

Outcomes of Uniportal Video-Assisted Thoracoscopic Surgery for Thoracic Emergencies

Shimaa Ahmed Mosallam^{1*}, Ahmed Farghal Ahmed Mohammed², Karam Mosallam Eisa³, Mohamed Abdel Bary Ahmed³

1 Department of Cardiothoracic Surgery, Qena Faculty of Medicine, Qena, Egypt.

2 Lecturer of Cardiothoracic Surgery, Qena Faculty of Medicine, Qena, Egypt.

3 Professor of Cardiothoracic Surgery, Qena Faculty of Medicine, Qena, Egypt.

***Corresponding Author: Shimaa Ahmed Mosallam**

ABSTRACT

With the increasing enthusiasm for minimally invasive techniques, many general and thoracic surgeons have renewed their interest in thoracoscopy. Over the past two decades, the use of video-assisted thoracic surgery (VATS) has expanded to treat a range of thoracic conditions that were traditionally managed through open thoracotomy. (REF). We aim to review, discuss, The role of uniportal (VATS) in the management of thoracic emergencies. (H. Pan et al., 2024).

How to Cite: Shimaa Ahmed Mosallam*, Ahmed Farghal Ahmed Mohammed, Karam Mosallam Eisa, Mohamed Abdel Bary Ahmed, (2025) Outcomes of Uniportal Video-Assisted Thoracoscopic Surgery for Thoracic Emergencies, Vascular and Endovascular Review, Vol.8, No.7s, 144-152. DOI: <https://doi.org/10.15420/ver.2025.08.07s.144-152>.

Background

The development of VATS dates back to the early nineteenth century when the endoscope was first used for internal examination. Shortly after, artificial pneumothorax was introduced as a therapeutic approach for pulmonary disease, and later, thoracoscopy emerged as a method to visualize the pleural cavity and release adhesions. Technological progress in the 1980s, particularly in microcamera design, paved the way for modern video-assisted thoracoscopic surgery in the 1990s. Since then, VATS has evolved globally, progressing from procedures performed under general anesthesia to awake surgeries, and from traditional three-port to (uniportal) techniques, with ongoing innovations anticipated (Re Cecconi et al., 2024).

Basic Principles of VATS

The fundamental operative strategy in (VATS) involves orienting the thoracoscopic instruments and camera in a triangulated configuration, ensuring they are directed toward the target pathology (Fig. 1). To perform thoracoscopy effectively, several key principles must be followed (Vinh et al., 2021).

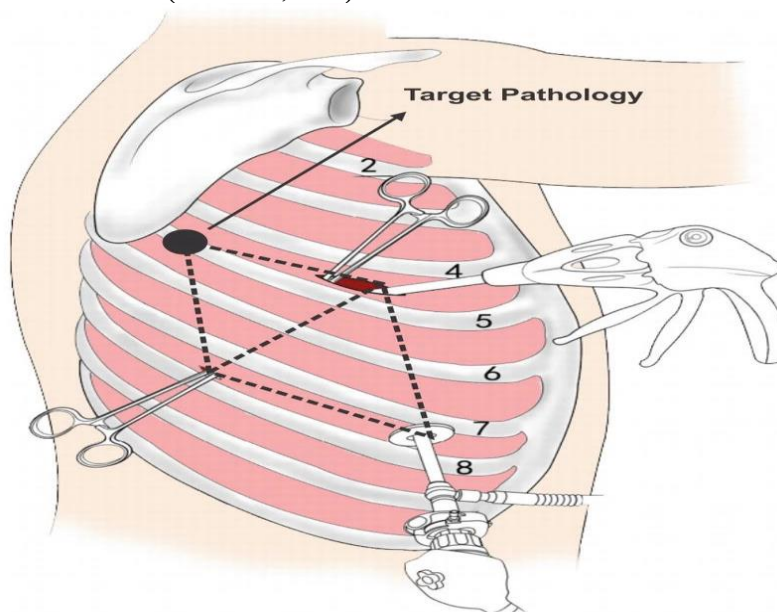


Fig 1: Baseball diamond: Principle for port placement (Agarwal & Kukreja, 2023).

The placement of trocars and the thoracoscope should be guided by the target site to achieve a panoramic view and provide sufficient space for tissue manipulation. Proper positioning of both the camera and instruments is crucial for procedural efficiency, preventing crowding that can lead to “fencing” and avoiding mirror imaging by maintaining a unified direction of approach. To ensure control and safety, instruments or the camera should be moved individually rather than simultaneously. Manipulation should only occur under direct thoracoscopic visualization, and all instruments should be sufficiently long to facilitate comfortable and effective operation (Grossi et al., 2023).

Anesthesia

General anesthesia combined with single-lung ventilation is the most commonly employed technique for video-assisted thoracic surgery (VATS), typically achieved using a double-lumen endotracheal tube or a bronchial blocker (Fig. 2)(Patel et al., 2023).

