Editorial Commentary

How should we manage the chest drainage after a video-assisted thoracoscopic surgery lobectomy?

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A recent paper from Holbek *et al.* (1), published in the *European Journal of Cardio-Thoracic Surgery*, opens a room for interesting discussion about the management of chest drainage after minimally-invasive lobectomy.

Chest tube duration after a thoracic procedure, for either air and/or fluid drainage is the main factor which may influence overall lenght of stay, hospital costs, postoperative morbidity as well as patient's quality of life.

Historically, textbooks and articles recommend the use of 2 chest tubes after lobectomy, even with unjustified evidence concerning appropriate drainage of air and/or fluids. As there is no strong evidence that 2 chest tubes are more effective than 1 (2-4), few years ago a guideline was published, recommending the use of 1 drainage, only after an uncomplicated lobectomy (5).

Postoperative tube's management is often influenced by surgeon's custom and personal experience. The main aim is to reduce possible air leaks, shortening, therefore, its duration. Usually, air leak developing after an uncomplicated lobectomy is a self-limiting physical phenomenon, but prolonged air leaks (PALs) (after 5–7 days) may be observed in up to 26% of patients (6).

Chest drain external suction application has been diffused amongst Thoracic Surgeons since the early 2000s, when some papers demonstrated that there was no difference or clinical benefit between suction or water-seal (7,8). Placing suction has the theoretical potential advantage of improving the pleural apposition to the chest wall. However, on the other hand, increasing the intrapleural negative pressure by applying an external suction may worsen air leak duration, by heightening the size of existing alveolar-pleural fistulas (9). Besides, in the water-seal system, an intrathoracic suction pressure still exists, originating from the height difference between the tip of the chest tube and the level of the collection chamber (9).

Therefore, a standardization of terminology was necessary and a recent publication (5) clarified the terminology related to suction application, by using the terms of:

(I) Passive drainage, when intrapleural pressure rises above the atmospheric pressure;
(II) Active drainage, when a subatmospheric pressure (negative) is applied to the pleural space, either by an external pump, or by creating a column of liquid within the chest tube that extends below the level of the pleural space (the so called "siphoning effect").

Another very important issue is related to the distinction between a regulated (variable) suction and an unregulated (fixed) one.

The first one is a form of an active drainage that adjusts its activity according to the need in the chest cavity, with the aim to maintain a pre-selected pressure value (10). An example of this is observed in the clinical situation of a persistent air leak, where the lung parenchyma is not able to completely expand, by maintaining an intrapleural negative pressure (5).

More, the wall suction, which has been commonly used for many years in the General Thoracic Surgery Units, is a typical example of unregulated or fixed suction. It is, in fact, an external suction source which is not able to vary its levels, providing, therefore, a constant and fixed suction to the pleural space.

Suction or not suction is not a merely academic discussion: the rapid fluid and air aspiration from the pleural cavity by applying an active suction may increase postoperative complications, as for example, lung overdistension, promoting, therefore, pulmonary oedema development (11).

By using traditional chest drainages, air leak is evaluated as bubbling of air in chamber, usually during cough or forced expiratory maneuvers by the patient. These results may be affected by either the inability to quantify air leak and a possible inter-observer variability of this phenomenon (12). Furthermore, the difference between a true air leak from a clinically not influencing one, due to intrapleural pressure differences which may occur with cough, is difficult to settle by using these devices.

The recent electronic drainage systems clinical diffusion has made a precise airflow measurement possible, providing, therefore, an objecticve standardization for chest tube removal. Clinical experiences from different Institutions demonstrated that an air flow lesser than 40 mL/min for the last 6–8 h could be considered safe for chest drainage removal.

Brunelli *et al.* (13) for the first time designed a prospective randomized trial on air leak duration after lobectomy (performed through a muscle and nerve-sparing thoracotomy) comparing regulated tailored suction and regulated seal. The Authors used an electonic system (Thopaz, Medela AG, Switzerland) able to maintain the pleural pressure within a preselected value, and passively working (as a one-way valve) when the preset pressure is below –8 cmH_2O. They divided patients into 2 groups: Group 1, with regulated individualized active suction [selected according to the type of lobectomy, as reported in their previous paper (14)]; Group 2, with regulated seal mode (–2 cmH_2O), with the device working without any active suction.

The results showed that either air leak, fluid output, chest tube duration and incidence of air leak longer than 7 days were similar in the 2 groups. But in those patients with an air leak detected immediately after extubation, it lasted significantly lesser in Group 2 (87.4 Group 1 *vs.* 52.9 s Group 2; P=0.07). This seemed to demonstrate that: (I) regulated suction and regulated seal modes have the same effects on the postoperative course in uncomplicated lobectomy, and (II) a regulated seal might less traumatically manage early originating air leaks, probably arising from a more delicate lung parenchyma.

The article by Holbek *et al.* (1), goes in the same direction. By using the same electronic device and including VATS lobectomy, only, they randomized 111 patients into 2 groups: Group 1 with –2 cmH_2O suction, and Group 2 with –10 cmH_2O suction, respectively. Patients were treated according to the ERAS (Enhanced Recovery program) protocol used in that Unit. Chest tube was removed when air leak was lower than 20 mL/min for at least 12 h; daily fluid output allowing drainage removal was not well detailed in the paper. The results showed that drainage duration, median time to air leak cessation, median potential drainage duration and median total fluid output were significantly lesser in the Group 1 patients. Also persistent air leaks (>5 days) were significantly less frequent in that patients. Small size (15 mm) apical pneumothorax after chest drainage removal was observed in 101 patients (46 in Group 1); 7.2% of them (10 patients in Group 1 *vs.* 6 in Group 2, P= NS) only, required chest tube reinsertion.

Lesson learned from this paper is in line with data emerging from the recent literature. The results of some recent randomized controlled trials (7,8,15,16), in fact, do not support suction in the postoperative course of uncomplicated lobectomy, and their final message is that no additional suction seems to be required in routine postoperative. Whilst the water-seal system works as a sort of "physiologic suction", as demonstrated before, external suction seems to be extremely effective in reducing post-operative pneumothorax development (9). Same conclusions have been authoratively underlined in a recent meta-analysis by Lang *et al.* (17). Nevertheless, in their national survey results amongst 25 Units of Thoracic Surgery in the United Kingdom published in the same paper, the Authors report that out of the 91 surgeons represented, the majority (68%) routinely apply low-pressure suction in patients receiving lung resection (17). This study has emphasized some limitations in the routine clinical practice: (I) the lack of a formal protocol for postoperative chest drainage's management; (II) the great variability among surgeons of the criteria for stopping suction and removing chest tubes; (III) the electronic systems prevalent use, which replace traditional "wall suction" and improve patient's early mobilization.

In conclusion, even if some evidences favouring no-

suction have recently emerged from the literature, it is difficult to change Surgeons' mindset in the postoperative drainage management. Electronic devices and ERAS large diffusion worldwide, a greater attention to overall hospitalization costs and new randomized trials might open new horizons in a clinical greater postoperative drainage standardization.

Acknowledgments

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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