at five years after surgery and results in graft disfunction.(2,3) A worsening of obstructive pattern represents a serious anesthetic challenge, particularly for the unpredictability of post-operative weaning from mechanical ventilation (MV).(2) Furthermore, a prolonged tracheal intubation along with MV significantly increases the risk of ventilator-associated pneumonia in immunosuppressed patients. In addition, in single LTx recipients with pulmonary fibrosis a variable degree of ventilation/perfusion mismatch develops and MV leads to an unpredictable risk of overdistension and barotrauma.(2)

Whereas a LTx patient needs a strong immunosuppressive therapy, renal failure is a well-known complication of long-term calcineurin inhibitors therapy; in some cases, this evolve to end stage renal disease (ESRD) and need of hemodialysis or renal transplant.(4,5)

Our patient have provided written authorization to publish this case report.

## Case Description

A 67-year-old male patient with severe comorbidities was admitted for a renal transplant from a liv-


**Figure** 1. 1A Preoperative chest X-Ray prior CT-scan, supine position. 1B Preoperative CT-scan, T6-T7 level. Right lung's interstitial fibrosis with cardio-mediastinal and hemidiaphragm retraction and left lung's fibrotic bands with cylindrical bronchiectasis are visible. ("S" Superior; "I" Inferior; "A" Anterior; "P" Posterior.)

ing donor. He had developed a chronic renal failure (eGFR 14 mL/min/1.73 $m^2$) due to cyclosporine toxicity.

Forty-one years prior he had undertaken a chemotherapic treatment with bleomycin for a mediastinal Hodgkin's lymphoma. Consequently, he developed bilateral pulmonary fibrosis necessitating, thirty-two years ago, a single left LTx. After thirty-two years some factors, including Pneumocystis jirovecii pneumonia and type I chronic bronchiolar rejection, had reduced graft function, configuring a Chronic Lung Allograft Dysfunction. Pulmonary Function Tests result in a $FEV_1$ of 1,59 L/s, and thoracic computed tomography scan revealed a left lung with fibrotic bands and cylindrical bronchiectasis, with a right lung with an interstitial fibrosis that caused cardio-mediastinal and hemidiaphragm retractions (Fig.1). Pre-operative echocardiographic evaluation showed left atrial dilatation, left ventricle parietal hypertrophy and mild aortic stenosis, with normal ejection fraction (65%). Previous GA were characterized by prolonged respiratory function recovery.

A multidisciplinary discussion concluded to proceed with locoregional anesthesia plus sedation technique (Fig.2); a back-up plan in case of failure or complications was set up.

The opportunity to schedule surgery, due to a living donor transplant and the residual diuresis, allowed optimizing preoperative patient status and planning each step.

Following bilateral central vein assessment, a triple-lumen Central Venous Catheter was placed in the right anonymous vein, ultrasonographically and electrocardiographically guided. Anesthesia was preceded also by right radial artery catheterization to achieve a minimally invasive blood pressure monitoring. The arterial line was connected, through Edwards Lifesciences FloTrac® system, to Edwards Lifesciences HemoSphere® advanced monitoring platform. An important limitation of this type of monitoring in a spontaneous breathing patient is the unreliability of Stroke Volume Variation (SVV), that resent of the variability of tidal volume. However, cardiac output (CO) analysis through this monitoring system was chosen to guide a zero-balance fluid therapy. Standard intraoperative monitoring as indicated by Società Italiana di Anestesia Analgesia Rianimazione e Terapia Intensiva (SIAARTI) were followed.

