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Research Article

Bronchiectasis: Etiology, Diagnostic Modalities, and Surgical Management

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Abstract:

Background: Bronchiectasis is a chronic disease characterized mainly by chronic cough with the production of purulent sputum. It is still seen in Iraq and developing countries, although its incidence is much lower in the developed countries.

Objectives: To highlight the etiology and the diagnostic workup of patients affected by this disease process and to assess the outcome of the surgical intervention in a properly selected patient.

Methods: Fifty-six patients were enrolled in the current study. Thirty patients were excluded as they were not surgical candidates. Twenty-six patients met our criteria, as they were surgical candidates, whose files were studied retrospectively. All the cases were admitted to the Thoracic and Vascular Department of the Surgical Specialties Hospital of the Medical City Teaching Complex, Baghdad/ Iraq, from 1st January 2018 to 31st December 2022. All cases underwent pre-operative blood investigations, diagnostic imaging, and bronchoscopy. They were subjected to surgeries with different resection procedures.

Results: Twenty of the cases were females (76.9%). while six patients were male (23.1%). The youngest patient was a seven-year-old female and the oldest was a 59-year-old male. The mean age was 27.3 years, and the median was 33 years. The most common symptoms were cough with purulent sputum. A CT scan of the chest was performed on all patients. The right middle lobe and the left lower lobe were the most affected. Twenty-five patients underwent classical postero-lateral thoracotomy. The right middle lobe and the left lower lobe were the most common lobes resected. Only one patient underwent video-assisted thoracoscopic surgery (VATS). The histopathological results were consistent with bronchiectasis in 24 patients. Post-operative morbidity included atelectasis and wound infection in one patient, they were managed successfully medically. No mortality was reported in the study.

Conclusion: Once bronchiectasis is well-established, surgery in properly selected patients, with complete resection of the involved lobe or lobes, offers the best chance of cure and optimum control of the patient's symptoms.

Keywords: Bronchiectasis; Hemoptysis; Lobectomy; Pulmonary resection; Video-assisted thoracoscopic surgery (VATS).

Introduction:

Bronchiectasis is a chronic disabling disease, still seen in Iraq and many developing countries. It is defined as a persistent abnormal dilatation of the bronchi, generally beyond the sub-segmental level, characterized by chronic cough, which is productive in nature (1). The term bronchiectasis is derived from the Greek words (broncho meaning wind-pipe) and (ectasis meaning stretching or extension) (2). Most patients with bronchiectasis present with a cough that is productive of purulent sputum, shortness of breath, hemoptysis, fever, pleuritic chest pain, and clubbing of the fingers in the advanced disease state. The onset is mostly in childhood, whereas the symptoms generally appear in the second or third decade of life. The disease is more common in females, of whom 50% present with hemoptysis (2).

Grossly, bronchiectasis is divided into three morphological types: Cystic, Varicose, and Tubular. Lannee first described the pathological findings of bronchiectasis in 1819, and the term "bronchiectasis" was applied by Hasse in 1898. The first successful operation for bronchiectasis was a partial lobe resection, performed by Krause in 1898. Sicard and Foresteir introduced bronchography in 1922, Figure (1), but this has now been completely superseded by Computerized Tomography (2).

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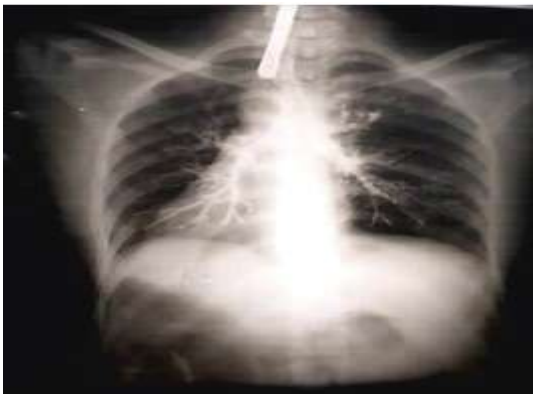

Figure (1) Bronchography

Bronchiectasis can be classified into:

1- Congenital bronchiectasis affects 25% of the patients. It results from problems due to lung maturation during intrauterine life, for example, Kartagener's syndrome (2), Figure (2), which includes (bronchiectasis, situs inversus, sinusitis, and sperm hypomotility). It represents a genetic disorder with abnormal ciliary motility, thus impairing clearance of the sputum resulting from bronchiectasis (3).

