



Understanding the practice of thoracic surgery during the COVID-19 pandemic

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Abstract

The COVID-19 pandemic has affected the entire medical community including the thoracic surgical practice. The guidelines, consensus statements, and preliminary recommendations published by the thoracic surgeons so far have appreciated the importance of triage of patients with thoracic surgical diseases and multidisciplinary team (MDT) meeting. Delaying surgery or planning alternative treatment in patient care should be done by taking input from experts in thoracic specialties. The procedures that can be carried out in a hospital are based on the prevalence of COVID-19 patients within the hospital and availability of hospital resources. As a result, proper triaging, ensuring safety of patient and health care personnel, and optimal utilization of the available resources remain the cornerstone while fighting the COVID-19 pandemic. In this manuscript, we highlight these issues with respect to practice of thoracic surgery.

Keywords Thoracic surgery · COVID-19 · SARS-Cov-2

Introduction

The COVID-19 pandemic has affected all aspects of our society in general and health care in particular. The World Health Organization (WHO) described the COVID-19 virus as “a new pathogen that is highly contagious, can spread quickly, and must be considered capable of causing enormous health, economic, and societal impacts in any setting.” [1]. Surgical practice across the globe is in a dilemma. In this minireview, we have analyzed the advice issued by different associations. We have also gathered evidence from the literature to formulate an advisory relevant to thoracic surgical practice in India, in face of the current COVID-19 pandemic. The important guidelines analyzed in this review include the following:

1 COVID-19 guidance for triage of operations for thoracic malignancies: a consensus statement from thoracic surgery outcomes research network [2]

- 2 Preliminary recommendations for lung surgery during COVID-19 epidemic period [3]
- 3 General thoracic surgery services across Asia during the 2020 COVID-19 pandemic [4]
- 4 Lung cancer and mesothelioma service guidance during the COVID-19 pandemic version 2.4: the restoration and recovery COVID-19 endemic phase [5]
- 5 Recommendations for surgery during the novel coronavirus (COVID-19) epidemic [6]
- 6 Pleural services during the COVID-19 pandemic – revised published by British Thoracic Society [7]
- 7 Tube thoracostomy during the COVID-19 pandemic: guidance and recommendations from the AAST Acute Care Surgery and Critical Care Committees [8]
- 8 Thoracic anesthesia of patients with suspected or confirmed 2019 novel coronavirus infection: preliminary recommendations for airway management by the European Association of Cardiothoracic Anesthesiology Thoracic Subspecialty Committee [9]

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Besides, we have also reviewed the outcome of the survey of thoracic surgical practices among surgeons of Europe, Asia, and South America, conducted by the European Society of Thoracic Surgeons (ESTS) [10].

Based on these, the perspective gained can be discussed under the following headings.

A Major changes in thoracic surgical practice during the COVID-19 pandemic

The ESTS survey revealed that the pandemic has considerably affected the normal functioning of hospitals providing thoracic surgery services. In total, 53.33% of the hospitals surveyed have reported providing only emergency services and attending to urgent oncological surgeries [7]. Increase in the hospital's COVID-19 population has depleted the resources and restricted its ability to provide surgical care, forcing surgeons to prioritize treatment, even among their cancer patients [2]. The National Health Service (NHS) in the UK has witnessed forced unprecedented transformation, resulting in radical alterations to services [5]. Similar thoughts have been expressed by the *Asian Cardiovascular and Thoracic Annals* [4] with reports of thoracic services maintained from “significant reduction to near normal service.” Based on these observations, the *Indian Journal of Surgery* [6] has suggested developing new protocols and practices when services are resumed.

B. General measures to manage thoracic surgical patients

In synchrony with guidelines proposed for other surgical procedures, most hospitals have to cancel or reduce non-urgent thoracic outpatient visits during this pandemic. Urgent procedures that may have a life-threatening consequence get utmost priority with rescheduling of elective and non-urgent admissions. Infection control measures should be compliant with the latest guidance [5].

C. General guidance for the triage of patients with thoracic surgical diseases

In the current pandemic, multidisciplinary team (MDT) meeting has become even more important. It has been recommended that delaying surgery or advising alternative treatment in patient care should be done by consulting experts in thoracic malignancies and MDTs should guide the management [2]. Hospitals have resorted to converting MDTs from meeting physically to a digital platform. The ESTS survey [7] showed that during the pandemic, more than one-third of the MDT meetings were converted to digital meetings with the same frequency (36.05%). Some hospitals carried out MDTs as usual with social distancing (21.48%). The survey has also shown that the treatment decision in these meetings remained unchanged for most of the participants (54.50%).