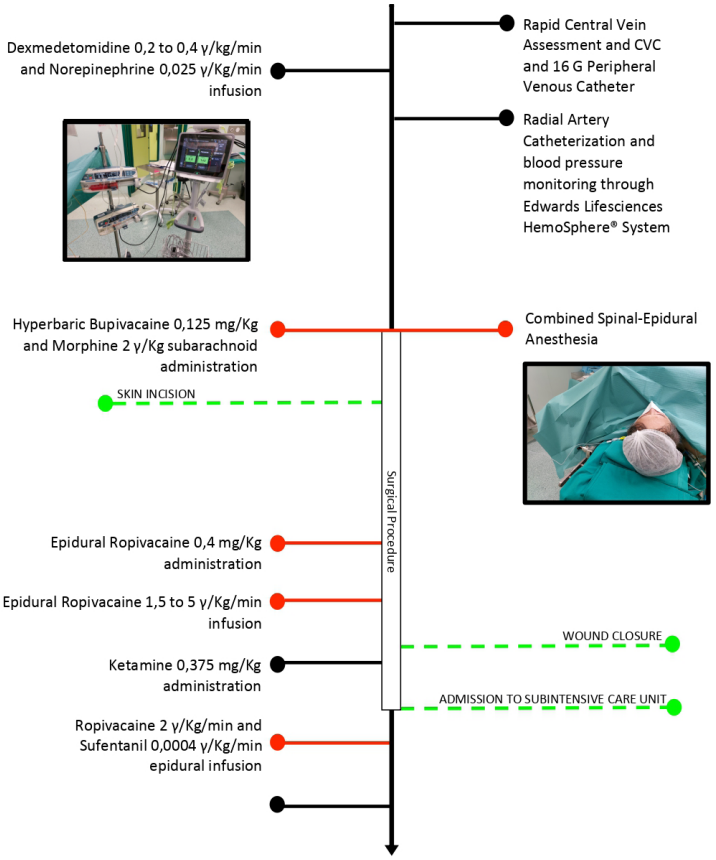


**Figure** 2. Perioperative management scheme, from admission to the operating room to transfer to sub-intensive care unit. Drugs administered neuraxially are highlighted by the red line.

A target systolic pressure > 130 mmHg, as per our internal protocol, was set. To counteract the possible sympathetic block following subarachnoid anesthesia, norepinephrine infusion was begun, at a dose of 0,025 γ/Kg/min; it was interrupted before the end of surgical procedure, with the maintenance of adequate pressure values.

The combined spinal-epidural (CSE) set was Smiths Medical® Epidural Minipack System 1. The patient was in right lateral decubitus and epidural space at T11 to T12 level was identified. Spinal anesthesia was induced with hyperbaric bupivacaine 5 mg/mL at a dose of 10 mg (0,125 mg/Kg) and morphine 0,15 mg (≈ 2 γ/Kg). Finally, a 16G epidural catheter was introduced.

Intraoperative sedation was achieved using a continuous infusion of dexmedetomidine (0,2-0,4 γ/kg/min). Dexmedetomidine choice as sedative agent was related to less respiratory depressant effects than other sedatives such as propofol or opioids, and because its metabolism is not influenced by age or renal function.

A Gibson incision in the right iliac fossa was performed; kidney renal vessels were anastomosed with the external iliac vessels and the transplant ureter was anastomosed with the bladder. Surgery lasted 174 minute and urine production from the graft started immediately. During the procedure, patient remained in spontaneous breathing with stable respiratory rate and low flow of oxygen (≤ 4 L/min) was administered.

For intraoperative pain management, epidural administration of ropivacaine 5 mg/mL at a dose of ≈ 0,2 mg/Kg was needed twice, followed by continuous epidural infusion of ropivacaine 3,75 mg/mL at a variable dose (1,5-5 γ/Kg/min). To relieve discomfort during surgical wound suture, ketamine was administered twice (0,25 mg/Kg + 0,125 mg/Kg), with no

change in respiratory rate and $SpO_2$. Continuous epidural infusion of ropivacaine 2 γ/Kg/min and sufentanil 0,0004 γ/Kg/min and acetaminophen 1 g administration every 8 hours was effective for postoperative pain management. Epidural catheter was removed on postoperative day 3 (POD3).

At the end of the procedure, patient was transferred to subintensive care unit. Until POD5 the patient required low flow oxygen administration. Because of pulmonary fluid overload patient required diuretic therapy up to POD3. Beginning from POD5, there was a slow but constant gain-of-function of the graft, proven by an improvement of renal function indexes and by the resolution of the pulmonary fluid overload and need of oxygen therapy.

