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VATS Versus Surgery for Management of Spontaneous Pneumothorax in Nasiriyah City: A Single Center Study

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Abstract

Background: Pneumothorax is a clinical condition characterized by the accumulation of air in the pleural space, leading to lung collapse. The management of pneumothorax can be conservative, interventional, or surgical. (VATS) has emerged as a cornerstone of contemporary thoracic surgery, facilitating a shift toward minimally invasive surgical techniques. This approach enables surgeons to perform intricate thoracic procedures with enhanced visualization through a thoracoscope an elongated endoscopic instrument equipped with a camera and light source thereby minimizing the need for extensive incisions typically required in traditional thoracotomy.

Patients and Methods: The samples were collected from the hospitals of Thi-Qar Governorate (Al-Hussein Teaching Hospital and Al-Nasiriyah Teaching Hospital from January 2022 to January 2025 after obtaining approval from the official authorities to conduct the research Information about patients. Medical history, symptoms, age, etc. was taken.

Results: Most patients affected by spontaneous pneumothorax were (15-30) years old. The presentation of the patients was in the form unilateral chest pain, dyspnea and other signs and symptoms related to the thoracic cage. The right side was affected more than the left side in our study and most patients indicated for VATS had recurrent pneumothorax. No recurrence of spontaneous pneumothorax was recorded after management by VATS.

Discussion: The Al-Mourgi & Alshehri study emphasized that smoking significantly increases the risk of spontaneous pneumothorax, with heavy smokers facing up to 100 times the risk of non-smokers. All studies of VATS show that VATS is of high value in the preventing recurrence of spontaneous pneumothorax and is applied widely nowadays.

Conclusion: Video-Assisted Thoracic Surgery (VATS) has proven to be a highly effective and minimally invasive technique for the management of spontaneous pneumothorax. The advantages of VATS is low mortality rate, short hospital stay, cosmetic advantage, low recurrence rate, reduced postoperative pain and complications, improved patient recovery.

Recommendations: Minimally Invasive: Unlike open-chest surgery, VATS requires only small incisions, leading to less tissue damage, minimal bleeding, and a faster recovery time. Early Referral to Specialized Thoracic Centers is always mandatory. Smoking Cessation Programs should be promoted, as smoking significantly increases the risk of pneumothorax. Regular medical check-ups for high-risk individuals (e.g., tall, thin males, smokers, those with lung diseases) is indicated. Training and Investment in VATS is needed.

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Introduction

Pneumothorax

Pneumothorax is a clinical condition characterized by the accumulation of air in the pleural space, leading to lung collapse. The management of pneumothorax can be conservative, interventional, or surgical.

Epidemiology

The incidence of non-traumatic pneumothorax is 7.4 to 18 per 100000 people per year. It is much higher in smokers (12% vs. 0.1% lifetime risk). Primary spontaneous pneumothorax often affects young males, tall and thin built, often smokers. The incidence of recurrence is 20 to 60% in the first 3 years after the first episode.

Secondary spontaneous pneumothoraces also occur in patients with underlying lung disease; thus epidemiology varies greatly. Catamenial pneumothorax affects young women of childbearing age.

Etiology

1. Traumatic - results from blunt or penetrating injuries to the chest wall.

2. Spontaneous - primary spontaneous pneumothorax occurs in people with no underlying lung disease or inciting event, secondary spontaneous pneumothorax occurs in people with significant underlying parenchymal lung disease and results from some inciting incident, such as a bleb rupture.

3. Iatrogenic - is a subtype of traumatic pneumothorax, where an injury occurs as a result of a diagnostic or therapeutic medical intervention (i.e., insertion of a central line, etc.)

4. Catamenial - is a non-traumatic pneumothorax that occurs in women in conjunction with their menstrual period. Although not entirely understood, the cause is believed to be endometriosis of the pleura.

Clinical Features

The clinical presentation varies depending on the etiology and the size of the pneumothorax. Some patients may be asymptomatic, and pneumothorax is diagnosed as an incidental finding during the workup for another condition.

The most common presenting symptoms are chest pain and shortness of breath (64 to 85%). Chest pain is usually severe, sharp/stabbing, pleuritic and radiates to ipsilateral shoulder/arm. Symptomatic onset is sudden, and in primary spontaneous pneumothorax can decrease after 24 hours, possibly due to gradual spontaneous resolution of the pneumothorax. Patients can also present with anxiety and cough, but these symptoms are less common. The patient may have a normal physical exam if the pneumothorax is small. However, with large enough pneumothorax, there may be absent breath sounds on the affected side. Many patients with first time spontaneous pneumothorax do not seek medical help for several days.

The signs and symptoms of tension pneumothorax are more severe, and timely diagnosis and treatment are crucial for the patient's survival. Tension pneumothorax, besides chest pain and shortness of breath, presents with hemodynamic compromise. The patient may have profound hypoxia and hypotension. The gradual accumulation of air in the pleural space due to one-valve situation causes the shift of the mediastinum to the contralateral side and compression of vena cava and eventual compromise of the cardiac output, producing life-threatening hypotension and hypoxia. On physical exam, the patient has absent breath sounds on the affected hemithorax, tracheal deviation to the contralateral side, tachycardia, and jugular venous distention — undiagnosed and untreated tension pneumothorax results in hemodynamic collapse and death.

