Original Article

# A survey of medical thoracoscopy practices in India

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## ABSTRACT

**Background:** Medical thoracoscopy (MT) is a useful diagnostic and therapeutic procedure for a variety of pleural conditions. There is a lack of literature on prevalent practices of MT in India. **Aims and Objectives:** The objective of the study was to study the prevalent practices of MT in India. **Materials and Methods:** A structured online survey on various aspects of thoracoscopy was designed on the "Google Forms" web software. **Results:** One hundred and eight responses were received, of which 100 respondents performed MT. The majority were pulmonologists, and most had started performing thoracoscopy within the last 5 years. Rigid thoracoscope was the most commonly used instrument. The common indications of procedure included undiagnosed pleural effusion, talc pleurodesis, and adhesiolysis. Local anesthesia with conscious sedation was the preferred anesthetic modality. Midazolam, along with fentanyl, was the most widely used sedation combination. 2% lignocaine was the most commonly used concentration for local infiltrative anesthesia. Nearly two-thirds of the respondents reported having encountered any complication of thoracoscopy. Significant reported complications included empyema, incision/port-site infection, re-expansion pulmonary edema, and procedure-related mortality. **Conclusion:** MT is a rapidly evolving interventional pulmonology procedure in India. There is, however, a significant variation in practice and variable adherence to available international guidelines on thoracoscopy. Formal training programs within India and national guidelines for pleuroscopy considering the local resources are required to improve the safety and yield of this useful modality.

**KEY WORDS:** Lung cancer, pleura, pleural effusion, pneumothorax, thoracoscopy

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## INTRODUCTION

Undiagnosed pleural effusion is a common clinical scenario that pulmonologists encounter in clinical practice. A pleural biopsy is usually the next line of investigation for a pleural effusion that remains undiagnosed despite diagnostic thoracentesis. Medical thoracoscopy (MT)/pleuroscopy allows one to obtain pleural biopsy under direct visualization using a variety of available (rigid or flexi-rigid) instruments.[1] Apart from pleural biopsy, other pleural interventions are also feasible during pleuroscopy. MT/pleuroscopy is a rapidly growing facet of interventional pulmonology.[2] Pulmonologists are increasingly adopting this modality for a variety of diagnostic and therapeutic indications. Few international guidelines are available on the technical performance of the procedure.[3] Limited literature is available regarding the prevalent practices of pleuroscopy in India.

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MT practices vary according to individual preference and availability of resources. We designed this survey to study the prevalent practices of MT in India.

## MATERIALS AND METHODS

This survey on the practices of MT was a collaborative online survey conducted by the Department of Pulmonary, Critical care, and Sleep Medicine at the All India Institute of Medical Sciences, New Delhi, India, and the Department of Pulmonary Medicine at the Christian Medical College, Vellore, India. The survey consisted of 84 questions, divided into four sections. The online study was undertaken using the "Google Forms" interface in English. Google Forms is a free online tool for the administration of personalized surveys and is commonly utilized in medical research. The responses can be automatically retrieved to a spreadsheet and analyzed.[4,5]

The structured questionnaire was divided into various sections. It consisted of multiple questions on general information, respondent expertise, mode of learning thoracoscopy, indications, patient preparation, monitoring, periprocedural sedation, local anesthesia, and postprocedural complications of pleuroscopy. A preliminary questionnaire was prepared and circulated among authors for discussion. Subsequently, the survey was mock filled and reviewed, and questions were refined based on individual inputs and discussion. The final questionnaire link was E-mailed to pulmonologists across the country using E-mail lists from major national bodies, i.e., the Indian Association for Bronchology, the Indian Chest Society, and the National College of Chest Physicians of India. Furthermore, personal E-mail lists of authors identified potential respondents. We sent E-mails, and a reminder E-mail was sent 1 month later. The survey link was kept open for responses for the next 6 months. Participation was entirely voluntary and without any financial incentive. For statistical analysis, replies were downloaded as excel spreadsheets and analyzed. Responses from those performing MT were included in the study. Descriptive statistical analysis was performed using STATA statistical analysis package (version 11.2), StataCorp LLC, Texas, USA. Categorical variables were presented as number (percentages) and continuous variables as mean (standard deviation) or median (interquartile range [IQR]). $P < 0.05$ was considered statistically significant.

