Editorial

Localization of air leaks by soap bubble

Kazuhiro Ueda

Department of General Thoracic Surgery, Graduate School of Medical and Dental Sciences, Kagoshima University, Sakuragaoka, Kagoshima, Japan
Correspondence to: Kazuhiro Ueda. Department of General Thoracic Surgery, Graduate School of Medical and Dental Sciences, Kagoshima University, 8-35-1 Sakuragaoka, Kagoshima 890-8520, Japan. Email: uedakazu@m.kufm.kagoshima-u.ac.jp.
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Prolonged air leak (5 days or more) is the most frequent complication after major lung resection. The main reasons for prolonged air leak include lung tissue fragility due to emphysematous lung formation, impaired wound healing, and overlooked air leak points. Some potentially preventive measures against prolonged air leak include the use of surgical sealant and buttressing materials during pulmonary resection, obliterating free space by pleural tenting or pneumoperitoneum, or dissecting the pulmonary ligament (1). Recently, we recommend using a bioabsorbable sheet material to cover areas of air leak or to reinforce suture sites in order avoid tearing of the fragile sutured lung in patients in whom intractable air leaks are identified during pulmonary resection (2). In addition to reducing the duration of chest tube drainage, the use of a bioabsorbable sheet in combination with surgical sealant contributed to omitting postoperative chest tube drainage in patients undergoing major lung resection. According to our retrospective comparative study, omitting chest tube drainage contributed to reducing postoperative pain and the length of hospital stay (3). Although these preventive measures potentially reduce the rate of prolonged air leak, they cannot be successfully implemented unless air leak points are accurately identified during surgery. During surgery, most surgeons routinely perform a water seal test in order to identify the presence or absence of air leak. It may be relatively difficult to localize the air leak point by a water seal test using saline solution. In contrast, a water seal test using distilled water facilitates the accurate identification of air leak point because the air leak point can be clearly visualized underwater using a thoracoscope. However, it is easy to lose visual contact with the air leak point after the water seal test because the air leak point cannot be marked during the water seal test. To solve this issue, Yang and Chang developed a novel method of identifying air leak points using a minimal amount of water (4). They used a certain conditioned surfactant solution to form soap bubbles at the air leak point. This method can facilitate the marking of the air leak point, which can be performed immediately after the identification of soap bubbles. As a result, the site of the air leak can be accurately sutured. The concept is quite simple and can be implemented by anyone. I congratulate the authors on their efforts in developing a practical and ideal method of utilizing the surfactant. Many respiratory surgeons want to hear from the authors regarding the outcome of their initial clinical experience regarding the use of Yang's bubble solution. I dare to recommend the authors before the clinical application of Yang's bubble solution. First of all, as the authors noted, it remains unclear whether the soap bubble forming property of Yang's bubble solution differs at different temperatures, for instance at 20 or 37 degrees. This point is important for determining how the solution should be kept in the operating room before usage. Second, it should be clarified whether Yang's bubble solution is also useful in identifying the extent of air leaks. The authors clarified the characteristics of the soap bubbles in an *ex vivo* porcine lung in which pin hole was made. However, it remains unknown whether the solution is also useful in lungs with extensive tears that are often accompanied by massive air leaks. With respect to the amount of solution required, the authors noted that 100 mL per patient is sufficient. However, I do not fully agree with this issue because a wide view (shown in the attached video clip) is not usually obtained during *in vivo* thoracoscopic surgery. Furthermore, an air leak test using the solution should also be performed after closure of

the air leak point. After reading the paper, I do not feel that the air leak test using Yang's bubble solution can replace the conventional water seal test. Although the air leak test with Yang's bubble solution may be useful in the localization of air leaks, a water seal test may be indispensable for the intraoperative determination of the presence or absence of air leaks. The supplemental use of a soap bubble test in combination with a water seal test may contribute to preventing air leak points from being overlooked and facilitate the accurate stitching of the air leak point, and thereby reduce the rate of prolonged postoperative air leak and the length of postoperative hospital stay. Finally, I am very happy to have come across this interesting and invaluable paper.

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Footnote

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