2- Acquired Bronchiectasis, 75% of which occurs due to medical conditions such as infection, cystic fibrosis, and primary ciliary dyskinesia, which damages the walls of the airways leading to acquired bronchiectasis, Figure (3).

The factors that appear to produce bronchial damage are complex, but the main two etiological factors are bronchial obstruction and infection.

Diagnosis:

A) Plain X-ray of the chest: A plain X-ray of the chest can show a collapsed segment of a lobe or lung, cavities, or pneumonic patches. However, the severity and extent of bronchiectasis cannot be assessed on plain chest films alone (2).

B) CT-Scan of the chest: High-resolution computed tomography (HRCT) of the chest is the "gold standard" for radiological diagnosis of bronchiectasis (2).

C) Pulmonary function tests (PFTs): May have different patterns of airflow limitation, including obstructive, restrictive, or mixed lung function impairment.

D) Bronchoscopy: Is indicated to exclude foreign bodies, especially in children, for exclusion of proximal obstruction in adults with localized disease, for obtaining a broncho-alveolar wash in acutely ill patients for culture and sensitivity tests, or for localizing the source of bleeding in patients with hemoptysis (3)

E) .

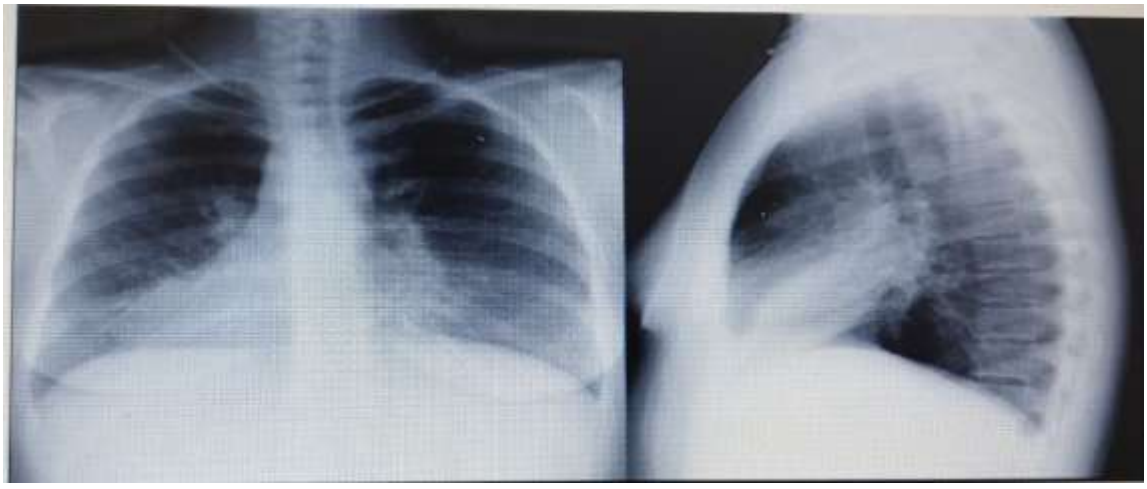

Figure (2) Congenital Bronchiectasis (Kartagener's syndrome)