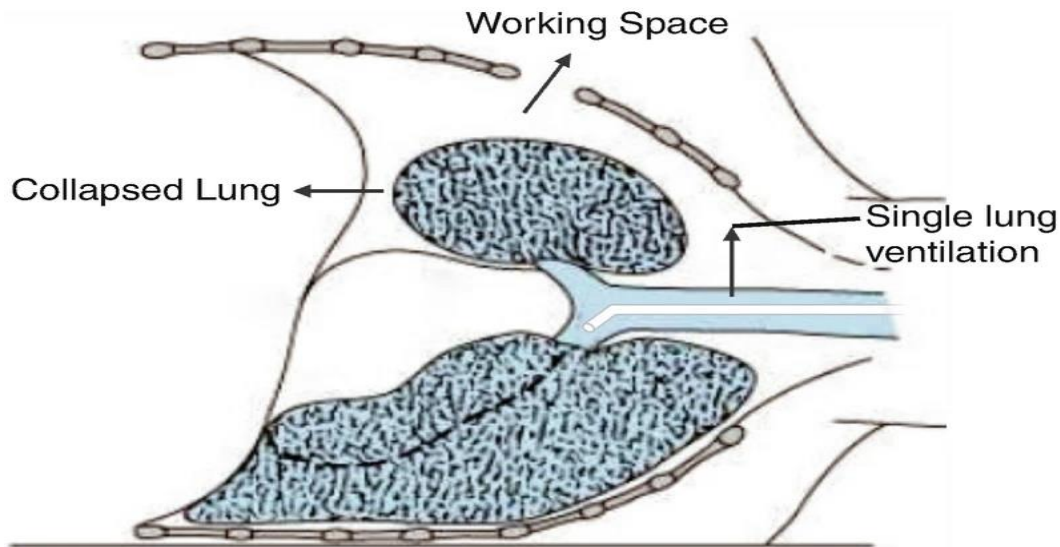


Fig 2: Double lumen single lung ventilation (Agarwal & Kukreja, 2023).

The main indications for double-lumen tube intubation include preventing cross-contamination of a healthy lung by blood or pus, managing ventilation in the presence of major air leaks such as bronchopleural fistula or tracheobronchial trauma, performing bronchopulmonary lavage, and facilitating procedures like pneumonectomy, lobectomy, and thoracic aneurysm repair. Conversely, single-lumen tube intubation is often utilized in procedures such as esophagectomy, esophageal mobilization, thymectomy, thoracic spine access, sympathectomy, and certain diagnostic thorascopies. In these cases, insufflation of carbon dioxide at the start of the operation helps achieve adequate lung collapse, with intrapleural pressure maintained below 10 mm Hg to prevent mediastinal tension or hemodynamic instability. Airtight reusable or disposable trocars are essential to maintain thoracic gas seal during carbon dioxide insufflation (Suzuki et al., 2024).

Indications

Uniportal Video-Assisted Thoracoscopic Surgery (U-VATS) has emerged as a minimally invasive alternative to conventional multiport VATS and thoracotomy for selected thoracic emergencies. While the fundamental principles of emergency management (rapid assessment, resuscitation, chest tube drainage) remain unchanged, U-VATS can provide rapid diagnostic clarity and definitive treatment in carefully selected, hemodynamically stable patients. The principal emergency indications in which U-VATS has proven useful or is increasingly applied include retained or massive hemothorax, traumatic or refractory pneumothorax, and selected penetrating thoracic injuries where visualization and limited repair are feasible (Dezube, 2023).

Early evacuation of retained clotted blood reduces the risks of infection, fibrothorax, trapped lung, and prolonged respiratory compromise. U-VATS allows direct visualization, evacuation of clots, control of bleeding sources when possible, and pleural toilet with fewer port sites and reported reduced postoperative pain and shorter hospital stay compared with open thoracotomy in stable patients. trauma patients with persistent air leak or failure of lung re-expansion after tube thoracostomy, thoracoscopic assessment permits identification of the air-leak source (e.g., bulla, lung laceration, bronchial injury) and allows targeted repair or stapling. Uniportal access offers similar diagnostic and therapeutic capability to multiport VATS in experienced hands, with potential advantages in operative ergonomics and cosmesis (Galvez et al., 2023).

Hemodynamically stable patients with penetrating chest trauma where imaging is inconclusive, U-VATS offers both diagnostic assessment and the opportunity for limited therapeutic maneuvers (evacuation of hemothorax, control of small bleeding sources, repair of lung lacerations) (Agrafiotis et al., 2024).

The management of traumatic hemothorax and its sequela, retained hemothorax, has undergone a significant evolution in recent years. The traditional approach of tube thoracostomy followed by thoracotomy for retained hemothorax has been challenged by the advent of minimally invasive techniques. The use of VATS in this setting has been shown to be a safe and effective alternative to open surgery, with lower rates of postoperative complications and shorter hospital stays (Patel et al., 2021).

The uniportal VATS approach, with its potential for even less surgical trauma, is an attractive option for managing traumatic and retained hemothorax. A number of studies have now been published demonstrating the feasibility and safety of uniportal VATS in this setting. The study by Sanna et al. (2017) provides a detailed overview of the uniportal VATS approach for hemothorax, highlighting the technical nuances of the procedure and the excellent outcomes that can be achieved (Sanna et al., 2017).

The timing of intervention for retained hemothorax is a critical factor in determining the success of the procedure. The meta-analysis by Ziapour et al. (2020) provides compelling evidence that early VATS intervention (within 7 days of trauma) is associated with a lower risk of conversion to thoracotomy and a shorter hospital stay (Ziapour et al., 2020). The more recent study by Zambetti et al. (2022) further supports the concept of early intervention, demonstrating that VATS performed within 72 hours of trauma is associated with the best outcomes (Zambetti et al., 2022).

In Rocco's extensive experience of uniportal VATS in 644 patients, the evacuation of hemothorax constituted a minor indication among other diagnostic and therapeutic thoracic procedures. This technique is characterized by a single small incision, through which articulating instruments are introduced. The instruments pivot within the chest cavity to prevent interference, a fundamental difference from the standard three-port technique (Rocco et al., 2013). The surgeon's position directly in front of the patient

facilitates an approach that develops along a sagittal plane. Successful execution is highly dependent on optimal incision placement along the posterior axillary line and requires a specific learning curve. While the surgical objectives mirror those of multiportal VATS, the procedure mandates the use of specialized flexible or articulated instruments (Bertolaccini et al., 2013). In addition to its role in managing traumatic hemothorax, uniportal VATS has also been shown to be a safe and effective approach for a range of other thoracic emergencies. The removal of foreign bodies from the thoracic cavity is another area where uniportal VATS has been shown to be a valuable tool. A recent study by Essa and Ahmed (2022) supports the use of uniportal VATS for the removal of retained shrapnel from the thoracic cavity, demonstrating that the approach is safe and effective in this challenging clinical scenario (Essa, and Ahmed, 2022).

