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FOREWORD

Video-assisted thoracic surgery techniques for lung cancer: which is better?

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"The search for minimal invasiveness has a prominent key role in thoracic surgery, but research is vital to reveal the 'true' advantages of surgical innovations."

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The main aim of the 3rd Mediterranean Symposium in oncologic thoracic surgery was to discuss the role of video-assisted thoracic surgery (VATS) in the treatment of lung cancer, and to try to understand if the known widespread use in the common practice of thoracic surgery, including major resection for lung cancer, will influence the treatment of lung cancer. Secondary aims were an in-depth analysis of N2 disease in the era of minimally invasive surgery, and how to face the need of randomized trials in lung cancer.

In general the majority of the participating surgeons (**Figure 1**), agreed that the most important recent innovation in thoracic surgery is certainly the fast introduction of the so-called uniportal VATS (or single-incision VATS) to perform anatomical lung resection for lung cancer. Furthermore, it has been noted that most operations are performed in China, especially in Shanghai where surgeons are performing around 8000 lung resections per year.

Problem statement

Over the last 15 years, despite considerable innovation in VATS for anatomical lung resection has been introduced, several VATS modifications to perform anatomical resection for lung cancer have been reported as shown in **Box 1**. Interestingly, leaders of each technique try to convince other colleagues that their VATS technique is better than the other. Moreover, the rapid growth of VATS has resulted in some conceptual confusion about the type of VATS technique to use to perform anatomical lung resection, which has made it difficult for all but the most avid surgeons to keep up with developments in this domain.

Therefore, the purpose of this article is to critically examine all papers related to VATS published in this supplement in order to look at the extent to which recent innovation in VATS could influence the behavior of the surgeons; to provide pragmatic recommendations for

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Figure 1. Faculty from the 3rd Mediterranean Symposium in Thoracic Surgical Oncology.

how to select the appropriate VATS technique for anatomical lung resection for lung cancer; and identify several interesting directions for future research.

Semantic terminology

The first attempt to clarify terminology was given 15 years ago [1]. Although recently Treasure wrote that VATS should stand for video-assisted thoracoscopic surgery and not for video-assisted thoracic surgery [2], I would disagree. The reason why I disagree is basically explained by the fact that video-thoracoscopic surgery should be used when a classic thoracoscope (optic and operative channel assembled in one instrument – medical thoracoscopy) is employed, while when the optic is separated from surgical instruments the term 'video-assisted thoracic surgery' better describes the method. In a few words, the T could create confusion as it could stay either for thoracoscopic or thoracic. It would be polite to call video-assisted thoracic surgery (VATS) and video-assisted thoracoscopic surgery (VAtS – medical thoracoscopy).

Another point of discussion, but without an answer yet, is the weakness of the rationale of why a surgeon sometimes, during a VATS resection, looks directly inside the chest through a 5 cm utility incision with the help of an optic, the procedure should not be called VATS.

We have been very blessed that, with the intellectual inputs of international eminent thoracic surgeons, we have attempted to clarify and resolve the existing ambiguity in VATS procedures and propose specific terms identifying distinct approaches for minimally invasive thoracic procedures [3].

Several VATS modifications for the same operation

One thing is certain, whether the surgeon uses one VATS technique instead of another to treat lung cancer, he performs the same operation: lung resection and lymphadenectomy. The surgeon can prefer the fissureless method or another, but at the end of the story the same operation is performed. One could argue that single-incision VATS has less possibility to develop postoperative chest pain but this has not been demonstrated yet [4].

N2 disease in the minimally invasive era

Treasure and De Leyn [5] made an in-depth analysis of the new perception in the era of VATS to operate on patients with lung cancer if the N2 disease could be removed [6]. Nevertheless they pointed out that the European Society Thoracic Surgeons guidelines for intraoperative lymph node staging in non-small-cell lung cancer although called 'guidelines' fall short of the international standard required of clinically trustworthy 'guidelines'. The author proposes an analogy with breast cancer and suggests that randomized trials will be required rather than follow-up studies to obtain a definitive answer.

