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Original Article

Uniportal VATS in Clotted Hemothorax

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ABSTRACT

Objective: To report outcomes of patients undergoing VATS for clotted hemothorax.
Study Design: Cross sectional observational study.
Place and Duration of Study: Department of Surgery, Lady Reading Hospital, Peshawar Pakistan, from Jan to Dec 2022.
Methodology: A total of 64 patients with evident clotted hemothorax were included. Pre-operative demographics, operative (interventional) variables included duration of VATS, intra-operative findings such as clotted hemothorax, blebs etc. Post-operative variables included pain scores on visual analogue pain scale and the need for opioid analgesics and complications (like recurrence, wound infection, hemorrhage, need for admission into ICU, length of hospital stay, mortality, etc.). Statistical Package for the Social Sciences (SPSS) version 23.0 was used for data analysis.
Results: Mean age of patients was 35.27 ± 12.75 years with 37 (57.8%) males and 27 (42.2%) females. Mean duration of surgery was 95.65 ± 29.56 mins. Conversion of uniportal VATS occurred in 04 (6.25%) of patients. Admission in ICU post-operatively in 04 (6.25 %), recurrence of hemothorax in 03 (4.7%), bleeding in 01 (1.6%), wound dehiscence in 03 (4.7%), mean pain on VAS was 4.19 ± 1.63. Mean duration of intercostal tube was 4.51 ± 2.48 days and hospital stay was 5.3 ± 2.1 days. Mortality was observed in 04 (6.25%) patients.
Conclusion: Favorable outcome was reported in patients undergoing VATS for clotted hemothorax using a single port. Minimal adverse events/complications both intra and post-operatively were reported using uniportal VATS for patients with clotted hemothorax.
Keywords: Clotted Hemothorax, Uniportal, Video Assisted Thoracic Surgery.

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INTRODUCTION

In recent years, there has been a paradigm shift in the field of thoracic surgery with the advent of minimally invasive techniques, particularly Video-Assisted Thoracoscopic Surgery (VATS).[1] Among the various approaches to VATS, the uniportal VATS technique has gained prominence for its reduced invasiveness and potential benefits in the management of complex thoracic pathologies.[2] Clotted hemothorax, characterized by the accumulation of clotted blood in the pleural space, poses a unique challenge to thoracic surgeons, requiring a delicate balance between effective evacuation and preservation of lung tissue.[3] This research will shed light into the application of uniportal VATS in the context of clotted hemothorax, exploring its efficacy, safety, and potential advantages.

Hemothorax, the accumulation of blood in the pleural cavity, can result from various etiologies, including trauma, vascular injuries, or underlying medical conditions.[4] When the blood within the pleural space undergoes clotting, the situation becomes more complex, requiring meticulous surgical intervention for both clot evacuation and optimal patient outcomes.[5] Traditionally, thoracotomy has been the gold standard for managing clotted hemothorax; however, the associated morbidity and prolonged recovery have led surgeons to seek alternative approaches.[6]

The emergence of uniportal VATS has revolutionized the landscape of thoracic surgery.[7] This technique involves a single incision, usually ranging from 2-5cm, through which a video camera and surgical instruments are introduced into the pleural space.[8] Uniportal VATS offers advantages such as reduced postoperative pain, shorter hospital stays, and improved cosmetic outcomes compared to traditional multiport VATS or thoracotomy.[9] While uniportal VATS has been extensively applied in various thoracic conditions, its role in clotted hemothorax remains an area of active exploration.[10]

Clotted hemothorax demands a nuanced surgical approach that not only addresses clot evacuation but also minimizes damage to surrounding structures.[11] Uniportal VATS, with its limited access point, provides a less invasive means of achieving these objectives.[12]

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The single incision allows for precise visualization and manipulation of the pleural space, facilitating targeted evacuation of clots while minimizing trauma to adjacent tissues.[13]

Moreover, the uniportal approach offers the potential for reduced postoperative pain, a critical consideration in patients recovering from traumatic injuries.[14] Pain management is a key factor influencing the overall recovery process, and the minimally invasive nature of uniportal VATS aligns with the growing emphasis on enhanced recovery after thoracic surgery (ERATS) protocols.[15] By mitigating pain and discomfort, uniportal VATS may contribute to faster mobilization, reduced hospital stays, and improved patient satisfaction in the context of clotted hemothorax.[16]

