



Why to change from multiportal to uniportal VATS?

Dania Nachira¹, Elisa Meacci¹, Mahmoud Ismail², Diego Gonzalez-Rivas^{3,4}, Stefano Margaritora¹

¹Department of General Thoracic Surgery, Catholic University of Sacred Heart, Fondazione Policlinico Universitario “A.Gemelli”, Largo A. Gemelli, 8, 00168, Rome, Italy; ²Department of Surgery, Competence Center of Thoracic Surgery, Charité - Universitätsmedizin Berlin, Charitéplatz 1, Berlin 10117, Germany; ³Department of Thoracic Surgery, Shanghai Pulmonary Hospital, Tongji University School of Medicine, Shanghai 200433, China; ⁴Department of Thoracic Surgery and Minimally Invasive Thoracic Surgery Unit (UCTMI), Coruña University Hospital, Coruña, Spain

Correspondence to: Dania Nachira, MD. Department of General Thoracic Surgery, Fondazione Policlinico Universitario “A.Gemelli”, Largo A. Gemelli, 8, 00168, Rome, Italy. Email: danynac@libero.it.

Abstract: In the age of technology, we are witnessing the proliferation of innovations in each field, like in surgery. Always new minimally invasive techniques are changing and renewing the thoracic surgery, offering patients countless advantages. Among these techniques, Uniportal VATS has been gaining more and more success in the last years, promising superior results compared to other minimally invasive approaches. In this article we analyze the main pros and cons of each technique for showing why Uniportal VATS seems to offer higher benefits.

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In the era of minimally invasive surgery, all the oncoming surgical techniques aim to reach the same oncological radicality with less and less invasiveness, obtaining at the same time better cosmetic results, less postoperative pain and faster recovery of patient.

Uniportal Video assisted thoracic surgery (VATS) has been generating an increasing interest among thoracic surgeons over the last six years (1,2), promising superior results compared to conventional multiportal VATS.

A growing number of centers all over the world has started to perform Uniportal VATS successfully, however the still lacking good clinical evidence on this innovative approach allows opponents to criticize it and to be concerned about safety and efficacy of the treatment.

In this article, we evaluate why to change from multiportal to Uniportal VATS by analyzing all the factors in favor of Uniportal VATS according to the main literature and also retracing and reporting our experience in the field.

From multiportal to uniportal VATS

Triportal VATS

In the early 1990s, Kirby and his group published their first experience with VATS lobectomy (3), soon followed by Lewis's one in 1995 (4).

Since then, the number of VATS procedures has multiplied rapidly and nowadays triportal VATS is a well-established technique, whose safety and effectiveness are widely demonstrated (5).

The triportal VATS approach consists of two ports and a small service incision of 3–4 cm.

Therefore it allows the same proven oncological efficacy as open surgery but with less postoperative pain, better cosmetics results and faster recovery of patients compared to muscle sparing thoracotomy. It is also less expensive than other minimally invasive techniques, like robotic surgery that ensures the same outcomes for patients but with higher costs.

Nevertheless, there are different criticisms that can be moved against this approach, above all concerning technical aspects that can adversely affect the operators' comfort. Indeed, the trapezoidal configuration of triportal VATS interferes with the optical source, creating a new optical plane that generates a torsion angle not favorable with standard two-dimensional monitors (6,7). The position for the surgeon can be uncomfortable because he has to turn his neck and often work with his shoulders raised for handling the instruments. It can be even more uncomfortable for the assistant if he stands on the opposite side, having a different visual axis (8).

Furthermore, by this technique the lung palpation can be sometimes difficult or rather impossible.

Robotic surgery

In the wide scenario of minimally invasive techniques, robotic surgery plays an important role.

First introduced at the beginning of 2000s, nowadays Robotic thoracic procedures are performed in almost big centers in the world (9-11).

Robotic equipment, like the widespread Da Vinci® surgical system, provides better instruments and a better view of the operative field, thanks to a three/four robotic arms with large range of motion (7 degrees of freedom), 3D-high definition 30° stereo endoscope with 10× magnification (rather than 2×/3×) and less fogging (therefore less camera manipulation). The surgeon can operate comfortably seated at his console with precise movements and no tremor transmitted to the instruments. Patients can benefit from better cosmetic results and faster recovery with consequent shorter postoperative hospital stay, thanks to less postoperative pain.