Finally, uniportal VATS can also play a valuable role in the diagnostic evaluation of patients with thoracic emergencies. In cases where the diagnosis is unclear, uniportal VATS can provide a minimally invasive means of obtaining a definitive diagnosis, without the need for a full thoracotomy. The ability to directly visualize the thoracic cavity and to obtain tissue for biopsy can be invaluable in guiding the management of these complex cases (Constantinescu et al., 2024).

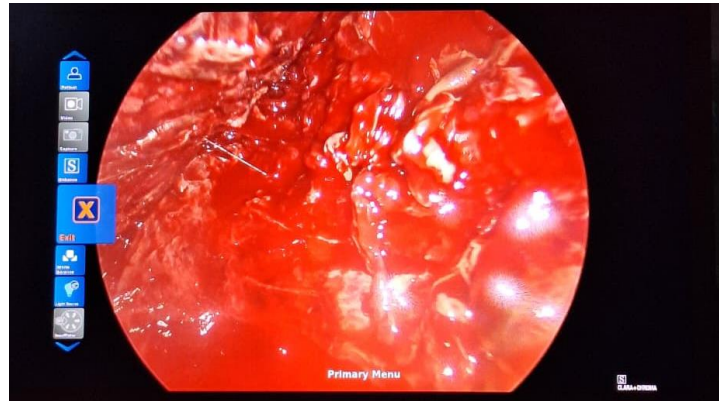


Fig 3: High-resolution computed tomography of massive hemothorax.

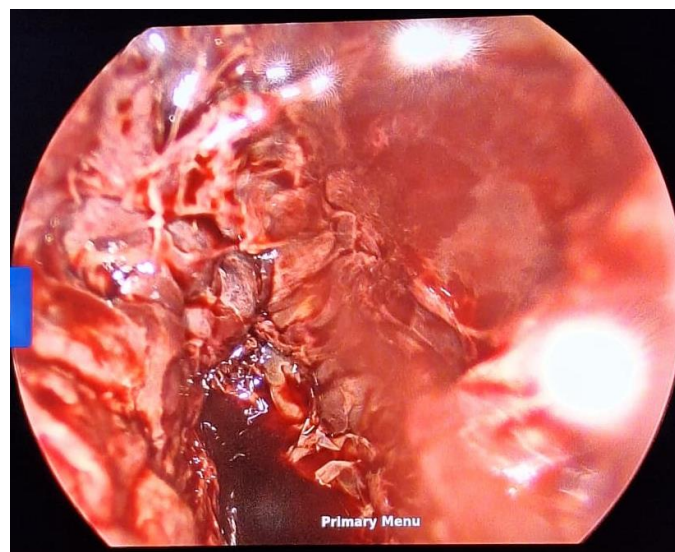


Fig 4: High-resolution computed tomography of massive hemothorax.

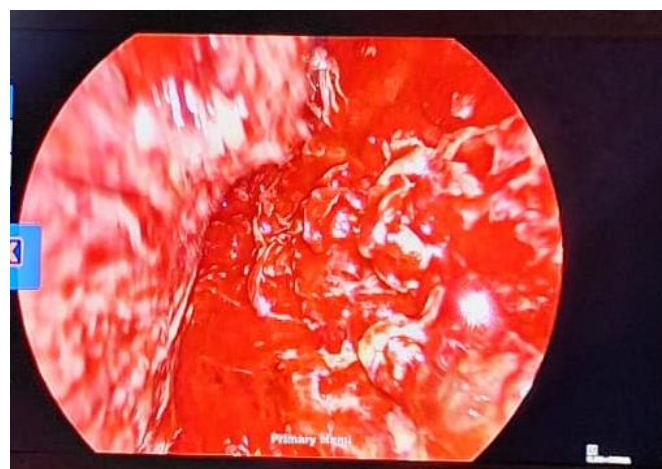


Fig 5: High-resolution computed tomography of massive hemothorax

Preoperative Work Up

The purpose of preoperative assessment in video-assisted thoracic surgery (VATS) is to evaluate patient-specific risks and anticipate potential morbidity related to the procedure, with emphasis on pulmonary and cardiac status as these represent the most frequent postoperative complications. Cardiac risk assessment should align with American Heart Association recommendations, beginning with noninvasive testing and progressing to invasive studies or interventions as needed. Particular attention is given to patients with prior myocardial infarction, heart failure, diabetes, cerebrovascular disease, or those unable to climb two flights of stairs (Young et al., 2025).

Pulmonary evaluation focuses on determining adequate respiratory reserve using pulmonary function tests, and when indicated, perfusion scanning or exercise testing. This assessment encompasses three domains respiratory mechanics (FEV_1), parenchymal function (DLCO), and cardiopulmonary interaction (VO_{2max}). Laboratory investigations should include complete blood count, electrolyte panel, coagulation profile, and liver function tests. Preoperative imaging such as contrast-enhanced CT confirms the surgical extent and feasibility of a VATS approach, while PET scanning is reserved for suspected or confirmed malignancies to assess disease spread and guide surgical planning (Sampsonas et al., 2023).