Traditional approaches to clotted hemothorax often involve thoracotomy, which entails a larger incision, rib spreading and potential damage to intercostal nerves. These factors contribute to increased postoperative pain and longer recovery times.[17] Furthermore, the extensive exposure provided by thoracotomy may lead to unnecessary manipulation of healthy lung tissue, exacerbating respiratory compromise in an already compromised patient.[18]

Uniportal VATS presents an alternative that addresses these challenges. The smaller incision minimizes the disruption of intercostal nerves, resulting in decreased postoperative pain. Additionally, the targeted approach of uniportal VATS enables surgeons to evacuate clots precisely, sparing healthy lung tissue and minimizing unnecessary trauma. As the surgical community strives for more patient-centric approaches, uniportal VATS emerges as a promising technique in the management of clotted hemothorax.[19]

Studies comparing outcomes between uniportal and multiport VATS or thoracotomy consistently highlight the advantages of the uniportal approach, demonstrating comparable efficacy with reduced postoperative pain, shorter hospital stays, and improved patient satisfaction.[20]

However, the specific application of uniportal VATS in clotted hemothorax remains an underexplored area. Limited studies have investigated the nuances of this technique in addressing the unique challenges posed by clotted blood in the pleural space. Existing literature often focuses on broader applications of uniportal VATS, prompting the need for dedicated research to elucidate its role in clotted hemothorax management.

In conclusion, as thoracic surgery continues to evolve, uniportal VATS stands at the forefront of innovation, offering a less invasive alternative for managing clotted hemothorax. This research endeavors to bridge existing gaps in the literature, shedding light on the specific applications and outcomes of uniportal VATS in this challenging clinical scenario. Through a comprehensive exploration of its technical feasibility, postoperative outcomes, and impact on patient recovery, this study aims to pave the way for a more refined and patient-centric approach to hemothorax management.

The objectives of this study were to report the outcomes of patients undergoing VATS for clotted hemothorax.

METHODOLOGY

This cross sectional observational study included all patients that presented to Lady Reading Hospital, Peshawar, Pakistan, from January to December 2022 for surgery due to hemothorax whether primary or secondary. Patients presenting to the Department of Surgery with evident clotted hemothorax through clinical and radiological findings, either primary or secondary including trauma or blunt or penetrating type, injuring intra-thoracic or extra-thoracic structures were included in the study. Traumas resulting in bleeding into the thorax which arose from chest wall, intercostal or internal mammary arteries, great vessels, mediastinum, myocardium, lung parenchyma, diaphragm, or abdomen were all included in the study using non-probability convenient sampling technique. Patients undergoing uniportal VATS for either recurrent hemothorax or due to other than thoracic disease and those managed conservatively were excluded from the study.

The pre-operative demographic variables included age, gender, co-morbidities, smoking status, history of addiction, surgical indications, insertion of chest tube (applied or nor prior to VATS) and duration of clotted hemothorax. Operative (interventional) variables included duration of VATS, intra-operative findings such as clotted hemothorax, blebs etc. surgical technique (conventional, stapled, sutured or ligation). Post-operative variables included pain scores on visual analogue pain scale and the need for opioid analgesics and complications (like recurrence, wound infection, hemorrhage, need for admission into intensive care unit, length of hospital stay, mortality, etc.).

The data was collected from patients' hospital record and their operative notes after ethical approval from the Hospital Ethical Review Committee. Statistical

Package for the Social Sciences (SPSS) ver 23 was used for collection the data. Statistics were recorded on two basis viz., frequency and percentages were reported for qualitative data and mean and standard deviation for quantitative data. Demographics of the study included age, gender, smoking status, co-morbidities (hypertension, diabetes, addiction, other systemic diseases, etc.). Data analysis and presentation was divided into three parts viz., the first part included pre-operative and demographics variables. The second part included operative findings while the third part included post-operative findings *p*-value of <0.05 was considered as statistically significant.

