Editorial

Prolonged air leak after lung surgery—prevalent complication without a perfect solution

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Prolonged pulmonary air leak after lung surgery is defined as a postoperative air leak of more than five days duration (1). Prolonged air leak after lung resection (wedge, segmentectomy, or lobectomy) is one of the most common complications known well to every thoracic surgeon. This adverse event leads to prolonged hospital length of stay, increased medical costs, higher readmission rates and strongly affects morbidities (2). The postoperative air leak is associated with atelectasis, pneumonia, slow patient mobilization, and the development of pleural empyema. Development of postoperative pleural empyema in patients with prolonged air leak after radical pleurectomy decortication (PD) for pleural mesothelioma (PM) was recently found to be associated by our group with shorter overall survival compared to the group of patients after PD who did not develop empyema (3). Thoracic surgery, such as anatomic lung resections, lung volume reduction surgery (LVRS), and lung-sparing surgery for PM, are commonly associated with prolonged air leaks (4). Several factors were proposed as predictors of prolonged air leaks after lung surgery. Preoperative ones such as reduced predicted postoperative forced expiratory volume in 1 s, chronic steroid use, left lung surgery and upper lobe resection. Intraoperative predictors such as marked pleural adhesions and the grade of air leak before chest closure (1,4). By identifying the group with higher probability for prolonged air leak and minimizing the leak before leaving the operating room we might decrease the associated complication rates. The thoracic surgeon should make every effort to reduce the rate of postoperative air leaks to avoid post-operative complications. Improving lung staplers and surgeons' technical skills in handling delicate emphysematous lungs play a significant role in decreasing the rate of prolonged air leaks. Despite the use of sophisticated surgical instruments, including buttressed staplers, an adaptation of strict techniques to handle fissureless lobes, and the appliance of sealants to the lung, the incidence of pulmonary air leakage (PAL) after lobectomy and LVRS is up to 26% and 46% respectively (4). The large variety of treatment options such as pleural tent, chemical pleurodesis, autologous blood patch pleurodesis, use of endobronchial valves and surgical sealants testifies for the lack of one good solution for such common complication. While routine use of surgical sealants in every lung surgery is not recommended, in high-risk group they might decrease the duration of air leak (5). Given the different mechanical characteristics and modes of action of surgical sealants and the paucity of literature comparing between them, Hermans and colleagues in

their article, "Sealing effectiveness of a novel NHS-POx based patch: experiments in a dynamic *ex vivo* porcine lung" compare a novel patch based on porcine derived gelatin impregnated with functionalized polyoxazolines (GATT patch, GATT Technologies BV, Nijmegen, The Netherlands) to commercial gels (Progel, C.R. Bard Inc., Murray Hill, NJ, USA; Coseal, Baxter International Inc., Deerfield, IL, USA) and patch sealants (Hemopatch, Baxter International Inc. and Tachosil, Takeda Pharmaceutical Company Limited, Tokyo, Japan) products (6). The investigation and comparison of the aerostatic properties of this novel product with commercial products mentioned above were conducted in an *ex-vivo* porcine lung model. The authors found improved adhesive strength compared to other patch sealants, superior bursting pressure compared to Tachosil, Hemopatch, Coseal and Progel and better air leak reduction than the other examined patches using the novel GATT patch Double. Importantly, the GATT patch demonstrated improved adhesive properties to the entire parenchymal lung defect without debonding, which mostly characterize gel sealants and not patches. The GATT patch was found to be safe in clinical trials of the liver but safety outcomes in the thorax should be assessed further. In summary, despite the existence of multiple commercial surgical sealants in the world of thoracic surgery, there is an unmet need for an effective single sealant that would significantly minimize prolonged air leaks and prevent their associated implications. In their recent publication, Hermans and colleagues demonstrate promising results in *ex vivo* porcine lung model using novel patch to reduce air leak after lung surgery. By facilitating and optimizing the use of GATT double patch mainly in the era of minimally invasive surgery and establishing its efficacy in randomized *in vivo* trials, it might have a significant and promising impact on many of our thoracic patients.

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