Preoperative management Positioning

During video-assisted thoracic surgery (VATS), the patient is placed in the lateral decubitus position (Fig. 6), ensuring the thorax is surgically prepared for potential conversion to open thoracotomy if needed. The operating table is flexed at the level of the scapular tip to widen the intercostal spaces, either by table adjustment or with a bolster, positioning the operative lung upward and the nonoperative lung downward in a dependent position. This arrangement provides excellent access to thoracic structures including the lungs, pleura, esophagus, pericardium, and mediastinum. Proper padding of all pressure points is essential to prevent nerve injury, and the patient's shoulder and arm on the operative side should be extended and securely supported on a side rest to maintain stability throughout the procedure (Barcelos et al., 2024).

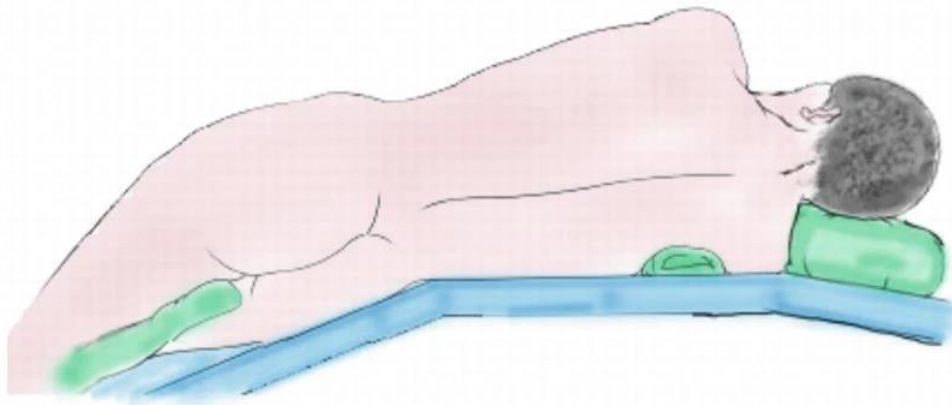


Fig 6: Position of VATS: Lateral decubitus (Agarwal & Kukreja, 2023).

Port Placement

Port placement in video-assisted thoracic surgery (VATS) is performed under sterile conditions by creating incisions parallel to the long axis of the intercostal space. These incisions should be made at the center of the intercostal space to avoid damage to intercostal nerves located along the inferior rib margin. Entry into the pleural cavity is achieved by bluntly spreading the fascia and muscle layers with a hemostat. The first port is typically positioned farthest from the target site—most often in the seventh or eighth intercostal space along the anterior to midaxillary line to provide optimal visualization and later serve for chest tube placement. The second port is made in the anterior fourth or fifth intercostal space between the midclavicular and anterior axillary lines, while the third port is placed posteriorly in the fifth or sixth intercostal space near the scapular border (Fig. 7)(Li et al., 2023).

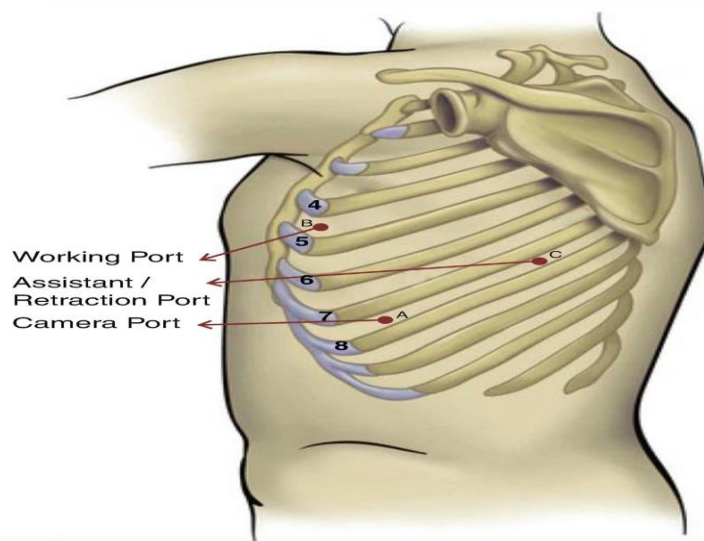


Fig 7: VATS: Port placement (Agarwal & Kukreja, 2023).

Various configurations have been developed worldwide, with the earliest described “baseball diamond” arrangement featuring three 10–12 mm incisions. Contemporary modifications include two-port and single-port (uniportal) techniques, the latter allowing simultaneous use of the camera and instruments through one incision, reflecting the ongoing evolution toward less invasive surgical access (Sakakura & Eguchi, 2023).

Instruments

Video-assisted thoracic surgery (VATS) utilizes specialized instruments characterized by a long working length, allowing surgeons to maintain familiar handling similar to open techniques while ensuring precise control and optimal tactile feedback. Sliding shaft designs enable full functionality through small ports or limited incisions, reducing tissue trauma and enhancing maneuverability. Over the past decade, continuous innovations have improved the ergonomics and efficiency of VATS instruments. Commonly used tools include short trocars (Fig. 8), 30° or 45° telescopes, and a range of 5 mm thoracic or endoscopic instruments such as grasping forceps, decortication ring forceps (Fig. 9b), DeBakey forceps, dissectors, scissors, and suction devices (Fig. 9a) (Kern, 2024).

