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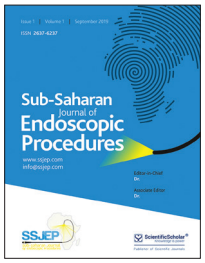

Review Article

The expected indications for video-assisted thoracoscopic surgery in Sub-Saharan Africa

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ABSTRACT

Video-assisted thoracoscopic surgery (VATS) in Sub-Saharan Africa (SSA) is still an evolving surgical procedure that can be used for well-selected patients to treat various pathologies such as pleural disease, lung pathology, esophageal disease, diaphragmatic pathology, mediastinal disease, and other conditions. From the review of literature, over the years, for which VATS has been in use showed that SSA with a good sizeable population has still not embraced the surgical procedure. This is so despite the wide spectrum of diseases and clinical conditions in the region for which VATS can conveniently be applied in other to improve post-operative outcome and reduce post-operate mortality rate. Thus, this review should be a wakeup call for the region and to stimulate the desire in them to make consistent efforts by training doctors and putting the necessary infrastructures in place to ensure the adoption of this method of medical and surgical practice as it decreases post-operative complications and post-operative mortality rates.

Keywords: Indications, Sub-Saharan Africa, Video-assisted thoracoscopy

INTRODUCTION

What is video-assisted thoracoscopic surgery (VATS)?

VATS is one of the evolving surgical procedures that is yet to be fully embraced as an important armamentarium for patient care in the day-to-day surgical practice,[1-3] especially in Sub-Saharan Africa (SSA). There are many thoracic surgical practices in SSA that may require the use of VATS, but due to the mitigating problems of cost and unavailability of human and material resources, it is not being used for them. As a matter of fact, the use of VATS was first reported in Nigeria just about 3 years ago[4] but was first introduced for the management of chest trauma in South Africa 6 years ago.[5] This is sadly so as the region population has over 1 billion persons and with a great disease burden[6] that will be ameliorated by the use of VATS.

Video-assisted thoracoscopic surgery with the acronym, VATS is a type of chest surgery that is[6] carried out using a video camera which is passed into the pleural cavity after making small chest wall incisions that are strategically placed on the intercostal space to gain access into the pleural cavity. The benefit of using VATS is while exploring the advantage of causing minimal tissue invasion and destruction as against open method of thoracotomy that involves the cutting of skin and muscles to gain access into the pleural cavity, it causes less post-operative complication.[1,2,7] and decreased mortality rate.[7] It is important to point out that there is a learning curve that is important before the surgeon can be considered an expert in VATS.

ANATOMICAL BASIS FOR VATS

The chest or the thorax is the upper part of the trunk which has the superior portion known as the thoracic inlet and the inferior portion is known as the thoracic outlet which is separated from the lower portion of the trunk by the diaphragm. It has an anterior portion that is formed by the sternum and the attaching costal cartilages. The sternum is made of the manubrium, the body, and the xiphoid process. The lateral portion has the right and the left sides which are basically bordered by the first 10 ribs on each side. The posterior portion is formed by the thoracic vertebrae and the adjoining portion of all the 12 ribs.[8] The interesting thing in all this is that there is the space in between the ribs known as the intercostal space that forms the basis for the VATS.[9]

Approach to VATS – To conduct a successful and safe VATS procedure, there should be patient assessment which will include history taking, clinical evaluations, as well as some important investigations.

Pre-operative assessment

History and clinical evaluation

The pre-operative assessment is undertaken in other to identify high risk patients who will likely develop complications after the procedure and to reduce mortality rates.[7] The pre-operative work-up will likely include tailored history to the problems that could exacerbate the effect of anesthesia and increase post-operative complication. These are a history of bleeding disorder, pulmonary diseases, previous surgery, drug allergy, concurrent medications; smoking, alcohol use and history of comorbidities such as diabetes and hypertension. The clinical evaluations are done to check for anemia, state of patients' nutrition, presence of chronic obstructive pulmonary disease, and obesity.[3]

Investigations

Lung function test is conducted with the forced vital capacity and forced expiratory volume 1 (FEV1) measured. The residual volume, total lung capacity, diffusing capacity of carbon monoxide (D_{LCO}), and transfer coefficient of carbon monoxide are calculated. These values are expressed in absolute terms (liters, liters per second) and as a percentage of the theoretical values.[10] Impaired pre-operative respiratory function is defined by an FEV1 and/or diffusing capacity of carbon monoxide (D_{LCO}) <80% of the predicted value.[7]

Cardiopulmonary exercise test (CPET) involves measuring the respiratory oxygen uptake (Vo_2), carbon dioxide production (Vco_2), and ventilatory measures during a symptom-limited exercise test.[11] CPET is being increasingly used in a wide spectrum of clinical applications for the evaluation of undiagnosed exercise intolerance and for objective determination of functional capacity and impairment.

VATS procedure

VATS procedure is commonly done under general anesthesia with single- or double-lumen endotracheal tube depending on whether lung isolation is required or not. For instance, single lung isolation is achieved with a double-lumen endotracheal tube, especially in cases, where endobronchial aspiration is anticipated such as empyema associated with lung abscess or post-pneumonectomy empyema with bronchopleural fistula.[11-13] It is desirable that an anesthetist who is competent in thoracotomy be used,[14,15] this is so as there may be the need to convert to open method should VATS fail.

