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Video-assisted thoracic surgery in a Nigerian teaching hospital: Experience and challenges

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Abstract

Background: Video-assisted thoracic surgery (VATS) is well established. Its application in Nigeria has however been limited and not been reported. The aim of this study was to describe our institutional experience and challenges with VATS.
Materials and Methods: This was a retrospective cross-sectional study of all patients that underwent VATS in our institution between March 2008 and June 2013. Data were extracted from a prospectively maintained database.
Results: Two hundred and sixty-one patients were assessed as potential VATS cases. VATS was initiated in 26 patients, but completed in 25 patients (9.6%) as there was one case of conversion of a planned VATS bullectomy due to the failure of one lung ventilation. There were 12 males and 13 females. Mean age was 40.7 ± 13.9 years. The indication was interstitial lung disease in 9 patients (36%), malignant pleural effusion in 6 patients (24%), spontaneous pneumothorax in 5 patients (20%), indeterminate pulmonary nodule in 2 patients (8%), pleural endometriosis in 2 patients (8%) and bronchogenic cyst in one patient (4%). Procedures performed were lung biopsy in 13 patients (52%), pleural biopsy and pleurodesis in 6 patients (24%), bullectomy and pleurodesis in 5 patients (20%) and excision of bronchogenic cyst in one patient (4%). Mean hospital stay was 4 ± 0.7 days. There were no complications and no mortalities.
Conclusion: VATS is being performed in our institution with successful outcomes. The use of VATS in Nigeria is encouraged. The relatively high cost of VATS is, however, a major limitation to more widespread use.

Key words: Nigeria, video-assisted thoracic surgery, experience

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Introduction

Video-assisted thoracic surgery (VATS) is essentially minimally invasive surgery of the chest where a thoracotomy is avoided, access to the chest being via small incisions for port access for camera and surgical instrumentation. A utility access may be created for the purpose of extracting specimens, but there is no spreading of the ribs.[1] Initially introduced in the early 20th century by Jacobaeus[2] its application waxed and waned, but the improvements in fiberoptics in the 1950s spurred development and increased use of this approach to thoracic surgery (TS).[3]

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A minimally invasive approach to achieve the same results as open thoracotomy but with the advantages of reduced hospital stay, better cosmesis, and less pain is intuitively appealing. It is now a rapidly developing field and has become increasingly popular with its use as an alternative approach in a number of diagnostic and therapeutic thoracic procedures being supported by a robust evidence base.[1,4] Its use has also extended into major pulmonary and esophageal resections.[5,6] However in the midst of this rapid development this approach to TS has seen very limited application in the developing world and there is no evidence

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in the literature of its use in Nigeria. Some progress has been made in our institution with the use of VATS.

This study was conducted because the use of VATS in thoracic practice in Nigeria has not been described. The aim of this study was, therefore, to describe our experience, and the challenges encountered with the use of VATS in our institution.

Materials and Methods

Institutional settings

Lagos is the capital of Lagos State, with an estimated population of 21 million. The study was carried out in an urban 600 bedded tertiary care hospital in Lagos with a cardiothoracic division which receives referrals largely from the medical department of the same hospital as well as from smaller peripheral hospitals in the state.

The indication for VATS was established from the clinical history, physical examination, review of chest radiograms and computerized tomography scans. In addition to the usual preoperative investigations for any major procedure, lung function tests, arterial blood gases and trans-thoracic echocardiogram were performed routinely for cardiovascular and respiratory evaluation to confirm that the patient was suitable for one-lung ventilation (OLV).

Apart from routine patient monitoring, essential monitoring in theatre involved continuous pulse oximetry and capnography to monitor end-tidal carbon dioxide. All patients were premedicated with glycopyrrolate 0.2 mg and induction of anesthesia was achieved with propofol 2 mg/kg, suxamethonium 2 mg/kg, fentanyl 2 mcg/kg or pentazocine 15 mg/kg after which the appropriate size of a portex brand left double lumen tube (DLT) was introduced in all cases. Anesthesia was maintained with isoflurane 1–1.5 MAC, atracurium 0.5 mg/kg and fentanyl as needed. DLT placement was verified early in the series by chest auscultation and by flexible bronchoscopy in the majority of patients later.

Only instrumentation specifically designed for VATS was used. For most procedures, a 2 cm incision was made in the 7th intercostal space just below the angle of the scapula. The pleural cavity was explored with a finger to exclude adhesions that might prevent lung collapse. A camera was introduced through that port and the lung and pleura visualized. Depending on the procedure being performed, additional ports were introduced for grasping forceps and endoscopic staplers as required. Ports were sited such that if conversion to thoracotomy was required this could easily achieved by an incision joining the ports. Operative manipulations varied depending on the exact procedure being performed.