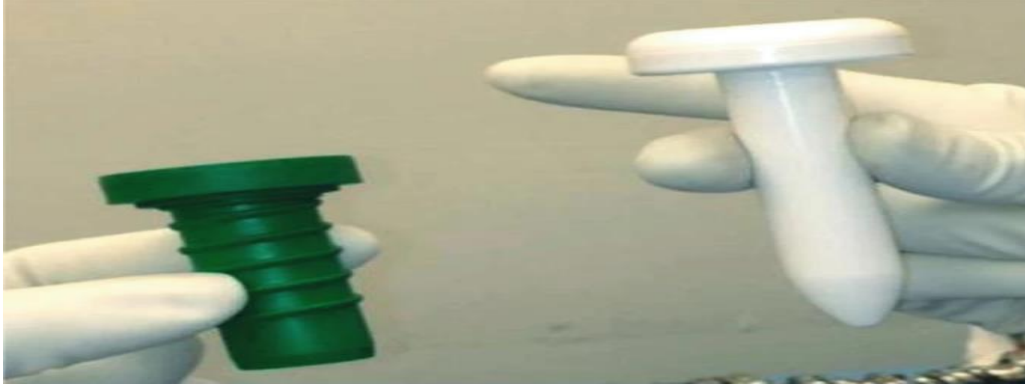


Fig 8: VATS: Short trocars (Agarwal & Kukreja, 2023).

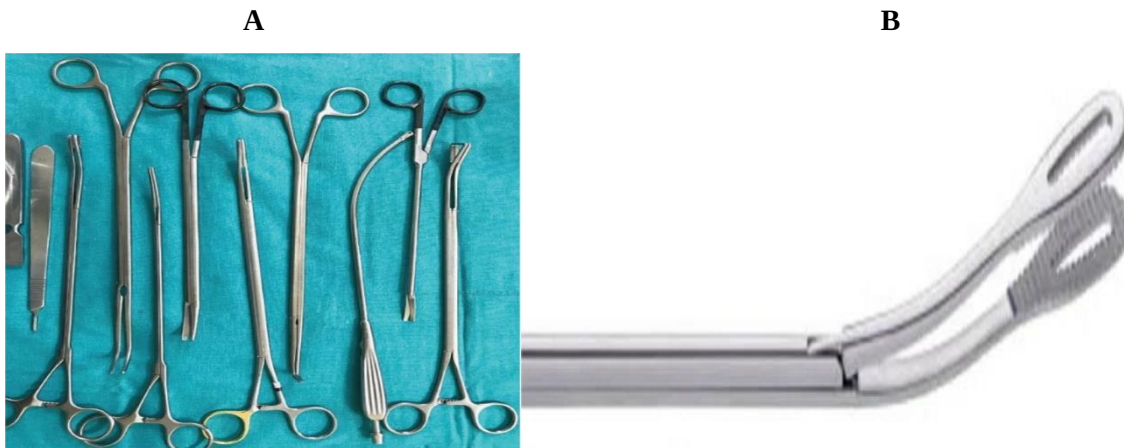


Fig 9A: VATS Instrument: Thin Shaft and Curved shape Instruments (Agarwal & Kukreja, 2023).

Fig 9B: Decortication Forcep (Agarwal & Kukreja, 2023).

C

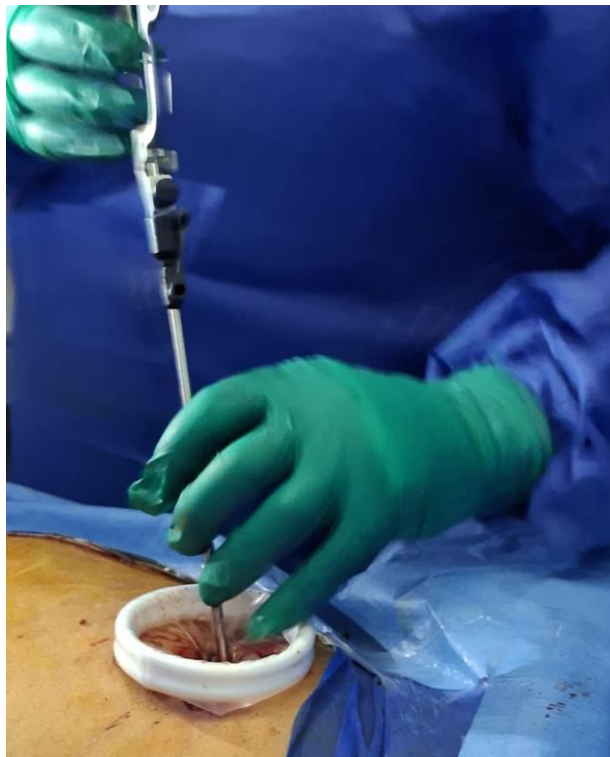


Fig 9C: Port Placement

Additional key instruments include 5 mm bipolar shears, vessel sealing devices, endo-peanuts, 10 mm clip appliers, curved-tip endo-staplers, wound protector, and large specimen retrieval bags. Standard open thoracic instruments should also be available on a separate table to allow rapid conversion if necessary (Laven et al., 2024).

The OR Setup

An optimal operating room setup for video-assisted thoracic surgery (VATS) must ensure readiness for immediate conversion to open thoracotomy if required. The environment should include a high-definition (HD) video system that provides sharp, high-resolution visualization of the intrathoracic cavity, along with a complete set of VATS instruments. The arrangement of the operating room and equipment should be organized according to the surgeon's preferred approach, which may follow either an anterior (Fig. 10a) or posterior (Fig. 10b) configuration. This structured organization enhances workflow, safety, and efficiency throughout the procedure (Muca & Reddy, 2025).