Robotic-assisted thoracic surgery

During the symposium very little was discussed about robotic-assisted thoracic surgery (RATS) for lung cancer, and the main reason was due principally because in the real world, RATS is performed only in few worldwide centers, and controversy remains about the application of RATS because of the lack of well-established evidence. For the majority of hospitals, it is still too expensive, and the reported long duration of the operating room usage is not suistanable [7].

Awake (tubeless) thoracic surgery

Awake thoracic surgery has successfully been used to perform wedge resections of the lung for diagnostic purposes, pneumothorax and tracheal resections, but recently its use for major lung resection could arise ethical concern [8]; on the contrary, the concept of enhanced recovery ('fast-track') after thoracic surgery and anesthesia permits the allowance of an increased number of video-assisted parenchymal lung resections in managing primary lung cancer. A tremendous experience with 1000 tubeless VATS at the Rome Tor Vergata University demonstrated that this technique in expert hands can be accomplished in a safe manner with effective results [9].

VATS for lung cancer & long-term survival

The most wanted desire of a patient with cancer who undergoes an operation is to be cured, or, if it is not possible to be cured, to live longer with a good quality of life. The first question which arises is obvious: would VATS permit to survive longer than open surgery? During the symposium it was well shown, through a comparative analysis using SEER-Medicare database [10,11] that VATS is 'probably' better than open surgery but the question of "Is VATS superior to the open approach to treat lung cancer?" remained unanswered. Moreover, the question why single-incision VATS should be preferred to standard VATS seems to add no value at the more important existing question: is VATS superior to open surgery? [12]. Nevertheless, VATS should be the standard for early-stage lung cancer as it results in minimal morbidity with no compromise in long-term survival [11].

Which VATS technique is preferable?

The very recent published critical overview says truthfully the true color of the real situation [4]: it is evident that there is no VATS technique which is superior to another to treat lung cancer in terms of longer survival or improved chest pain score. Nowadays it is hard to suggest one VATS technique as the preferred method to perform major lung resection for lung cancer. For the same reasons, the surgeon should choose the VATS method that best suits him [13]. To note, in contrast with the proponents that VATS should be performed only in high-volume units, we have demonstrated that VATS seems to be an effective and safe approach to perform major lung resection in a low-volume unit formed by a single surgeon with a previous high-volume experience [14].

Future research

Many points will need clarification in the future. Even if not scientifically proven, seeing that the operation to treat lung cancer performed via all existing VATS techniques or open surgery is the same, it appears unclear why VATS should guarantee longer survival than open surgery. Large number of patients will be necessary to prove longer survival rates and therefore it has been suggested that large randomized controlled trials are necessary to compare VATS (every VATS technique to open surgery), to open surgery [15].

Two thoracic groups have demonstrated that the aid of 3D reconstructions, of the lung and heart, are very useful to obtain preoperative information before VATS surgery [16,17]. The 3D reconstruction could also forecast a reliable body reconstruction for futuristic self-determining robotic surgery. Robots could start and finish the operation without a human guiding the scalpel with intelligence capabilities. Although the intelligent and autonomous robots offer new opportunities, doubts, law and ethical issues need to be evaluated and resolved [7].

A well-documented experience with long-term survival is mandatory [18] because patients are asking for evidence of survival, and not just on one opinion based on not well-documented experience. On this subject I agree with those authors who wrote that the E in EBM (evidence-based medicine) stands for Evidence, not

Box 1. Existing video-assisted thoracic surgery techniques for non-small-cell lung cancer.

- Single incision (uniportal)
- Bi-portal
- 3–4 ports (multi-portal)
- Mini-thoracotomy (6 cm)

for eminence, experience, expertise, eloquence or any other words that have been used to give authority to one or a group of surgeons [19]. As more innovation and research will be necessary, data from national databases [20] could be used within an international cooperation project to start and finish large prospective studies.

The search for minimal invasiveness has a prominent key role in thoracic surgery, but research is vital to reveal the 'true' advantages of surgical innovations [21].

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