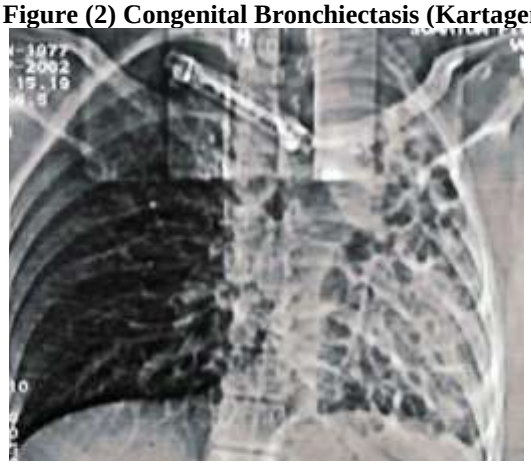

Figure (3): Destroyed left lung (Bronchiectasis)

Treatment: Treatment of bronchiectasis has been performed, according to European Respiratory Society (ERS) guidelines. Thus, the options of treatment include long-term inhaled or oral antibiotic therapy, eradication of new pathogenic microorganisms, and antibiotic treatment for exacerbations of chronic bronchial infection, (3).

Indications of surgery: The current guidelines by the ERS do not consider surgery until the symptoms are well-controlled (3). Surgery is indicated in persistent symptoms despite having one year of medical treatment, symptoms exacerbations that are either severe or frequent, interfering with social/ professional life, recurrent hemoptysis, or localized severely

damaged lobe/ segment that may be a source of sepsis if left *in situ* and may lead to the extension of lung damage (3).

Surgical procedures:

1- Thoracotomy: The extent of lung resection was determined by the extent of the disease and the cardiopulmonary reserve. Thus, lobectomy was performed for lesions limited to one lobe, segmentectomy for a fairly limited disease or when the pulmonary function is impaired, and pneumonectomy for extensive disease affecting the whole lung (3).

2- The video-assisted thoracoscopic surgery (VATS) for lobectomy in patients with bronchiectasis includes three ports, two ports, or one port VATS (4-5). Ocakcioglu described uni-portal VATS lobectomy through a utility incision of 3–5 cm from the fifth intercostal space in the anterior position, without using a rib retractor (5). During a three-port VATS, the incisions change depending on the type of resection, an upper or lower lobectomy (4). The presence of intrathoracic adhesions is a challenging problem during VATS. This can be released by blunt or sharp dissection, or it may result in the conversion of the VATS procedure to an open procedure (6). At the end of the VATS procedure, the thorax is closed after retrieval of the resected specimens and meticulous control of the air leak and hemorrhage (5)

Morbidity: The most common postoperative complication is atelectasis or sputum retention, followed by a persistent air leak.

Mortality: Chol H *et al.,* showed that comorbidities increased the mortality rate of patients with bronchiectasis both before surgery or postoperatively (7).

The study aimed to focus on the aetiology and diagnostic workup of patients affected by this disease and assess the surgical intervention's outcome in the operated-upon patients.

Patients and Methods

This is a case series study of 56 patients with bronchiectasis conducted in a single center, the Thoracic and Vascular Department in the Surgical Specialties Hospital of the Medical City Teaching Hospital / Baghdad / Iraq, during the period from 1 January 2018 to 31 December 2022.

Informed written consent was obtained after explaining the nature of the operation and its risks. The approval of the ethics committee was obtained from the Health Ethics Committee at the College of Medicine, University of Baghdad, with the registration number: 171, on 23. June 2024. Ethical considerations were obtained according to the Helsinki Declaration.

The main determinants of sampling and inclusion in our study were the surgically treated patients (Surgical Candidates). The patients were sampled regardless of their age, and both genders were included.

Non-surgical patients were excluded from our study. Twenty-six patients with bronchiectasis were admitted to our ward during the above-mentioned five-year period and were managed by our research team. The remaining 30 patients were excluded due to different reasons: Having bilateral advanced or diffuse changes or being medically unfit for any pulmonary resection. Some cases for which rigid bronchoscopy was done, had disappeared from the follow-up. Only 26 patients met the criteria for our study (operable or surgical candidates), hence, they were included in our study. They were subjected to different types of surgical resection procedures. For those cases, medical history was taken, a physical examination was conducted, and laboratory findings were recorded for all the patients, with radiological assessment by CXR and CT-scan. Rigid bronchoscopy was done under GA. Subsequently, after confirmation of the diagnosis, the patients were scheduled for surgery. Full information on these patients was retrieved from their medical files or the surgeon's notes.