Evaluation

Traumatic pneumothorax must be a suspected diagnosis in any blunt or penetrating chest trauma. Adequate history, physical exam and chest X-rays are the mainstays of the diagnosis. However, small pneumothoraces are often missed on physical exam and chest X-ray and may be present on CT chest during a diagnostic workup for other injuries.In patients who present with sudden onset of sharp pleuritic chest pain and shortness of breath, spontaneous pneumothorax should always be on a differential diagnosis list. The diagnosis is often made by upright chest radiograph, except tension pneumothorax which is a clinical diagnosis. Point of care ultrasound is commonly used in the evaluation patients with pneumothorax. In fact, ultrasound can rapidly diagnosis pneumothoraces with better accuracy than standard chest X-ray, while sparing the patient radiation exposure. The definition of large vs. small pneumothorax is by the distance between the lung margin and chest wall. Small pneumothorax: the presence of a visible rim of less than 2 cm between the lung margin and the chest wall. Large pneumothorax: the presence of a visible rim of greater than 2 cm between the lung margin and the chest wall. The chest radiograph is thought to underestimate the size of pneumothorax.

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Differential diagnosis: of non-traumatic spontaneous pneumothorax includes: pneumonia, acute asthma exacerbation, bronchitis, pulmonary embolism, aortic dissection, costochondritis, acute coronary syndrome, anxiety or panic attack, diaphragmatic injuries, GERD, esophageal spasm, Mallory-Weiss tear, Boerhaave's syndrome, mediastinitis, myocarditis, pericarditis, pleurodynia, tuberculosis, pulmonary empyema, lung abscess.

In traumatic pneumothoraces, tension pneumothorax and concomitant hemothorax must always be considered. There is a high association of other traumatic injuries in the chest and abdomen in patients with traumatic pneumothorax. Therefore, an appropriate full trauma evaluation must be completed by emergency physicians and trauma surgeons to exclude other injuries.

Classification:

There are two types of pneumothorax: 1-Traumatic 2-Atraumatic.

The two subtypes of atraumatic pneumothorax are: A- primary B-secondary.

A-Primary spontaneous pneumothorax (PSP) occurs automatically without a known eliciting event

B-Secondary spontaneous pneumothorax (SSP) occurs after an underlying pulmonary disease.

- Airway disease:

– Bullous disease including COAD

– Asthma

– Cystic fibrosis

– Hyaline membrane disease

- Infection:

– Pneumonia

– Lung abscess

– TB

- Neoplasm (primary and secondary)
- Interstitial lung disease:

– Sarcoidosis

– Collagen vascular disease

❖ Others:

– Pulmonary embolism

– Endometriosis

– Marfan's syndrome

– Catamenial

- Traumatic pneumothorax can be the result of blunt or penetrating trauma. Pneumothoraces can be even further classified as simple, tension, or open. A simple pneumothorax does not shift the mediastinal structures, as does a tension pneumothorax.

Management

Investigations

• Plain CXR

• Chest CT - Scan

• Other investigations like sputum examination, arterial blood gas analysis, bronchoscopy, etc.

Treatment

depends on the clinical scenario for patients with associated symptoms and showing signs of instability

1_ Needle: needle decompression is the treatment of a pneumothorax. This usually is performed with a 14- to 16-gauge and 4.5 cm in length angiocatheter, just superior to the rib in the second intercostal space in the midclavicular line. After needle decompression or stable pneumothoraces,

2-Chest tube/ thoracostomy tube: the treatment is inserting a thoracostomy tube. This usually is placed above the rib in the fifth intercostal space anterior to the midaxillary line. The size of the thoracostomy tube usually ranges depending on the patient's height and weight and whether there is an associated hemothorax.

3-Surgery: Open "sucking" chest wounds are treated initially with a three-sided occlusive dressing. Further treatment may require tube thoracostomy and chest wall defect repair. In an asymptomatic small primary spontaneous pneumothorax (Depth less than 2cm),

1- The patient is usually discharged with follow-up in outpatient after 2-4 weeks.

2_If the patient is symptomatic or the depth/size is more than 2cm, needle aspiration is done; after aspiration, if the patient improves and residual depth is less than 2cm, then the patient is discharged; otherwise, tube thoracostomy is done.

In secondary spontaneous pneumothorax,

1-If the size/depth of pneumothorax is less than 1cm and there is no dyspnea, the patient is admitted, high-flow oxygen is given, and observation is done for 24 hours.

2-If size/ depth is between 1-2cm, needle aspiration is done, then the residual size of pneumothorax is seen; if the depth after the needle aspiration is less than 1cm, management is done with oxygen inhalation and observation,

and in case of more than 2cm, tube thoracostomy is done. In case of depth more than 2cm or breathlessness, a tube thoracostomy is done.

Spontaneous Pneumothorax

Definition:

spontaneous pneumothorax (SP) describes the movement of air from the lung into the pleural cavity in the absence of trauma ،Spontaneous pneumothorax (SP) is a common thoracic condition with an incidence of seven to nine cases per 100,000 of the population annually. It has an estimated recurrence rate of 23±50% after the first episode which may rise up to 80% after the third pneumothorax.