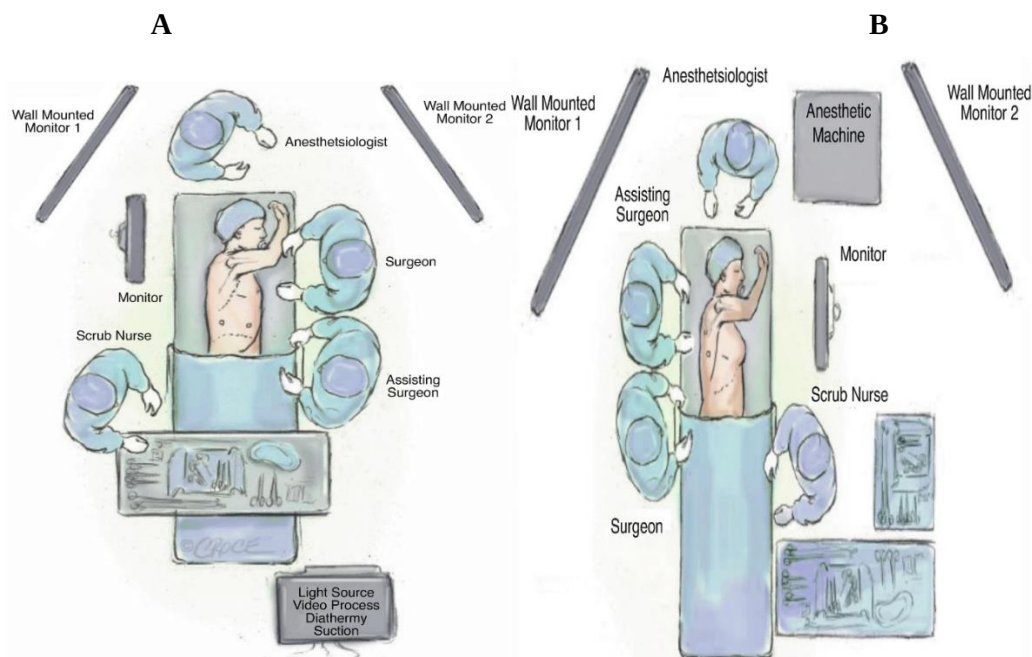


Fig 10A: Anterior approach: Video-assisted thoracic surgery (Agarwal & Kukreja, 2023).

Fig 10B: Posterior approach: Video-assisted thoracoscopic surgery (Agarwal & Kukreja, 2023).

Other Emergency Applications: Spontaneous Pneumothorax, Foreign Body Removal, and Diagnostic Challenges

In addition to its role in managing traumatic hemothorax and pleural empyema, uniportal VATS has also been shown to be a safe and effective approach for a range of other thoracic emergencies. The management of spontaneous pneumothorax, for example, has been revolutionized by the advent of VATS. The uniportal approach, with its potential for reduced pain and a shorter hospital stay, is an attractive option for the management of spontaneous pneumothorax, demonstrating that the approach is associated with a lower risk of recurrence and a shorter hospital stay compared to the multiport approach (Essa RA, Ahmed SK et al 2022). The removal of foreign bodies from the thoracic cavity is another area where uniportal VATS has been shown to be a valuable tool. A recent study by Essa and Ahmed (2022) supports the use of uniportal VATS for the removal of retained shrapnel from the thoracic cavity, demonstrating that the approach is safe and effective in this challenging clinical scenario [Click or tap here to enter text..](#)



Fig 11: Anatomical landmark for port placement in sympathectomy (Agarwal & Kukreja, 2023).

Video-assisted thoracic sympathectomy (VATS-S) is indicated for conditions such as hyperhidrosis, splanchnic pain, reflex sympathetic dystrophy, and upper extremity ischemia refractory to medical management, as well as selected cases of prolonged QT interval. The patient is positioned supine with both arms extended and the trunk elevated at approximately 30° (Fowler position) to facilitate lung collapse. Under general anesthesia with single-lung ventilation, a bilateral two-port VATS approach is employed. The surgical field includes the neck, both axillae, and upper thoracic regions down to the costal margins (Çetin et al., 2025).

Small 1 cm incisions are made at the fourth or fifth intercostal space along the anterior axillary line for the camera port (Fig. 11), and carbon dioxide insufflation up to 8 mm Hg aids lung collapse. A zero-degree thoracoscope provides visualization of the sympathetic chain beneath the parietal pleura, while a diathermy hook introduced via the third intercostal space enables precise cauterization. The sympathetic chain is divided between T2–T3 for palmar hyperhidrosis and T2–T4 for axillary hyperhidrosis, with careful identification of possible variations such as the Kuntz nerve (Fig. 12) (Raveglia et al., 2025).

