



Practice patterns and trends in surgical treatment for chronic lung infections: a survey from the Brazilian Society of Thoracic Surgery

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Background: Chronic lung infections represent a diversity of clinical entities that combined respond to significant public health, particularly in developing countries. However, there is no data regarding the practice patterns, surgeons' preferences, and technological usage, especially among Brazilian surgeons, in the setting of the surgical treatment of chronic lung infections. We, therefore, surveyed Brazilian thoracic surgeons from the Brazilian Society of Thoracic Surgery (SBCT) about practice patterns and trends in surgical treatment for chronic lung infections.

Methods: A cross-sectional anonymous survey of all thoracic surgeons from the Brazilian Society was conducted in 2019. As the study was purely descriptive no further statistical evaluation was performed.

Results: The responsive rate was 34% (259/766) from 23 of the 26 states in Brazil. A total of 141 (54.4%) participants reported their institution as a surgical reference for chronic infection lung disease, only 13.1% of surgeons have a high-volume service (more than 11 cases operated annually). The majority (76.2%) of respondents performed 1–5 surgical resection to treat tuberculosis (TB) sequelae, but only 62 (30.1%) had performed more than one resection to treat active TB. Chronic lung infection (76%) and hemoptysis (66%) were the most common symptoms as surgical indications. A proportion of 42.2% of the respondents do not have and/or perform routine drug sensitivity tests. In addition, 19.3% of respondents were not familiar with the recommendations of surgery in the treatment of pulmonary TB. Video-assisted thoracoscopic surgery (VATS) is available for 80% of respondents, while robotic surgery is for only 10%. Most (86%) surgeons have access to surgical staplers. Among the structural resources, respiratory isolation beds in the intensive care unit (ICU) (80%) and ward (79%) are frequently available resources. However, less than 12% of surgeons have in their institution a specific operating room for sputum-positive patients.

Conclusions: Lung resection for chronic infectious disease is an essential area of activity for thoracic surgeons in Brazil, which occurs mainly in the public sphere, with no concentration of cases per surgeon or institution. The lack of adequate resources in many centers justifies the creation of reference centers for improving care for these patients.

Keywords: National survey; lung resection; surgical outcomes; infectious disease; non-cystic fibrosis bronchiectasis

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Introduction

Chronic lung infections represent a diversity of clinical entities that combined respond to significant public health concerns due to their increasing prevalence, illness severity, and substantial economic burden on the healthcare system particularly in developing countries (1,2). The most important etiologies are non-cystic fibrosis bronchiectasis, tuberculosis (TB), fungal infections, cystic fibrosis, and immunoglobulin deficiencies (3). In Brazil, TB indeed represents the most crucial etiology due to its high incidence, 31.6 cases/per 100,000 people in 2020, placing Brazil among the high-burden countries for TB (4).

Until recently, chronic lung infections were considered an orphan and essentially neglected disease from a surgical therapeutic standpoint. However, over the last few decades, recent data about the results of adjuvant surgical treatment in the scenarios of drug-resistant TB (5), as well as nontuberculous mycobacteria (6) and fungal infections (7), had restored thoracic surgery to a prominent position as a therapeutic option for these patients. Another important indication for surgery in the chronic pulmonary infections setting is the treatment of complications like hemoptysis and repeated infections; lung resection, in these cases can not only solve these complications but also restore the patient's quality of life (8).

The surgical treatment of pulmonary infections usually is

highly complex which can be demonstrated by the relatively high complications rate (9). Thoracic surgeons need to be familiar with all aspects of lung disease, the patient's clinical condition, and the technological and human resources available in their service and their region. The decision to use adjuvant resection must be taken in the light of reliable data, making it essential to carry out studies that show the current scenario of thoracic surgery in the context of infectious diseases. However, to our knowledge there is no data regarding the practice patterns, surgeons' preferences, and technological usage, especially among Brazilian surgeons, in the setting of the surgical treatment of chronic lung infections. This information could help not only surgeons to perform these operations better but also the clinician to indicate and health care managers to guide their decision about this relevant group of diseases.

We, therefore, surveyed Brazilian thoracic surgeons from the Brazilian Society of Thoracic Surgery (SBCT) about practice patterns and trends in surgical treatment for chronic lung infections to improve our understanding of the status of real-world practice. We present this article in accordance with the SURGE reporting checklist (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-23-111/rc>).

Methods

A cross-sectional survey of all thoracic surgeons from the SBCT was conducted. A list of all active members of the SBCT was made available by the SBCT in 2019, and all thoracic surgeons received an electronic invitation to complete the questionnaire through the Research Electronic Data Capture (REDCap: hosted at the University of Sao Paulo) platform. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the local Institutional Review Board (Cappesq #15364819.2.0000.0065), and it was an official effort of the SBCT. The survey was anonymous, and all participants in this survey gave their consent to complete the survey.

