Reducing futile thoracotomy rates in PET-CT staged non-small cell lung cancer: Clinical risk factors from a population based review

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Objectives
The use of PET-CT in staging non-small cell lung cancer (NSCLC) reduces futile thoracotomy rates from approximately 40% to 20%. We aimed to identify pre-operative clinical risk factors for futile thoracotomy in patients staged with PET-CT.

Methods
The British Columbia Cancer Agency (BCCA) provides care to 4.5 million people. A retrospective chart review was conducted on all patients referred to the BCCA in 2009-2010 who had staging PET-CT and thoracotomy for NSCLC. Exclusion criteria included clinical N2 disease or any other cancer diagnosis within 5 years. Futile thoracotomy was defined as a benign lung lesion, exploratory thoracotomy, pathologic N2/N3 disease, stage IIIB/IV, inoperable T3/T4 disease, or recurrence or death within 1 year of surgery. The futile thoracotomy and non-futile thoracotomy groups were compared with the Fisher test in univariate analysis and logistic regression model multivariate analysis.

Results
108 patients met inclusion criteria. Thoracotomy was futile in 27 patients (25%); 14 recurred within 1 year of surgery, 10 had pathologic N2 and 1 each incomplete resection, pleural disease at surgery, or death within 1 year. On univariate analysis, PET-CT + N1 (odds ratio [OR] 3.77, p 0.008) and primary tumor size > 3.2 cm (OR 2.93, p 0.026) were associated with futile thoracotomy. On multivariate analysis, ECOG >1 (OR 4.57, p 0.017), PET-CT + N1 status (OR 4.24, p 0.006) and primary tumor size > 3.2cm (OR 2.87, p 0.039) were associated with futile thoracotomy. 82%, 73%, and 60% of patients with these risk factors, respectively, did not undergo mediastinal staging with either mediastinoscopy or endobronchial ultrasound (EBUS). Thoracotomy was futile due to N2 disease in 21% and 23% in patient with a non-staged mediastinum with risk factors of PET-CT+ N1 or primary tumor > 3.2cm, respectively, whereas patients with ECOG greater than 1 had futile thoracotomies primarily due to relapse within 1 year of surgery (31%). Overall, 30% of all patients had pre-operative mediastinal staging with mediastinoscopy and/or EBUS.

Conclusions
Mediastinal staging with mediastinoscopy or EBUS is underutilized for patients with futile thoracotomy risk factors of PET+N1 or primary tumor size >3.2cm, with associated high rates of futile thoracotomy due to N2 disease. Pre-operative ECOG >1 is primarily associated with futile thoracotomy due to relapse within 1 year of surgery, not N2 disease.