

Lung Assistance as a Bridge to Transplantation

Asistencia respiratoria como puente al trasplante

To the Editor:

Lung transplantation is the treatment of choice for numerous lung diseases in their terminal stages, when other therapeutic options have been ruled out.¹ Owing to the scarcity of donor organs, increasingly more patients are dying while on a waiting list. We report the case of a 28-year-old man with cystic fibrosis who was waiting for a double-lung transplant and who required noninvasive mechanical ventilation during an exacerbation episode. His condition worsened and intubation was finally required. In spite of invasive ventilation, he developed refractory respiratory acidosis with retention of carbon dioxide (CO₂), and a lung-assist device (Novalung) was placed. This membrane controls the gas gradient, taking a continuous inflow of oxygen and removing CO₂ through the outflow,² to maintain protective ventilation parameters.³ Heparin was administered to keep the activated partial thromboplastin time between 50 and 60 seconds, and a flow rate of 1 to 2 L/min through the lung-assist membrane was obtained. The Table shows the respiratory and hemodynamic variables before and after the patient was placed on the lung-assist system.

At 36 hours an appropriate donor was located and a sequential double-lung transplant was performed with cardiopulmonary bypass and a central venous catheter in place. The lung-assist device was removed after the procedure. During early postoperative care

the patient developed grade 3 primary graft dysfunction that was managed with mechanical ventilation and prostaglandins. Extrapulmonary complications included kidney failure that required hemofiltration, and thrombocytopenic purpura and convulsions due to drug toxicity. At 26 days the patient was discharged from the intensive care unit and a week later he was discharged from hospital. At 2 months, when the present letter was written, he felt well and had normal lung function and a good quality of life.

To date, the only type of lung assistance that has been widely used in certain hospitals is extracorporeal membrane oxygenation, but poor results in adults have been reported owing principally to the high incidence of complications (eg, abnormal coagulation and bleeding) and the complexities involved in managing the system.³ Based on experience with the Regensburg group's Novalung,² we are considering possible use of this device as a bridge to transplantation in candidates with irreversible lung failure and CO₂ retention. The advantages of the Novalung device compared with extracorporeal membrane oxygenation are ease of placement and management, and a low incidence of severe complications. However, the Novalung's oxygen-bearing capacity is limited; the device should not be used when patients are hemodynamically unstable since flow depends on cardiac output. The Novalung is clearly an effective system for respiratory assistance in removing CO₂. It provides protective mechanical ventilation and extends time for patients on waiting lists who would not otherwise survive long enough to receive a transplant.

References

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David Gómez-de Antonio, José Luis Campo-Cañaveral
and Pablo Gámez*

Servicio de Cirugía Torácica, Hospital Universitario Puerto
de Hierro, Madrid, Spain

* Corresponding author.

E-mail address: dgavm@yahoo.es (P. Gámez).

Table

Respiratory and Hemodynamic Values With Lung Assistance

	Baseline	6 h	12 h	24 h	36 h
Respiratory parameters					
FiO ₂	0.95	0.95	0.95	0.9	0.9
PIP, mm Hg	40	33	34	32	33
PEEP	2	7	10	10	10
Vol/min, L/min	12	4.5	4.8	4.3	3.7
PaO ₂ , mm Hg	92	78	56	65	67
PaCO ₂ , mm Hg	115	68	69	57	56
pH	7.27	7.43	7.39	7.43	7.43
Hemodynamic parameters					
MAP, mm Hg	90	80	90	93	97
Inotropic support, yes/no	Yes	Yes		No	No

Abbreviations: FiO₂, inspired oxygen fraction; MAP, mean arterial pressure; PEEP, positive end-expiratory pressure; PIP, peak inspiratory pressure.