Survey design

The survey encompassed 30 questions that explored the practice of lung resection for bronchiectasis. The questions focus on four different topics: (I) characteristics of the services; (II) surgical approach; (III) perioperative management; (IV) availability of technologies and difficulties encountered in the treatment of these

Highlight box

Key findings

- This study reviews the status of real-world surgical practice for patients with chronic lung infections in Brazil.

What is known and what is new?

- The surgical treatment of pulmonary infections usually is highly complex which can be demonstrated by the relatively high complications rate.
- This report is the first to elucidate current surgical treatment for chronic lung infections practice patterns and trends. The results suggested that more resources, including cutting-edge surgical technology and a multidisciplinary discussion, are not widely available, which could contribute for better surgical outcomes in these heterogeneous groups of patients.

What is the implication, and what should change now?

- The lack of adequate resources in many centers justifies the creation of reference centers allowing faster adoption of structural, human, and technological resources may represent an essential strategy for improving care for these patients.

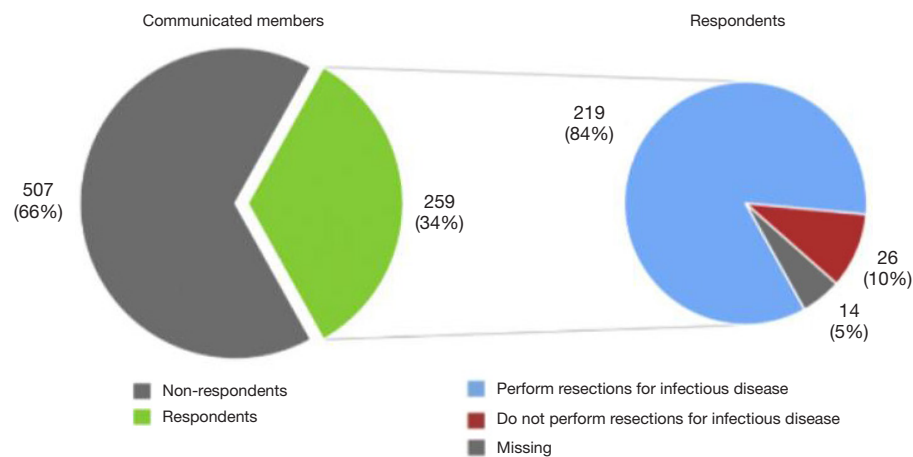


Figure 1 Survey response rate and geographic location of respondents.

pathologies (Appendix 1). As for the etiology, the question asked to the surgeons divided the etiologies into: Tuberculosis Sequelae (including sequelae with and without associated aspergillosis infection), Active Tuberculosis including Multidrug Resistant Tuberculosis, Mycobacteria Non-Tuberculosis and Bronchiectasis non-cystic fibrosis and not post-tuberculosis. There was no personal data exposure.

As the study was purely descriptive and no comparisons were made, no further statistical evaluation was performed.

Results

Demography

Of the 766 SBCT active members reported, 259 (34%) answered the survey from 23 of the 26 states in Brazil (Figure 1). Eighty-four percent of the surgeons [219] usually perform lung resection for chronic infectious lung disease. A total of 26 (10%) do not perform lung resection for chronic infectious diseases, and the reasons alleged are lack of referral or because it is not the institution's focus. The majority perform it in a public institution whether academic or assistance (Table 1). Although 141 (54.4%) participants reported their institution as a surgical reference for chronic infection lung disease, only 13.1% of surgeons have a high-volume service (more than 11 cases operated annually). Mostly (47.5%), operate 1–5 cases per year. The clinical specialty that most referred patients to surgical treatment was pulmonology (79.2%) followed by infectious disease specialists (48.3%) (Table 1).

The most common chronic lung disease was TB

followed by non-cystic fibrosis bronchiectasis. Respondents who reported having performed resections due to TB sequelae, there was another question asking whether there was associated aspergillosis infection. A total of 206 participants answered the question: “How many operated cases had associated aspergilloma or cavitory chronic aspergillosis?”. Of the respondents, 35 (17.0%) said they had none, while the majority, 155 (75.2%) said they had 1–5 resections. Only 16 respondents (7.8%) had more than 6 lung resections associated with pulmonary aspergillosis.

The majority (76.2%) of respondents performed 1–5 surgical resection to treat TB sequelae, but only 62 (30.1%) had performed more than one resection to treat active TB (Table 2). Mostly did not perform any surgery as an adjuvant treatment to nontuberculous mycobacteria in the period of 1 year. The responders reported that chronic lung infection (76%) and hemoptysis (66%) were the most common symptoms as surgical indications. Moreover, 142 participants (54%) also performed more than one surgical treatment to control general symptoms and improve quality of life.

