



The Scope of Clinical Thoracic Surgery Practice in Nigeria: 13-Year Single Center Review

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Abstract: Background: Thoracic surgery as one of the oldest surgical specialties to have branched off from general surgery has a relatively wide scope, covering the diagnosis and treatment of the diseases affecting the various regions of the chest. The practice of this specialty and challenges affecting it in Nigeria is hereby reviewed. Aims/Objective: To review the scope of clinical thoracic surgery practice in Nigeria including its challenges and compare same with international standard. Methods: For a period of 13 years (2007-2019), the practice of clinical thoracic surgery in Nigeria was reviewed with data from the National Cardiothoracic Center of Excellence (NCTCE). The social-demography profile of the involved patients, the congenital and acquired pathologies of the various anatomic regions of the chest, diagnosis and treatment methodologies including outcomes and challenges were extracted from the database, reviewed and analyzed. Results: A total of 1883 general thoracic pathologies in 1200 patients were managed. Of this number, pleural pathology accounted for the highest number (n=687, 35.6%). 657 males and 543 females were involved with aM: F ratio of 1:0.8. Of 1883 cases, 1283 (68.1%) had some form of surgical interventions. Within this group, chest tube drainage± pleural biopsy/pleurodesis was the highest (n=611, 47.6%). Late presentations of malignant lung diseases, lack of expertise and equipment for minimal access techniques were some of the challenges. Conclusion: General thoracic surgery as a mono-specialty should be embraced, encouraged and upgraded by the training institutions in our sub-region since the workload for experts in the specialty is enormous.

Keywords: Scope, Thoracic, Nigeria, Training Institutions, Chest

1. Introduction

Thoracic surgery involves the surgical treatment of thoracic trauma, pulmonary and esophageal diseases. The volume of thoracic surgery has increased, subsequent to an increased incidence of trauma and cancer [1]. The scope of privileges in general thoracic surgery includes the evaluation, diagnosis, treatment and consultation for patients with congenital and acquired abnormalities of the chest wall, lungs, pleura, and mediastinal structures; and traumatic injuries to the chest and cardiothoracic structures [2]. Thoracic surgeons assess, stabilize, and determine the disposition of patients with emergent conditions in

accordance with medical staff policy.

The successful practice of thoracic surgery is via a team affair and members of this team usually includes surgeons, anaesthesiologists, pain management specialists, nurses, physiotherapists, respiratory therapists, occupational therapists, dietician and social workers [3]. A detailed and structured preoperative evaluation is very vital for successful intra-operative and postoperative outcome [3, 4]. The postoperative events that have significant bearing on recovery include but not limited to removal of all or part of lungs, painful incisions, retention of secretions, change in the shape and mechanics of thoracic cage, reconfiguration of gastrointestinal continuity which may result in suboptimal

pulmonary function, reduced appetite, frailty and increased risk of aspiration [5].

Shortly after the introduction of laparoscopic video-assisted techniques there was a real revival of thoracoscopic procedures and the term VATS, video-assisted thoracic surgery, was introduced. VATS is presently used for a variety of thoracic diseases including lung cancer [6]. For patients with lung cancer, preoperative evaluation of the mediastinal lymph nodes is important to estimate local operability and/or to consider the necessity of neoadjuvant treatment. Cervical mediastinoscopy (CM) is generally accepted as a safe and highly accurate procedure in the staging of lung cancer [7]. Surgical use of robotics, or computer-assisted surgical systems (CAS), has evolved over the last 10 years, for the treatment of chest diseases, however, the development has really occurred in the last 3 to 4 years [8].

General thoracic procedures can be divided into minor, major and large/specialistic, according to their complexity and costs, the latter requiring specific training and dedication due to their complexity and low numbers: knowledge of all aspects of pathophysiology, epidemiology, diagnosis, treatment and postoperative care of patients with surgical disease of the chest [9]. Surgeons working in a general thoracic (GTS) unit or department must be competent in all domains of a general thoracic surgical practice: preoperative, intra-operative and postoperative. They must be able to participate in multidisciplinary team discussions on treatment of diseases of the chest.

2. Materials and Methods

For a period of 13 years (2013-2019), the practice of clinical thoracic surgery in Nigeria was reviewed with data from the National Cardiothoracic Center of Excellence (NCTCE). The socio-demographic profiles of the involved patients, the congenital and acquired pathologies of the various anatomic regions of the chest, diagnosis and treatment methodologies including outcomes and challenges were extracted from the database, reviewed and analyzed.

