



Modern day guidelines for post lobectomy chest tube management

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Introduction

Despite decades of thoracic surgeons performing lobectomies there has been difficulties in creating a standardized postoperative chest tube management plan. This is partly due to lack of evidence and partly due to diversities in the cultures and different philosophies of care by surgeons and institutions. With the introduction of enhanced recovery after surgery (ERAS) in thoracic surgery, there has been a push towards more standardized pathways (1). Chest tubes management is a frequent daily task for every thoracic surgeon worldwide and a decision regarding chest tube removal, clamping, maintenance and replacement is such a common practice that it is embarrassing that there yet to be developed universal, evidence-based guidelines to allow practicing physicians worldwide to take a uniform approach towards chest tubes management. In this regard, the clinical practice guidelines created by the Society of Translational Medicine are a helpful addition and will help in guiding clinicians with the day to day chest tube management decision making.

The guidelines are practical and cover most pertinent issues related to chest tube management. They also quite clearly reflect the fact that some recommendations are made based on a relatively low-level evidence. We would like, however, to point out several points requiring further discussion and clarifications.

Timing of chest tube removal after lobectomy

As rightly pointed out, there is insufficient literature to

make a strong recommendation regarding the timing of removal of a chest tube. This highlights the need for more robust studies to create more evidence-based pathways which will ultimately benefit our patients. The guidelines recommendation is based on a volume that should lead to minimal reinterventions. However, the trial quoted in the guidelines showed a re-intervention rate of 20% based on the volume the guidelines proposes. There have been two other randomized control trials using 200 and 300 mL as their upper threshold with intervention rates of 2.7% and 9.8% respectively. Using higher thresholds will lead to shorter chest tube duration and potentially reduced length of stay but at a trade-off of a potential need for higher reintervention rates. A recent article from the Ottawa group has demonstrated that models of fluid output measurements at 6, 8, and 12 hours were nicely predictive of the total 24-hour fluid output that comply with a predetermined volume threshold considered acceptable for safe chest tube removal (2). At our institution we use 350–400 mL/24 hours as the threshold for removal. However, we have not found our re-intervention rates to be that substantial. Eventually, as clearly indicated by the guidelines, as well as by an editorial attached to the Ottawa paper (3), a well-designed randomized controlled trial might, ultimately, provide us with a more definitive answer.

The guidelines do not mention an air leak threshold by which it is safe to remove a chest tube. Using the analog system this would be self-explanatory as chest

tubes would not be removed if an air leak was present. However, analog systems are subjected to inter-observer variability in reporting an air leak. As such, a common practice is to clamp the chest tube for a set period of time as a trial prior to chest tube removal. This can be done in any instance in which the absence of an air leak is in question. Digital pleural drainage systems were introduced to reduce this interobserver variability. The interest in electronic pleural drainage systems is increasing given the number of randomized trials being published on the subject (4,5). They provide a continuous rather than a static image of what is occurring within the pleural space. Digital systems also provide information regarding trends in air leaks, fluid outputs and intrathoracic pressure. The manufacturers of most devices state that chest tube removal with an air leak less than 40 mL/min for 12 or more hours with intrathoracic pressures exceeding that generated by the device is an indicator for safe chest tube removal. In a study performed at our institution comparing digital and analog drainage we found the use of digital pleural drainage systems decreased rates of prolonged air leak (5). This was attributed to the ability of digital systems to provide intermittent suction rather than continuous. In a recent meta-analysis of 10 randomized control trials, the use of digital pleural drainage systems was associated with decreased length of stay, decreased chest tube duration, decreased air leak duration and decreased cost.

The guidelines recommend the use of a pleural fluid-to-blood protein ratio as an indicator of safety for removal. The PrR_{p/B} ratio provides an objective measure that the output has changed from an exudative to a reactive transudative fluid. This may provide an additional level of reassurance that a chest tube is safe to be removed. However, it is unclear how practical this method is, as it requires a laboratory test to be implemented as part of the routine patients' pathways, a practice which might not be easily adopted by a tight cost-saving environment practiced in most parts of the world.

Number of chest tubes and drainage

The recommendation that one chest tube will suffice for a standard lobectomy seems based on solid data. There have been two meta-analyses which have shown the use of single chest tube to be superior to the use of two chest tubes. Using a single chest tube was found to be associated with reduced post-operative pain, less drainage and reduced length of stay without requiring increased interventions (6).

The guidelines do not address the caliber of tube that should be used. There are no good studies analyzing the impact of chest tube size after lobectomy though there have been numerous trials on the treatment of thoracic empyema using small caliber drains and showing good efficacy, similar to that of a large bore chest drain (7). The use of smaller caliber tubes post chest trauma has also been associated with no increased re-intervention rates (8,9). If these are extrapolated to the post-lobectomy space, it might not be needed to routinely use 28–32 Fr chest tubes when a 20 Fr would suffice. The use of smaller drains has been shown to help with reduction in chest tube site pain and drainage volumes (9). As before, a well-designed prospective trial/s will have the potential to address this specific issue.

The recommendation regarding routine chest tube clearance by milking or stripping the tube is based on evidence from cardiac surgery and as such it is unclear if this recommendation should be routinely applied post lobectomy. It is noteworthy that most digital drainage systems do not allow milking of the tube. Nevertheless, the question of the optimal maintenance of chest tube patency remains. In this regard, perhaps a recommendation regarding the routine use of chest tube flushes post-operatively would be more helpful. Given that most patients will likely have their chest tubes removed by post-operative day one or two, the likelihood of fibrinous accumulation compromising chest tube function is low, unless a notable initial bleeding does exist. As such, intuitively the less manipulation a chest tube has in the post-operative course, the lower the likelihood of it being mispositioned or developing an infective complication. There have been no studies looking into the use of post-operative chest tube flushes in maintaining tube patency. There is some weak evidence in the trauma literature showing that the use of saline flushes immediately after chest tube insertion reduces the risk of retained hemothorax. As such, if the outputs post lobectomy appear to be more sanguineous perhaps routine flushes in the post-operative period may be of benefit.

As indicated in the guidelines, the maintenance of chest tubes to underwater seal or -8 cmH₂O in the immediate post-operative period would be in keeping with most ERAS protocols in thoracic surgery.

In summary, The Society for Translational Medicine guidelines are a welcome addition to the literature and will help to solidify our daily practice. Ultimately, the optimal management of chest tubes in the post-operative period should lead to reduction in length of stay, improvement in

patients' pain, quality of life and satisfaction and reduction in the need for re-intervention. The introduction of the digital drainage systems might help with the creation of more objective and standardized management pathways. Finally, one might expect a need for a revised guideline within several years, providing that a higher-level evidence related to this commonly practiced intervention is to be published.

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Footnote

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