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LETTER TO THE EDITOR

Video-assisted thoracoscopic surgery lobectomy or open lobectomy for non-small-cell lung cancer? Minimizing selection bias in observational studies

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We have read with interest the paper by Hanna *et al*. [1], comparing oncological outcomes between video-assisted thoracoscopic surgery (VATS) lobectomy and open lobectomy for non-small-cell lung cancer (NSCLC) using propensity score matching, to minimize selection bias in the retrospective cohort in their hospital. To date, more and more surgeons have performed VATS lobectomy for early NSCLC and concern for its long-term oncological outcomes is emerging. However, most of the reports on this issue are retrospective and only one randomized trial has been reported so far, as the authors correctly note [2]. Non-randomized comparisons between treatments are subject to selection bias, because we 'select' the cases for VATS lobectomy or for other approaches. Two systematic reviews and meta-analyses have been published [3, 4], but they are not exempt from the selection bias either, because they themselves are based on retrospective cohort studies.

Hanna *et al*. tried to minimize this selection bias in the retrospective cohort by using propensity score matching, and this will be effective for this purpose when properly and ideally conducted. However, we find several important questions in statistical methods of this study. Propensity score is developed to minimize large differences of the observed covariates in observational studies, which would lead to biased results. Propensity score itself is defined as 'the conditional probability of being treated given the individual's covariates' [5]. And, therefore, propensity score matching should be performed to match VATS lobectomy and open lobectomy with regard to similar patient backgrounds based on the preoperative information. The authors used five variables to construct their propensity score, three of which, however, derive from postoperative pathological information. These cannot logically influence the choice of a surgical procedure. And after matching the cases between VATS lobectomy and open lobectomy using propensity score based on these variables, they analysed the prevalence of preoperative comorbidities, rates of lymph node samplings and long-term oncological outcomes. We cannot help saying that such analysis is contradictory to the definition of propensity score matching, which predicts 'the conditional probability of being treated given the individual's covariates'. On the other hand, oncological outcomes between two groups may have no significant difference, because they matched the cases based on pathological T and N, which is defined to predict oncological prognosis. If the authors wish to compare the difference between two groups based on postoperative pathological results, simple multivariate analysis should be chosen, even though they themselves are not free from the selection bias in this retrospective cohort.

We believe that more preoperative information should be adopted for propensity score such as preoperative comobidity, clinical information of the tumour including clinical TNM stage, histology and location, as we routinely use to decide upon the type of procedure preoperatively and, after matching the cases, oncological outcomes should be compared between two groups according to pathological TNM stagings.

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