Data were analyzed using IBM Corp released 2011, IBM SPSS Statistics for windows, version 20.0, Armonk, NY; IBM Corp. IBM Corp. Rates and proportions were calculated with 95% confidence interval. The proportions were compared using student's *t*-tests. Level of significance was set at $P < 0.5$.

In our tertiary hospital, the National Cardiothoracic Center of Excellence has dedicated theater, but not wards or ICU for thoracic surgical patients. They are 6 surgeons, 3 anaesthetists which later reduced to 2, 8 theater nurses, 3 biomedical engineers and 3 theater technicians. The practice is affected by interdependence with services of other specialties in the hospital like Respiratory medicine, Radiology, Histopathology, Radio-oncology, Pharmacy, Microbiology Haematology and Chemical pathology as well as Financial Accounts Department.

3. Results

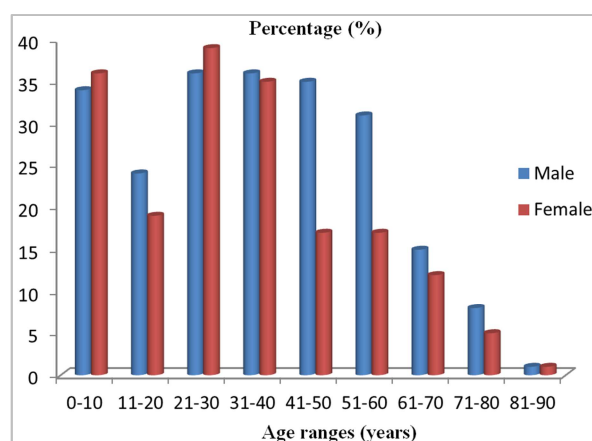


Figure 1. He age ranges and gender distributions of patients involved in clinical thoracic surgical.

This figure shows the distributions of age ranges in years for both males and females. In this group the age ranges of 21-30 years were the highest for both genders. This was followed by age ranges of 31-40 years. The least affected was the age range of 81-90 years.

Table 1. Surgical Pleura Pathology.

| Types of pathology | Number | Percentage (5) |
|---|--------|----------------|
| Chronic empyema thoracis±Bronchopleural Fistula | 60 | 8.7 |
| Malignant pleura effusion | 211 | 30.7 |
| Traumatic haemothorax | 25 | 3.6 |
| Thoracic endometriosis syndrome (TES) | 10 | 1.5 |
| Pneumothoraxes | 25 | 3.6 |
| Chylothorax | 2 | 0.3 |
| Benign Pleural effusions | 350 | 50.9 |
| Pleural based masses | 4 | 0.6 |
| | 687 | 100 |

This table showed the distributions of various pleura and pleural space pathologies. Benign or nonmalignant pleural effusions were the highest, followed by malignant pleural effusions (MPE) and chronic empyema thoracis with or without bronchopleural fistula (BPF) respectively. Pleural based masses warranting tru-cut or open biopsies were the least.

Table 2. Surgical Chest wall pathology.

| S/No | Chest wall pathology | Number | Percentage (%) |
|-------|--|--------|----------------|
| 1 | Anterior chest wall masses, breast cancer excluded | 90 | 32.4 |
| 2 | Osteomyelitis of ribs | 15 | 5.4 |
| 3 | PyogenicChest granuloma | 5 | 1.8 |
| 4 | Blunt chest injury with intact pleura | 50 | 19.0 |
| 5 | Posterior chest wall masses | 10 | 3.6 |
| 6 | Intrathoracic chest wall mass | 1 | 0.4 |
| | Flail chest | 15 | 5.4 |
| 7 | Sternal tumours | 6 | 2.2 |
| 8 | Clavicular tumours | 2 | 0.7 |
| 9 | Rib fractures | 75 | 27.0 |
| 10 | Sternal fractures | 8 | 2.9 |
| 11 | Chronic sternal wound sinus | 1 | 0.4 |
| Total | | 278 | 100 |

This table showed the distributions of chest wall pathologies. Anterior chest wall masses were dominant followed by traumatic rib fractures and blunt chest injuries with intact pleura. Intrathoracic chest wall mass and chronic sternal wound sinuses were the least.

