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FEASIBILITY OF SURVEILLANCE AFTER LUNG TRANSPLANTATION USING MULTIVOLUME MRI INSTEAD OF IONIZING RADIATION TECHNIQUES IN CYSTIC FIBROSIS PATIENTS

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Background

Lung transplantation (LT) is a consolidated therapy for end-stage cystic fibrosis (CF) patients. Post-LT surveillance requires several computed tomography (CT) scans, entailing a high radiological hazard for such young immunosuppressed patients. The acquisition of a conventional proton magnetic resonance (^{1}H-MRI) at different lung volumes has been recently used to study ventilation impairment. We aimed to investigate the use of multivolume ^{1}H-MRI to identify signs of lung structural damages in CF patients after LT, and to compare regional variations on ^{1}H-MRI with classical markers of acute lung allograft dysfunction.

Methods

CF patients, of both sexes and all ages, undergoing LT at our centre in Milan were enrolled. Re-LT and single LT were excluded. As per our surveillance protocol, multivolume CT scan and pulmonary function tests are performed 3, 6 and 12 months after LT. In addition, a conventional ^{1}H-MRI of the lung was obtained. Four classes of ventilation defects were considered (consolidation, air trapping, low ventilation, healthy). To process CT and MR images, we developed an algorithm describing ventilation distribution in the follow-up of LT patients.

Results

From August 2018 to September 2019, 35 patients underwent LT. Twelve recipients had an indication other than CF and one underwent re-LT, and they were therefore excluded. We enrolled 22 subjects; due to early graft failure (1 case) and logistical issues (4 cases), only 17 patients completed the 1-year protocol. Our results show that expiratory-inspiratory difference in MRI signal-intensity correlated to both CT-density ($r=0.52$, $p<0.0001$) and FVC percent predicted (%pred)($r=0.42$, $p=0.03$). Linear correlation between MRI and CT functional maps including all categories of ventilation defects is $r=0.79$ ($p< 0.0001$). MRI percent volumes of low ventilation correlated to FEV1 %pred ($r=-0.41$, $p=0.01$) and to FVC %pred ($r=-0.63$, $p<0.001$).

Conclusions

Our study confirms the feasibility of a novel radiation-free imaging technique for young CF patients' surveillance after LT, providing new functional imaging biomarkers for early detection of acute lung allograft dysfunction. This approach may increase the quality of diagnostic examination by improving survival and quality of life of CF-patients undergoing LT.

Disclosure of interest: None declared