Patient was discharged home on POD12, with normal renal function (serum creatinine 1,3 mg/dL).

## Discussion

While GA represents the technique of choice in renal transplant surgery, locoregional anesthesia (spinal or CSE) has been reported in years.(4-6) To overcome the drawbacks of epidural anesthesia alone, a CSE anesthesia has been widely accepted in lower abdominal surgery, below umbilical line.(6,7) Spinal anesthesia provides a rapid onset of both sensitive and motor block, along with enough muscle relaxation; the insertion of an epidural catheter allows the titration and prolongation of anesthesia and analgesia.(5-7) This type of anesthetic technique could be a feasible option for those patients whose GA could be at high risk, for example in LTx-patient, because it does not elicit bronchoconstriction, nor alter mucociliary clearance, and rarely is associated with a consistent hemodynamic impairment , ensuring adeguate renal perfusion.(2,4-6,8,9) Prophilactic norepinephrine infusion was chosen to counteract hypotension due to vasodilatation and bradicardia related to CSE anesthesia sympatetic block, ensuring adeguate graft perfusion without fluid administration needing.(10,11)

In this patients, proper fluid management is challenging.(2) Not only transplanted lungs are highly susceptible to fluid overload, since the lymphatic drainage is severely compromised due to hilar interruption of lymphatic drainage, but also ESRD predisposes to fluid overload.(2,12,13) Hypervolemia may lead to pulmonary edema, while hypovolemia may cause hemodynamic instability.(12,13) A hemodialytic treatment is usually performed either the day before or on the day of the procedure.(12,13) Optimal volume status prior surgery is based upon estimates of anticipated fluid to be administered and/or lost during surgery.(12,13) As a result, if too much fluid is removed, there is the risk of hypotension during anesthesia-induced systemic vasodilatation.(12,13) If euvolemia is not achieved and/or the patient receives large fluid volume during surgery, hypervolemia and possibly pulmonary edema can occur in the immediate postoperative period.(12,13) A careful fluid intake management is recommended to avoid pulmonary interstitial fluid storage and the subsequent pulmonary edema.

Furthermore, metabolism, elimination, distribution and degree of plasma protein binding of most anesthetic drugs may be delayed and altered in patients with ESRD, resulting in higher-than-expected plasma concentrations.(12,13)

As far as it concerns intraoperative monitoring, it depends on the severity of clinical conditions and on the type of scheduled surgical procedure.(2) If a large amount of blood loss is predictable, with a strong need of volume replacement, CO and fluid responsiveness indexes such as stroke volume variation (SVV) should be monitored.(2,14,15)

In postoperative period, attention should be paid to the use of opioids as analgesic, for risk of respiratory depression, cough-reflex attenuation, and bowel distension with diaphragm elevation.(2) Current evidences suggests that thoracic epidural analgesia with epidural infusion of very low doses of opioids in combination with a local anesthetic drug is safe and effective in relieving postoperative pain in LTx recipients, without major consequences on intercostal muscles tone or respiratory function.(2,6,8,9) Importat benefits of a locoregional anesthesia are reduced graft's thrombosis risk, an analgesic targeted activity with minimal opioid need, less respiratory mechanic impairment and the possibility to avoid orotracheal intubation, lowering infective and respiratory risk of complication in patient at high risk of difficult weaning from mechanical ventilation.

## Conclusions

ESRD is a possible complication of immunosuppressive therapy with cyclosporine, widely used in LTx patients. A cooperative and willing patient, a good planning and teamwork between nephrologists, transplant surgeons and anesthesiologists, led to a successful clinical result.

Whereas GA remains the gold standard anesthesia technique for kidney transplant surgery, a locoregional anesthesia, in particular a CSE anesthesia, along with an appropriate sedation could be a feasible and effective option in patients at high risk of respiratory complications.

**Conflict of Interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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