Editorial

Risk factors involved in performing lobectomy to treat bronchial carcinoma

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Determining which patients will suffer complications or die when submitted to pulmonary resection remains the greatest concern of pulmonologists and thoracic surgeons. Due to the increasing incidence of lung cancer cases, the following types of pulmonary resection are being employed with ever greater frequency: segmentectomy; lobectomy (with or without surgical reconstruction of the bronchus); and pneumonectomy. They can be associated with thoracoplasty, the resection of the superior vena cava, aorta or carina.

The complexity of the resections depends on changes in the patterns of patients, who are of an advanced age, smoke (or used to smoke) heavily and have one or more of the following comorbidities: varying degrees of emphysema; arterial hypertension; heart disease; diabetes; and vascular diseases (peripheral, renal, hepatic or cerebral).

Despite these risks, we cannot counsel against pulmonary resection, since total resection of the tumor, evaluated in isolation, still offers the best results in terms of five-year survival rates. To decrease these risks, we need to know, with the greatest possible degree of accuracy, what will occur in the intra-operative and post-operative periods.

If we have no notion of what will occur post-operatively, performing a pulmonary resection can cure the cancer and yet, if the resection is too extensive, leave the patient a pulmonary invalid. In addition, some types of pulmonary resections in some patients will certainly create complications, thereby increasing the suffering of the patient, who will spend more time in the hospital, while reducing the number of available beds and increasing hospital costs. Nor is it acceptable that patients with stage IA lung cancer, whose chances for cure are 80%, suffer complications or die because one or more risk factors were neglected before surgery, and the appropriate prophylaxis was not performed. In cases of patients with stage IA lung cancer the use of lobectomy is unacceptable, even anti-ethical, because it results in morbidity and mortality rates that are much higher than the nationally and internationally established means. Full knowledge of the risk factors is important to continue reducing morbidity and mortality rates, rather than to justify the excess of bad results.

The difficulty in not knowing for sure what will occur with our patients in the intra-operative and post-operative periods motivated us to conduct a study on the so-called risk factors. The accurate and statistically representative establishment of one or more risk factors results in the adoption of prophylactic measures (in the pre-operative, intra-operative and post-operative periods), which will impede their manifestation or reduce their negative impacts.

Brazilian authors, such as Saad et al.,[1] Cataneo,[2-3] and Stanzani et al.[4] have carried out studies on this subject.

Saad et al., in a prospective study carried out in 145 patients, searched for variables that could be the cause of pulmonary complications in the first 72 hours after surgery. They concluded, after logistic regression, that the variables responsible for the complications were: history of bronchospasm; decrease in body mass index; number of years smoking; and surgical time. In that study, the Torrington-Henderson perioperative respiratory therapy (PORT) scale did not predict the complications but aided the selection of patients at risk for suffering complications.

In his excellent thesis and study, Cataneo evaluated, among the most accessible tests in the medical practice (walk test, stair-climbing test and spirometry), which one was comparable with the gold standard - ergospirometry - in the prediction of complications. He concluded that walk tests and stair-climbing tests were superior to spirometry.

Stanzani et al. carried out a prospective study involving 50 patients. Most of them had been submitted to lobectomy, although others had undergone lobectomy with surgical reconstruction of the bronchus, pneumonectomy or bilobectomy. In that study, 46% of the patients developed cardiopulmonary complications, 3.3% died, and 20.7% developed air leakage. These results were similar to the 44%, 2.9%, and 20.6%, respectively, found by Sánchez et al.[5] in a study published in this issue of the Brazilian Journal of Pulmonology.

In their study, Stanzani et al. tried to determine whether the Torrington-Henderson PORT scale and the Epstein scale would be able to predict complications. They concluded that both scales underestimated (to a statistically significant degree) the occurrence of minor and moderate complications when the risk was considered low. Both scales predicted correctly (and significantly) the greater number of complications in patients classified as high risk.

The difficulty that the scales described to date have in accurately predicting complications is related to the complexity of their application, the many variables that have to be evaluated and the fact that they are not designed for use in cases of pulmonary resection. Due to the fact that they were developed for clinical diseases, oncological diseases or abdominal surgeries (which few pulmonary resections are), such scales do not distinguish simple resections (lung biopsy) from more complex resections (pneumonectomy, with or without carinoplasty, and others).

In their excellent study, presented in this issue of the Brazilian Journal of Pulmonology, Sánchez et al.[5] sought to establish a correlation between the various comorbidities and the incidence of complications. Although it was a retrospective study, the potential limitations of this type of analysis and the large number of analyzed variables were balanced by the exceptionally large number of surgical patients analyzed (305), as well as by an appropriate statistical study. In the univariate analysis the authors showed that gender, age, smoking habits, pre-operative chemotherapy, diabetes, forced expiratory volume in one second (FEV_1), ratio between FEV_1 and forced vital capacity, body mass index (BMI), the PORT scale score and the Charlson scale score were all associated with the occurrence of complications.