Table 3. Surgical pathology (tracheobronchial tree/lungs).

| S/No | Ttracheobronchial tree/lung pathology | Number | Percentage (%) |
|-------|--|--------|----------------|
| 1 | Massive haemoptysis | 10 | 1.8 |
| 2 | Foreign body in the airway | 30 | 5.3 |
| 3 | Primary lung cancer | 150 | 26.4 |
| 4 | Secondary lung cancer | 200 | 35.2 |
| 5 | Destroyed lung syndrome (PTB) | 50 | 8.8 |
| 6 | Lung abscess | 13 | 2.3 |
| 7 | Benign lung masses | 70 | 12.3 |
| 8 | Bronchogenic cyst | 2 | 0.4 |
| 9 | Lung contusions | 15 | 2.6 |
| 10 | Traumatic lung lacerations | 25 | 4.4 |
| 11 | Lung infarction | 2 | |
| 12 | Interstitial lung diseases | 1 | 0.2 |
| 13 | Short segment cervical tracheal stenosis | 1 | 0.2 |
| Total | | 569 | 100 |

In this table the pathologies of the tracheobronchial tree/lungs were displayed. Secondary lung cancer was the highest followed by primary lung cancer. The least were interstitial lung diseases and short segment tracheal stenosis.

Table 4. Surgical mediastinal pathology.

| S/No | Mediastinal pathology | Number | Percentage (%) |
|-------|---|--------|----------------|
| 1 | Anterior mediastinal masses | 10 | 22.2 |
| 3 | Posterior mediastinal masses | 4 | 9.0 |
| 4 | Mediastinal masses with superior vena cava syndrome | 3 | 6.7 |
| 5 | Retrosternal goiter | 5 | 11.1 |
| 6 | Myaestina Gravis | 8 | 17.8 |
| 7 | Thymomas | 15 | 33.3 |
| Total | | 45 | 100 |

This table showed the distributions of the pathologies of the mediastinum. Thymomas were the highest followed by other anterior mediastinal masses. The least was the mediastinal masses with superior vena cava syndrome (SVS).

Table 5. Surgical pericardium pathology.

| S/No | Pericardial pathology | Number | Percentage (%) |
|-------|---|--------|----------------|
| | Pericardial effusion | 65 | 52.9 |
| | Massive pericardial effusion with impending tamponade | 20 | 16.3 |
| | Effusive constrictive pericarditis | 10 | 8.1 |
| | Cardiac tamponade | 8 | 6.5 |
| | Constrictive pericarditis | 14 | 11.4 |
| | Pyopericardium | 1 | 0.8 |
| | Haemopericardium | 5 | 4.1 |
| Total | | 123 | 100 |

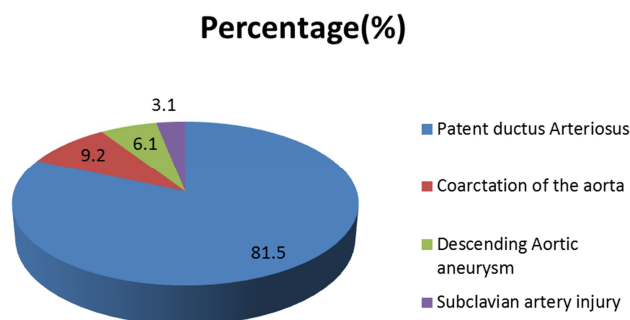


Figure 2. Thoracic vascular pathology.

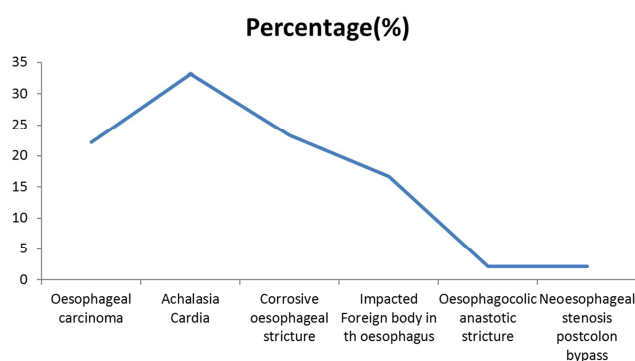


Figure 3. Surgical pathology of the oesophagus.

The table showed the distributions of the pathologies of the pericardium. Large pericardial effusion warranting closed or open drainage was the highest, followed by massive pericardial effusion with impending cardiac tamponade. One case of pyopericardium was the least.

This figure showed the thoracic vascular pathologies managed during the envisaged period. Patent ductus arteriosus (PDA) was the highest followed by coarctation of the aorta, The least was subclavian artery injury.

This figure showed the distributions of the surgical pathologies of the oesophagus. Achalasia cardia was the highest followed by corrosive oesophageal stricture. Oesophagocolonic anastomotic stricture and neoesophageal stenosis were the least

This figure showed the distributions of the surgical pathologies of the diaphragm. Traumatic diaphragmatic rupture

(TDR) was dominant followed by hiatal hernias. The least was TDR with herniation through the central tendon of diaphragm.