Classification

Primary and secondary pneumothorax must be considered as different populations. The specific abnormality of the lung leading to a pneumo- thorax is a major factor that governs the surgical tech- nique which can be used to deal with it. The pathological lesion leading to((primary spontaneous pneumothorax)), typically in young and otherwise fit patients, is a pul- monary bleb, usually situated at the apex of a lobe. These blebs are by definition small (less than 1 cm). Although the blebs may be multiple, the intervening lung is healthy. This group of patients is easily treated surgically by many different techniques, all of which involve excision or ablation of the bleb. Virtually all cases can be treated very effectively with VATS. In contrast, ((secondary pneumothorax)) which typically occurs in patients with emphysematous lungs is more difficult to treat surgically. The patients are usually elderly with limited pulmonary reserve

and may have other medical problems. The site of the air leak may be a bulla or a generally emphysematous part of the lung. The bullae are often of complex shape, being multi- locular, sessile, and merging into the adjacent diseased parenchyma. Rarely is a discrete, large, pedunculated bulla responsible for a pneumothorax, although if it is, this may be dealt with by ligating the neck of the bulla.

Pathophysiology

- Emphysema-like changes:

As PSP occurs in a normal patient without known lung disease. It is important to note that this does not mean there is no underlying pathologic process. A finding of abnormal pleura is very common in PSP. Abnormalities seen in PSP include blebs and bullae, which are otherwise known as emphysema-like changes (ELCs) Abnormalities can be visualized radiographically with high-resolution computed tomography (CT) scans and macroscopically at thoracoscopy

- Pleural porosity:

ELCs are not the sole cause of PSP. Pleural porosity explains air leak that has been described in areas where no ELCs are seen. High-grade abnormalities were not seen in control patients. When studied with electron microscopy, the linings of some resected areas of ELC have been shown to be almost completely absent of mesothelial cells and have abnormal pores present

- Distal airway inflammation:

Pathologic findings suggest an inflammatory cause to the formation of ELCs. Chronic distal airway inflammation with lymphocyte and macrophage infiltration alongside fibrotic changes and compensatory emphysema can be seen microscopically in areas of lung tissue from patients with PSP. It has been proposed that distal airway inflammation associated with PSP leads to obstructive gas trapping and consequent increases in distal airway pressure, which possibly causes air leak into the pleural space

- Genetics:

Familial inheritance of pneumothorax describing the clustering of PSP in certain families has been published. Autosomal dominant, autosomal recessive, polygenic, and X-linked recessive inheritance mechanisms have been proposed. In one study of 198 patients with this syndrome, 48 patients (24%) had a history of pneumothorax.

It is hypothesized that familial spontaneous pneumothorax is caused by a connective tissue disorder that exhibits mendelian inheritance and FBN1 has been postulated as the causative gene.

- Smoking:

Cigarette smoking is a significant risk factor for PSP. It is thought to be due to the consequences of airway inflammation leading to airway obstruction with a check valve phenomenon, causing air trapping and development of pneumothorax. It is found that cannabis smoking may have a causative link to spontaneous pneumothorax. Toxicological screening showed that tetrahydrocannabinol (THC) which is the active ingredient in Hashish & Cannabis comes on top of the list that associated with increased risk of pneumothorax followed by Tramadol.

Cinical features:

Clinical diagnosis: In the absence of an associated disorder, PSP is rarely seen before puberty. It is more common in men than in women by a ratio of 6:1, and it is more common in smokers than in nonsmokers. The typical patient with SP is a young, tall, thin male in late adolescence or early adulthood. Many patients (especially those with PSP) therefore present several days after the onset of symptoms. The longer this period, the greater is the risk of re-expansion pulmonary edema (RPO). Generally, SSP associated with clinical symptoms which are more severe than those associated with PSP, and the most prominent symptom is breathlessness that is out of proportion to the size of the pneumothorax. These clinical manifestations are therefore unreliable indicators of the size of the pneumothorax.

Physical signs:

Physical signs of a pneumothorax may be subtle but, characteristically, include: -

Reduced lung expansion, hyper-resonance on percussion, decreased chest movement ipsilaterally and diminished breath sounds on the side of the pneumothorax. Added sounds such a ‘clicking’ can occasionally be audible at the cardiac apex. In association with these signs, cyanosis, sweating, severe tachypnoea, tachycardia and hypotension may indicate the presence of tension pneumothorax. Arterial blood gas measurements are frequently abnormal in patients with pneumothorax, with the arterial oxygen tension (PaO2) being <10.9 kPa in 75% of patients but are not required if the oxygen saturations are adequate (>92%) on breathing room air .

Investigations:

Plain CXR, Chest CT - Scan, Other investigations like sputum examination, arterial blood gas analysis, bronchoscopy, etc.

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Management

The main goal for the treatment of spontaneous pneumothorax is to evacuate the gas from the pleural space and the prevention of recurrences. The guidelines from the American College of Chest Physicians (ACCP) and the British Thoracic Society (BTS) are focused mainly on the management of pneumothorax in adults but not pediatric cases, specifically. Nevertheless, it is appropriate to initiate 100% oxygen via a non-rebreather mask and continuous cardiopulmonary monitoring for patients with spontaneous pneumothorax. Oxygen increases the rate of absorption of the gas from the pleural space up to four-fold compared to the absorption of 1% to 2% of the volume per day without oxygen. Clinically unstable patients with severe symptoms or symptoms suggestive of tension pneumothorax can be treated with emergent needle decompression as a bridge to tube thoracostomy placement.

