Case Report

Long-term Success of Combined Kidney–Lung Transplantation in a Patient With Cystic Fibrosis

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A R T I C L E   I N F O

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A B S T R A C T

Advanced kidney disease is usually considered an absolute contraindication for lung transplantation due to the difficult management of these patients in the post-operative period. Combined lung–kidney transplantation, however, could offer an opportunity for selected patients with renal and pulmonary dysfunction. This study summarizes the long-term success of a double transplantation in a 38-year-old male patient with cystic fibrosis who presented respiratory and kidney failure. After a complicated post-operative period, the patient currently lives completely independently 46 months after the operation and he enjoys excellent pulmonary and renal function.

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Introduction

The International Society for Heart and Lung Transplantation considers that advanced dysfunction of the major organs constitutes an absolute contraindication for lung transplantation. Nevertheless, this possibility must be considered in some cases, as patients with renal failure occasionally present other serious dysfunctions and could benefit from combined solid organ transplant. Thus, double transplantation may be indicated in some selected patients, as in the present case. Combined heart–lung and liver–lung transplants have been carried out for many years now, with good clinical results. However, very few case reports of combined lung–kidney transplantation (CLKT) have been described in the literature and, as far as we are aware, none have described this procedure in patients with end-stage renal disease on dialysis. We present the first case of CLKT successfully carried out on a dialysis patient in Spain.

Case Report

The recipient was a 38-year-old male with cystic fibrosis (CF) who presented severe respiratory failure and end-stage renal...
disease. The renal dysfunction was related to long-term amino-
glycoside exposure. He was dialysis-dependent and had been on
hemodialysis for the previous three years. Lung transplantation
was proposed in this patient (who was oxygen-dependent) in
September 2008 due to pulmonary hypertension, frequent infections and
multiple hospital admissions.1

Preoperative blood tests showed the following results: hemat-
ocrit 29.1%, creatinine 10.1 mg/dl, urea 160 mg/dl, Na 140 mEq/l
and K 5.8 mEq/l; arterial blood gas results were as fol-
 lows: pH=7.46, pO2=56 mmHg and pCO2=42 mmHg. Spirometry
revealed an obstructive disease, with forced vital capacity (FVC)
of 2690 cc (50%) and forced expiratory volume in one second
(FeV1) of 1480 cc (30%). Sputum culture detected the presence of
methylillin-resistant Staphylococcus aureus (MRSA), Pseudomonas
aeruginosa, Stenotrophomonas maltophilia, Aspergillus fumigatus,
Candida albicans and Candida tropicalis. Cytomegalovirus
(CMV) serology was negative. The echocardiogram showed normal sys-
tolic function, mild pulmonary hypertension (mean pulmonary
arterial pressure (PAP) of 47 mmHg), mild tricuspid regurgitation
and minimal aortic regurgitation. Chest tomography revealed the
presence of diffuse bilateral bronchiectases and alveolar lesions
mainly affecting the upper lobes.

The donor was a 41-year-old woman with a history of chronic
hypertension who suffered a brain hemorrhage. Her last arte-
rial blood gas showed the following values: PaO2=534 mmHg
with FiO2=100% and positive end-expiratory pressure (PEEP)
of 5 cmH2O. Endotracheal aspirate cultures and CMV serology
were negative. The donor had remained in the intensive care unit (ICU)
for 24 h, and the explantation surgery proceeded without compli-
cations. The lungs were preserved in Perfadex* (Vitrolife, Sweden).

The recipient underwent hemodialysis immediately before
surgery, and was then admitted to ICU with intubation and
FiO2=100% and PEEP=10 cmH2O. His hematocrit was 30%, cre-
itinine 3.6 mg/dl, Na 146 mEq/l and K 5.7 mEq/l. His blood
gas values were as follows: pH=7.35, pO2=295 mmHg
and pCO2=42 mmHg. Noradrenaline (0.48 μg/kg/min) and nitric
oxide (60 ppm) were used for establishing hemodynamics in the
following 48 h. Immunosuppression was induced with basiliximab
and maintained with tacrolimus (blood levels 10 ng/ml post-
operatively and 7 ng/ml at 6 months), mycophenolate mofetil
(1500 mg/12 h post-surgery, tapered to 4 μg/ml in the maintenance
phase) and prednisone. Corticoid levels were 30 mg/day postopera-
tively and were gradually reduced to 15 mg/day at 6 months and
10 mg/day after one year.

