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Uniportal video-assisted thoracic surgery lobectomy: a consensus report from the Uniportal VATS Interest Group (UVIG) of the European Society of Thoracic Surgeons (ESTS)

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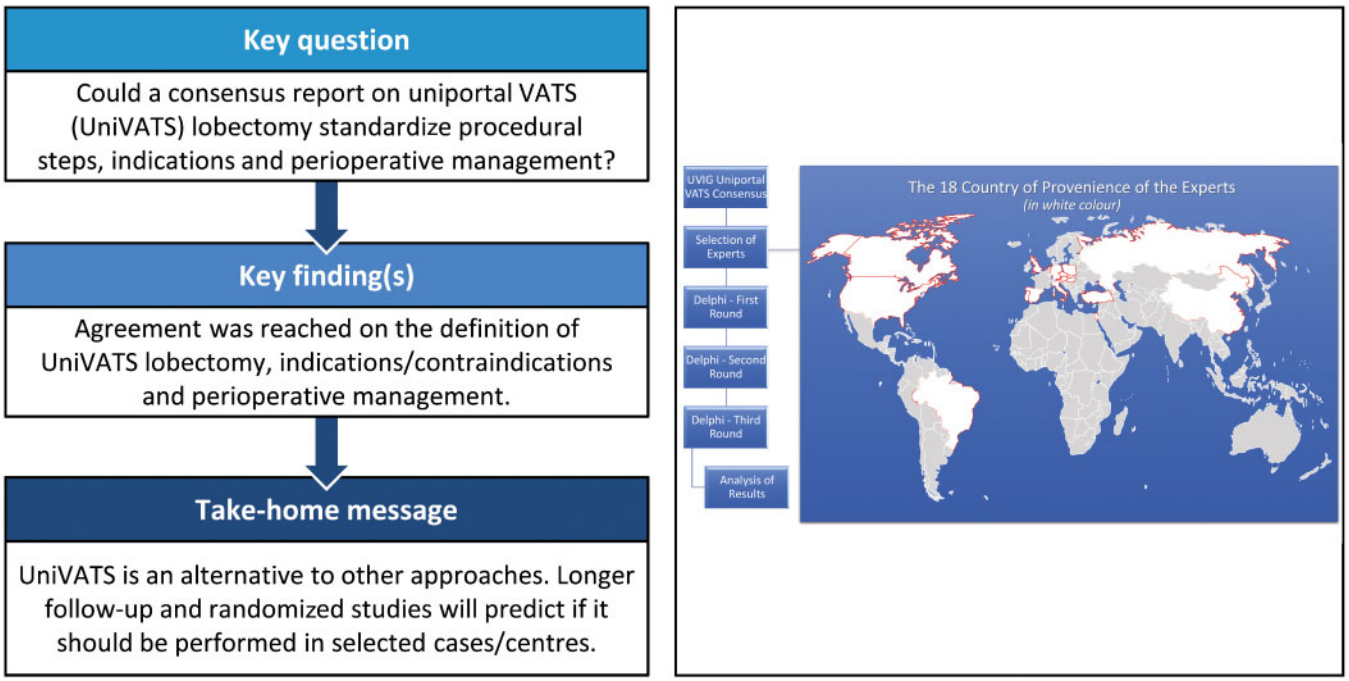

Abstract

OBJECTIVES: Our goal was to report the results of the first consensus paper among international experts in uniportal video-assisted thoracoscopic surgery (UniVATS) lobectomy obtained through a Delphi process, the objective of which was to define and standardize the main procedural steps, optimize its indications and perioperative management and identify elements to assist in future training.

METHODS: The 40 members of the working group were convened and organized on a voluntary basis by the Uniportal VATS Interest Group (UVIG) of the European Society of Thoracic Surgeons (ESTS). An e-consensus finding exercise using the Delphi method was applied to require 75% agreement for reaching consensus on each question. Repeated iterations of anonymous voting continued for 3 rounds.