For stable patients presenting with a small primary spontaneous pneumothorax for the first time, conservative management with supplemental oxygen and observation of at least 6 hours is recommended. If repeat chest radiograph shows evidence of a stable pneumothorax and the patient has access to adequate follow-up, then the patient can be discharged with strict return precautions for a 24-hour recheck. The British Thoracic Society suggests that certain asymptomatic patients with large primary spontaneous pneumothorax may be considered for observation without active intervention. The American College of Chest Physicians recommends aspiration for large or symptomatic primary spontaneous pneumothorax with a small-bore catheter (14F or smaller) or, if the initial aspiration fails, admission with a chest tube (16F to 22F). Larger primary spontaneous pneumothorax can be further managed with video-assisted thoracoscopy surgery (VATS) or thoracotomy to perform bullectomy, pleurectomy, and mechanical pleurodesis (i.e., dry gauze abrasion). VATS is less invasive than thoracotomy and has been shown to be an effective measure in the treatment and prevention of spontaneous pneumothorax recurrence.

Patients with recurrent primary spontaneous pneumothorax should be admitted with thoracostomy tube placement as a bridge to VATS. In patients that are unwilling to undergo VATS, are poor surgical candidates, or are being managed in an institution where VATS is not readily available, chemical pleurodesis can be performed with the introduction of irritants such as tetracyclines (i.e., doxycycline, minocycline) or talc via the thoracostomy tube. The inflammatory processes associated with chemical pleurodesis lead to the formation of pleural adhesions that effectively obliterate the pleural space.

In adults presenting with secondary spontaneous pneumothorax, both the American College of Chest Physicians and the British Thoracic Society recommend admission with supplemental oxygen and repeat chest radiograph in small secondary spontaneous pneumothorax. The

organizations also recommend placement of a pleural catheter or thoracostomy tube if the secondary spontaneous pneumothorax is large, the patient is symptomatic, or the secondary spontaneous pneumothorax is bilateral. Observation alone is not recommended as there is an increased risk for mortality in secondary spontaneous pneumothorax. Referral to a thoracic specialist is recommended, but not until the patient is stabilized with a chest drain.

Video-Assisted thoracoscopic Surgery

Introduction:

Pneumothorax is a clinical condition characterized by the accumulation of air in the pleural space, leading to lung collapse. The management of pneumothorax can be conservative, interventional, or surgical

Overview of Video-Assisted thoracoscopic Surgery (VATS)

Historical Background

The origins of VATS date back to the early 20th century when Jacobaeus first introduced thoracoscopy for pleural examination. However, the development of advanced imaging technology, surgical instruments, and anesthesia techniques in the 1990s led to the widespread adoption of VATS for complex thoracic procedures.

(VATS) has emerged as a cornerstone of contemporary thoracic surgery, facilitating a shift toward minimally invasive surgical techniques. This approach enables surgeons to perform intricate thoracic procedures with enhanced visualization through a thoracoscopean elongated endoscopic instrument equipped with a camera and light sourcethereby minimizing the need for extensive incisions typically required in traditional thoracotomy. VATS has been effectively employed for various indications, including lung resections (lobectomies and wedge resections), pleural biopsies, and the management of thoracic empyema.

Instruments Utilized in VATS

The efficacy of VATS relies on specialized instrumentation that enhances surgical precision and safety. Key instruments include:

1. Thoracoscope: allows for real-time visualization of the thoracic cavity. Modern thoracoscopes feature high-definition cameras that provide a magnified view of the surgical field.

2. Endoscopic Graspers and Scissors: Designed to facilitate the manipulation and transection of tissues within the confined thoracic space.

3. Electrocautery Devices: Used for hemostasis and tissue dissection, delivering controlled thermal energy to coagulate blood vessels.

4. Endoscopic Staplers: Critical for achieving hemostatic closure of resected lung parenchyma.

5. Optical Systems and Monitors: High-resolution monitors display thoracoscopic images, enabling the surgical team to maintain situational awareness throughout the procedure.

Indications for *Video-Assisted thoracoscopic* Surgery (VATS) Generally:

1. Lung Cancer: Indicated for the resection of primary lung tumors, allowing for oncological clearance with reduced postoperative morbidity

2. Pleural Effusion: Employed for drainage and biopsy of pleural effusions, particularly in cases of empyema.

3. Benign Lung Lesions: Indicated for the resection of benign pulmonary nodules, especially when diagnostic uncertainty exists.

4. Mediastinal Masses: Utilized for the excision of mediastinal tumors, providing access with minimal invasiveness.

5.pneumothorax

6. Thoracic Outlet Syndrome: Used for the decompression of thoracic outlet syndrome due to anatomical anomalies

7. Lung Biopsy: Facilitates obtaining tissue samples for definitive diagnosis of pulmonary conditions

8. Pulmonary Fistula or Bronchopleural Fistula: Indicated for the repair of fistulas, promoting closure while minimizing thoracic trauma.

