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ORIGINAL ARTICLE

Twenty-years of lung transplantation in Taiwan: Effects of cumulative institutional experience on early outcomes

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Background/purpose: Lung transplantation in Taiwan began in 1991, but the experience was limited and diverse in the early years. We examined the cumulative institutional experience of the largest lung transplant cohort in Taiwan.
Methods: A retrospective review of lung transplantations performed at a single institution from December 1995 through August 2016 was conducted. For comparative purposes, the cohort was divided into halves, with an early group (undergoing lung transplantation in the first decade) vs a late group (undergoing lung transplantation in the second decade). Standardized donor selection, organ procurement, and preservation protocols for brain-dead donors were applied. The outcomes measured were 30-day mortality and actuarial survival using the Kaplan–Meier method.
Results: The cohort included 50 recipients in the early group and 42 recipients in the late group. Compared with the early group, recipients in the late group were significantly older (38.8 ± 11.6 vs 44.8 ± 13.4 years, p = 0.024) and more of them required mechanical

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ventilation before transplant (26.0% vs 66.7%, $p < 0.001$). There were more female donors (12.0% vs 33.3%, $p = 0.021$) and gender-matched donors (34.0% vs 61.9%, $p = 0.012$) in the late group. A total of 87 recipients (94.6%) had cardiopulmonary bypass (CPB) or extracorporeal membrane oxygenation (ECMO) support during transplant, and CPB was used significantly less in the late group. Graft procedures (14.0% vs 47.6%, $p < 0.001$), delayed chest closure (0% vs 21.4%, $p < 0.001$), and early tracheostomy (24.0% vs 52.4%, $p = 0.005$) were performed more in the late group. The durations of hospital and ICU stays were comparable in both groups, but the 30-day mortality was significantly lower in the late group (30.0% vs 2.4%, $p = 0.001$).
Conclusion: Although the results were undesirable in the first decade of the transplant program, the cumulative institutional experience led to significantly improved outcomes in the second decade of the transplant program.

Introduction

Lung transplantation is a lifesaving therapeutic option for treatment of end-stage lung disease, and the International Society of Heart and Lung Transplantation (ISHLT) reported that survival after lung transplantation became superior to that in the non-transplant group due to improved immunosuppressant therapy and refinements in surgical technique.[1] Since the first case of cadaveric lung transplantation performed in 1991 in Taiwan, many patients with various diagnoses including chronic obstructive pulmonary disease (COPD), pulmonary arterial hypertension, cystic fibrosis, and idiopathic pulmonary fibrosis were candidates for lung transplantation. Given the small lung donation rate in Taiwan and an urgency-based national allocation policy, none of the medical centers authorized to performed lung transplantation in Taiwan reached five lung transplantation cases per year over the last two decades.[2] Nonetheless, the cumulative institutional experiences in both surgical procedures and perioperative care improved surgical outcomes despite the limited numbers of cases. Since 1995, lung transplantations continued to be performed in our institution annually and without interruption for 20 years, and the results for different periods have been reported.[2–7] Thus, we sought to convey valuable information gained from one of the few large, annually operating lung transplantation programs in Taiwan. We conducted this study to assess the effect of institutional experience in lung transplantation on perioperative outcomes and survival and to evaluate 20 years of evolution in the clinical practice of the lung transplantation in Taiwan.

Methods

Study design and patient selection

This retrospective cohort study included all patients who underwent single or bilateral lung transplantation at National Taiwan University Hospital (Taipei, Taiwan), a 3200-bed tertiary care medical center, from December 1995, through August 2016. Heart—lung transplant recipients were excluded from this study. The patients who underwent lung transplantation needed to meet the selection criteria published by the ISHLT. The diagnoses of recipients were categorized according to the Lung Allocation Score (LAS) system.[8] The Research Ethics Committee of National Taiwan University Hospital approved this study and waived the requirement for informed consent because of the retrospective nature of the study (approval number: 201703041RIND).

In our hospital, only cadaveric lung transplantations were performed. All donor's lungs were retrieved from brain-dead donors. Potential lung donors were recruited by the selection criteria of ISHLT and allocated by the Taiwan Organ Registry and Sharing Center (TORSC) since July 2006. In Taiwan, the patient with the highest risk of short-term death received priority for organ allocation. When the waiting list was posted on the national organ allocation network, patients were categorized into three different categories according to their status of disease severity. The other considerations of organ allocation included lung size matching, estimated with body height, the chest circumference between donor and recipient, and the tissue crossmatch results. Except for one patient with positive crossmatching results who was treated with plasma exchange, intravenous immunoglobulin, and basiliximab during lung transplantation, the other recipients had negative crossmatching results. For comparative purposes, the cohort was divided into halves, with an early group (the first 50 patients) and a late group (the next 42 patients).

Surgical strategy

Donor's lungs were obtained by standard multiple organ procurement surgeries. The lung transplant physicians assessed the donor lungs with attention to the cause of death, radiographic appearance, bronchoscopic examination, arterial blood gas concentrations, and intraoperative organ palpation. The acceptance criteria of the donor's lungs for transplant are based on the ISHLT criteria for cadaveric lung donors. Lung grafts were preserved by both antegrade and retrograde infusion with organ perfusate followed by cooling.

All single lung transplantations were performed through a posterolateral thoracotomy approach, and double lung transplantations were performed through a bilateral sequential posterolateral thoracotomy or bilateral transverse thoracosternotomy (clamshell thoracotomy). Cardiopulmonary bypass (CPB) was initially the standard practice