RESULTS

From the total of 64 patients undergoing VATS for clotted hemothorax and included in the study with mean age of 35.27 ± 12.75 years and 37 (57.8%) males and 27 (42.2%) females, 44 (68.75%) of patients were diagnosed with primary hemothorax while 20 (31.25%) with secondary hemothorax. About 21 (32.81%) of patients were reported to have some sort of addiction. 48 (75%) patients had positive history of smoking cigarette.

Regarding co-morbidities, 23 (34.9%) of patients were diabetic, 19 (29.7%) hypertensive and 4 (6.25%) had other systemic disease such as thyroid/renal disease (Table I).

Table-I: Baseline Demographics of patients undergoing VATS for clotted hemothorax (n=64)

Variables	n (%)
Mean Age (Years) = 35.27 ± 12.75	
Gender	
Male	37 (57.80)
Female	27 (42.20)
Diagnosis	
Primary Hemothorax	44 (68.75)
Secondary Hemothorax	20 (31.25)
Addiction	
Yes	21 (32.81)
No	43 (67.20)
Smoking Status	
Yes	48 (75)
No	16 (25)
Co-Morbidities	
Diabetes	23 (34.90)
Hypertension	19 (29.70)
Other	04 (06.25)

With regards to the post-operative findings of patients undergoing VATS due to clotted hemothorax the mean duration of surgery was 95.65 ± 29.56 mins. Conversion of uniportal VATS occurred in 4 (6.25%) of patients. Admission in ICU post-operatively was reported in 04 (6.25%) patients. Recurrence of hemothorax was observed in 3 (4.7%) of patients. Bleeding was found in 1 (1.6%) of patient. Wound dehiscence was reported in 3 (4.7%) patients.

Mean pain on Visual Analogue Pain scale was reported to be 4.19 ± 1.63. The mean duration of intercostal tube was observed to be 4.51 ± 2.48 days. The mean duration of hospital stay was 5.3 ± 2.1 days. Mortality was observed in 04 (6.25 %) of patients (Table II).

Table-II: Post-operative findings of patients undergoing VATS for clotted hemothorax (n=64).

Variables	n (%)
Mean Duration of Surgery (mins) = 95.65 ± 29.5	
Conversion of uniportal VATS	04 (6.25)
ICU Admission	04 (6.25)
Recurrence	03 (4.70)
Bleeding	01 (1.60)
Wound dehiscence	03 (4.70)
Mean Pain (on VAS)	4.19 (1.63)
Mean Duration of Intercostal Tube (days) = 4.51 (2.48)	
Mean Hospital Stay (days) = 5.3 (2.10)	
Mortality	04 (6.25)

DISCUSSION

The results of this study proved to be favoring the uniportal VATS for patients with clotted hemothorax. Both intra and post-operative complications were observed to be minimal among the patients. Only 4 (6.25%) patients were reported have uniportal VATS failure along with admission into ICU, 3 (4.7%) had recurrence of hemothorax and wound dehiscence each while only 1 (1.6%) patient suffered hemorrhage.

Similar to the findings of this study, in a research which focused on the technical aspects of uniportal VATS in clotted hemothorax cases.[21,22] Their findings supported the feasibility of this approach, emphasizing the ability to achieve effective evacuation with a single incision.[21] The study highlighted the importance of thorough preoperative planning and patient selection, suggesting that uniportal VATS is technically feasible and safe in appropriately selected cases of clotted hemothorax.[22]

In accordance with the findings of our study, several comparative studies have investigated outcomes between uniportal VATS and traditional approaches in clotted hemothorax.[23,24] However in this study only patients undergoing uniportal VATS were included as this is the only procedure carried out at our institution for clotted hemothorax. A study conducted a retrospective analysis, reporting comparable efficacy

in clot evacuation and a significant reduction in postoperative pain scores in the uniportal VATS group. Moreover, the study demonstrated a shorter hospital stay for patients undergoing uniportal VATS, aligning with the broader trend observed in other VATS procedures and also similar to this study.[24]

Maintaining optimal respiratory function is crucial in patients undergoing thoracic surgery, particularly in the context of clotted hemothorax where compromised lung function may already exist. Uniportal VATS, with its focus on minimizing trauma to healthy lung tissue, has shown promise in preserving postoperative respiratory function. Various studies have reported favorable respiratory outcomes and enhanced recovery in patients undergoing uniportal VATS due to clotted hemothorax.[25]

While existing literature provides valuable insights into the application of uniportal VATS in clotted hemothorax, there is a need for more prospective studies. Further research should explore long-term outcomes, including recurrence rates, and address potential selection biases in the existing retrospective studies. Additionally, standardized protocols for the application of uniportal VATS in clotted hemothorax could contribute to a more comprehensive understanding of its role in this specific clinical scenario.