The patient is positioned in the lateral decubitus and the thorax is prepped and draped as it would be for a thoracotomy. After induction of general anesthesia, access is gained through the intercostal space after placing three 1 cm incisions from where the corresponding "ports" are inserted in such a manner that if thoracotomy is required, the incisions can be linked up together to create a greater one.[14,15] Then, thoracoscope is inserted and the ipsilateral lung is collapsed for optimal visualization of the intrathoracic structures and a detailed examination of the pleural cavity. The conventional three ports so inserted are the camera port, the utility port, and the posterior port. It is from the conventional ports method that other modifications such as the modified three-port technique and the uniportal technique emerged.[1,2] At the end of the procedure, a chest tube is placed in the pleural space.

CLASSIFICATION OF THE INDICATIONS VATS

The broad classification of the indication for VATS just like for any endoscopic procedure can be for diagnostic or therapeutic use. These two classifications can be found in the management of any conditions listed below:

Pleural disease

Pleural diseases are quite common worldwide and in the SSA.[16] There is a large burden of infective and neoplastic pathologies in the SSA.[17] Many of pleural disease may be diagnosed using simple techniques, but VATS can be very helpful in the more complex cases, and with the use of VATS, as a last resort, the sensitivity for diagnosing the pleural pathology was 83% and the specificity was 100% with a predictive value of a negative result being 25%.[18] Pleural conditions that can be tackled with the use of VATS are catamenial pneumothorax,[19] pleural effusion, mesothelioma, pleural plaques, and pleural thickening and pleural effusion of unknown etiology where pleural biopsy is to be taken. VATS pleurectomy-decortication is feasible in the majority of

cases and independently improves survival for patients with advanced malignant mesothelioma.[20]

Peripheral bronchopleural fistula which is an abnormal communication between the lung and the pleural cavity can be a complication of many lung surgeries, especially in tropical regions, where the incidence of tuberculosis is high. The problem encountered intraoperatively, is in the identification of point of air leak. However, with the use of VATS, there is a better visualization, which allows more secure fixation of the vascularized grafts, and a decreased need for intervention as compared with the open approaches.[21,22]

VATS is equally appropriate modality for the management of empyema thoracis. The procedure will help to secure diagnosis of the etiology of empyema and the phase of development,[12] and in complex empyema thoracis requires adjunctive treatment with VATS.[13] Other areas where VATS has been commonly employed are pleura membrane biopsy, pleurodesis, or clearance of effusion and ligation of bleeding intercostal arteries or ruptured thoracic ducts.[23]

Lung pathology

The areas in lung pathology that VATS can be used are draining of lung abscess, excision of lung tumor, lung biopsy to establish diagnosis, pulmonary resection such as pulmonary lobectomy or pneumonectomy (for bronchiectasis, lung sequestration, lung hamartoma, lung cancer, lung cysts, etc.) and bronchoplasty surgery (central bronchopleural fistula, bronchial stenosis, etc.).[23,24]

VATS is indicated in failed therapies such as lung abscesses that have been unresponsive to antibiotic regimens and postural drainage or treatment failure that necessitated the use of transbronchial drainage with radiographically guided or open procedures. A treatment failure for lung abscess patients is that a patient with a lung abscess still remained febrile despite a 2-week course of antibiotics and three unsuccessful percutaneous drainage attempts. The advantage of the use of VATS for the treatment is that it facilities exploration and localization of the abscess and also facilitates endoscopic unroofing and debridement of the cavity. Furthermore, VATS offers a reliable and expedient option for refractory lung abscesses when compared to standard therapy alone.[25]

Esophageal disease

VATS is used for esophageal perforation that is complicated with empyema thoracis.[13] In esophagectomy, VATS can be used in combination with laparoscopy. Thus, VATS is used in the mobilization of the thoracic esophagus while laparoscopy is used to access the gastric conduit. The use of VATS for Heller myotomy is considered as a safe and effective approach in the treatment of esophageal achalasia, and VATS resection of benign esophageal neoplasm or esophageal diverticulum is also convenient and simple.[23]

Diaphragm pathology

VATS is used for plication of the diaphragm for diaphragmatic eventration resulting from phrenic nerve paralysis. Conventionally, the plication of the diaphragm was done through thoracotomy that increases morbidity for the patient after surgery. The aim of the diaphragmatic plication is to return the abdominal contents back to their normal position and allow for greater lung expansion by reducing the abundant diaphragmatic encroachment into the pleural space.[26]

Congenital diaphragmatic hernia (CDH) is a rare congenital disease that requires neonatal surgical treatment, and the traditional modality has been through surgical repair of the diaphragm by laparotomy. However, VATS techniques for the repair of CDH with late presentation have been described in the literature.[27]

VATS for truncal vagal nerve or sympathetic or splanchnic nerve resections

Truncal vagotomy is indicated for recurrent ulceration or recurrent gastrointestinal bleeding after a previous stomach surgery. VATS with bilateral truncal vagotomy presented an alternative treatment for the management of recurrent ulceration after previous stomach surgery for peptic disease.[28] VATS is applied for upper thoracic or lower thoracic sympathectomy or splanchnicectomy.[25,29]

Mediastinal disease

Most of the mediastinal tumors and surgical diseases can be treated with mini-invasive surgery such as mediastinal ectopic thyroid gland, thymic cyst, myasthenia gravis, and Stage I thymoma, and mediastinal lymph node dissection.[25,29-31]

CONCLUSION

The use of VATS in SSA is not yet in place in spite of the huge population of the area and the various disease spectra it can be used for diagnosis and treatment. The reason for this is not farfetched; the major mitigating factors of cost and lack of human and material resources are staring at us. Thus, this should be a wakeup call for the region to make a consistent effort in using this method of medical and surgical treatment of patients as it decreases post-operative complications and post-operative mortality.

Declaration of patient consent

Patient's consent not required as the patient's identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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