D. Triage for thoracic surgical diseases

Guidelines of triage for thoracic surgical patients have classified patients into three risk categories for COVID-19: confirmed patients, high-risk patients, and low-risk patients. This has been categorized depending on confirmed laboratory tests

for COVID-19, epidemiological history, clinical findings, computed tomography (CT) scan of the thorax, and blood reports [6]. Conventional pulmonary surgery has been divided into two categories:

- (a) elective surgery—operations that can be observed over 3 months and surgery is not recommended during the pandemic (e.g., benign pulmonary nodules) and
- (b) limited period surgery—operations that should be performed within 1 month (for example, patients with a clear diagnosis of lung cancer) [3].

Aerosol-generating procedures like tracheal surgery including sleeve resections are a potential source of dissemination of COVID-19 infection. An exhaustive guideline on the subject has been proposed by the European Association of Cardiothoracic Anesthesiology. The thoracic surgery network has recommended deferring tracheal resection tumor surgery, unless it is of very aggressive histology [2].

The risk level of all surgical patients should be evaluated before or immediately after admission to hospital. Different protocols followed by the concerned hospital should be applied based on the COVID-19 risk level of patients. Elective surgeries for the confirmed and suspected patients should be rescheduled, and they should be assessed daily. However, all the guidelines suggest that in case of emergency surgery, the severity of threat to the patient's life and health should be considered, when scheduling the surgery.

Just like the type of patients, the hospital status has also been classified into 3 phases and recommendations have been made regarding the kind of malignant thoracic procedures that can be carried out during those phases [2]. Based on the prevalence of COVID-19 patients within the hospital, availability of hospital resources, and the rate of change (in terms of increasing prevalence of infections and resource depletion), a “compass statement” has been introduced giving additional direction to “navigate volume restriction, based on perceived risk to patients and hospital staff.” The 3 phases described by the compass statement are phase I, phase II, and phase III. Guidance has been provided regarding the procedures that can be carried out, deferred, or alternative treatment suggested, depending on the phase the hospital is in. As for example in phase I:

- (a) Surgeries to be performed as soon as possible are solid, or predominantly solid (>50%), lung cancers, or presumed lung cancers > 2 cm with clinically node-negative status.
- (b) Surgeries deferred (estimate 3 months): predominantly ground glass (< 50% solid) nodules or cancers.
- (c) Alternative treatment considered: endoscopic therapy for early-stage esophageal cancer (stage T1a/b superficial).

Similarly, there are lists of surgeries recommended for phase II and phase III [2].

Also, recommendations have been made to consider balancing the benefit of adjuvant chemotherapy, treatment without biopsy, using Herder score, and frozen section for intraoperative confirmation [5].

Experience from Asian thoracic surgeons has shown that in many countries, there was a drop in non-neoplastic thoracic operations and malignancy and lung transplant had the highest priority [4].

Super-urgent and urgent lung transplantation was carried out during the COVID-19 pandemic [11]. The guidelines for transplant during COVID-19 [12] and successful result of lung transplantation in COVID-19 survivor have opened up the scope for newer indication of lung transplant.

Patients with benign lung diseases may be followed up outside the hospital (no less than 3 months); for example, in a bronchiectasis patient with hemoptysis, surgical treatment can be deferred until the outbreak is over, if the patient is relatively stable [3].

In case of pneumothorax, patients may be managed on an outpatient basis except patients with large air leak or who have failed management with 12-Fr chest drain with a Heimlich valve [7]. In patients with confirmed or suspected COVID-19 with a chest drain and air leak, connecting the drain to wall suction and a viral filter onto the suction port is advised. Empyema in a COVID-19-negative patient should be treated as usual [7].

To manage emergencies and thoracic trauma, a thoracic procedure team has been recommended. They have advised to set up a chest drainage system in high-risk patients with addition of fluid containing sodium hypochlorite, prior to chest drain insertion [8].

E. Diagnostic workup for thoracic surgical patients including screening

The screening of thoracic surgical patients is different for elective and emergency or semi-emergency procedures. The guidelines of the Indian Council of Medical Research (ICMR) suggest that all high-risk patients undergoing elective operations should undergo reverse transcription polymerase chain reaction (RT-PCR) test for COVID-19 before surgery [6]. The term high risk is defined as symptomatic contacts of laboratory-confirmed cases and asymptomatic direct and high-risk contacts of a confirmed case. They should be tested once between day 5 and day 14 of coming in contact.

For RT-PCR testing within an interval of 3 days or less of contact, and who had an eventual confirmed diagnosis of COVID-19 infection by RT-PCR testing, the sensitivity is 71% [13]. In the case of a life-threatening emergency situation, operation has to be carried out irrespective of the COVID-19 status, with full personal protective equipment

(PPE) protection. The guidelines are evolving as more evidence becomes available.

The Truenaat test (NAAT) for COVID-19 can give report within 2 h. In emergency, this is beneficial both to the patients and to the health care personnel. In general, wherever possible, NAAT or RT-PCR testing of all patients prior to surgery is recommended [3, 5, 9].

