



Non-intubated thoracic surgery—the surgeon perspective

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The introduction of the double-lumen tracheal tube represented a turning point in thoracic surgery. With one-lung ventilation (OLV) it is possible to operate more easily based on an excellent exposure of the lung and mediastinal structures (1). The interest in “non-intubated thoracic surgery” (NITS) was aroused about 20 years ago, when Mukaida *et al.* (2) described pneumothorax patient operated under local anesthesia. Currently, this technique is a very valid alternative to general anesthesia especially in functionally compromised patients, allowing to avoid the negative effects that heavy drugs and the intubation inevitably entails (3-5). These considerations are even more significant considering the widespread use of video-assisted thoracic surgery (VATS). In fact, VATS in reduced volume ventilation or in spontaneous breathing without positive pressure ventilation shows a double benefit: (I) the minimally invasive surgical technique with less invasiveness, reduced postoperative pain, shorter hospitalization and rapid recovery of patient; (II) the targeted anesthesia tolerated even by patients with a high index of comorbidity. Although non-intubated VATS was reserved in the past only for minor interventions, several studies displayed recently excellent results also in the treatment of mediastinal pathologies, in major lung resections or in the surgical treatment of pleural empyema (6,7). Chen *et al.* (8) demonstrated that non-intubated VATS can be used to perform lobectomies in early stages non-small cell lung cancer (NSCLC) patients, allowing the levels of efficacy and safety comparable to the standard technique. Liu *et al.* (9), in a randomized control study, compared patients underwent “non-intubated VATS” with patients underwent intubation under general anesthesia. The first group showed

faster recovery and less drug use in the postoperative period. Obviously, the experience of surgeon and anesthesiologist and the skill in the management of the airways must be taken into account, as absolute contraindications are still previous thoracic surgery or radiotherapy for the high risk to develop parenchymal adhesions (10). The selection of patients is a key point. In fact, patients with high comorbidities and compromised respiratory reserve benefit significantly from this minimally invasive method but must be able to tolerate tracheal intubation and general anesthesia in case of adverse events. Although the American Society of Anesthesiologists refers to grade 1 or 2 patients the ideal clinical status to proceed with non-intubated method, many studies (11-15) reported excellent results in high-risk patients for severe lung or cardiac diseases. Gonzalez-Rivas *et al.* (16), in a review of literature, verified the safety of the technique and its easy application in major and minor resections, underlining how the associated uniportal approach should be the new challenge of thoracic surgery. A further advantage of “non-intubated VATS” is the lower rate of complications than single-lung ventilation, due to hypoxia and/or hypercapnia (17). These conditions are accentuated by pulmonary hypoventilation linked to selective intubation, with inevitable systemic impact especially in patients with high pulmonary or intracranial pressures or cardiac arrhythmias. An important aspect is the cough control resulting from inadequate sedation, which often makes the procedure difficult. The role of the anesthesiologist is fundamental as the dosage of the drug must be related to both the need of surgeon and the stabilization of patient, avoiding significantly depressing the breath. Some authors proposed the use of lidocaine spray on

the surface of the pulmonary parenchyma and by inhalation to prevent bronchial reactivity or vagal nerve block (16,18). In “non-intubated VATS” the reported conversion rate ranges from 0 to 10% (10), caused by surgical (difficulty in exposing lung and mediastinal structures, presence of adhesions and/or bleeding) or anesthetic (respiratory or cardiocirculatory instability) complications. Therefore, the advantages/disadvantages ratio must always be considered. On the one hand: low invasiveness or impact on the respiratory and cardiovascular system, fast recovery times and low activation of stress hormones with less effects on the immune system and on the lymphocytes activation (19). On the other hand: less airway control, reduced room for maneuver, involuntary movements of the patient, difficulty in immediate conversion. In conclusion, “non-intubated VATS” is currently a rational choice in patients with high comorbidity index or respiratory and hemodynamic instability. Surgeons who wish to approach this method should: (I) start with minor and then move on to more complex interventions; (II) select patients very carefully, better with a multidisciplinary decision; (III) consider and recognize the essential role of anesthesiologist; (IV) create a team able to manage all difficulties and complications that this technique inevitably entails.

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aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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