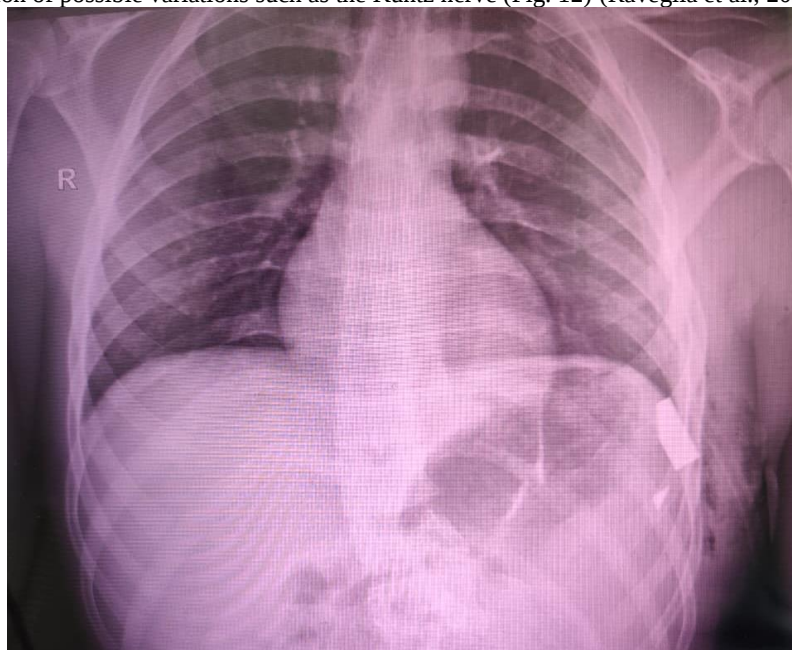


Fig 12. Preoperative chest X-ray showing a retained bullet

All procedures were performed using the uniportal VATS technique through a single incision measuring approximately 3-4 cm in length, typically placed in the 4th or 5th intercostal space at the anterior axillary line. The incision was made without rib spreading, and a wound protector was used to minimize tissue trauma. A 30-degree thoracoscope was inserted through the single port along with the surgical instruments. The operative approach was tailored to the specific pathology encountered, including evacuation of hemothorax, repair of lung lacerations, control of intercostal artery bleeding, and removal of foreign bodies when indicated. Conversion to open thoracotomy was considered when adequate visualization could not be achieved, when bleeding could not be controlled thoracoscopically, or when complex repairs were required that could not be safely performed through the uniportal approach.

Conclusion:

Uniportal VATS allows for minimally invasive access to the thoracic cavity through a single small incision, reducing post-operative pain and accelerating recovery. It also improves cosmetic outcomes while maintaining procedural safety and efficacy.

REFERENCES

1. Agarwal, N., & Kukreja, B. (2023). Basic Principles and Advanced VATS Procedures. In D. Lomanto, W. T.-L. Chen, & M. B. Fuentes (Eds.), *Mastering Endo-Laparoscopic and Thoracoscopic Surgery: ELSA Manual* (pp. 183-198). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-3755-2_30
2. Agrafiotis, A. C., Moraitis, S. D., & Sotiropoulos, G. (2024). Uniportal video-assisted thoracoscopic surgery for minor procedures. *Journal of Personalized Medicine*, 14(8), 880.
3. Barcelos, R. R., Steimer, D., & Figueroa, P. U. (2024). How I do it: Uniportal video-assisted thoracoscopic lobectomy. *JTCVS Techniques*, 25, 180-185. <https://doi.org/10.1016/j.xjtc.2024.02.010>
4. Çetin, M., Süral, F., Türk, İ., Solak, N., Sönmez, K., & Aydoğdu, K. (2025). Systemic effect of sympathectomy in the treatment of localized hyperhidrosis. *Updates in Surgery*. <https://doi.org/10.1007/s13304-025-02163-8>
5. Dezube, R. (2023, 2023/11). *Thoracoscopy and Video-Assisted Thoracoscopic Surgery*. MSD Manual. <https://www.msdmanuals.com/professional/pulmonary-disorders/diagnostic-and-therapeutic-pulmonary-procedures/thoracoscopy-and-video-assisted-thoracoscopic-surgery>
6. Galvez, C., Maroto, S., Sebastian, L., Lirio, F., del Campo, J., Sesma, J., & Bolufer, S. (2023). Bleeding control during uniportal video-assisted thoracic surgery without conversion: evidence and technical aspects. *Video-Assisted Thoracic Surgery*, 8.
7. Grossi, S., Cattoni, M., Rotolo, N., & Imperatori, A. (2023). Video-assisted thoracoscopic surgery simulation and training: a comprehensive literature review. *BMC medical education*, 23(1), 535.
8. Kern, A. (2024). Commentary: A New Frontier: Exploring Novel Articulating Hand-Held Instruments in Video-Assisted Thoracoscopic Surgery. *J Chest Surg*, 57(4), 339-341. <https://doi.org/10.5090/jcs.24.067>
9. Kim, S., & Chiu, S. (2020). Techniques for robotic lung resection. *Video-Assisted Thoracic Surgery*, 5. <https://vats.amegroups.org/article/view/5361>
10. Laven, I., Verkoulen, K., Franssen, A., Hulsewé, K. W. E., Vissers, Y. L. J., Štupnik, T., Gonzalez-Rivas, D., & de Loos, E. R. (2024). Evolution of uniportal video-assisted thoracoscopic surgery: optimization and advancements. *J Thorac Dis*, 16(8), 4839-4843. <https://doi.org/10.21037/jtd-24-647>
11. Li, Q., Li, Y., Lin, L., & Duan, L. (2023). Evolution of minimally invasive thoracic surgery. *Annals of Cardiothoracic Surgery*, 12(2), 128-129. <https://www.annalscts.com/article/view/16993>
12. Muca, A., & Reddy, R. M. (2025). Four-port, no assistant port, robotic thoracoscopic surgical technique for lung lobectomies. *Video-Assisted Thoracic Surgery*, 10. <https://vats.amegroups.org/article/view/11020>
13. Pan, H., Chen, H., Kong, W., Ning, J., Ge, Z., Tian, Y., Zou, N., Zhu, H., Zhang, J., Tao, Y., Gu, Z., Zheng, M., Ruan, G., Jiang, L., Li, Z., Huang, J., Zhou, C., Xu, G., & Luo, Q. (2024). Video-Assisted Thoracoscopic Surgery Versus Thoracotomy Following Neoadjuvant Immunochemotherapy in Resectable Stage III Non-Small Cell Lung Cancer Among Chinese Populations: A Multi-Center Retrospective Cohort Study. *Clinical Lung Cancer*, 25(5), 395-406.e395. <https://doi.org/https://doi.org/10.1016/j.clcc.2024.03.008>
14. Patel, M., Wilson, A., & Ong, C. (2023). Double-lumen tubes and bronchial blockers. *BJA Education*, 23(11), 416-424. <https://doi.org/10.1016/j.bjae.2023.07.001>
15. Raveglia, F., Guttadauro, A., Cioffi, U., Sibilia, M. C., & Petrella, F. (2024). Is RATS Superior to VATS in Thoracic Autonomic Nervous System Surgery? *Journal of Clinical Medicine*, 13(11), 3193. <https://www.mdpi.com/2077-0383/13/11/3193>
16. Raveglia, F., Lugaresi, M., Furak, J., Batirel, H. F., Bolukbas, S., Falcoz, P. E., Agrafiotis, A. C., Aigner, C., Depypere, L., Silva, J. S., Novoa, N. M., & Daddi, N. (2025). Thoracic autonomic nervous system surgery current application-a survey among members of the European Society of Thoracic Surgeons. *J Thorac Dis*, 17(2), 979-990. <https://doi.org/10.21037/jtd-24-1167>
17. Re Cecconi, E., Mangiameli, G., De Simone, M., Cioffi, U., Marulli, G., & Testori, A. (2024). Vats lobectomy for lung cancer. What has been the evolution over the time? [Mini Review]. *Frontiers in Oncology*, Volume 13 - 2023. <https://doi.org/10.3389/fonc.2023.1268362>
18. Sakakura, N., & Eguchi, T. (2023). Port Placement Variations for Robotic Lung Resection: Focusing on Their History, Conventional Look-Up-View and Horizontal Open-Thoracotomy-View Techniques, and More. *Journal of Personalized Medicine*, 13(2), 230. <https://www.mdpi.com/2075-4426/13/2/230>
19. Sampsonas, F., Antonogiannaki, M., Vittorakis, S., Kyriakopoulos, C., Boutlas, S., Boutou, A., Ntoliou, P., & Tzanakis, N. (2023). Preoperative evaluation of the respiratory system: A narrative review based on Hellenic Thoracic Society guidelines. *Pneumon*, 36(3), 1-15.
20. Suzuki, J., Shiono, S., Watanabe, H., Takamori, S., Hoshijima, K., Abe, K., & Uchida, T. (2024). *Surgical techniques*