RESULTS: Overall, 31 international experts from 18 countries completed all 3 rounds of questionnaires. Although a technical quorum was not achieved, most of the responders agreed that the maximum size of a UniVATS incision should be ≤4 cm. Agreement was reached on many points outlining the currently accepted definition of a UniVATS lobectomy, its indications and contraindications, perioperative clinical management and recommendations for training and future research directions.

CONCLUSIONS: The UVIG Consensus Report stated that UniVATS offers a valid alternative to standard VATS techniques. Only longer follow-up and randomized controlled studies will predict whether UniVATS represents a valid alternative approach to multiport VATS for major lung resections or whether it should be performed only in selected cases and by selected centres. The next step for the ESTS UVIG is the establishment of a UniVATS section inside the ESTS databases.

Keywords: Uniportal video-assisted thoracoscopic surgery • Single site incision • Lung cancer • Consensus • Delphi approach

INTRODUCTION

Since its introduction more than 16 years ago [1, 2], uniportal video-assisted thoracoscopic surgery (UniVATS) has emerged as a feasible alternative to the multiport VATS approach to patients with non-small-cell lung cancer [3–5]. Thoracic surgeons have been able to perform increasingly complex thoracic procedures [6–10] and have included this approach in their surgical armamentarium as an extension of the conventional 3- or 2-port VATS technique [11–17]. The development of specific instrumentation and improvements in articulating staplers have contributed to the widespread dissemination of this technique, especially on the Asian continent [17, 18]. The basic geometric concept of UniVATS resides in bringing the effective fulcrum of the instruments inside the chest cavity, enabling better visualization and minimal mutual interference while producing a sagittal approach to the target intrathoracic lesion similar to the one obtained with open thoracotomy [19, 20]. The diffusion of UniVATS across the globe was prompted by its promise of being the least invasive approach [21–24]. However, in this setting, questions about the real benefits and treatment efficacy of this approach remain unanswered due to the methodological quality of the evidence, which remains weak. Nonetheless, there is a more recent trend towards more and better-quality studies published on UniVATS, which may generate more useful data shortly to define the role of UniVATS [4].

Table 1: Summary of responses regarding the definition of UniVATS lobectomy

What would be the maximum size of a uniportal VATS incision for lobectomy?	*N* (%)
<4 cm	8 (26)
4 cm	14 (45)
6 cm	9 (29)
8 cm	0
More than 8 cm	0
Which would be the site of a UniVATS incision for lobectomy?	
Anterior axillary line	13 (42)
Middle-anterior axillary line	13 (42)
Middle axillary line	0
Middle-posterior axillary line	5 (16)
Posterior axillary line	0
Could you give information about the diameter of the camera?	
5 mm	9 (29)
10 mm	22 (71)
Could you give more information about the camera?	
0 degree	2 (6)
30 degree	26 (84)
3D camera	3 (10)
Where does your assistant stand during a UniVATS procedure?	
Same side	24 (77)
Opposite side	7 (23)
Do you use a skin retractor?	
Yes	31 (100)
No	0
Do you use a trocar?	
Yes	3 (10)
No	28 (90)
Where do you place the chest tube?	
Same incision	29 (94)
Different incision	2 (6)
What is the number of chest tubes placed after a UniVATS lobectomy?	
1 chest drain	30 (97)
2 chest drains	1 (3)
What is the size of the chest tube placed after a UniVATS lobectomy?	
20 Fr	4 (13)
24 Fr	18 (58)
28 Fr	8 (26)
32 Fr	1 (3)

3D: 3-dimensional; UniVATS: uniportal video-assisted thoracoscopic surgery.

This study reports the results of the first consensus paper among international experts in UniVATS lobectomy obtained through a Delphi process with the aim to define and standardize the main procedural steps, optimize its indications and perioperative management and identify elements to assist in future training.

