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Editorial

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Prevention of Prolonged Air Leak after Video-Assisted Thoracoscopic Anatomical Resection: A New Perspective

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Editorial

Prolonged air leak (PAL) after lung anatomical resection remains a long-unsolved problem. After the advent of MITS (minimally invasive thoracic surgery) and the ERAS era (Enhanced Recovery after Surgery), PAL significantly burdens the postoperative course [1]. Often the average hospital stay is less than five days and therefore the appearance of PAL can prolong it. Even in the presence of PAL, patients are increasingly discharged home early with a thoracic drainage system [2,3]. Some studies have shown in these patients an increase in hospital readmissions and costs [4]. PAL after VATS (Video-Assisted Thoracic Surgery) anatomical resections has a high clinical and economic impact and should be avoided. Prevention plays a fundamental role.

There are three stages in which we can act:

- In the preoperative phase with the adoption of predictive risk models,
- Intraoperative through the stratification of patients at risk of PAL and the selective treatment of intraoperative alveolar air leaks,
- In the postoperative period, with proper management of the chest tube.

As we have recently demonstrated, current risk models do not have sufficient discriminatory capacity to be used in standard clinical practise [5]. The C statistics of the best four PAL risk models [6-9] do not exceed 0.65. Like the weather, reliably predicting good and bad conditions can change human behaviour [10]. This could drive surgeons to quickly remove chest tubes in low-risk cases and use expensive prophylactic therapies for high-risk cases. Nevertheless, currently, predictive models are not yet particularly discriminatory. One possible reason is that there is a high level of randomness in the occurrence of PAL, which probably cannot be reduced. The other possibility is that until now, the models did not include some essential variables. In our view, the addition of objective intraoperative assessment of intraoperative alveolar air leak (IAAL) to the well-known preoperative and postoperative risk factors is key to improving the success of PAL prediction and prevention.

Many surgeons suggest detecting IAALs through an immersion test after completing a VATS anatomical resection [11]. The next step represents the crux of the prevention of PAL. If the immersion test is positive, in our opinion, to follow a logical progression, an objective quantification of air leaks through a mechanical ventilation test (MVT) is mandatory because it allows classifying IAALs [12] into:

- mild (<100 ml/min)
- moderate (>100 and <400 ml/min)
- severe (>400 ml/min)

Some evidence supports this classification. Takamochi et al. demonstrated that a postoperative loss <100 mL/min is usually self-limiting [13]. An air loss >100 ml/min during the first 24 hours after surgery is significantly helpful in predicting PAL after lung resection. We have previously shown that in unselected patients with moderate IAAL (>100 and <400 ml/min) and not treated intraoperatively (control group), the duration of postoperative air leak is 5.04 ± 3.63 days [14]. Brunelli and colleagues demonstrated that unselected patients submitted to lobectomy with an IAAL >500 ml/min measured after lung resection would have an expected air leak duration of 15 days [15]. Whether there is a consensus on considering mild IAAL as self-limiting and not to be treated, moderate IAAL is still a matter of debate. We have shown that intraoperative sealing treatment of unselected patients with moderate IAAL leads to a significant reduction in the length of hospitalization (2.1 days) and hospitalization costs [14]. However, this is only true in centres where patients are not discharged early with chest drainage. Therefore, these patients must be stratified by other known risk factors. This way, we will be able to predict PAL more accurately. Takamochi [13] has already been able to demonstrate a significant correlation between patients at high risk for PAL and a moderate postoperative AL (air leak >100 ml/min) to predict PAL. Further studies are needed to demonstrate a close correlation between PAL and IAAL, especially in high-risk patients.

Severe IAAL >400 ml/min. is commonly considered to be treated because the risk of PAL is too high. In these cases, standard procedures are usually required, including parenchymal suturing or stapling.

Postoperatively the use of digital chest drainage systems reduces the inter-operator differences [16] and the overall drainage duration [17]. Furthermore, digital monitoring of intrapleural pressure (IPP) can estimate the risk of PAL after VATS lobectomy [13,18,19]. Strongly negative IPPs in the first 24 postoperative hours represent a significant predictor of PAL [20]. The association of significant preoperative and intraoperative risk factors, objective quantification of postoperative AL, and digital monitoring of IPP potentially represent a reliable way to predict PAL in the postoperative course. A postoperative risk stratification model could lead to early treatment of postoperative ALs. Further studies are required to confirm and define its role.

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