9. Can be used in oesophagectomy and hiatal hernia management.

Indications of VATS in Pneumothorax

VATS is typically indicated in the following scenarios:

• Recurrent pneumothorax: Recurrent episodes, particularly if they are affecting the same lung.

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• Persistent air leak: When the pneumothorax persists despite conservative management.

• Failure of conservative treatment: When a pneumothorax does not resolve with simple aspiration or chest tube insertion.

• Large or bilateral pneumothorax: In cases where the air leak is significant or both sides are affected.

Contraindications:

While VATS is generally safe and effective, there are absolute and relative contraindications:

- Absolute Contraindications:

1. Inability to tolerate single-lung ventilation.

2. Extensive pleural adhesions.

3. Uncontrolled bleeding or hemodynamic instability.

-Relative Contraindications:

1. Large tumors requiring en bloc resection.

2. Severe pulmonary dysfunction limiting operative feasibility.

Advantages of VATS

1. Minimally Invasive Approach: Significantly reduces postoperative morbidity and enhances recovery trajectories.

2. Decreased Length of Stay: Associated with shorter hospital stays compared to traditional open approaches.

3. Lower Complication Rates: Confers a lower incidence of postoperative complications. Can be used in oesophagectomy and hiatal hernia management reduce risk of infection ,chronic pain and prolonged air leaks in pneumothorax

4. Aesthetic Outcomes: Smaller incisions result in favorable cosmetic results, enhancing patient satisfaction.

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Disadvantages of VATS

1. Steep Learning Curve: Requires significant training and technical proficiency.

2. Patient Selection Criteria: Not all patients are suitable candidates; some may require conversion to open surgery.

3. Resource Limitations: Advanced surgical technology and skilled personnel are necessary for successful implementation.

4. Complication Risks: Potential for intraoperative complications, including bleeding and vascular injury.

Patient Outcomes Following Video-Assisted Thoracic Surgery (VATS).

Recovery Times

Patients undergoing VATS typically experience faster recovery times compared to those who undergo traditional open thoracotomy. Studies indicate that the minimally invasive nature of VATS results in less postoperative pain, allowing patients to mobilize earlier. The average hospital stays after VATS lobectomy ranges from 2 to 5 days, while traditional thoracotomy may necessitate a stay of 5 to 10 days or more.

Additionally, patients often resume normal activities within 1 to 2 weeks post-VATS, compared to 4 to 6 weeks for those who underwent open surgery.

Complication Rates

The safety profile of VATS is generally favorable, with lower complication rates compared to traditional surgical approaches. A meta-analysis of multiple studies indicates that the overall complication rate for VATS ranges between 5% to 10%.

Common complications include:

- Arrhythmias.
- Blood clots and strokes.
- Bruising.
- Collapsed lung (pneumothorax) or atelectasis (lung air sacs don’t properly in[ate).

- Damage to nearby glands, organs, nerves or blood vessels.
- Hypoxemia (low blood oxygen).
- Infections.
- Internal bleeding and blood loss.
- Respiratory problems like pneumonia

Long-Term Outcomes

Long-term outcomes for patients undergoing VATS, particularly in lung cancer resections, are comparable to those associated with traditional thoracotomy. Studies indicate that patients undergoing VATS for lung cancer have 5-year survival rates similar to those who underwent open surgery. This emphasizes that the choice of surgical technique should consider patient-specific factors rather than surgical modality alone.

Comparison Between VATS and Traditional Approaches for Treating Pneumothorax

The management of pneumothorax has historically relied on traditional techniques such as chest tube placement and, in cases of recurrent or large pneumothoraces, open thoracotomy. While these methods can be effective, they often involve more significant trauma to the thoracic cavity and longer recovery times. VATS, on the other hand, offers a minimally invasive alternative for treating pneumothorax, allowing for direct visualization and targeted intervention. In cases where surgical intervention is necessary, such as pleurodesis to prevent recurrence, VATS significantly reduces postoperative pain and recovery time compared to open surgery. Studies have shown that VATS for pneumothorax results in shorter hospital stays, typically 1 to 3 days compared to 4 to 7 days for traditional open approaches. Furthermore, the complication rates are lower with VATS, with fewer patients experiencing prolonged air leaks and other postoperative complications. This minimally invasive approach not only improves patient comfort but also enhances overall outcomes, making VATS a preferred option in contemporary thoracic surgical practice for the treatment of pneumothorax.

VATS Procedure in Pneumothorax Management

VATS is a minimally invasive procedure where a thoracoscope (small camera) and specialized instruments are inserted through small incisions in the chest wall. The process typically includes the following steps:

1. Preparation: The patient is positioned under general anesthesia. A single-lumen endotracheal tube is used to facilitate ventilation, and the patient is placed in a lateral decubitus position.

2. Insertion of Ports: Small incisions (usually 3) are made for the introduction of the thoracoscope and surgical instruments.

3. Examination of the Pleural Cavity: The thoracoscope is inserted to visualize the lung and pleura for abnormalities such as blebs, bullae, or other causes of air leakage.