MATERIALS AND METHODS

The working group was convened and organized by the Uniportal VATS Interest Group (UVIG) of the European Society of Thoracic Surgeons (ESTS). The 40 members of the working group comprised thoracic surgeons invited to participate on a voluntary basis by a smaller project team (L.B. and G.R.), which coordinated and guided the UVIG activities. The working group members represented academic centres, large teaching hospitals and community hospitals from Europe, North America, Brazil and Asia. The Delphi method enables the development of consensus among experts within a medical speciality. The main characteristics of the Delphi method include anonymity to avoid one expert's dominance, an iterative procedure to tolerate changes of opinion in different rounds and precise feedback for the expert by revealing responses of the previous round. Several studies have demonstrated the value of the Delphi method in areas of health care and epidemiology, mainly when robust forms of evidence such as randomized controlled trials were unavailable [25]. The ideal number of participants required to obtain consensus in the medical field using the Delphi method is unknown [26]. Therefore, the number of experts selected was based on prior experiences in which the Delphi method was used and on the expected response rate [25]. An individualized email invitation that presented 26 questions was sent to each of the experts with a link to a secure website (Delphi Decision Aid, http://armstrong.wharton.upenn.edu/). To strengthen the validity of the process, 3 rounds of voting were used. The invitation for the first round of voting was sent in June 2018 with 2 reminder emails before the closure of the first round of voting. An email invitation to view the results of the first round and concomitantly participate in the second Delphi round was distributed in July 2018, and 2 reminder emails were subsequently sent. An email invitation to view the results of the second round of voting and concurrently participate in the third round of voting was distributed in August 2018, and 2 reminder emails were subsequently sent. Anonymous responses to the questions in the 3 rounds were tabulated into a centralized database. The experts did not have access to the opinions of the other experts during the rounds voting. The results from the third round of voting formed the basis for the current consensus. The consensus was defined a priori as more than 50% agreement among the panel of experts. The clinical practice was considered recommended if 50–74% of the experts reached an agreement. The clinical practice was considered highly recommended if 75% or more of the experts reached an agreement [25]. There was no confidential information required for this study. Ethics committee approval was believed not required. Categorical data were reported as frequency, number and percentage. Ceiling effects could not be assessed given the relatively low numbers of expert participants [27].

RESULTS

Overall, 31 international experts from 18 countries completed all the 3 rounds of questionnaires. Regarding the definition of UniVATS (Table 1), albeit a technical quorum was not achieved, most of the responders (71%) agreed that the maximum size of the incision should be ≤4 cm. Conversely, there was consensus on the fact that rib spreading should not be contemplated in any stage of the procedure (100%). According to most experts, the incision should be done in the anterior or middle-anterior axillary line (84%) and should depend on the patient's anthropometric features. Most experts agreed that a 30-degree (84%) 10-mm (71%) camera should be used in uniportal procedures although a 30-degree, 5-mm camera could be used for paediatric uniportal resections and in minor procedures. The assistant position should be on the same side (77%) whereas the use of a trocar for the camera was generally discouraged (89%). Moreover, there was a high recommendation (97%) about the placement of only one 24-Fr (58%) chest tube placed through the same incision (94%).

Regarding the indications and contraindications for UniVATS lobectomy (Table 2), tumours sized <5 cm (T1 and T2b) (65%) associated with N0/N1 disease (55%) can be considered amenable to UniVATS lobectomy. Although chest wall involvement is not an absolute contraindication (58%), the central location of a tumour invading hilar structures represents a relative contraindication (61%) as do previous ipsilateral thoracic surgery and pleurisy (65%).

A summary of responses related to perioperative management is presented in Table 3. The experts recognized that complete ipsilateral systematic lymph node dissection is the most appropriate associated staging procedure (65%) and that it should be performed in all patients (74%). Conversely, there was no consensus on the clinical situations that would be used to recommend the conversion to multiport VATS or to open thoracotomy. The intercostal nerve block was the preferred strategy (74%) for managing postoperative pain.

For training in UniVATS lobectomy (Table 4), 50 cases (71%) are deemed the cut-off number required to overcome the learning curve. In addition, more than 50 annual resident cases are required for the definition of a UniVATS lobectomy training centre (65%). Thoracic surgeons should perform more than 40 cases annually to maintain uniportal operative skills (58%), and surgeons should be proctored while initiating a UniVATS lobectomy programme (81%).