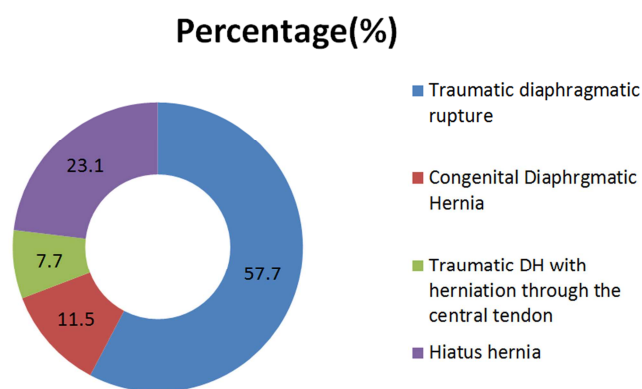


Figure 4. Surgical Pathology of the diaphragm.

Table 6. The number of thoracic surgical procedures.

| S/No | Thoracic surgical procedures | Number | Percentage (%) |
|-------|---|--------|----------------|
| 1 | Chest wall resection ± reconstruction | 106 | 8.6 |
| 2 | Chest tube drainage (CTTD)/pleural biopsy with Abraham's needle | 611 | 47.6 |
| 3 | Pleurectomy& lung decortications | 70 | 5.5 |
| 4 | Subxiphoid pericardial window | 90 | 7 |
| 5 | Pericardiectomy | 24 | 1.9 |
| 6 | Monald's procedure/percutaneous drainage of lung abscess | 3 | 0.2 |
| 7 | Lobectomy (upper/lower) | 30 | 2.3 |
| | Trucut biopsy&minithoracotomy for lung masses | 120 | 9.4 |
| 8 | Pnuemonectomy | 70 | 5.5 |
| 9 | Completion pneumonectomy | 5 | 0.4 |
| 10 | Clagget procedure | 6 | 0.5 |
| 11 | Oesophagectomy + cervical oesophagostomy + gastrostomy | 10 | 0.8 |
| 12 | Oesophagocardiomyotomy (Modified Heller's procedure) | 30 | 2.3 |
| 13 | Coarctation of aorta repair | 6 | 0.5 |
| 14 | Colon bypass | 21 | 1.6 |
| 15 | Diaphragmatic hernia repair ±prosthesis | 26 | 2 |
| 16 | Annerysmorraphy (DTA) | 5 | 0.5 |
| 17 | Vascular repair (subclavian artery) | 2 | 0.2 |
| 18 | Ligation of Patent ductus Arteriosus | 53 | 4.1 |
| Total | | 1,283 | 100 |

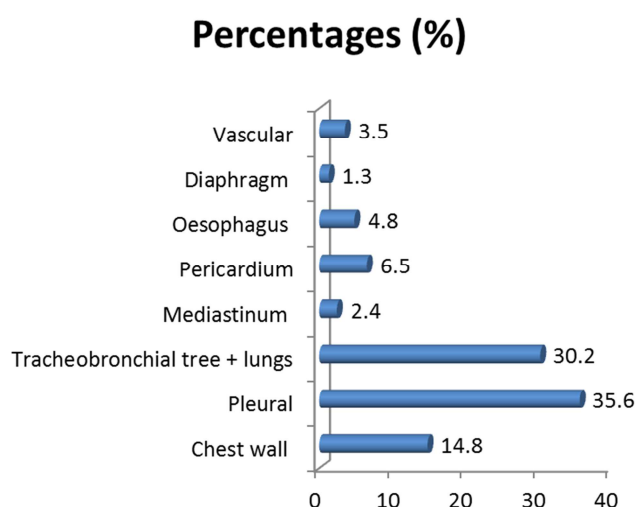


Figure 5. Thoracic anatomic regional pathologies.

This table showed the distributions of the number of

thoracic surgical procedures performed within the envisaged period. Chest tube drainage (CTTD)/pleural biopsies with Abraham's needle was the highest followed by Trucut biopsy&minithoracotomy for lung masses. The least was Monald's procedure/percutaneous drainage of lung abscess.

This figure showed the distributions of thoracic anatomic regional pathologies managed. Pleural region was significant followed by the tracheobronchial tree/lungs. The least was the diaphragmatic region.

4. Discussion

Thoracic Surgery is that branch of surgery concerned with congenital and acquired diseases of the chest wall, mediastinum, lungs, trachea, pleura, esophagus, stomach and diaphragm. At a tertiary hospital in Nigeria, a center was designated National Cardiothoracic Center of Excellence (NCTCE) in cardiac, thoracic and vascular Surgery as far back as in 1984 [10]. The surgeons are mixed surgeons for the 3 specialties, however the practice of cardiac

surgeries especially Open Heart Surgery is very limited due to deficiency in requisite equipment, inadequate skills among the members of the multidisciplinary cardiac team and funding [11].