## RESULTS

We received 108 responses, of which 100 responded that they were performing MT. The responses from these 100 participants were included in the final analysis.

### Baseline characteristics and indications for the procedure

The baseline demographic characteristics are summarized in Table 1. The mean age of the respondents was 40.5 (±8.46) years, and 95% were males. Pulmonologists

**Table 1: Baseline characteristics of the survey respondents**

| Characteristics | *n* (%) |
|---|---|
| Total number of respondents | 108 |
| Performing thoracoscopy | 100 (92.6) |
| Age (years), mean (SD) | 40.5 (8.46) |
| Male gender | 95 (95.0) |
| Performing flexible bronchoscopy | 96 (96.0) |
| Area of specialization | |
| Pulmonologist (adult patients) | 95 (95.0) |
| General physician | 4 (4.0) |
| Thoracic surgeon | 1 (1.0) |
| Duration since performing thoracoscopy | |
| Less than a year | 9 (9.0) |
| 1-3 years | 36 (36.0) |
| 3-5 years | 22 (22.0) |
| 5-10 years | 22 (22.0) |
| More than ten years | 11 (11.0) |
| Thoracoscopy examinations performed over the last 1 year, median (IQR) | 20 (3 -90) |
| Place of work/designation | |
| Private practitioner (multi-specialty hospital) | 47 (47.0) |
| Teaching faculty medical college | 28 (28.0) |
| Post-MD/DNB/DM or equivalent training | 9 (9.0) |
| Private practitioner (clinic) | 9 (9.0) |
| Postgraduate trainee | 2 (2.0) |
| DM fellow | 4 (4.0) |
| Others | 1 (1.0) |
| Mode of learning thoracoscopy | |
| Working under someone performing thoracoscopy | 33 (33.0) |
| Formal training program within India | 19 (19.0) |
| Structured training program outside India | 17 (17.0) |
| Training workshop in India | 15 (15.0) |
| Self-learned | 13 (13.0) |
| Others | 3 (3.0) |
| Type of Thoracoscope | |
| Rigid thoracoscope | 42 (42.0) |
| Flexi-rigid thoracoscope | 29 (29.0) |
| Both | 26 (26.0) |
| Use flexible bronchoscope for thoracoscopic examination | 3 (3.0) |
| If using rigid equipment, type of rigid thoracoscope (%) | |
| 10 mm diameter scope with 5 mm working channel | 61.6 |
| 7 mm scope with 3 mm working channel | 13.7 |
| An optical telescope with optical forceps | 13.7 |
| Mini-thoracoscope (Wolf) | 8.2 |
| Laparoscope | 1.4 |
| Others | 1.4 |
| Place of performing thoracoscopy | |
| OT | 48 (48.0) |
| Bronchoscopy room | 45 (45.0) |
| Intensive care unit | 3 (3.0) |
| Both bronchoscopy room and OT* | 4 (4.0) |
| Number of assistants during the procedure, Median (IQR) | 3 (1-5) |
| Availability of thoracic surgeon/general surgeon backup in case of complications | 81 (81) |
| Availability of separate recovery room for observation following procedure | 68 (68) |
| Availability of facility to video record the procedure | 84 (84) |
| Indications for performing thoracoscopy | |
| Pleural biopsy in undiagnosed pleural effusion | 99 (99.0) |
| Talc pleurodesis | 71 (71.0) |
| Adhesiolysis | 74 (74.0) |
| Visceral pleural biopsy | 17 (17.0) |
| Pneumothorax treatment (bleb stapling, mechanical pleurodesis, etc.) | 15 (15.0) |