Different surgical approaches were performed for our patients according to the location of the diseased segment, lobe, or lobes, such as thoracotomy under general anesthesia and single or double-lumen intubation. The resected segment or the lobe (or lobes) (biopsy material) was sent for a histopathological study, and the patient was discharged well after full recovery and removal of any inserted drain. One of our patients was subjected to VATS. The patients were followed up in the outpatient clinic, which was not regular and was depending on patients' compliance.

The data was collected in a standard form, including age, gender, presenting symptoms, preoperative investigations, imaging findings, bronchoscopic appearances, operative findings, surgical resection technique, postoperative complications, morbidity, and mortality.

Results

Of the 26 patients studied, 20 (76.9%) were females. and the remaining six patients were male (23.1%). The youngest patient was a seven-year-old female, while the oldest was a 59-year-old male, with a mean age of 27.3 years. The distribution of these patients with regard to their age and gender is illustrated in Figure (4).

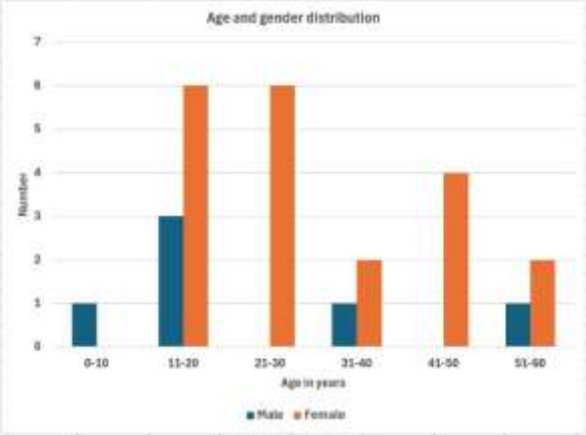

Figure (4) age and gender distribution.

As regards the morphological types of CT, cystic bronchiectasis was seen in 15 patients (57.7%). The least common was the varicose type which was seen in five patients (19.2%). The remaining 6 cases were a combination of two or more morphological types. The most common lobes affected were the right middle lobe and the left lower lobe. Bilateral pulmonary lobes involvement was also seen. The distribution of lung involvement through the imaging findings is illustrated in Table (1).

Table (1): Lung involvement by chest CT- scan in patients with bronchiectasis

Variable	Categories	Number (%) of patients
Right lung	RML	9 (33.8)
	RUL& RML	3 (11.5)
	RLL	1 (3.8)
Left lung	LLL	7 (26.9)
	LUL	2 (7.7)
Bilateral	RM, lingual	2 (7.7)
	RML & LLL	1 (3.8)
	RLL& LLL	1 (3.8)

Twenty-five patients underwent the classical postero-lateral thoracotomy and one underwent VATS which was a right middle lobectomy case. The distribution of the types of surgical procedures and the number of patients with their percentage is illustrated in Table (2).

Table (2): Distribution of the cases by the surgical procedure performed

Type of surgery	Number (%) of patients
Rt. middle lobectomy	9 (33.8)
Lt. lower lobectomy	7 (26.9)
Lt. upper lobectomy	2 (7.7)
Rt. lower lobectomy	1 (3.8)
RM lobectomy and RU lobectomy	3 (11.5)
Rt. middle lobectomy and ligulectomy	2 (7.7)
RM lobectomy and Lt. lower lobectomy	1 (3.8)
RL lobectomy and LL Lobectomy	1 (3.8)

The histopathological report of these patients showed that bronchiectasis was seen in 24 patients (18 females and 6 males), T.B. bronchiectasis was seen in two patients (females), Table (3).