This study although investigated the use of uniportal VATS for clotted hemothorax thoroughly yet due to limited sample size and the fact that the study was carried out a single center, with selection, observer and record bias all coming into consideration, the findings of this study cannot be generalized to the general population. Further multi-centered comparative studies with greater sample size and comparing uniportal VATS with other types of VATS and for other conditions than clotted hemothorax would be enlightening to the findings reported in this study.

CONCLUSION

The results of this study reported a favorable outcome in patients undergoing VATS for clotted hemothorax using a single port. Minimal adverse events/complications both intra and post-operatively were reported using uniportal VATS for patients with clotted hemothorax.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AA: Conception, study design, drafting the manuscript, approval of the final version to be published

TA & VA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published

MAK: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

REFERENCES

1. Grossi S, Cattoni M, Rotolo N, Imperatori A. Video-assisted thoracoscopic surgery simulation and training: a comprehensive literature review. BMC Med Educ 2023; 23(1): 535. https://doi.org/10.1186/s12909-023-04482-z.
2. Zhang K, Chen HG, Wu WB, Li XJ, Wu YH, Xu JN, et al. Non-intubated video-assisted thoracoscopic surgery vs. intubated video-assisted thoracoscopic surgery for thoracic disease: a systematic review and meta-analysis of 1,684 cases. J Thorac Dis 2019; 11(8): 3556-3568. https://doi.org/10.21037/jtd.2019.07.48.
3. Rezk ME, Elnahas AM, EMohamed M, Elrebigi MM, El-Moteleb AE. Video-assisted thoracoscopic surgery versus limited posterolateral thoracotomy for management of post traumatic clotted hemothorax. Cardiovasc Thorac Surg 2020; 5: 1-7.
4. Zeiler J, Idell S, Norwood S, Cook A. Hemothorax: A Review of the Literature. Clin Pulm Med 2020; 27(1): 1-12. https://doi.org/10.1097/CPM.0000000000000343.
5. Terada T, Nishimura T, Uchida K, Hagawa N, Esaki M, Mizobata Y. How emergency physicians choose chest tube size for traumatic pneumothorax or hemothorax: a comparison between 28Fr and smaller tube. Nagoya J Med Sci 2020; 82(1): 59-68. https://doi.org/10.18999/nagjms.82.1.59
6. Shaalan A, El Wakeel EE, Elkamail YA. Surgical outcome post early thoracoscopic surgery for clotted traumatic hemothorax versus thoracotomy. Zagazig Uni Med J 2023; 29(2): 601-11. https://doi.org/10.21608/ZUMJ.2022.128724.2530
7. Siu IC, Ng CS. The future of the uniportal approach. Annals of Cardiothorac Surg 2023; 12(1): 46. https://www.annalscts.com/article/view/16979
8. Siu ICH, Li Z, Ng CSH. Latest technology in minimally invasive thoracic surgery. Ann Transl Med 2019; 7(2): 35. https://doi.org/10.21037/atm.2018.12.47.
9. Al-Ameri M, Sachs E, Sartipy U. Uniportal versus multiportal video-assisted thoracic surgery for lung cancer. J Thorac Dis 2019; 11(12): 5152-5161. https://doi.org/10.21037/jtd.2019.12.01.
10. Alshehab D, AlGhunaim E, AlOtaibi FH, Aleid Y, AlElewah A, Sotis R, et al. Role of uniportal video-assisted thoracoscopic surgery in the management of penetrating thoracic injuries. Kardiochir Torakochirurgia Pol 2022; 19(3): 155-157. https://doi.org/10.5114/kitp.2022.119765.
11. Coselli JS, Mattox KL, Beall AC Jr. Reevaluation of early evacuation of clotted hemothorax. Am J Surg 1984; 148(6): 786-90. https://doi.org/10.1016/0002-9610(84)90438-0.
12. Ng CS. Uniportal VATS in Asia. J Thorac Dis 2013; 5(Suppl 3): S221. https://doi.org/10.3978/j.issn.2072-1439.2013.07.06
13. Ng CS, Gonzalez-Rivas D, D'Amico TA, Rocco G. Uniportal VATS-a new era in lung cancer surgery. J Thorac Dis 2015; 7(8): 1489-91. https://doi.org/10.3978/j.issn.2072-1439.2015.08.19.
14. Bertolaccini L, Rocco G, Viti A. Geometrical characteristics of uniportal VATS. J Thorac Dis 2013; 5 Suppl 3(Suppl 3): S214-6. https://doi.org/10.3978/j.issn.2072-1439.2013.04.06.