4. Definitive Treatment:

• Pleurodesis: A procedure that involves the introduction of irritants (e.g., talc) into the pleural space to induce adhesion between the visceral and parietal pleura, preventing future pneumothoraces.

• Blebs/Bullae Resection: Blebs or bullae are excised to prevent future leaks.

• Mechanical or Chemical Pleurodesis: If the pneumothorax is recurrent, pleurodesis is performed to reduce the chances of future episodes.

5. Postoperative Care: Chest drainage is usually required for a short period post-surgery, and the patient is monitored for any complications, including infection or re-expansion pulmonary edema.

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Figure 1: The image shows two small surgical incisions on the chest wall, a common approach in Video-Assisted Thoracoscopic Surgery (VATS). These incisions are used to insert the thoracoscope and surgical instruments, allowing access to the thoracic cavity through a minimally invasive technique. This method reduces tissue damage, accelerates recovery, and minimizes postoperative pain and hospital stay compared to traditional open surgery

Patients and Methods:

The samples were collected from the hospitals of Thi-Qar Governorate (Al-Hussein Teaching Hospital and Al-Nasiriyah Teaching Hospital from January 2022 to January 2025 after obtaining approval from the official authorities to conduct the research Information about patients. Medical history, symptoms, age, etc. was taken.

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Table 1: Correlation of the Patients' Gender suffered from pneumothorax and was treated by VATS

Gender of Patient	No. of Patients	Percentage
Male	20	100%
Female	Zero	0%

Table 2: Correlation of the Patients Age and suffered from pneumothorax and was treated by VATS.

Age	No. of Patients	Percentage
15-20y	8	40%
21-25y	1	5%
26-30y	9	45%
31-35y	1	5%
36-40y	1	5%

Table 3: This table shows site of pneumothorax in all patients.

Affected side	No. of patient	Percentage
Right side	13	65%
Left side	7	35%

Table 4: Presentation of Patients with Pneumothorax.

Presentation	No. of patients	Percentage
Unilateral chest pain	20	100%
Dyspnea	15	75%
Cough	6	30%
Unilateral shoulder pain	4	20%
Fever	10	50%
Obstructive shock with cyanosis	1	5%

Table 5: Table shows patients treated with VATS during the first attack or after recurrence Pneumothorax. All Patient had been exposed to VATS after recurrence of pneumothorax except 3 for whom VATS was done after first attack due to the fact that were living in rural areas and they were afraid of recurrence and it's dangerous consequences

Case	No. of Patients	Percentage %
VATS after first attack	3	15%
VATS after recurrent	17	85%

Table 6: Shows The relationship of smoking with pneumothorax

Smoking status	No. of Patients	Percentage%
Smokers	7	35%
Non-Smokers	13	65%

Table7: All were tall, slim and athletic except 2 who were a little bit obese

Case	No. of patients	Percentage%
Tall, Slim and Athletic	18	90%
Slightly obese	2	10%

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Table 8: showing develop Pneumothorax during exercise and rest

Case	No. of patients	Percentage%
Development of Pneumothorax During Exercise	14	70%
Development of Pneumothorax During Rest	6	30%

Table 9: This table shows the recurrence of pneumothorax after VATS. It also shows mortality during and after VATS.

Recurrence Of Pneumothorax after VATS	**0%**
Mortality during VATS	0%
Mortality after VATS	0%

Discussion:

Our research was compared with two studies conducted in different countries. J.M. Galbis Caravajal (2003): Video-Assisted Thoracoscopic Surgery in the Treatment of Pneumothorax (107 patients, published in Archivos de Bronconeumología). Al-Mourgi & Alshehri (2015): VATS vs. Conservative Treatment for First-Time Spontaneous Pneumothorax (19 patients, published in International Journal of Health Sciences, Qassim University) Iraq Study (2024): VATS in Management of Spontaneous Pneumothorax in Thi Qar Province (20 patients).

Number of Patients and Gender Distribution

The Galbis Caravajal study had the largest sample size, including both males and females, making its findings more generalizable. The Al-Mourgi & Alshehri study had a male-to-female ratio of 18:1, reinforcing the fact that spontaneous pneumothorax (SP) is far more common in males. The Iraq study included only male patients, which might reflect either the actual prevalence in that region or cultural and medical accessibility factors that limited female participation.

We observe that the sample size different This is due to the presence of specialized centers and the number of doctors referring patients to these specialized centers, which is something we lack in our country.

Smoking Status

The Al-Mourgi & Alshehri study emphasized that smoking significantly increases the risk of spontaneous pneumothorax, with heavy smokers facing up to 100 times the risk of non-smokers.

The Iraq study documented smoking in 35% of patients, lower than expected, possibly due to regional lifestyle differences. Galbis Caravajal did not report smoking status, making direct comparison difficult.

Symptoms and Presentation

Chest pain and dyspnea were the most common symptoms across all studies, confirming that these are the key clinical signs of spontaneous pneumothorax. The Iraq study reported fever in 50% of cases, which is unusual for pneumothorax. This suggests possible coexisting infections or inflammatory reactions.

Diagnosis Methods

All studies relied on chest X-ray and CT scans for diagnosis. Galbis Caravajal also emphasized clinical examination, which remains a vital part of diagnosis but is often supplemented with imaging.