Table (3): Distribution of the cases by histopathology results and gender

Histopathology results	Females – No. (%)	Males - No. (%)	Total - No. (%)
Bronchiectasis	18 (90)	6 (100)	24 (92.3)
T.B bronchiectasis	2 (10)	0 (0)	2 (7.7)
Total (100%)	20	6	26

The postoperative complications and follow-up were as follows:

- Atelectasis in three patients (11.5%), which were treated successfully by rigid bronchoscopy under GA, for cleaning of the thick endo-bronchial secretion, in addition to chest physiotherapy.
- Wound infection in one patient (3.8%) which was treated with parenteral antibiotics according to the culture and sensitivity.
- Most of the above-mentioned surgically treated patients attended the follow-up clinic for a few months. They were in good general condition and nearly symptomless.
- No mortality was reported in the studied patients.

Discussion:

Bronchiectasis is still seen in our daily thoracic surgery practice in Iraq but with decreasing frequency in presentation and surgical interferences. Of the 26-patients included in our study, the female-to-male ratio was 3.3:1 which is higher than other studies (3,4) where females predominated (60%, and 56%) respectively. There was a clear gender-associated differences with regard to disease formation, portending worse clinical outcomes for female patients. The role of sex steroid hormones in the microbial endocrinology space is emerging and how this affects the airway microbiology in bronchiectasis is an important avenue for future study (8) The age range in the current study differs from other studies such as the study by Waleed et al in which the youngest was a three-year-old boy, who presented with cough and recurrent chest infection while the oldest was an 80-year-old man with a long history of cough and excessive sputum production, for whom continuous medical treatment was provided (2). Nine of our patients fell within the second decade of life (11-20 years), representing 34.6%, comparable to the above-mentioned study (2) in which 17 out of 50 patients (34%) were in the second decade of life. The type and distribution of presenting symptoms in our series is comparable to that reported by Waleed et al (2). The CT scan, the gold standard as an imaging diagnostic tool for bronchiectasis, and had superseded bronchography, which was the main diagnostic imaging in the 1980s and early 1990s, of the 20th century which were comparable to other studies (2,9). Waleed *et al* (2)

reported that the distribution of the morphological types was cystic in (32%), cystic and tubular in (20%), tubular in (20%), and varicose type in (8%) of their series. The remaining (20%) could not be accurately characterized as they possibly were mild cases. The results of the current study are also comparable to the study by Wu et al (9) in which the proportion of cystic bronchiectasis patients was significantly higher than tubular and varicose types. Magnetic resonance Imaging (MRI) was not used in our study, which was the case in many other studies (2, 3, and 6). MRI offers radiation-free lung imaging, which can identify bronchiectasis by wall thickening and fluid accumulation. Smaller airways become visible when altered by peri-bronchiolar inflammation or mucus retention. MRI of the lungs and airways excelled with its unique combination of morphologic and functional imaging capacities, which was useful for research (10)

Surgery was the treatment of choice for the 26 patients enrolled in our study which was similar to other studies (2, 3.). VATS was performed on only one patient which was not comparable to other studies (4-5) where VATS was used as the principal type of resection. The most common type of surgery was right middle lobectomy and left lower lobectomy which coincides with another study (3) although left lower lobectomy, right lower lobectomy, and right middle lobectomy with decreasing frequency were reported in the Waleed *et al* study (2). In patients with bilateral disease, the most affected side was the first to be operated upon, followed 3 -6 months later by surgery on the other side, which was comparable to other studies (2, 3).

The postoperative morbidity of (15.3%) found in the current study is close to another study (11) with a postoperative morbidity rate of 19.8% where atelectasis was the most common postoperative complication. No mortality was reported in our study, similar to the study of Aydoğdu et al (3). Nowiński et al [11] reported a mortality rate of 10.6% among 539 patients in a 41-month retrospective study.

Limitations

One of the important limitations was poor documentation on the patients, whose records were retrospectively evaluated. Limitation of VATS as it needs more experience and more instruments supply

Conclusion

Once bronchiectasis is well-established, surgery in properly selected patients, with complete resection of the involved lobe or lobes, offers the best chance of cure and optimum control of the patient's symptoms.

