



# Postoperative chest tube management for patients undergoing lobectomy: evidence-based practice

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Comment on: Gao S, Zhang Z, Aragón J, *et al.* The Society for Translational Medicine: clinical practice guidelines for the postoperative management of chest tube for patients undergoing lobectomy. *J Thorac Dis* 2017;9:3255-64.

Submitted Sep 28, 2018. Accepted for publication Sep 30, 2018.

doi: 10.21037/jtd.2018.10.12

View this article at: <http://dx.doi.org/10.21037/jtd.2018.10.12>

Postoperative management of chest tubes following lobectomy remains controversial and might eventually lead to increased health care cost and unnecessary interventions (1). Combining clinical expertise with the best available evidence from systematic reviews and/or meta-analysis have shown to decrease variability in clinical practice leading to improved health care outcomes (2). Unfortunately, few cardiothoracic surgery practices are evidence-based (3). The Society for Translational Medicine and The Chinese Society for Thoracic and Cardiovascular Surgery thought to investigate this by performing a systematic review of the literature on the postoperative management of chest tube in patients undergoing lobectomy based on current published data using American College of Physicians Task Force grading system (4,5).

There is a considerable disagreement among surgeons regarding the amount of chest tube output before removal. This is due to the paucity of prospective randomized studies as well as the variability of practice among surgeons (academic *vs.* private, low- *vs.* high-volume, more *vs.* less experienced surgeons) (6). Although some authors suggested that it is safe to remove chest tube with an output of less than 450 mL/d following pulmonary resection, others recommended a more conservative approach with an output of 300 mL/d (7). Current systematic review suggested that chest tube can be removed safely if output is <450 mL/d without evidence of pleural infection, chylothorax or hemothorax (grade 2B: weak recommendation, moderate quality evidence) (5). However, it should be noted that up to 20% of patients had therapeutic thoracentesis when output

reached 450 mL/d as compared to lower output in a recent randomized trial (8).

The use of two pleural tubes (one placed in the apex of the pleural cavity and the other over the diaphragm) following lobectomy was frequently recommended in the medical literature and widely accepted (9). However, such practice is associated with increased postoperative pain. A recent meta-analysis found that single-drain method is effective and reduced postoperative pain, hospitalization times as well as duration of drainage in patients who undergo a lobectomy as compared to two chest tubes (10). Such results were also confirmed in the recent guidelines (5) and further clinical research on such topic is probably unnecessary (grade 2A: weak recommendation, high quality evidence).

Following pulmonary resection, milking or stripping of chest tubes to promote drainage of the thorax was a routine practice, extrapolated from empyema management postoperatively due to the viscosity of fluid drained. Such practice was primarily done to ensure patency of the chest tube, clearing blood clots and detecting any early postoperative bleeding. A randomized control trial showed that milking or stripping of chest tube did not improve clinical outcomes such as duration of chest tube drainage, quality of effusion, air leakage or length of hospitalization (11). The current guidelines confirmed chest tube clearance by milking and stripping offers no advantages in patients after lobectomy and further investigation on this subject is also probably unnecessary (grade 2B: weak recommendation, moderate quality evidence) (5).

It is controversial whether or not wall suction should be applied following lobectomy. On one hand, some experts, apply suction to increase adherence of the visceral and parietal membranes, thereby, promoting healing and decreasing the progression of subcutaneous emphysema (if air leak due to fistula developed). In contrast, other experts avoid suction believing that suction promotes continued patency of a fistula. There are two forms of suction: (I) regulated or variable; and (II) unregulated or fixed. The former applies suction to maintain the desired intrapleural pressure in order to reliably assess the effect of different levels of negative pressure on the duration of air leak. This could be done through a digital drainage system. The latter delivers a fixed controlled suction without feedback from the chest cavity and is achieved when chest tube is connected to wall suction. The current guidelines reviewed all previous studies and concluded that chest tube suction offers no further advantage over water seal (grade 2A: weak recommendation, high quality evidence) (5). Furthermore, regulated seal was as effective and safe as regulated suction in managing chest tubes following lobectomy when using a digital drainage system (grade 2B: weak recommendation, moderate quality evidence) (5).

Removal of a chest tube is a routine practice performed following lobectomy. This practice should be standardized so that high-quality care is provided for thoracic surgery patients. There was ongoing debate on whether a chest tube should be removed at end expiration or inspiration in order to decrease the incidence of pneumothorax following removal. Studies have shown that phase of inhalation or exhalation did not affect the incidence of recurrence and is not likely as important as a Valsalva maneuver. Coordination with the patient as well as combining rapid removal of chest tube with a Valsalva maneuver to ensure positive intrathoracic will likely be an effective and safe way to remove a chest tube (7). Such a practice has been confirmed in the current guidelines as well (grade 2A: weak recommendation, high quality evidence) (5).

The expression of air leak in mL/min rather than bubbles as well as the ability to record and retrieve the trend of an air leak makes it possible to standardize chest tube management and objectively assess time of chest tube removal following lung resection. Electronic digital drainage systems use different technologies and software to measure or estimate the airflow either directly through a flow sensor or indirectly based on intrapleural pressure through a pressure sensor. Furthermore, such drainage system has the ability to apply regulated suction pressure

in the pleural space to maintain the desired negative intrapleural pressure initially preset by the user independent of patient, tube and device position. The current guidelines have summarized all available randomized clinical trials comparing electronic drainage system to traditional drainage devices and showed that use of such system might translate to shortened chest tube duration and hospital length (grade 1B: strong recommendation, moderate quality evidence) (5).

The postoperative management of chest tube following lobectomy is an integral part of continuous management of thoracic surgery patients with the goal to remove such tube early but safely. The Society for Translational Medicine has taken an important step forward in providing an up-to-date evidence about how to effectively manage and remove chest tube following lung resection.

### Acknowledgements

None.

### Footnote

*Conflicts of Interest:* The author has no conflicts of interest to declare.

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**Cite this article as:** Kheir F. Postoperative chest tube management for patients undergoing lobectomy: evidence-based practice. *J Thorac Dis* 2018;10(Suppl 33):S4130-S4132. doi: 10.21037/jtd.2018.10.12