Perioperative management

According to the perioperative planning of patients, 63 (24.3%) of the surgeons held a multidisciplinary board. In comparison, 83 (38%) reported following some protocol to improve surgical outcomes: 47 (21%) follow the nutritional optimization protocols and 36 (17%) follow the enhanced recovery after surgery (ERAS), which is a

Table 1 Characteristics of the services

Questions of the survey	N	%
In what type of institution are they held?		
Public teaching hospital	82	31.7
Public hospital	82	31.7
Privacy teaching hospital	9	3.5
Privacy hospital	51	20.0
Missing	35	13.5
Is the service considered a reference in the region for infectious disease?		
Yes	141	54.4
No	81	31.3
Missing	37	14.3
What is the number of resections performed in the year 2019?		
<1	4	1.54
1–5	123	47.5
6–10	61	23.6
11–15	20	7.7
>15	14	5.4
Missing	37	14.3
Which specialty referred the most patients to surgical treatment?		
Pneumology	205	79.2
Infectiology	125	48.3
Medical clinic	16	6.2
Basic health unit	16	6.2
Spontaneous demand	6	2.3
Others	8	3.1

Table 2 Approximate number of lung resections performed per indication annually

Indication	Number of lung resection				
	0	1–5	6–10	11–15	>15
Tuberculosis sequelae, n (%)	13 (6.3)	157 (76.2)	31 (15.0)	5 (2.4)	3 (1.5)
Non-cystic-fibrosis bronchiectasis and not secondary to TB, n (%)	53 (25.7)	137 (66.5)	16 (7.8)	1 (0.5)	2 (1.0)
Tuberculosis resistant (active infection), n (%)	149 (72.3)	60 (29.1)	2 (1.0)	0 (0.0)	0 (0.0)
Non-tuberculous mycobacteria, n (%)	165 (80.1)	46 (22.3)	0 (0.0)	0 (0.0)	0 (0.0)

TB, tuberculosis.

standardized perioperative measure aimed at decreasing postoperative organ dysfunction, facilitating recovery and achieved through the introduction of various evidence-based perioperative measures (10). It is a protocol that has been adopted by several services and specialties. Despite

having been initially introduced in colorectal surgery, there are already studies showing good results in thoracic surgery as well (11,12). Preoperative evaluation is done mainly with cardiovascular risk assessment (86%) and lung function test (98%), but only 26.2% perform diffusion capacity of the

lungs for carbon monoxide (DLCO).

Among the preoperative care for patients specifically with TB, almost half of the respondents (42.2%) do not have and/or perform routine drug sensitivity tests. In addition, 19.3% of respondents were not familiar with the recommendations of surgery in the treatment of pulmonary TB and multidrug- and extensively drug-resistant TB, published by the World Health Organization (WHO) 2014, updated in 2016 (10,11). By contrast, 40% responded they were satisfied with the treatment offered to those patients and considered WHO recommendations (13,14).

Surgical approach

Video-assisted thoracoscopic surgery (VATS) is available for 80% of respondents, while robotic surgery is for only 10%. Most (86%) surgeons have access to surgical staplers to perform vascular, bronchial ligatures, and resection of the lung parenchyma. In-room bronchoscope to assist selective intubation is also available to 70% of the participants. Four percent of surgeons do not have any of those resources mentioned.

A total of 206 participants completed the questions about complications and their management. More than half 54.8% [142] had empyema after more than one lung resection. Of those who had empyema as a complication, 60.5% [86] reported that bronchial stump fistula was associated. Only 87 (42.2%) responders reported endoscopic treatment for bronchial stump fistula available in their institution. Despite the procedure's availability, 30 (14.5%) responders don't perform endoscopic interventions in those cases. The other 119 (57.7%) surgeons do not have this resource.

Regarding the treatment of the residual cavity in the postoperative period, the majority 59.7% [123] of respondents, do not perform the additional treatment to normal chest drainage. On the other hand, some preventive measures are performed intraoperatively by the participants, including 34 (16.5%) myoplasty, 43 (20.9%) thoracoplasty, 109 (53%) phrenic nerve block, 6 (2.9%) phrenic nerve section and 38 (18.4%) pneumoperitonea.

Availability of technologies and difficulties encountered in the treatment of these pathologies

Among the structural resources, respiratory isolation beds in the intensive care unit (ICU) (80%) and ward (79%) are frequently available resources. However, less than 12% of surgeons have in their institution a specific operating room

for sputum-positive patients. Other available resources reported by the participants to improve the surgical outcomes of the patients were physiotherapy (82%) and pain control groups for the postoperative period (27%).

