



Level of evidence on long-term results after VATS lobectomy: state of the art

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In the last few years, video-assisted thoracic surgery (VATS) has been gaining interest and consensus among thoracic surgeons worldwide, becoming the procedure of choice in an increasing number of institutions.

After some initial concerns on oncological and long-term results of VATS technique for performing lobectomy for NSCLC, nowadays VATS lobectomy has been becoming widely used for the treatment of stage I-II lung cancer not only in university and reference centers of thoracic surgery.

This step forward was possible thanks to the growing of surgical experience in VATS, the implementation on VATS programs in several centers, the increasing interest among young surgeons in this technically more demanding procedure, the proliferation of VATS training course everywhere, the new technologies and improvement of surgical dedicated instruments and above all the proliferation of medical literature in favor of VATS lobectomy.

However, the current evidence supporting VATS lobectomy is mainly made up by observational non-randomized studies, national database or institutional analyses (1-5) and meta-analyses (6,7) showing VATS superiority compared to thoracotomy in peri- and post-operative complications, hospital stay, chest tube duration, postoperative pain and quality of life.

Indeed, if the superiority of VATS in quality of life and

faster recovery after surgery is well investigated, few reports evaluated the long-term survival after VATS compared to open lobectomy. Furthermore, recently the oncological outcomes of VATS were also questioned by three national analyses reporting that nodal upstaging in VATS is less frequent than in thoracotomy (8-10).

To answer this lack of oncological evidence, a recent national study entitled “*A National Analysis of Long-term Survival Following Thoracoscopic Versus Open Lobectomy for Stage I Non-small-cell Lung Cancer*” was published in *Annals of Surgery* by Yang *et al.* (11), evaluating the long-term (5 years) survival of VATS versus open lobectomy for T1-2, N0, M0 NSCLC.

The authors are to be commended for examining, for the first time in a national analysis, the long-term survival together with nodal upstaging in VATS lobectomy compared to open surgery.

After propensity matching, they found that:

- (I) the VATS approach provided patients a shorter hospital length of stay (5 *vs.* 6 days, $P < 0.001$);
- (II) the VATS approach was not significantly different compared with the open approach with regard to nodal upstaging (7.1% *vs.* 8.4%, $P = 0.18$ for cN0-N1 and 4.5% *vs.* 3.9%, $P = 0.45$ for cN2), 30-day mortality and 30-day readmission rate;
- (III) there were no significant differences in 5-year

survival between the VATS and open groups (66.3% vs. 65.8%, $P=0.92$).

While the results about hospitalization and 30-day mortality didn't add anything to pre-existent literature, the conclusions on nodal upstaging and long-term survival are important.

As the authors stated in the study, the main explanations to their improved lymph nodes evaluation in VATS lie in an increasing surgical experience achievable nowadays in comparison to the past experience reported in previous works, and in the homogeneity of the sample analyzed (in the present study there was no significant difference in tumor size between open and VATS groups, compared to previous analyses where larger tumors—basically with higher risk of N1 or N2 disease—were treated by thoracotomy).

The same conclusion on lymphadenectomy under VATS was achieved by another recent study by Zhang *et al.* (12), where mediastinal lymphadenectomy in NSCLC had the similar surgical effectiveness to thoracotomy with quicker recovery, less postoperative complication and length of hospital stay. Also here, the authors underlined the importance of accumulation of surgical experience and improvement of surgical instruments for gaining better results in this technically more demanding procedure.

In fact, it is certain that lymphadenectomy requires a technical expertise to be performed adequately above all in VATS. With the increasingly spreading of the technique and its quick development from simple lobectomies to advanced and challenging pulmonary resections, undoubtedly nodal dissections and then oncological outcomes benefit from that, becoming increasingly similar to standard open thoracotomy.

Therefore, Yang and colleagues concluded that VATS does not compromise early and long-term oncologic outcomes when used for early-stage lung cancer, claiming a broader implementation of VATS techniques for early stage tumors.

A subsequent Swedish nationwide study published by Al-Ameri *et al.* (13) confirmed that the implementation of a VATS program did not prejudice patient safety and oncological efficacy, showing less postoperative complications (risk of transfusion, reoperation, pneumonia...) and better long-term survival (1- and 5-year) following VATS lobectomy compared to open lobectomy for NSCLC.

The natural development of the technique, recognized as safe and feasible, together with the spreading of VATS

training courses (14) all over the world and the parallel improvement of technology gave the possibility of a faster diffusion of VATS as technique of choice in several centers and a consequent faster overcome of the learning curve (15). This is of fundamental importance for an oncologically effective surgery, with always lower rate of conversion (Yang's reported a rate of 21% in his series (11), but as stated in the paper, it reflects the varied scenario of a national analysis, where not only experienced centers are involved).

If this is widely true for performing lobectomies for T1-2 N0 tumors, in case of post-induction surgery or N1 tumors, VATS lobectomy can be more challenging, requiring more expertise from the surgeons.

Recently, the same panel of authors analyzed VATS lobectomy compared to open one for cT1-2N1M0 NSCLC in a national series (16). Again, they found that VATS lobectomy was associated with shorter hospital stay, similar nodal upstaging rates and no significant difference in long-term survival compared to open surgery, concluding that thoracoscopic technique is also feasible in the treatment of stage II (cN1) NSCLC.

Proceeding in this direction, thanks to increasing oncological data, longer follow-up available and claimed wide multicenter and randomized studies, in the near future there will be enough evidence in literature for stating the oncological effectiveness and outcomes of VATS lobectomy for a broader spectrum of lung tumor stages.

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Footnotes

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

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