Transverse thoracosternotomy was performed for sequential
double lung transplantation, followed by kidney transplant in the
right iliac fossa using the standard technique. The ischemia time
was 2, 4 and 7 h for the left lung, right lung and kidney, respectively.

The patient was extubated 34 h after the intervention. MRSA,
Pseudomonas aeruginosa, Pseudomonas mucoidi, Candida albicans
and Candida tropicalis were detected in the tracheal aspirates,
but the samples were negative for CMV. Intravenous (line-
zolid, voriconazole, trimetoprim-sulfametoxazole and piperacillin/
tazobactam) and inhaled antibiotic treatment (tobramycin and
amphotericin lipid complex) was instigated.

Progressive deterioration in respiratory function, with CO2
retention, resulted in reintubation on day 10 post-surgery. Acute
lung rejection was suspected and corticosteroids were admin-
istered for three days. The patient presented anuria during the
immediate postoperative period and required continuous venous-
ous hemodialysis for 25 days. Renal Doppler ultrasound showed
permeable blood vessels. The first renal biopsy (with a serum
tacrolimus level of 13 ng/ml) showed mild interstitial fibrosis,
mild atherosclerosis, moderate acut tubular necrosis, absence of
glomerular pathology and weakly positive for CD4 in the per-
itubular capillaries. Renal function gradually recovered, and the
creatinine clearance was 42 ml/min 2 months after surgery. On
day 50 post-surgery, the patient presented abdominal pain associ-
ated with leukocytosis. Acute cholecystitis was diagnosed and the
patient underwent a cholecystectomy with peritoneal lavage, after
which an urgent laparotomy revealed the presence of a perforated
gangrenous gall bladder, with associated choleperitonitis.

The patient was discharged 80 days post-transplant, with
improvement in the spirometry and renal function (Fig. 1A and B).

![Figure 1](image.png)

**Figure 1.** Renal and lung function follow-up data after the double transplant.
Forty-two months after the DLKT, the patient was asymptomatic and leading an active life. The chest X-ray did not show any abnormal findings (Fig. 1C) and the FEV1 was 3340 cc (84.5%); serum creatinine was 1.3 mg/dl, and the creatinine clearance 86 ml/min.

Discussion

According to clinical guidelines for lung transplantation, CF is the third most common indication for which this procedure is performed, but the multisystem nature of the disorder poses additional difficulties in the selection of candidates. These patients often present chronic infections due to antibiotic-resistant microorganisms which remain in the airways and sinuses after the transplant; in the context of immunosuppression, this constitutes a source of possible lung infections. Although nephropathy is rare in CF, this disorder shows some abnormalities in renal function, and various drugs are used in the treatment of CF and infections that may be nephrotoxic, such as the aminoglycosides.

The first case of a double lung–kidney transplant was published in 1998 in a patient with pulmonary lymphangioleiomyomatosis and renal angioplasms after a unilateral nephrectomy. This patient had acceptable creatinine clearance, so a possible postoperative deterioration in renal function could be avoided. No similar cases were subsequently published, and although the International Society of Heart and Lung Transplantation database includes cases of patients treated with combined transplantation of a single lung–kidney, there are no data on their preoperative renal function or postoperative survival.

Simultaneous solid organ transplant has been more common in recent years, and attempts have been made in reviews of combined liver–kidney transplantation and combined heart–lung transplantation to analyze the indications, technical considerations and expected results. Rana et al. recently published the description of a simultaneous combined heart–lung–kidney transplantation with satisfactory results, and highlighted the results of a previous study, in which the simultaneous transplantation of multiple organs from the same donor showed lower rejection rates than single organ transplantation.

CLKT is a surgically viable intervention at present, but postoperative patient management may be difficult, given that the strict fluid restriction required to prevent pulmonary edema must be balanced with the need for abundant fluid intake for renal function. Furthermore, immunosuppressive treatment for lung transplantation must be optimized to reduce the nephrotoxic effects, especially when anti-calcineurin drugs are used. In our case, the required dose of calcineurin inhibitors was reduced by using basiliximab for the induction phase and tacrolimus/mycophenolate instead of cyclosporine/azathioprine for the maintenance phase.

In conclusion, CLKT may be indicated in patients who are candidates for lung transplantation with concomitant end-stage renal disease. This procedure is surgically viable, but perioperative patient management is complex. To obtain good results, CLKT should only be carried out in specially trained centers with adequate donor and recipient selection.

Conflict of Interest

The authors do not have any conflicts of interest.

References