Discussion

This survey demonstrated that lung resection is performed by many thoracic surgeons in most states in Brazil and is still a public health problem. Despite most surgeons reporting a lack of resources in their institutions, the vast majority reported having access to minimally invasive surgery. Sequelae of TB are the most common indication reported by surgeons. On the other hand, many respondents still do not perform surgery as an adjuvant treatment for multidrug-resistant pulmonary tuberculosis (MDR-TB). This study reviews the status of real-world surgical practice for patients with chronic lung infections in Brazil. To the best of our knowledge, this is the first survey of lung resection for this etiology

Pulmonary resection due to infectious lung disease is an important activity for the Brazilian thoracic surgeon, mainly in the public sphere. In this survey, 84% of the participants usually perform lung resection for chronic infectious lung disease. However, there is a decentralization of the number of cases per surgeon/or institution due to the fact that only 13.1% are at a high service volume. The creation of reference centers allowing greater adoption of structural, human, and technological resources may represent an essential strategy for improving the care of these patients, considering that almost half of the respondents (42.2%) do not have and/or perform routine drug sensitivity tests, which is highly recommended for these patients, and less than 12% of surgeons have in their institution a specific operating room for sputum-positive patients, which represents a breach in the health care protection measures.

Despite the unavailability of some resources, VATS is available for 80% of respondents. The use of VATS has increased worldwide, becoming the method of choice in the appropriate cases of malignant and benign lung disease (15). The feasibility of resection depends on the local anatomical situation, particularly inflammation and adhesions (16). The VATS was reported to be cosmetic, the postoperative pain and blood loss were significantly lower in the VATS treatment group, and the operation time was shorter than in a thoracotomy (17). In addition, shorter hospital stays and fewer complications in VATS patients were reported in another study (18). Fatal complications like bronchopleural

fistula and empyema may occur regardless of the surgical approach (19). However, we don't have any published studies regarding the results of the VATS approach in lung resections for inflammatory/infectious diseases in Brazil, which due to the heterogeneity of the disease could be very different from what is reported in the literature.

In this survey sequelae of TB is the most common indication for lung resection, this can be explained because of the emergence of drug-resistant strains of *M. tuberculosis*. Nonetheless, most surgical procedures in TB patients have been performed on a case-by-case basis, and current evidence is, therefore, from observational studies with a paucity of reliable data on the indications and surgical outcomes (20). Consequently, the 2014 WHO consensus statement stipulated that patients should receive at least 4–6 months of an appropriate anti-TB regimen before surgery (13). Moreover, the most recent WHO-MDR-TB guidelines, updated in 2016 (14), recommend partial lung resection in adjuvant with MDR-TB treatment. By contrast, about 23.9% of the respondents in this study were not aware of these published recommendations (14). It stands to reason that because respondents were not familiar with the indications and benefits of adjuvant lung resection, 70% do not perform any adjuvant surgical treatment for MDR-TB, which in the upcoming scenario of TB resistance increase is concerning.

This study has potential limitations that need to be considered when interpreting the results. Although our response rate is consistent with other electronic healthcare professionals' surveys (21,22), it can be considered low. Both the length of the questionnaire and the fact that it was sent electronically likely contributed to our low response rate. Furthermore, to our knowledge, there are no validated surveys for investigating specific surgical treatments for chronic infectious lung diseases for us to draw comparisons. Lastly since the responders, in most of the cases, do not have databases, the questions about surgical volumetry were responded by memory, obviously, some subjectivity is also present in the answers. To mitigate these limitations, we categorized the possible responses. Despite these limitations, we believe our study revealed the status of surgical treatment for chronic infectious diseases in Brazil: lacking resources, including cutting-edge surgical technology and a multidisciplinary discussion, are not widely available, which could contribute for better surgical outcomes in these heterogeneous groups of patients. This report is the first to elucidate current surgical treatment for chronic lung infections practice patterns and trends.

Conclusions

Lung resection for chronic infectious disease is an essential area of activity for thoracic surgeons in Brazil, which occurs mainly in the public sphere, with no concentration of cases per surgeon or institution. The lack of adequate resources in many centers justifies the creation of reference centers allowing faster adoption of structural, human, and technological resources may represent an essential strategy for improving care for these patients.

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Footnote

Reporting Checklist: The authors have completed the SURGE reporting checklist. Available at <https://jtd.amegroups.com/article/view/10.21037/jtd-23-111/rc>

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-23-111/coif>). AWM reports receiving honoraria for lectures from AstraZeneca and Merck Sharp & Dome. RMT reports personal fees from AstraZeneca, Medtronic, Roche, BMS, MSD, Takeda, and Intuitive. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the local Institutional Review Board (Cappesq #15364819.2.0000.0065), and it was an official effort of the SBCT. The survey was anonymous, and all participants in this survey gave their consent to complete the survey.

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