15. Homma T, Shimada Y, Tanabe K. Decreased postoperative complications, neuropathic pain and epidural anesthesia-free effect of uniportal video-assisted thoracoscopic anatomical lung resection: a single-center initial experience of 100 cases. J Thorac Dis 2022; 14(9): 3154-3166. https://doi.org/10.21037/jtd-22-6.
16. Nagano H, Suda T, Ishizawa H, Negi T, Kawai H, Kawakami T, et al. Uniportal video-assisted thoracic surgery lowers the incidence of post-thoracotomy pain syndrome. Fujita Med J 2020; 6(2): 31-36. https://doi.org/10.20407/fmj.2019-008.
17. Broderick SR. Hemothorax: etiology, diagnosis, and management. Thorac Surg Clin 2013; 23(1): 89-96, https://doi.org/10.1016/j.thorsurg.2012.10.003.
18. Khalaf AE, Ghoneim AE, Mahmoud AB, Abdelwahab AA. Video assisted thoracoscopic surgery vs thoracotomy in management of post traumatic retained hemothorax: a randomized study. The Cardiothorac Surg 2023; 31(1): 11.
19. Ahmad T, Ahmed SW, Soomro NH, Sheikh KA. Thoracoscopic evacuation of retained post-traumatic hemothorax. J Coll Physicians Surg Pak 2013; 23(3): 234-236.
20. Shaalan A, El Wakeel EE, Elkamail YA. Surgical outcome post early thoracoscopic surgery for clotted traumatic hemothorax versus thoracotomy. Zagazig Uni Med J 2023; 29(2): 601-11.
21. Ziapour B, Mostafidi E, Sadeghi-Bazargani H, Kabir A, Okereke I. Timing to perform VATS for traumatic-retained hemothorax (a systematic review and meta-analysis). Eur J Trauma Emerg Surg. 2020; 46(2): 337-346. https://doi.org/10.1007/s00068-019-01275-2.
22. Abid A, Ahmad T, Shaikh KA, Nasreen S, Sikander N, Mazcuri M. Video Assisted Thoracoscopy as a therapeutic modality in evacuating retained or clotted haemothoraces. J Pak Med Assoc 2021; 71(5): 1428-1431. https://doi.org/10.47391/JPMA.288.
23. Reinersman JM, Passera E, Rocco G. Overview of uniportal video-assisted thoracic surgery (VATS): past and present. Ann Cardiothorac Surg 2016; 5(2): 112-117. https://doi.org/10.21037/acs.2016.03.08.
24. Harris CG, James RS, Tian DH, Yan TD, Doyle MP, Gonzalez-Rivas D, et al. Systematic review and meta-analysis of uniportal versus multiportal video-assisted thoracoscopic lobectomy for lung cancer. Ann Cardiothorac Surg 2016; 5(2): 76-84. https://doi.org/10.21037/acs.2016.03.17.
25. Guido-Guerrero W, Bolaños-Cubillo A, González-Rivas D. Single-port video-assisted thoracic surgery (VATS)-advanced procedures & update. J Thorac Dis 2018; 10(Suppl 14): S1652-S1661. https://doi.org/10.21037/jtd.2018.05.43.