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Review

The evolution of lung transplantation for cystic fibrosis: A 2017 update

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Abstract

Lung transplantation (LTx) is an established therapy for patients with end-stage cystic fibrosis (CF). Indeed, CF is the commonest indication for those aged < 50 years of age needing LTx. CF LTx is associated with a 45% 10 year survival - according to the world's largest registry. It is important all otherwise suitable CF patients with severe lung disease have a timely referral for discussion and consideration of the possibility of LTx. LTx discussions must carefully consider colonisation or infection with *Burkholderia cenocepacia*, *Mycobacterium abscessus* and *Scediosporium* - as good LTx outcomes cannot be guaranteed. A bridge to LTx with extra-corporeal lung support is a realistic option, but remains a relative contraindication to LTx. Improvements in LTx matching technology and post-operative management are steadily improving overall long-term outcomes, although chronic allograft rejection remains problematic. Expert multidisciplinary life-long post-LTx care remains the key to success.

Keywords: Lung transplantation; Cystic fibrosis; Extracorporeal membrane oxygenation; Immunosuppression

Contents

Abbreviations: LTx, lung transplantation; CF, cystic fibrosis; ECLS, extracorporeal life support; VV-ECMO or VA-ECMO, veno-venous or veno-arterial extracorporeal membrane oxygenation; DBD, donation-after-brain-death; ECD, extended criteria donors; DCD, donation-after-circulatory-death; HLA, human leucocyte antigen; DSA, donor specific antibodies; CLAD, chronic lung allograft dysfunction; PASP, pulmonary artery systolic pressure; mPAP, mean pulmonary artery pressure; NIV, non-invasive ventilation; WHO, World Health Organisation.

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1. Introduction

Lung transplantation (LTx) is an established management strategy for end-stage lung disease in patients with cystic fibrosis (CF) - improving survival and quality-of-life [1]. LTx has evolved steadily since the first CF transplants in the 1980's - with pre-LTx assessments, timing of referral and wait-listing strategies, perioperative LTx management and long term follow-up all subject to rigorous scrutiny and subsequent refinement. There is a clear need to disseminate these LTx findings back to the CF centres to ensure a seamless transition of CF care. This review aims to provide an update of current practice and controversies.

2. Overall picture and outcomes

The number of LTx performed for all indications continues to increase linearly year by year, with a total of 51,000 ever performed world-wide [2]. Between 1995 and 2015 7419 LTx were performed for CF - representing some 16.2% of all LTx over that period. Of these CF LTx, 97% were bilateral and 3% single LTx [2].

As is illustrated in Fig. 1, (representing USA only data) the absolute number of CF LTx per year appears relatively static over recent years [3]. Although improvements in CF care may be partially explaining this picture, it is also still apparent that many patients with LTx eligibility criteria [4] are not even referred for LTx evaluation [5,6]. In one recent USA study examining why 35% of potentially eligible CF patients weren't referred, it was noted non-referrals were associated with the absence of medical insurance, lower education levels, older age and *Burkholderia cepacia* culture [5]. In another recent French study, 31% of CF deaths were potentially preventable with timely LTx referral [6].

In the USA in 2015, CF LTx represented a very significant 44% of LTx performed for those aged under 50 years of age, vs 1% of LTx for those aged above 50 years (Fig. 2) [3]. While most CF LTx are performed in North America and Europe, there is experience around the world, and notably recent outcomes are similar around the globe (Fig. 3) [7]. Globally the 10 year CF LTx survival over the period 1990–2013 was 45% [2], with a somewhat higher survival of 50% reported in the Canadian CF Registry over a similar 1988–2012 period [8].