Functional respiratory imaging to predict FEV1 after lobectomy/pneumonectomy

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Rationale
ACCP guidelines (Chest 2007) recommend usage of segment method and perfusion scintigraphy for calculating post-operative FEV1 (poFEV1) in patients undergoing lob/pneumonectomy, respectively. In this trial, functional respiratory imaging (FRI) is evaluated for calculating poFEV1.

Methods
23 pts (14 analyzed/9 dropouts) were included. All patients underwent preoperative spirometry, perfusion scanning, and HRCT scans at RV and TLC. Post-surgery spirometry was acquired after recovery and before starting adjuvant therapy. FRI analysis provided regional expansion (EXP) and resistance (iRaw, before and after virtual resection). poFEV1 was predicted using ACCP formulas and (for FRI):

\[ poFEV_1^{predicted} = FEV_1^{pre} \cdot \left( 1 - \frac{iRaw_{after\ virtual\ resection}}{iRaw_{pre}} \cdot \frac{EXP_{virtual\ resected\ lobe/lung}}{EXP_{lungs\ pre}} \right) \]
Results

Figure 1 Results demonstrating the superior fit of FRI predicted poFEV1 to measured poFEV1

Conclusions

In contrast with ACCP, FRI predicted and actual poFEV1 are not significantly different. RMSE of FRI method is 43% smaller than ACCP, and is lower than the minimally important changes in FEV1 (323 ml, Respiratory Medicine 2013). Also, the slope of the linear fit from the FRI prediction is very close to 1, indicating that the model is very well predicting actual postoperative status and seems to be superior in poFEV1 prediction.

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