- for securing the surgical field in thoracoscopic anterior mediastinal tumor resection. *Video-Assisted Thoracic Surgery*, 9. <https://vats.amegroups.org/article/view/9245>
21. Vinh, V. H., Quang, N. V. D., Thanh, D. D. M., & Van Le Phong, T. (2021). Robotic video-assisted thoracoscopic surgery using multiport triangular trocar configuration: initial experience at a single center. *J Cardiothorac Surg*, 16(1), 77. <https://doi.org/10.1186/s13019-021-01455-5>
22. Wolosker, N., de Campos, J. R. M., Kauffman, P., da Silva, M. F. A., Faustino, C. B., Tedde, M. L., Puech-Leão, P., & Pêgo Fernandes, P. M. (2022). Cohort study on 20 years' experience of bilateral video-assisted thoracic sympathectomy (VATS) for treatment of hyperhidrosis in 2431 patients. *Sao Paulo Med J*, 140(2), 284-289. <https://doi.org/10.1590/1516-3180.2021.0078.R1.23072021>
23. Young, R. W., Kucera, J., Antevil, J. L., & Trachiotis, G. D. (2025). Preoperative cardiopulmonary assessment for video-assisted thoracoscopic surgery (VATS) pulmonary resection: a narrative review. *Video-Assisted Thoracic Surgery*, 10.
24. Patel, N. J., Dultz, L., Ladhani, H. A., Cullinane, D. C., Klein, E., McNickle, A. G., & Kasotakis, G. (2021). Management of simple and retained hemothorax: a practice management guideline from the Eastern Association for the Surgery of Trauma. *The American Journal of Surgery*, 221(5), 873-884.
25. Sanna, S., Bertolaccini, L., Brandolini, J., Argnani, D., Mengozzi, M., Pardolesi, A., & Solli, P. (2017). Uniportal video-assisted thoracoscopic surgery in hemothorax. *Journal of Visualized Surgery*, 3, 126.
26. Ziapour, B., Mostafidi, E., Sadeghi-Bazargani, H., Kabir, A., & Okereke, I. (2020). Timing to perform VATS for traumatic retained hemothorax (a systematic review and meta-analysis). *European Journal of Trauma and Emergency Surgery*, 46(2), 337-346.
27. Zambetti, B. R., Lewis Jr, R. H., Chintalapani, S. R., Desai, N., Valaulikar, G. S., & Magnotti, L. J. (2022). Optimal time to thoracoscopy for trauma patients with retained hemothorax. *Surgery*, 172(4), 1265-1269.
28. Rocco, G., Martucci, N., La Manna, C., Jones, D. R., De Luca, G., La Rocca, A., & Accardo, R. (2013). Ten years experience on 644 patients undergoing single-port (uniportal) video-assisted thoracoscopic surgery. *The Annals of thoracic surgery*, 96(2), 434-438.
29. Bertolaccini, L., Rocco, G., Viti, A., & Terzi, A. (2013). Geometrical characteristics of uniportal VATS. *Journal of thoracic disease*, 5(Suppl 3), S214.
30. Essa, R. A., & Ahmed, S. K. (2022). Uniportal video-assisted thoracoscopic surgery for retained shrapnel in the thoracic cavity: an update surgical approach for removal of foreign body. *Annals of Medicine and Surgery*, 75.
31. Constantinescu, A., Stoicescu, E. R., Iacob, R., Chira, C. A., Cocolea, D. M., Nicola, A. C., & Manolescu, D. (2024). CT-guided transthoracic core-needle biopsy of pulmonary nodules: Current practices, efficacy, and safety considerations. *Journal of Clinical Medicine*, 13(23), 7330.