



## Risk Stratification of Postoperative Dyspnoea: Is it Time to Change Practice?

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Lung cancer is the leading cause of cancer mortality worldwide [1]. In early stage disease, surgical resection offers the best chance of cure. Predicted postoperative lung function remains a key consideration in the assessment of patients' risk of post-operative dyspnoea and morbidity following resection. Patients with low predicted values are potentially excluded from surgical management. In their work, Oswald et al. [2] set out to examine the methods available for the prediction of postoperative lung function and determine their accuracy.

The review identified 135 studies, however, only 17 were included in the meta-analysis due to insufficient data and risk of bias. The studies identified 16 methods used to predict postoperative function, with perfusion scintigraphy and segment counting being the most common studied. Of the 16 methods identified, Computed Tomography Volume and Density scan analysis (CT-VD) was found to be the most accurate with respect to the prediction of postoperative Forced Expiratory Volume in 1 s (FEV1), whilst the evidence to predict the transfer factor for carbon monoxide (TLCO) was limited, with only two studies identified and the quality of evidence found to be low for all techniques.

The use of segment counting is currently recommended by the National Institute for Health and Care Excellence [3], the European Society of Thoracic Surgeons (ESTS) [4] and the American College of Chest Physicians (ACCP) [5]. The ACCP do however suggest the use of a quantitative radionuclide perfusion scanning to predict values following pneumonectomy and, the ESTS suggests the use ventilation or perfusion scintigraphy before pneumonectomy, or quantitative CT scan in borderline patients. Whilst individual practice varies, the majority of clinicians follow the guidance and utilize segment counting in everyday clinical practice due to the ease of the method and lack of requirement for any resource other than

basic mathematics. The threshold at which patients are excluded from surgery varies from one clinician to the next. A postoperative figure below 30% of the predicted value is generally agreed on as high risk, whilst some clinicians may use this value to request further investigations to inform on risk, others will use this as a definitive value to guide exclusion from surgical resection. In this patient cohort with low predicted postoperative values and multiple co-morbidities, it is debatable whether predicted postoperative FEV1 and TLCO are the best methods to accurately predict postoperative dyspnoea. The reality is that dyspnoea is multifactorial, not only dependent on pulmonary function but also cardiac performance. These patients may be more accurately assessed with the use of methods which encompass cardiac performance such as cardiopulmonary exercise tests or multifactorial risk stratification tools. Assessment based upon lung function alone may result in the exclusion of a cohort of patients with borderline lung function who may ultimately have a significant prognostic benefit from surgical resection. One such group is those with heterogeneous emphysema and tumors within the more emphysematous lobe. Clearly, in this case, segment counting may be grossly inaccurate, as resection may result in a 'lung volume reduction' effect with possible improvement in postoperative function. For these patients, CT-VD would provide a much more accurate estimation of postoperative values.

In many centres, CT-VD is not utilized despite the fact that the quality of routine preoperative scans is now sufficient to determine these measurements. This is likely due to a multitude of factors including a lack of requests from clinicians, a lack of training in the technique, and lack of time from reporting radiologists. The event of artificial intelligence in the reporting of CT scans may assist in a change of practice, eliminating all of these barriers, and perhaps even allowing the chest physician or surgeon to perform calculations in an outpatient setting.

The burden of lung cancer is a worldwide issue. The adoption of screening programmes across the globe will increase the

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number of patients identified with early stage disease that are suitable for resection, therefore importance of accurate risk stratification to maximize patients' access to surgery cannot be understated. This review has highlighted the paucity of good quality evidence regarding risk stratification of postoperative dyspnoea on which the current guidelines are based. It serves as a reminder to those clinicians performing risk assessment for surgical resection in their daily practice, to encompass other methods, namely CT-VD when assessing patients with borderline values, to ensure resection is offered to all those suitable, thus increasing resection rates and improving overall survival for patients with lung cancer.

#### Author Contributions

Ms. Udo Abah: Conception, draft and revision of manuscript.

Mr. Michael Shackcloth: Conception, draft and revision of manuscript.

#### Declaration of Competing Interest

Ms. Abah has nothing to disclose.

Mr. Shackcloth has nothing to disclose.

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