Lack of Utility of Thoracoscore in Evaluating Fitness for Surgery in Lung Cancer

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Abstract

Background. The thoracic surgery scoring system (Thoracoscore) is a multivariate scoring system with nine parameters used for predicting inpatient mortality after thoracic surgery. In clinical practice, the value of the thoracoscore in evaluating the fitness of individual patients for surgery is not clear.

Objective. The study objective was to evaluate the performance of thoracoscore in evaluating fitness for surgery for lung cancer and compare it with cardiopulmonary exercise test (CPEX).

Methods. We retrospectively analysed data over a 2-year period from the CPEX database of patients referred for pre-operative assessment prior to surgery for lung cancer.

Results. Twenty-two patients who had borderline lung function impairment had CPEX to assess fitness for surgery. Fifteen (68%) were deemed fit and went on to have thoracic surgery while 7 (32%) were considered high risk and were turned down. The predicted death rate based on thoracoscore for patients who had surgery was 3.5 ± 2.8 as compared to 3.4 ± 2.0 for patients who did not have surgery ($p > 0.05$). The mean peak VO_2 (peak oxygen uptake during CPEX) among those who had surgery was significantly higher than those who did not have surgery (14.2 mL/kg/min *versus* 10.1 mL/kg/min). There was no correlation of thoracoscore with lung function parameters, duration of hospital stay and peak VO_2.

Conclusions. Our study showed that CPEX remains a standard and useful tool for functional assessment prior to lung cancer resection. There is no correlation between thoracoscore and either CPEX or pulmonary function parameters. Thoracoscore should not be used to assess fitness for surgery. [Indian J Chest Dis Allied Sci 2015;57:13-15]

Introduction

Advances in chemotherapy and radiation oncology notwithstanding, surgery remains the best chance of cure in lung cancer. Pre-operative evaluation is very important to reduce surgery-related mortality and complications.

Thoracic surgery scoring system (Thoracoscore) is a recently validated multi-variate instrument with nine parameters and is the first scoring system to predict in-hospital mortality after general thoracic procedures.[1] It was derived from 15,183 patients who underwent thoracic surgery in 59 institutions in Europe. It also seems to predict mid-term mortality after thoracic surgery.[2] Currently, the role of thoracoscore in triaging patients for radical surgery is unclear. The European Respiratory Society (ERS) guidelines 2009[3] recommend that this scoring system should not be used for pre-operative evaluation of individual patients for fitness for lung resection. Instead, it recommends cardiopulmonary exercise testing (CPEX) as the standard test to assess exercise capacity and predict post-operative complications. In contrast, the British Thoracic Society guidelines of 2010[4] recommend thoracoscore for risk assessment before thoracic resection. In clinical practice, the value of the thoracoscore in evaluating the fitness of individual patients for surgery is unclear. Further, the correlation of thoracoscore with CPEX parameters, such as peak oxygen uptake (Peak VO_2) is not known. We, therefore, carried out a study to evaluate the performance of thoracoscore in evaluating patients for fitness to undergo surgery for lung cancer and compare it with CPEX.

Material and Methods

We retrospectively analysed data over a 2-year period from the CPEX database of patients referred for pre-operative assessment prior to surgery for lung cancer at the Essex Cardiothoracic Centre, a tertiary care regional referral hospital in the United Kingdom. The CPEX is done at our centre only in patients who have borderline values detected after resting pulmonary function tests. According to ERS/ESTS (European Society of Thoracic Surgeons) guidelines VO_2 peak (oxygen uptake)

measured during cardiopulmonary exercise testing is used to assess the fitness for lung resection. Those with peak VO_2 >75% of predicted or >20 mL/kg/min are considered fit for pneumonectomy, while those with peak VO_2 of 35% to 75% or 10-20 mL/kg/min predicted have post-operative forced expiratory volume in one second (FEV_1) calculated and are considered fit for limited resection. Those with a peak VO_2 <35% or <10 mL/kg/min are considered unfit for any resection.

Outcomes following surgery were reviewed. As a control group we compared the data from other patients who underwent thoracic surgery during the same time period. This group had adequate baseline resting lung function and did not have CPEX testing as they were considered at low risk. The nine parameters from which thoracoscore is calculated are age, sex, dyspnoea score, American Society of Anaesthesiologist Score, performance status, priority of surgery, diagnosis group, procedure and co-morbid diseases. Predicted death rate based on thoracoscore was calculated from this data.[5] The CPEX carried out by maximum symptom limited cardiopulmonary incremental protocol on a cycle ergometer starting with two minutes of rest, three minutes of unloaded cycling and subsequent increase in workload as per American Thoracic Society recommendations.[6] Data was analysed using Statistical Package for the Social Sciences (SPSS), version 16.0.