To establish more robust clinical evidence (Table 5), the panel of experts suggested a randomized controlled trial to compare UniVATS lobectomy with the multiport approach (58%). Nevertheless, a multi-institutional database containing UniVATS lobectomy as a treatment approach is needed for most of the experts (81%).

Table 2: Summary of responses regarding the indications for UniVATS lobectomy

T status	*N* (%)
T1 and T2b (≤5 cm)	20 (65)
T1, T2 and T3 (≤7 cm)	11 (35)
N status	
N0 only	6 (19)
N0/N1	17 (55)
N0/N1/N2	8 (26)
Chest wall involvement is a contraindication	
If involving parietal pleura	3 (10)
If involving rib(s)	10 (32)
Not a contraindication for a UniVATS lobectomy	18 (58)
The centrality of a tumour invading the hilar structure is	
Absolute contraindication	2 (7)
Relative contraindication	19 (61)
Not a contraindication	10 (32)
Previous thoracic surgery/pleurisy is	
Absolute contraindication	1 (3)
Relative contraindication	20 (65)
Not a contraindication	10 (32)

N: node; T: tumour; UniVATS: uniportal video-assisted thoracoscopic surgery.

DISCUSSION

The goal of the present consensus report was to define the procedure and to optimize the indications, the perioperative management and the training of UniVATS. The Delphi method is a useful qualitative instrument to establish consensus among a panel of experts by conducting repeated rounds of anonymous questionnaires [26]. The present project involved 31 international experts in UniVATS lobectomy from high-volume institutions around the world. There was not overwhelming agreement among the experts on the size of incisions for UniVATS lobectomy. However, the maximum size of the incision should be ≤4 cm in the anterior or middle-anterior axillary line. Eligibility for VATS lobectomy should include tumours in T1/T2 and N0/N1 status. Chest wall involvement was not considered an absolute contraindication for VATS lobectomy, whereas a hilar tumour was considered a relative contraindication. The group recommended systematic dissection of all of the ipsilateral lymph nodes as the most appropriate nodal staging procedure.

In a previous survey assessing the practice of VATS among the ESTS members (100 different institutions in 31 countries with data on 461 board-certified thoracic surgeons), 47% of the centres performing anatomical VATS resections reported the uniportal approach [3].

Previous papers on UniVATS found statistically significant results in terms of better perioperative outcomes and quicker hospitalization but unlikely to yield a clinical impact, mainly because differences were no longer significant in the propensity-matched analysis [3]. Furthermore, the group noted a paucity of robust long-term clinical data and strongly indicated the need for future randomized controlled trials designed to establish the exact role of UniVATS lobectomy compared with the multiport approach.

High-volume experience is essential for the surgical outcome [28, 29]. UniVATS advanced procedures should be done by surgeons who have performed more than 50 UniVATS lobectomies, so they can have the ability to confidently and safely perform various types of challenging procedures. The experts agreed that a surgeon should perform at least 50 cases to gain adequate technical proficiency. On the other hand, at least 40 cases should be performed annually to maintain effective skills. Surgeons who have converted to UniVATS fully understand the potential impact of this new approach [30]. There was strong agreement among the panel to increase the exposure of thoracic surgical trainees to VATS lobectomy [25].

Limitations

This paper has several limitations. A limitation of the Delphi method is related to the possibility of a poor response rate. Nevertheless, in this situation, a high response rate was achieved because all the selected experts who started the first Delphi round completed all the remaining Delphi rounds. The effective use of reminder emails may have also contributed to the follow-up of the experts. Another possible limitation is a consensus group on UniVATS lobectomy based on the individual experiences of skilled experts. The consensus is directed at the general thoracic surgical community where the indications for UniVATS lobectomy and the conversion to thoracotomy may also differ based on the surgeon's skills. However, the strength of the Delphi method depends on the participating experts. In the Delphi method, experts' votes were uniformly weighted. The experts were also blinded to the personal opinions of the other

Table 3: Summary of responses regarding perioperative management of UniVATS lobectomy procedures