*Contd...*

**Table 1: Contd...**

| Characteristics | *n* (%) |
|---|---|
| Pinch lung biopsy | 11 (11.0) |
| Sympathectomy | 4 (4.0) |
| Pericardial window | 1 (1.0) |
| Others | 4 (4) |

*3 of 4 perform in OT for adhesiolysis, 1 performs flexi-rigid thoracoscopy in bronchoscopy room for diagnostic indications and rigid thoracoscopy in operation theater for therapeutic indications. OT: Operation theater, IQR: Interquartile range, SD: Standard deviation

comprised the majority (95%), 4 (4%) were physicians, and one of the respondents (1%) was a thoracic surgeon. Almost two-thirds of the respondents (67%) had begun performing the procedure in the last 5 years. The median number of procedures performed in the previous year was 20 (IQR: 3–90). Of the respondents performing thoracoscopy, the majority practiced in private setup (56%); 28% were teaching faculties in medical colleges, 4% were super-specialty trainees, whereas 2% were postgraduate trainees. Thirty-three percent had learned the procedure by working under someone performing thoracoscopy, 17% had undertaken formal training programs outside India, 15% had learned in a training workshop, whereas 13% were self-taught. Only 19% of the respondents had learned thoracoscopy in a formal training program in India.

Rigid thoracoscope was the most commonly used instrument (42.0%), whereas the flexi-rigid thoracoscope was used by 29.0%. Almost a quarter (26%) of the respondents were utilizing both rigid and flexi-rigid thoracoscopes. Three percent of the respondents used a flexible bronchoscope for thoracoscopic examination. The rigid thoracoscope with a 10-mm diameter (with a 5-mm working channel) was the most commonly used (61.6%) instrument. 8.3% of the respondents were using the mini-thoracoscope. Operation theaters (48%) and bronchoscopy rooms (45.0%) were the standard locations for performing MT. The median number of assistants involved during thoracoscopy was 3 (IQR: 1–5). A video recording facility for the procedure was available in 84% of facilities. Surgical backup for management of potential complications was available with 81% of the respondents, and 68% had availability of separate recovery room for postprocedure monitoring. There was limited availability of instruments such as cryoprobes (18%) and electrocautery-diathermy (24%) in the thoracoscopy units.

The most common indications for thoracoscopy [Table 1] were evaluation of an undiagnosed pleural effusion (99.0%), performing talc pleurodesis (71.0%), and adhesiolysis (74.0%). Others included visceral pleural biopsy (17.0%), treatment of pneumothorax (15.0%), pinch lung biopsy (11.0%), pericardial window (1%), and sympathectomy (4%). All proceduralists used standard personal protective equipment during the procedure.

## Patient preparation, sedation, and monitoring

Written informed consent was obtained by most (97%) of the respondents before thoracoscopy. Less than half (45%) of the proceduralists provided an information sheet to the patients while scheduling the procedure. The majority of the respondents tend to obtain hemoglobin levels (91%), platelet counts (96%), and coagulation studies (89%) before the procedure. Blood glucose and renal function parameters were obtained by 70% and 79% of the respondents, respectively. The vast majority (91%) considered a recent chest radiograph or computed tomography (CT) scan of the thorax as an essential prerequisite for performing thoracoscopy. The patient preparation and monitoring details are shown in Table 2.

Almost all respondents (97%) routinely fasted the patients before thoracoscopy. Most of the respondents required patients to fast for >4 h, with the majority (64.3%) asking patients to fast for 4–6 h and 31.6% fasting patients for >6 h [Table 3]. 61.7% would consider discontinuing both aspirin and clopidogrel before thoracoscopy. 28.3% stopped only clopidogrel, whereas 4% allowed patients to continue dual antiplatelets. Most of the respondents required the patients to get admitted to the hospital 1 day prior (56%) or on the day (28.3%) of the procedure. Seventy-seven percent of the respondents considered CT thorax as a mandatory prerequisite before thoracoscopy. Local anesthesia with conscious sedation (76%) was the most commonly preferred anesthetic modality; 18% of the respondents preferred general anesthesia for the procedure. During the procedure, 61.2% administered continuous oxygen supplementation, whereas 34.7% administered oxygen only in case of desaturation during the procedure. Prophylactic low-molecular-weight heparin administration for patients at a high risk of venous thromboembolism was practiced regularly by only 32% of the respondents. These details are summarized in Table 3.