Results

Over this two-year period, 22 patients diagnosed with operable lung cancer with borderline lung function underwent CPEX test to assess fitness for thoracic surgical procedures including wedge resection, lobectomy and pneumonectomy. Fifteen patients (7 males, 8 females) were fit and had surgery while 7 patients (3 females, 4 males) were deemed as high-risk based on CPEX and did not have surgery. The mean age was 70 years (range 57-80 years). The mean FEV_1 in those who had surgery was 59% as compared to 66% in those who did not have surgery (p>0.05). The diffusing capacity of those who had surgery was 63% as compared to 50% in those who did not have surgery (p>0.05). The predicted death rate based on thoracoscore in patients who had surgery was 3.5 ± 2.8 as compared to 3.4 ± 2.0 for patients who did not have surgery (p >0.05) (Figure). The mean peak VO_2 (peak oxygen uptake during CPEX) among those who had surgery was 14.2 mL/kg/min as compared to 10.1 mL/kg/min in those who did not have surgery (p<0.05). There was no correlation between peak VO_2 and the predicted death rate or between the duration of hospital stay and peak VO_2 or the thoracoscore. There was no mortality in the operated patients.

In the control group of 21 patients, the mean FEV_1 was $75 \pm 18\%$ that was significantly higher than the 22 patients who had borderline lung function (FEV_1 62 $\pm 19\%$) and required CPEX (p<0.05). However, the
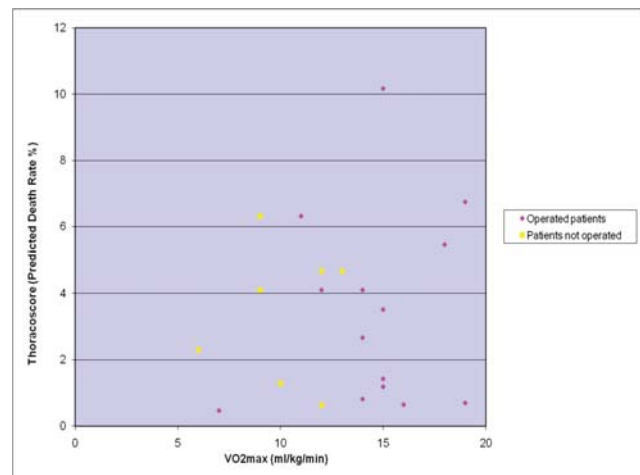

Figure. Relationship of thoracoscore and peak VO_2 among operated and non-operated patients.

predicted death rate based on thoracoscore of the control group was 3.9 ± 3.7, which was not statistically different from those with borderline lung function $3.5 + 2.5$ (p>0.05).

Discussion

Our study shows a lack of correlation between FEV_1 or peak VO_2 and thoracoscore. Thoracoscore may be a valid multivariate risk assessment tool but lacks the multi-faceted risk assessment available with CPEX testing. While thoracoscore has the advantage of being cost-effective as it can be readily calculated based on the available data, it may not be very useful in selecting the individual patients for major lung resection. These scoring tools should be considered as useful instruments for benchmarking and risk stratification among groups of surgical candidates and not for evaluating fitness for surgery.

During exercise, the lung experiences an increase in metabolism, ventilation, gas exchange and blood flow similar to those observed during the post-operative period after lung resection. Therefore, CPEX can be used to assess the physiological response after surgery. Peak VO_2 is the single most important measurement in CPEX and has well-established relationship with post-operative outcomes.[3,7-9] It is well standardised and is reproducible. In addition to the assessment of overall cardiopulmonary reserves, CPEX helps to determine whether the cause of the limitation is pulmonary, cardiovascular, musculo-skeletal or is multifactorial. This enables specific management strategies to be put in place, such as optimisation of chronic obstructive pulmonary disease treatment and management of coronary artery disease prior to considering lung resection surgery. Recently Bradley *et al*[10] also found that the thoracoscore has a poor discriminative and predictive ability for mortality and post-operative complications following lung resection.

Conclusions

Present study suggests that CPEX remains a standard tool for functional assessment prior to lung cancer resection surgery in keeping with the ERS/ESTS algorithm for the assessment of cardiopulmonary reserve. Thoracoscore should be used for risk stratification and not to assess fitness for surgery. The limitation of the present study is its retrospective design and small number of patients. Further studies are required to establish correlation between thoracoscore and peak VO_2 to enable reliable risk assessment based only on thoracoscore in centres where CPEX is not available.

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