Treatment Approach

Galbis Caravajal used VATS for all cases, often with pleurodesis, a technique to prevent recurrence. Al-Mourgi & Alshehri compared VATS with conservative treatment, showing that VATS led to shorter hospital stays and lower recurrence rates. The Iraq study performed VATS mostly after recurrence (85%), suggesting that conservative management was initially attempted but often failed.

Recurrence Rate After Surgery

Galbis Caravajal reported a low recurrence rate of 1.8%, confirming VATS effectiveness. Al-Mourgi & Alshehri found no recurrence in the VATS group, compared to 40.9% in the conservative group, reinforcing that VATS is superior to chest tube drainage alone. The Iraq study post-VATS pneumothorax recurrence rate: Number of patients who experienced post-VATS recurrence of pneumothorax after observation 0%

Mortality Rate

All studies reported zero mortality, confirming that VATS is a safe procedure.

Purpose of VATS and Complications

VATS was mainly used for recurrent pneumothorax and persistent air leaks in all studies. Galbis Caravajal had higher complication rates in secondary pneumothorax cases (45%), while primary cases had only a 6% complication rate. Al-Mourgi & Alshehri found minimal complications with VATS compared to conservative treatment.

Advantages of VATS

Lower recurrence rates compared to conservative treatment (as seen in Al-Mourgi & Alshehri). Minimally invasive with faster recovery (Galbis Caravajal, Iraq study). Shorter hospital stay and fewer complications than open surgery. Cost-effective in the long term despite higher initial costs (Al-Mourgi & Alshehri). The Iraq study did not specify complications, but their focus was on when VATS was performed

Conclusion:

Video-Assisted Thoracic Surgery (VATS) has proven to be a highly effective and minimally invasive technique for the management of spontaneous pneumothorax. The findings from this study reinforce several key advantages of VATS:

1. Low Mortality Rate – The study and comparison with other research confirm that VATS is a safe surgical procedure with a negligible mortality rate.

2. Short Hospital Stay – Patients who undergo VATS typically remain in the hospital for less than 48 to 72 hours, significantly reducing healthcare burden and improving patient recovery times.

3. Cosmetic Advantage – Unlike traditional thoracic surgeries that require large incisions, VATS involves small surgical wounds, leading to minimal scarring and an enhanced cosmetic outcome for patients.

4. Low Recurrence Rate – The recurrence of pneumothorax post-VATS is significantly lower compared to conservative management, making it a preferred choice for patients with recurrent pneumothorax.

5. Reduced Postoperative Pain and Complications – The minimally invasive nature of VATS translates to less postoperative pain, lower risk of infections, fewer air leaks, and decreased likelihood of chronic pain syndromes compared to open thoracotomy.

6. Improved Patient Recovery and Return to Normal Activities – Patients who undergo VATS resume daily activities much faster than those who undergo traditional open surgery.

Recommendations:

Based on the findings of this study and a comparison of VATS with traditional open-chest surgery, the following recommendations are proposed:

1. Preference for VATS Over Open Thoracotomy. Lower Risk & Mortality: VATS has significantly lower surgical risks and mortality rates compared to open thoracotomy. Minimally Invasive: Unlike open-chest surgery, VATS requires only small incisions, leading to less tissue damage, minimal bleeding, and a faster recovery time. Better Cosmetic Outcome: Open thoracotomy leaves large scars and may cause long-term musculoskeletal discomfort, whereas VATS results in small, nearly invisible scars. Shorter Hospital Stay: Patients undergoing VATS usually recover within 48-72 hours, while open thoracotomy patients may require a week or more in the hospital. Reduced Postoperative Pain and Complications: VATS leads to less pain, fewer infections, and a lower likelihood of long-term complications compared to open surgery.

2. VATS to Prevent Pneumothorax Recurrence. Patients with recurrent pneumothorax or persistent air leaks should undergo VATS as the first-line surgical intervention to prevent future episodes. VATS pleurodesis significantly reduces recurrence rates compared to conservative treatment or chest tube drainage alone. Early intervention with VATS can prevent severe complications, such as respiratory failure or lung collapse

3. Early Referral to Specialized Thoracic Centers. Patients diagnosed with pneumothorax should be referred to hospitals with VATS capability to ensure the best surgical approach is taken early, rather than resorting to repeated conservative management.

4. Public Awareness and Prevention. Smoking Cessation Programs should be promoted, as smoking significantly increases the risk of pneumothorax. Regular medical check-ups for high-risk individuals (e.g., tall, thin males, smokers, those with lung diseases). Exercise Caution: Athletes and individuals engaging in high-intensity sports should be educated on pneumothorax risks and symptoms.

5. Training and Investment in VATS. Governments and healthcare institutions should increase investments in VATS technology and surgeon training, ensuring more hospitals have access to minimally invasive thoracic surgery. Developing specialized VATS training programs to enhance surgeon proficiency and improve patient outcomes.

References:

1. Wang, J. et al. "The Evolution of Video-Assisted Thoracic Surgery." Thoracic Surgery Clinics.

2. Castañeda-Guarderas, A. et al. "The role of video-assisted thoracoscopic surgery in the management of lung cancer." Lung Cancer.