The field of cardiothoracic and vascular surgery encompasses three major disciplines—cardiac, general thoracic and vascular surgery. In the early stages of evolution, these three fields were practiced by the same individuals. This is the case even now in several practice settings all over the world. However, maturity in the development of each discipline led to sub-specialization and specific training programs, clinical product lines and academic departments, not necessarily in that order. The last 50 years have seen that happen, particularly to general thoracic surgery, in North America and Europe. This sub-specialization has led to focused research and clinical innovation which in turn has led to significant improvement in patient outcomes [12].

At our center, the thoracic surgery is practiced fully and the organization of the practice is thus: 24/7 emergency cover is provided by general thoracic surgical consultants with residents who are able to deal with the full range of thoracic surgical emergencies including 24/7 cover of thoracic surgical inpatients in surgical, pediatric, medical, oncology and gynaecological wards. There are 3-day weekly thoracic surgery out-patient clinics provided by consultants, assisted by residents. There are 3-day weekly thoracic surgery operations for elective cases, provided by consultants assisted by residents.

With this organization, our center was able to provide the procedures for the pathologies identified in tables 2-6 and figures 2-4. In the area of chest wall pathology, 278 (14.8%) cases were managed. In the previous work of Nwafor *et al* [13] in the same center, 158 chest wall tumours in 158 patients over a 15-year period were described. In the pleura and lungs/tracheobronchial tree, 687 (36.5%) and 569 (30.2%) cases respectively were managed. Similarly, in the mediastinum and pericardium including oesophagus, 45 (2.4%), 123 (6.5%) and 100 (5.3%) cases were managed respectively. The thoracic vascular (n=65, 3.5%) as well as diaphragmatic (n=100, 5.3%) cases respectively were treated.

In a related study by Qiogzhen Li *et al* [14] at Shanghai Jiabong University Chest hospital, 62, 571 thoracic surgery procedures requiring general anaesthesia were done for a period of 11 years. Here lung surgery (n=49732), oesophageal surgery (n=4975), mediastinal surgery (n=699), tracheal surgery (n=581) and others (n=292) were the components of the procedures. Also, in another study, Ren Jing *et al* [14], carried out a study involving thoracic surgery for non small lung cancer (NSLC) for 5 years in 453 patients [15]. In Japan, in 1986, the number of general thoracic surgery cases were 15,544, which increased to 75,306 in 2013. Furthermore, the number of lung cancer operations performed in 2013 was 37,008, occupying 49.1% of all general thoracic operations [16]. The number of lung operations increased from 6,421 in 1986 to 37,008 in 2013, a 5.76-fold increase during those 28 years. According to the Japanese Association of Thoracic Society (JATS) database,

the entire number of mediastinal tumors surgically treated throughout Japan in 2013 was 4,780 [16].

5. Challenges

As a low-income country, the practice of minimal access technique in thoracic surgery is virtually absent due to nonexistence of requisite skills and equipment. As a result, patients desirous of such procedures are lost to medical tourism [17]. To remain competitive, the general thoracic surgeon will have to keep pace with technologic advances and maintain a current knowledge in the field of thoracic oncology [18]. In the practice of general thoracic surgeries (GTS) in our center, there are limitations imposed by interdependence on other disciplines especially the anesthetists. The ratio of 6 surgeons to 2 anaesthetists is grossly inadequate and this has significant bearings in the number of cases managed surgically. In the 13-year review, there was a 7-year period of surge in foreign cardiac surgery missions in our center [11]. General thoracic cases except emergencies were usually kept in abeyance during the period of the missions because, the dedicated theater and the staff were usually occupied. This affected the number of GTS cases managed.

In addition, brain drain syndrome due to poor remuneration of workers, poor public power and water supply and very few altruistic blood donors in poorly equipped national blood banks [19, 20] are some of the numerous challenges affecting the GTS practice in our center, which happens to be one of the main accredited training centers for cardiothoracic surgery by West African College of Surgery (WACS) in West African Sub-region.

6. Conclusion

The scope of GTS practice even as a mono-specialty in Nigeria with a population of over 200 million is wide and can become wider if governments, non-governmental organizations and public spirited individuals including the regulator of the training institutions (West African College of Surgeons) and National Postgraduate Medical College of Nigeria (NPMC) can put hands on the deck and ensure that appropriate things are done.

Declarations

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Conflict of Interest

The authors do not have any conflict of interest.

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Ethical Clearance

This manuscript is the product of the audit of work in our center and is exempted from ethical clearance.

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