The sedative and anesthesia practices reported in the survey are shown in Table 4. A combination of agents was preferred for sedation by the majority (65.7%). Midazolam, along with fentanyl, was preferred by 54.5%, whereas 18.2% administered only midazolam. Only 7.1% routinely performed thoracoscopy under general anesthesia. 44.2% of the respondents reported the availability of both naloxone and flumazenil in the procedure area. None of the two reversal agents were available in 35.8% of the cases. Anesthesiologists administered sedation for 50% of the respondents, whereas bronchoscopy nurses administered sedation in 24.5%. 2% lignocaine was used most commonly (84.5%) for local infiltrative anesthesia. 36.5% did not monitor or document the total dose of lignocaine. 7.2% of the operators had encountered signs of possible lignocaine toxicity after thoracoscopy.

## Procedure performance and technical aspects

The procedure performance characteristics are summarized in Table 5. Thirty-four percent of the respondents preferred IV access on the hand on the same side as that of thoracoscopy. Thirty-eight percent preferred IV access on the contralateral side, and 26% did not have any specific preference.

**Table 2: Preprocedure investigations and patient preparation before thoracoscopy**

| Question | Yes (%) | No (%) |
|---|---|---|
| Obtain written informed consent before thoracoscopy | 97 (97.0) | 3 (3.0) |
| Provide a patient information sheet describing the procedure to patients while scheduling the procedure | 45 (45.0) | 55 (55.0) |
| Obtain coagulation studies (PT, INR, and APTT) routinely in patients planned for thoracoscopy | 89 (89.0) | 11 (11.0) |
| Obtain hemoglobin levels routinely in patients planned for thoracoscopy | 91 (91.0) | 9 (9.0) |
| Obtain blood glucose estimation routinely in patients planned for thoracoscopy | 70 (70.7) | 29 (29.3) |
| Obtain urea and creatinine level estimation routinely in patients planned for thoracoscopy | 79 (79.0) | 21 (21.0) |
| Obtain platelet counts routinely in patients planned for thoracoscopy | 96 (96.0) | 4 (4.0) |
| Viral markers (HIV/hepatitis B/hepatitis C) testing before thoracoscopy | | |
| Always | 75 (75.6) | 2 (2) |
| Most of the times | 12 (12.0) | |
| Sometimes | 10 (10.1) | |
| Routinely fast patients before thoracoscopy | 97 (97.0) | 3 (3.0) |
| Would consider performing thoracoscopy in the absence of a recent chest radiograph/CT thorax | 9 (9.0) | 91 (91.0) |

APTT: Activated clotting time, CT: Computed tomography, PT: Prothrombin time, INR: International normalized ratio

Nearly half (55.1%) performed a chest ultrasound just before the procedure. Pneumothorax induction before thoracoscopy was routinely performed by only 20% of the individuals. Povidone-iodine was the most preferred agent (86.9%) for skin preparation at the incision site. The intercostal nerve block was only practiced by 21.2% of the respondents, whereas the vast majority (78.9%) performed the procedure under local anesthesia only. The commonly used accessories for pleural insertion were metallic cannula with blunt conical tip trocar (44.9%) and plastic trocar with a cannula (40.8%). The majority of the respondents (79%) used approximately 1–2 cm size incision for trocar introduction. Triangle of safety was the preferred thoracoscopy port creation site in the majority (54.6%). However, 43.4% of the respondents made this decision based on preprocedure ultrasound findings. Only 8.2% of the respondents utilized a second entry port during MT. Most of the respondents (82.8%) routinely obtained a chest radiograph following thoracoscopy.