	N (%)
Which is the proper management of mediastinal lymph nodes in UniVATS?	
Total ipsilateral lymph node dissection	20 (65)
Lobe-specific lymph node dissection	6 (19)
Systematic lymph node sampling	4 (13)
Lobe-specific sampling	1 (3)
Random/no sampling	0
Which group would you recommend having complete ipsilateral lymph node dissection?	
All patients	23 (74)
Central tumour	0
Patients unfit for adjuvant chemotherapy or radiotherapy	0
N1-positive disease	3 (10)
N2-positive disease	4 (13)
None of above	1 (3)
Under which of the following clinical situations would you recommend conversion to multiport VATS?	
Pneumonectomy	4 (13)
Bronchial sleeve	1 (3)
Vascular sleeve	1 (3)
Bronchovascular sleeve	10 (32)
Pleural adhesions	0
Absence of fissure	0
Poor lung deflation	0
Major bleeding	4 (13)
Bronchopleural fistula	0
Chest wall involvement	0
Operating theatre time pressure	0
None of above	11 (36)
Under which of the following clinical situations would you recommend conversion to open thoracotomy?	
Pneumonectomy	7 (23)
Bronchial sleeve	0
Vascular sleeve	1 (3)
Bronchovascular sleeve	7 (23)
Pleural adhesions	0
Absence of fissure	0
Poor lung deflation	0
Major bleeding	11 (36)
Bronchopleural fistula	1 (3)
Chest wall involvement	0
Operating theatre time pressure	1 (3)
None of above	3 (10)
Management of immediate postoperative pain	
Epidural	1 (3)
Paravertebral nerve block	7 (23)
Intercostal nerve block	23 (74)

N: node; UniVATS: uniportal video-assisted thoracoscopic surgery.

participants to reduce peer pressure from influential experts, thereby granting optimal utilization of mutual knowledge and providing access to the change of opinion of the experts in light of feedback of results of previous rounds. The last limitation is the potential selection bias created by assembling a group of experts with the same interests and opinions. As a result, the conclusions should be taken cautiously when a UniVATS programme is in the initiation phase because the answering experts have already completed their learning curves. However, even if a minimal number of responders suggested that some performed operations or the level of proficiency is yet to be elucidated to be deemed as an expert, the above-mentioned results could be accepted as reasonable standards for UniVATS lobectomy.

Table 4: Summary of responses regarding UniVATS lobectomy training

	N (%)
How many UniVATS procedures are mandatory to overwhelm the learning curve?	
25	5 (16)
50	22 (71)
75	3 (10)
>100	1 (3)
Minimum resident case volume defining a training centre	
30 cases per year	11 (35)
>50 cases per year	20 (65)
UniVATS procedures performed by a surgeon to maintain the UniVATS lobectomy operative skills	
20 cases per year	11 (35)
40 cases per year	18 (58)
≥60 cases per year	2 (6)
Should a surgeon be proctored before commencing a UniVATS lobectomy programme?	
Yes	28 (90)
No	3 (10)

UniVATS: uniportal video-assisted thoracoscopic surgery.

Table 5: Summary of responses regarding future directions of UniVATS lobectomy studies

	N (%)
Is it necessary to perform a randomized controlled trial comparing UniVATS lobectomy versus multiport VATS lobectomy?	
Yes	18 (58)
No	13 (42)
Is it necessary to establish multi-institutional databases containing UniVATS lobectomy as a treatment approach?	
Yes	25 (81)
No	6 (19)

UniVATS: uniportal video-assisted thoracoscopic surgery.

CONCLUSIONS

The UVIG Consensus Report represents a collective agreement among international experts outlining the characteristics of the UniVATS lobectomy, the indications, the contraindications and the perioperative clinical recommendations. The UVIG Consensus Report stated that UniVATS offers a valid alternative to standard VATS techniques. Nevertheless, only longer follow-up and randomized controlled studies will predict whether UniVATS should be performed only in selected cases and by selected centres. The next step for the ESTS UVIG is the establishment of a UniVATS section inside the ESTS databases.

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