Nevertheless, robotic surgery has some important disadvantages: first of all, the high costs (12) with longer operative time and the necessity of dedicated skilled team (surgeons, scrub nurses, anesthesiologists...), all factors that make this type of surgery feasible only in high-volume centers. Furthermore, being a totally thoracoscopic technique, the direct lung palpation is impossible.

Biportal VATS

This approach, considered like “a bridge towards Uniportal VATS” by some surgeons, was conceived in the attempt to reduce the number of incisions compared to standard

triportal-VATS.

Therefore, while presenting some advantages of Uniportal VATS, it still retains some unfavorable aspects taken from triportal-VATS.

The main pros are: the use of the same anterior approach as for open surgery with the advantage of magnification given by the thoracoscope, the good lung palpation, a less postoperative pain compared to muscle sparing thoracotomy. Nevertheless, in this approach, the surgeon has a different visual axis rather than in open surgery (6,7) and there is a higher potential risk of fencing between instruments and camera shank, without good fluency in handling regular straight endoscopic instruments.

Uniportal VATS

First introduced as a diagnostic procedure for pulmonary nodules in 1998 (13), thanks to its minimal invasiveness Uniportal VATS gained more and more success and now it is used for more complex procedures, from pulmonary lobectomies to bronchoplasties (14-16).

As main advantage, this technique provides the same anterior approach as for open surgery with a direct visualization of target tissue, a good lung mobilization and palpation. Only one 3–4 cm incision is necessary (4th or 5th intercostal space), with no muscle disruption, no rib spreading, no necessity of trocars (17); a 10 mm 30° thoracoscope is used, hold in the upper part of the incision and all the other instruments can be inserted in the lower part of the same incision. Uniportal VATS gives the possibility of introducing several instruments through the same small incision and handling them comfortably, thanks to their curved shape.

Unlike triportal VATS, uniportal approach works along a sagittal plane from a caudo-cranial perspective. All the instruments, inserted parallel to this plane, keep the operative fulcrum inside the chest, preserving the depth of visualization (6,7).

Furthermore, uniportal VATS is more ergonomic and enables surgeons to have a more natural hand-eye coordination. All surgeons look at the same screen opposite to them and this improves the surgeon's body posture, decreasing the neck movements (8).

Probably for the reasons mentioned above, this approach seems to have a rather short learning curve for major lung resections above all after attending dedicated courses, masterclass and proctored cases (18,19).

But the main strength of this technique are the potential

advantages for the patients, like the less postoperative pain compared to other multiportal accesses, with a faster recovery of patients, shorter postoperative hospital-stay and better cosmetic results.

This minimally invasive technique is also less expensive than robotic surgery and it seems to have the same safety and oncological efficacy as all the other techniques (20).

It is exactly about this last point that the main oppositions against Uniportal VATS are moved; opponents are worried by the not yet good clinical evidence of safety and effectiveness of the technique.

As it happened for other techniques like triportal VATS (5), at the beginning it can be difficult having a solid scientific evidence based on prospective, randomized or multicentre studies.

Nevertheless a sufficient and increasing number of papers in literature have been showing the safety and efficacy of uniportal VATS, day after day (18,21-24). And this debate between proponents and opponents of Uniportal VATS can only be productive and stimulating for providing always new clinical evidence of better quality in the upcoming years.

The potential of the technique

Usually, the main indication of a technique represents its biggest limit. This does not seem valid for uniportal VATS. At the beginning designed for performing minor lung resections, uniportal VATS has been showing its big potential with all major pulmonary surgery (lobectomies, pneumonectomies, bronchoplasties...) (15,16) but not only.

As reported in the literature and also according to our experience, uniportal VATS allows direct view and good exposure also for performing mediastinal (anterior and posterior) surgery, extended lymphadenectomies, for removing neuronomas and pleural lesions, for repairing diaphragmatic defects (hernia, relaxatio...) and for esophagectomies (25) and intrathoracic esophageal diverticulectomies.

Conclusions

As until now has been exposed, the advantages for changing from multiportal to uniportal VATS are countless. They are not only for the surgeons, who can operate more comfortably, with a direct view and safely, but above all for the patients.

Indeed, uniportal VATS technique is already proven to

be safe and feasible, with satisfactory results not only in terms of cosmetics but also of fast recovery.

Furthermore, in an age when hospitals pay a lot of attention to their own budgets, it must be stressed that this technique provides a good benefit-cost ratio, without the need for expensive technologies and with a rather short learning curve for operators' training.

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