Recommendations

1-All efforts should be made, to eradicate the predisposing factors, that lead to the development of bronchiectasis.

2-All patients with chronic cough and sputum production, even with minimal imaging findings, should be subjected to rigid bronchoscopy under GA to try at least eradicate the infection

3-All future resection procedures should be directed towards VATS, regardless of the number of ports utilized. Furthermore, all young surgeons should attempt this policy, and the stakeholders, should arrange training sessions for all the active young surgeons, who are interested in improving their skills in this type of minimally invasive surgery

Authors declarations

We hereby confirm that all the Figures and Tables in the manuscript are ours. The project was approved by the local ethical committee at the College of Medicine, University of Baghdad, with registration number: 171, on the 23rd. of June 2024. Ethical considerations were obtained according to the Helsinki Declaration.

Conflict of interest: None

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Authors' contributions:

Study conception & design: (Waleed M. Hussen & Sabah N. Jaber). Literature search Waleed M. Hussen& Nabeel H. Mohammed. Data acquisition: (Waleed M. Hussen, Sabah N. Jaber & Nabeel H. Mohammed). Data analysis & interpretation: (Waleed M. Hussen, Sabah N. Jaber & Nabeel H. Mohammed). Manuscript preparation: (Waleed M. Hussen & Nabeel H. Mohammed). Manuscript editing & review: (Waleed M. Hussen).

Reference

1 .*Hill AT, Sullivan AL, Chalmers JD, De Soyza A, Elborn JS, Floto RA, et al. British Thoracic Society Guideline for bronchiectasis in adults. Thorax. 2019 Jan 1;74(Suppl 1):1-69. https://doi.org/10.1136/thoraxjnl-2018-212463*

2 .Hussain WM, Sultan KM, Momjian RB, Hamdani ZA. Focus on bronchiectasis; Iraqi Postgraduate Medical Journal. 2003, Vol. (2) No. (4)P (388_393). https://www.researchgate.net/publication/358884712_focus_on_Bronchiectasis

3 .Aydoğdu K, Çetin M, Yılmaz E, Demiröz ŞM, Türk İ, İncekara F, et al. Analysis of bronchiectasis patients who underwent video-assisted thoracoscopic surgery in a tertiary thoracic surgery center: Ten years of experience. Turkish Journal of Thoracic and Cardiovascular Surgery. 2024 Apr;32(2):202. https://doi.org/10.5606/tgkdc.dergisi.2024.25891

4 .Ceylan KC, Batihan G, Kaya ŞÖ, Usluer O, Gürsoy S. Video-assisted thoracic surgery for patients with bronchiectasis: European Respiratory Journal 2020 56: 1721 ;

https://erj.ersjournals.com/content/56/suppl_64/1721
5 .Ocakcioglu I. Uniportal thoracoscopic treatment in bronchiectasis patients: Preliminary experience. Videosurgery and Other Miniinvasive Techniques. 2019; 14(2):304-310
https://doi.org/10.5114/wiitm.2018.78971
6 .Hao X, Dazhong L, Lei Y, Jiaying Z, Linyou Z. Surgical treatment of bronchiectasis: 5 years of experience at a single institution. Journal of Laparoendoscopic & Advanced Surgical Techniques. Part A. 2019; 29(6):826-830 https://doi.org/10.1089/lap.2018.0694
7 .Choi H, Yang B, Kim YJ, Sin S, Jo YS, Kim Y, et al. Increased mortality in patients with non cystic fibrosis bronchiectasis with respiratory comorbidities. Sci Rep. 2021;11:7126. https://doi.org/10.1038/s41598-021-86407-8
8 .Vidaillac C, Yong VFL, Jaggi TK, Soh M, Chotirmall SH: Gender differences in bronchiectasis: a real issue? Breathe (Sheff). 2018 Jun; 14(2): 108-121 https://doi.org/10.1183/20734735.000218
9 .Wu FJ, Qi Q, Hu Q, [Correlation between chest CT features and clinical characteristics of patients with bronchiectasis]. Zhonghua Yi Xue Za Zhi 2019; 99: 2982-2988. https://pubmed.ncbi.nlm.nih.gov/31607029 /
10 .Juergen Biedere. MR imaging of the airways. Br J Radiol Vol .96(1146); 2023 Jun maging of the airways. Br J Radiol Vol .96(1146); 2023 Jun 1 https://doi.org/10.1259/bjr.20220630
11 -Adam Nowiński , Katarzyna Stachyra , Maria Szybińska, Michał Bednarek , Robert Pływaczewski Paweł Śliwiński The influence of comorbidities on mortality in bronchiectasis: a prospective, observational study. Adv Clin Exp Med. 2021;30:1315–21. https://doi.org/10.17219/acem/144200