In the multivariate analysis, only BMI and the Charlson scale continued to be associated with the occurrence of complications. Most variables lost significance in the multivariate analysis because the authors learned how to block their negative effects. For instance, early in the experience of the authors, pre-operative chemotherapy resulted in high rates of morbidity and mortality. However, these rates decreased significantly when the volume and fraction of inspired oxygen were reduced, together with the administration of corticosteroids, started at the initiation of anesthesia and continued for three days. With these measures, the incidence of complications with chemotherapy is now similar to that seen without chemotherapy.

Age was also excluded as a risk factor in the multivariate analysis. However, in my opinion, it is still very important in two aspects:

a) from an anatomical point of view, the pulmonary artery wall becomes thin and atherosclerotic with age, increasing the risk of rupture when dissected or ligated

b) the usual pre-operative tests typically conducted do not accurately depict the condition of the coronary and cerebral arteries in elderly patients. As a consequence, minor episodes of hypotension during surgery can cause myocardial or brain infarction.

I believe that we cannot yet rule out age as a risk factor for complications. However, as we increasingly perform surgical procedures in patients over 70 years of age, we learn how to minimize the effects of age. During surgery, we pay more attention to the pulmonary artery, and post-operative peridural anesthesia has become routine. As a result, the patient suffers less pain and can walk on the day after surgery, as well as cooperating more fully during physiotherapy (respiratory and motor). In addition, early diagnosis and treatment of depression have now become the norm and constitute an important factor in reducing morbidity rates.

The authors found that only two variables, BMI and the Charlson scale score, maintained their significance in the detection of post-operative complications. Table 4 of the article shows that the mean BMI among patients who suffered complications was 23.8 kg/m^2, compared with 25.3 kg/m^2 among those who did not suffer complications - a small but significant difference. These means are

above what the authors considered low BMI (18.5 kg/m^2), and we can see that 95% of patients that suffered complications presented BMIs between 15 kg/m^2 and 32.6 kg/m^2. Therefore, few were considered low-weight patients. It is not unusual for an individual with lung cancer to lose weight. When weight loss occurs, the tumor is large, typically presenting necrosis or abscess, and is likely to be releasing tumor necrosis factors and other toxins. Although BMI was an important and significant factor in this study, I believe that, in general, it does not allow us to predict complications. The authors should have defined a minimum BMI to predict complications.

As for the Charlson scale, although it is composed of various comorbidities, only one variable was considered. Therefore, it did not simplify the search for few risk factors to be analyzed. The Charlson scale was developed to analyze comorbidities in oncology. Therefore, it has no specificity for pulmonary resection. The authors concluded what we already knew: a decrease in FEV_1 and the ratio between FEV_1 and forced vital capacity are important factors in the development of complications and in mortality. They concluded that patients with moderate or severe emphysema (FEV_1 < 50%) presented more complications and more often died.

In relation to post-operative complications, the authors showed that air leakage (bronchial fistula) was of significant importance for the development of other complications, for increases in mortality rates and for the duration of hospital stays. This conclusion obliges thoracic surgeons to seek new solutions in order to impede or reduce air leakage. When such solutions are found, patients spend less time in the hospital and chest tube(s) are left in place for fewer days. In addition, patients suffer less pain, present less infection and less often develop empyema.

Pulmonologists and thoracic surgeons will certainly consult the study of Sánchez et al. in search of data that can predict what will occur in their patients during and after surgery. However, we still do not have a scale designed specifically for pulmonary resections. Such a scale should be developed through the analysis of a large number of patients in a prospective study that separates the most important factor or factors for every type of resection: anatomic segmentectomy; lobectomy (and its variants); pneumonectomy; and resections accompanied by the resection of the thoracic wall, superior vena cava, left atrium, aorta or carina. In the discussion of their article, Stanzani et al. stated that "Ideally, the new scale should contain few variables, favor clinical aspects, and should not need complex mathematic calculations to reach the risk score".

Finally, we should always bear in mind that even if we can devise an ideal scale, it will not be definitive. Certainly, with the passage of time, it will need to be reviewed, since aspects such as diagnosis, treatment, intra-operative care and post-operative care are under constant technical improvement, as well as because patients want to live longer but also want to preserve their quality of life. We should also be aware of the fact that risk scales are not developed to justify our failures but to continually reduce the rates of morbidity and mortality.

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