Bronchoscopy Bronchoscopy is an aerosol-generating procedure and thus predisposes health care workers to COVID-19. As a result, the British Thoracic Society (BTS) guideline has advised to carefully evaluate if bronchoscopy, including endobronchial ultrasound (EBUS), is really essential and if an alternative diagnostic modality, like positron emission tomography-computed tomography (PET-CT), could be deployed instead.

In brief, alternative investigation is to be considered for non-malignant indications. For malignant indications, with a negative result for COVID-19, patients may be taken up for bronchoscopy. For confirmed COVID-19-positive or suspected COVID-19 cases, bronchoscopy should be avoided for at least 28 days [5].

The ESTS survey report [7] has shown similar practice patterns with endobronchial investigations. Fiberoptic bronchoscopy (FOB), or EBUS, was delayed or unavailable in 30.50% hospitals surveyed. Spirometry, with and without arterial blood gas (ABG), diffusing capacity of the lung for carbon monoxide (DLCO), or cardiopulmonary exercise test (CPET) was not available in about 21% of hospitals surveyed during this period.

F. Guidance for working in the operating theater

A number of procedural and structural changes have to be undertaken in the operating theater. Endotracheal intubation, including lung isolation with double-lumen tube or bronchial blocker, is the commonest and most relevant aerosol-generating procedure (AGP) in thoracic surgery. As a result, full PPE precautions should be taken by the anesthetists during these procedures. Also, following AGP, it is recommended that the air conditioning should be turned off and after 20 min, the floors should be cleaned. This is known to clear the settled aerosols. The European Association of Cardiothoracic Anesthesiology Thoracic Subspecialty Committee has also advised to avoid awake intubation and full neuromuscular relaxation before intubation and has proposed several algorithms to prevent complications during intubation, ventilation, and extubation [9].

Several structural changes in the operating theater (OT) have been advised by many expert groups. It includes designating and isolating an OT specifically for COVID-19 cases, where possible. Construction of negative pressure OT with frequent air changes (≥ 12 air flow changes/h) is ideal and

should be constructed, if resources allow. Minimizing personnel in the OT and gadgets inside the OT to prevent fomites should be aimed for [14]. If a COVID-19-positive patient or strongly suspected patient has to be operated, it should be done in an exclusive operating room, preferably with negative pressure. Personal protective equipment must be worn as per protocol and extra personnel should not be allowed inside the operating room [4, 9]. There is no definite evidence on coronavirus; however, there are isolated reports showing that viruses may survive in surgical smoke created by electrosurgical instruments [15, 16]. To minimize the surgical smoke, a suction device should be used and an electrosurgical instrument should be set at a lowest effective power [4, 6]. For surgery in non-COVID-19 patients, the infectiousness potential has to be assessed and PPE as per hospital infection prevention control practices has to be used.

As a general rule, filtering facepiece (FFP2) mask, eye protection with or without face shields, and gown should be used by surgeons, when opening airways (sleeve lobectomy, tracheal surgery). Procedures such as chest drain insertion can be undertaken with level 1 PPE. For procedures such as thoracoscopy, where pleural fluid may splash, level 2 PPE should be worn [7]. The PPEs are to be used based on the risk profile of the health care worker. The Ministry of Health and Family Welfare of India has published a detailed guideline that should be followed [17]. The Japanese thoracic surgeons have suggested that surgeons fully equipped with PPE have considerable physical and mental fatigue and should try to reduce the operating time as much as possible and consider a change of personnel during surgery [4]. This is an important observation which requires due attention to shape our future surgical practice. Routine universal precautions should be perfectly acceptable in patients testing negative with RT-PCR for COVID-19 infection.

G. Medico-legal issues due to the COVID-19 pandemic

While there are no definite recommendations in this regard, the reasonable approach is to modify or add an additional consent form that provides the patient with the information that they may be susceptible to iatrogenic COVID-19 infection. Also, it is duly recognized in most of the publications that there are modifications in diagnostic and staging tests, along with the overall management policy, for the safety of patients. The additional risk of acquiring COVID-19 infection and the risk of the procedure have to be weighed against the benefit of the procedure and have to be adequately explained to the patient. This is important from both legal and ethical viewpoints. The harm that may result from not having a diagnosis and treatment has to be elaborated upon as well in this context. Time should be allowed for making these decisions and surgeons should be prepared to re-discuss matters with patients and their families [5].

Conclusion

The COVID-19 pandemic has immensely influenced the current-day thoracic surgical practice. The paucity of clinical data and unpreparedness to the pandemic have placed the thoracic surgeons across the world in a difficult situation. Even in this difficult time, thoracic surgeons all over the world are boldly trying to find out an optimum solution to this challenge. Triaging of patients, ensuring safety of patients and health care personnel, and rational utilization of the available resources are key measures in this fight against the COVID-19 pandemic. Further research, clinical studies, and exchange of knowledge will continue to empower and reshape our thoracic surgical practices.

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Compliance with ethical standards

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