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توسع القصبات: المسببات، طرق التشخيص والعلاج الجراحي

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الخلاصة
الخلفية: توسع القصبات مرض مزمن، وعلامته الكاملة هي السعال المزمن مع إنتاج بلغم قيحي. ولا يزال موجودا في العراق والدول النامية، على الرغم من أن نسبة حدوثه أقل بكثير في الدول المتقدمة.
الهدف: تسليط الضوء على المسببات المرضية، والعمل التشخيصي للمرضى المتأثرين بعملية المرض ونتائج التدخل الجراحي.
المرضى والطرق: تم تسجيل ستة وخمسين مريضا في دراستنا. تم استبعاد ثلاثين مريضا لأنهم لم يكونوا مرشحين للجراحة. استوفى ستة وعشرون مريضا معاييرنا، لأنهم مرشحون للجراحة، وتمت دراسة ملفاتهم بأثر رجعي. كانت جميع الحالات من الداخلين إلى قسم الصدر والأوعية الدموية في مستشفى التخصصات الجراحية في مجمع مدينة الطب التعليمي، بغداد / العراق، من 1 يناير 2018 إلى 31 ديسمبر 2022. خضعت جميع الحالات لفحوصات الدم قبل الجراحة والتصوير التشخيصي والتنظير القصبي. لقد خضعوا لعمليات جراحية بإجراءات استئصال مختلفة.
النتائج: كانت عشرون حالة من الإناث (76.9٪). كانت أصغر مريضة أنثى تبلغ من العمر سبع سنوات وكان أكبرها ذكرا يبلغ من العمر 59 عاما. كان متوسط العمر 27.3 عاما، وكان الوسيط 33 عاما. كانت الأعراض الأكثر شيوعا هي السعال مع البلغم القيحي. تم إجراء فحص التصوير المقطعي المحوسب للصدر على جميع المرضى. كان الفص الأيمن الأوسط والفص الأيسر السفلي الأكثر تأثرا، خضع خمسة وعشرون مريضا لاستئصال صدري خلفي جانبي كلاسيكي. كان الفص الأيمن الأوسط والفص الأيسر السفلي أكثر الفصوص استئصالا. خضع مريض واحد فقط لجراحة تنظير الصدر بمساعدة الفيديو (VATS). كانت النتائج النسيجية المرضية متوافقة مع توسع القصبات في 24 مريضا. شملت الأمراض بعد الجراحة انخماص الرئة وعدوى الجرح في مريض واحد، وتمت إدارتها بنجاح طبيا. لم يتم تسجيل أي وفيات في دراستنا.
الاستنتاج: بمجرد أن يتم إثبات توسع القصبات الهوائية بشكل جيد، فإن الجراحة في المرضى المختارين بشكل صحيح، مع الاستئصال الكامل للفص أو الفصوص المصابة، توفر أفضل فرصة للشفاء والسيطرة المثلى على أعراض المريض.
مفتاح الكلمات: توسع القصبات، نفث دموي، رفع فص رئوي، الاستئصال الرئوي، ناظور الصدر