Methods

Institutional ethics committee approval was obtained for the use of existing patient records and interrogation of an existing prospectively maintained electronic database. This was a retrospective cross-sectional study of all patients that were considered for VATS in our institution between March 2008 and June 2013. Data on potential VATS cases and cases that proceeded to VATS were extracted from the database. Extracted data included patient demographics, indication for VATS, VATS procedure performed, outcome, complications and histology of biopsy specimens. Summary data is presented as mean ± standard deviation, numbers or percentages as appropriate.

Results

During the study period, 261 patients were assessed as potential VATS procedures. VATS was initiated in 26 patients, but there was one case of conversion from a planned VATS bullectomy to an open thoracotomy due to the failure of OLV. VATS was completed in the remaining 25 patients (9.6%). There were 12 males and 13 females. The mean age was 40.7 ± 13.9 years. Figure 1 shows the distribution of potential VATS procedures and the number of cases that proceeded to VATS during the study period.

The indication for VATS was interstitial lung disease in 9 patients (36%), malignant pleural effusion in 6 patients (24%), spontaneous pneumothorax in 5 patients (20%), indeterminate pulmonary nodule in 2 patients (8%), pleural endometriosis in 2 patients (8%) and bronchogenic cyst in 1 patient (4%).

Video assisted thoracic surgery procedures performed were lung biopsy in 13 patients (52%), pleural biopsy and

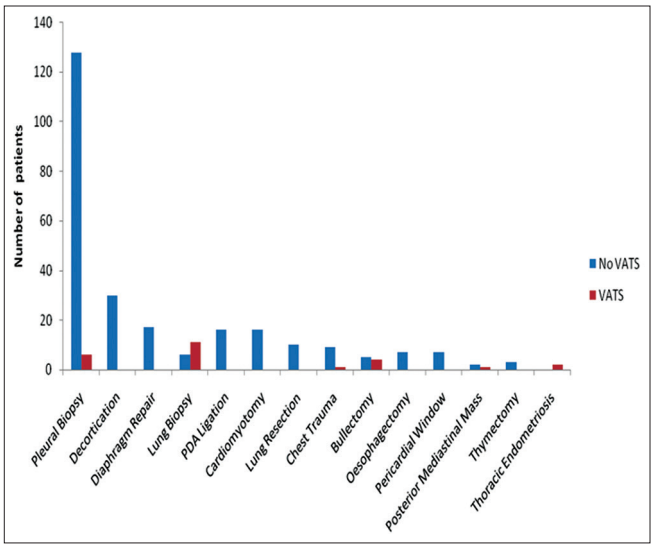

Figure 1: Potential VATS cases; VATS vs No VATS

Table 1: Procedures, indication and histology

Procedure	Indication	Histology
Lung biopsy (13)	Interstitial lung disease (9)	Pulmonary fibrosis (9)
	Pleural endometriosis (2)	Endometriosis (2)
	Pulmonary nodule (2)	Tuberculosis (2)
Pleural biopsy+ pleurodesis (6)	Malignant pleural effusion (6)	Adenocarcinoma (4)
		Mesothelioma (2)
Excision of bronchogenic cyst (1)	Bronchogenic cyst (1)	Bronchogenic cyst (1)
Bullectomy+ pleurodesis (5)	Spontaneous pneumothorax (5)	-

pleurodesis in 6 patients (24%), VATS bullectomy and pleurodesis in 5 patients (20%) and VATS resection of bronchogenic cyst in one patient (4%). The relationship between indication for VATS and specific procedure performed is as shown in Table 1.

There were no prolonged air leaks and all chest tubes were removed at 48 h. Mean hospital stay was 4 ± 0.7 days. No complications were seen. There were no mortalities.

Specimens taken at surgery were sent for all the cases except for the bullectomies. Histological diagnoses obtained from specimens taken at VATS are as shown in Table 1. No specimen was taken for the bullectomy cases.

Discussion

The 25 patients that successfully had VATS made up only 9.6% of cases we saw that were amenable to VATS. This is in contrast to what obtains in modern Thoracic practices where most of these procedures would been done by VATS.[1,3,4]

Video-assisted thoracic surgery could not be performed in one patient as the lung would not collapse following the institution of OLV. This occurred early in the series when we lacked appropriate flexible bronchoscopy for verification of positioning of double-lumen tubes (DLT) used for OLV and was probably due to DLT mal-positioning. Much as there are advantages to doing a thoracic procedure by VATS a note of caution must be sounded. A number of prerequisites must be fulfilled prior to embarking on VATS procedures. The surgeon performing the procedure should be well versed in doing the procedure by open thoracotomy (in the event that conversion to an open procedure is required). The Anesthetist must be familiar with OLV and checking DLT position with flexible bronchoscopy. Facilities for adequate preoperative cardiovascular and respiratory assessment, as well as postoperative care, must be available. Only instruments designed for VATS procedures should be used.[1] Jumping on the VATS bandwagon without these prerequisites would be premature and could result in unnecessary complications.[7]