3. Mazzella, A. et al. "Lobectomy for lung cancer: A comparison between video-assisted thoracoscopic surgery and thoracotomy." Journal of Thoracic Disease.

4. Bansal, S. et al. "Management of pleural effusion with video-assisted thoracoscopic surgery." The Annals of Thoracic Surgery.

5. Gruber, L. et al. "Minimally invasive resection of benign pulmonary nodules." Journal of Robotic Surgery.

6. Asamura, H. et al. "Thoracoscopic resection of mediastinal tumors." Annals of Thoracic Surgery.

7. Jansen, J. et al. "Video-assisted thoracic surgery for thoracic outlet syndrome." Journal of Thoracic Disease.

8. Nguyen, B. et al. "Diagnostic utility of video-assisted thoracoscopic lung biopsy." Respiratory Medicine.

9. Szapiro, D. et al. "Management of bronchopleural fistulas: A review." European Journal of Cardio-Thoracic Surgery.

10. Gagnon, M. et al. "Current techniques in thoracoscopic surgery." The Thoracic and Cardiovascular Surgeon.

11. Weigel, T. et al. "Instrumentation in VATS." Surgical Endoscopy.

12. Ghaferi, A. et al. "The role of energy devices in VATS." The Annals of Thoracic Surgery.

13. Nardelli, A. et al. "Endoscopic staplers: Advances and outcomes." Journal of Thoracic Disease.

14. Melton LJ, Hepper NGG, Offord KP. Incidence of spontaneous pneumothorax inBlomstedt County, Minnesota. Am Rev Respir Dis1979; 120:1379±1381.

15. Light RW. Management of spontaneous pneumothorax Rev Respir Dis1993; 148:245±248.

16- Waller DA, Forty J, Morritt GN. Video-assisted thoracoscopic surgery versus thoracotomy for spontaneous pneumothorax. Ann Thorac Surg 1994;58:372-6.

17- Graham AN, McManus KG, McGuigan JA. Videothoracoscopy and spontan

18-Keenan RJ, Landreneau RJ, Sciurba FC, Ferson PF, Holbert JM, Brown ML. et al. Unilateral thoracoscopic surgical approach for diffuse emphysema. J Thorac Cardiovasc Surg 1996;111:308-15.

19-Wakabayashi A. Thoracoscopic partial lung resection in patients with severe chronic obstructive pulmonary disease. Arch Surg 1994;129: 940-4.

20. Wong A, Galiabovitch E, Bhagwat K. Management of primary spontaneous pneumothorax: a review. ANZ J Surg [Internet]. 2019 Apr 5 [cited 2020 Apr

21. Cannabis increased the risk of primary spontaneous pneumothorax in tobaccosmokers: a case–control study | European Journal of Cardio-Thoracic Surgery| Oxford Academic. [cited 2020 Apr 9]; Available from: https://academic.oup.com/ejcts/article/52/4/679/3866758

22. Esmaeel HM, Radwan RA. Outcome of primary spontaneous pneumothorax: Could drug abuse have an effect? Egypt J Chest Dis Tuberc. 2017 Jul 1;66(3):441–4.

23. General Thoracic Surgery - Thomas W. Shields, Joseph LoCicero, Carolyn E. Reed, Richard H. Feins - Google Books.

24. Tschopp J-M, Bintcliffe O, Astoul P, Canalis E, Driesen P, Janssen J, et al. ERS task force statement: diagnosis and treatment of primary spontaneous pneumothorax TASK FORCE REPORT ERS STATEMENT. Eur Respir J. 2015; 46:321–35.

25. Henry M. BTS guidelines for the management of spontaneous pneumothorax. Thorax. 2003 May;58(90002):39ii – 52.

26. Macduff A, Arnold A, Harvey J. Management of spontaneous pneumothorax: British Thoracic Society pleural disease guideline 2010. 2010 [cited 2020 Apr

9]; Available from: http://thorax.bmj.com/

27_Schnell J, Beer M, Eggeling S, Gesierich W, Gottlieb J, Herth FJF, Hofmann HS, Jany B, Kreuter M, Ley-Zaporozhan J, Scheubel R, Walles T, Wiesemann S, Worth H, Stoelben E. Management of Spontaneous Pneumothorax and Post-Interventional Pneumothorax: German S3 Guideline. Respiration. 2019;97(4):370-402. [PubMed]

28_Wong A, Galiabovitch E, Bhagwat K. Management of primary spontaneous pneumothorax: a review. ANZ J Surg. 2019 Apr;89(4):303-308. [PubMed]

29_Santos C, Gupta S, Baraket M, Collett PJ, Xuan W, Williamson JP. Outcomes of an initiative to improve inpatient safety of small bore thoracostomy tube insertion. Intern Med J. 2019 May;49(5):644-649. [PMC free article] [PubMed].

30. Rocco G, et al. (2013). “Video-Assisted Thoracoscopic Surgery (VATS) for Primary Spontaneous Pneumothorax: A Systematic Review and Meta-Analysis.” Journal of Thoracic Disease.

31. Light RW. (2010). “Management of Spontaneous Pneumothorax.” Chest.

32. Hsu PK, et al. (2011). “The Role of VATS in the Treatment of Spontaneous Pneumothorax: A Review of Literature.” Thoracic Surgery Clinics.