A number of procedures that could have benefited from VATS like lung resection, esophagectomy, thymectomy, diaphragm repair, decortication, cardiomyotomy and patent ductus arteriosus ligation are still being performed as open procedures in our institution [Figure 1]. However our experience even with the simple VATS procedures was limited as most patients could not afford the cost of surgery. Hence open, less expensive procedures were performed. The cost of VATS bullectomy for spontaneous pneumothorax in our unit is 1,800 US dollars, with the cost of using staplers and reloads being 750 US dollars (almost half the cost of the procedure). Open thoracotomy without the use of staplers for the same procedure would cost 830 US dollars. This financial constraint has further limited the development of our VATS program.

Lung biopsy was performed in 13 of the 25 cases (52%). Lung biopsy or wedge excision of the lung has been shown to be preferable to open thoracotomy to obtain a histological diagnosis of lung pathology like indeterminate pulmonary nodules. This avoids the pain associated with thoracotomy, involves less surgical trauma and results in a reduction in hospital stay.[1]

A pleural biopsy was done in 6 of the 25 cases (24%). It has been shown that the diagnosis of pleural pathology like malignant pleural effusion has a better yield when performed by VATS. Diagnostic yield is around 62% with cytology, 44% with needle biopsy, but is as high as 95% for VATS as both representative tissue for histology and pleural fluid for cytology can be taken.[8] It has also been shown that without VATS, 20–25% of pleural effusions remain undiagnosed after repeated pleural fluid analyses and performance of pleural biopsies.[9] Unfortunately needle biopsy and pleural fluid aspiration is still commonly practiced in most Nigerian institutions.

VATS bullectomy and pleurodesis were performed in 5 of the 25 cases (20%). These cases presented with recurrent spontaneous pneumothorax. VATS is now the standard approach for the treatment of recurrent spontaneous pneumothorax. The pain of thoracotomy is avoided, concomitant bullectomy can be performed, the hospital stay is reduced, and with direct insufflation of the sclerosing agent there is less risk of failure of pleurodesis.[10] Mechanical pleurodesis by VATS has also been shown to be more effective than bedside pleurodesis.[11] The current consensus from the existing evidence base recommends VATS as the preferred procedure for undiagnosed pulmonary infiltrate, indeterminate pulmonary nodule, undiagnosed disease of the pleural space, recurrent or persistent pneumothorax, mediastinal or pericardial cystic tumors, management of empyema, hemostasis and suture of lacerations after trauma, cardiomyotomy, fundoplication and resection of benign esophageal lesions.[1,4] Major resections of pulmonary and esophageal cancer are more controversial. VATS

lobectomy is rapidly gaining popularity for lung resection as an alternative to open thoracotomy for the treatment of lung cancer. Apart from the obvious advantages of avoiding thoracotomy, reduced pain and reduced hospital stay, 5 years survival of stage 1 nonsmall cell bronchogenic carcinoma following VATS lobectomy has been shown to be similar to that of open thoracotomy.[12] For some thoracic surgeons, more than 50% of their lobectomies are now done by VATS.[13] Benign esophageal pathology like fundoplication and Hellers' cardiomyotomy is also increasingly being done by VATS.[6,14] Thoracoscopic esophageal resection for cancer was first described by Cuschieri *et al*. in 1992.[15] Moreover, though there were initial concerns about the adequacy of lymph node dissection,[16] centers with large experience in minimally invasive esophagectomy are reporting minimal morbidity and mortality with acceptable lymph node dissection.[17,18]

Mention is made in a report from Ghana about VATS practice in their thoracic program.[19] There are no reports in the literature of VATS in Nigeria. Though no formal survey has been done, the constraints to the development of VATS in Nigeria are likely to be training and the financial implications. As the practice of VATS so far is limited, surgeons in training are not exposed to this approach to TS. What medical insurance exists does not cover VATS procedures, so patients have to pay out of pocket. Despite the numerous benefits of VATS expounded above, the stark reality is that unless the cost of the procedure is reduced it will remain out of the reach of the average Nigerian.

Conclusion

Though the use of VATS in some selected thoracic pathologies is controversial, there is clear evidence to support the use of VATS to assist the diagnosis and treatment of several thoracic pathologies, which abound in Nigeria. We have shown in our limited series that VATS can be performed for these pathologies safely with no mortality or morbidity. The limitations to its use in Nigeria are likely to be adequate training and the financial cost. These problems are not insurmountable and can be resolved with assistance from industry in promoting education and reducing the costs of equipment and consumables to promote more widespread use of VATS.

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