Postthoracoscopy, the chest drain was removed by most of the respondents after lung expansion, on the same day (23.2%), or the next day (59.6%). In patients with nonexpanding lung following thoracoscopy, 67% discharged the patients with intercostal tube and bag. 11.3% would consider the insertion of an indwelling pleural catheter. Most of the respondents obtained 4–8 pleural biopsy pieces; all respondents sent samples for histopathology and relevant cultures, including for tuberculosis, as indicated. 18.2% of the respondents performed pleural cryobiopsy. Most of the respondents tend to discharge patients by the next day (67.4%), and 9.2% discharge the patients on the same day.

### Complications

Around two-thirds (68.8%) of the respondents reported that they had experienced some intraprocedural or procedure-related complications. Infective complications were most common. Empyema and incision/port-site infections were reported by 21.5% and in 7.7% of the respondents, respectively. Other reported complications included persistent air leak >48 h (16.9%), bleeding complications (either from biopsy or port site) (16.9%), failure of lung expansion (13.8%), and re-expansion pulmonary edema (9.2%). 6.2% reported having encountered severe cardiovascular complications (such as acute coronary syndrome and arrhythmias) following thoracoscopy. 7.7% of the respondents reported any procedure-related mortality. Table 6 describes the details of thoracoscopy related complications reported in this survey.

## DISCUSSION

We report the results of a comprehensive national survey on the prevalent practices of MT in India. This survey is the first survey on thoracoscopy practices in India, and the survey questionnaire is one of the most comprehensive, considering the few international studies also undertaken in this regard.

The findings of the survey highlight many vital aspects of thoracoscopy practice in India. There is an urgent need for formal thoracoscopy training programs in the country. Only a limited number of respondents received formal training in performing the procedure. There is greater use of the rigid thoracoscope in India, and these findings are similar to those reported in the USA and UK.[6-8] The diagnostic yield of either the rigid or the flexi-rigid thoracoscope is identical.[1,9] However, pain is likely to be reduced with the use of a flexi-rigid thoracoscope.[1] Interestingly, 26% of the respondents used both scopes. This likely reflects the degree of expertise with the proceduralist, wherein a particular scope may be used depending on the individual scenario. This is also reflected by the fact that a relatively large number of respondents reported the performance of advanced pleural procedures and not just limited to parietal pleural biopsy. This likely indicates that the survey responses likely report the characteristics of experienced operators.

Thoracic societies have published guidelines on the technical considerations of MT.[3] The findings of the survey also highlight differences in prevalent practices as compared with the available guidelines. Checklists have been demonstrated to decrease medical errors and improve quality and patient outcomes. In a recent survey, 75% of the respondents performing thoracoscopy used checklists; however, we did not ask this question in our survey.[10] Patient information sheets are recommended for a better understanding of the procedure for the patients; however, in the survey, only 45% of the respondents regularly provided written patient information sheets. An important observation

**Table 3: Patient preparation and monitoring details during thoracoscopy**

| Question | Responses | *n* (%) |
|---|---|---|
| Duration of fasting patients before thoracoscopy (h) | 4-6 | 63 (64.3) |
| | <4 | 4 (4.1) |
| | >6 | 31 (31.6) |
| If a patient planned for thoracoscopy is receiving aspirin or clopidogrel, what would you do? | Stop both before the procedure | 61 (61.7) |
| | Stop clopidogrel only | 28 (28.3) |
| | Stop aspirin only | 3 (3.0) |
| | Continue both | 4 (4.0) |
| | Others | 4 (4.0) |
| Admit the patient for the procedure - when? | A day before the procedure | 56 (56.0) |
| | Day of procedure | 33 (33.0) |
| | More than one day before the procedure | 10 (10) |
| | Do not admit (daycare) | 1 (1.0) |
| Do you think CT thorax must be performed before planning a patient for thoracoscopy? | Yes | 77 (77.0) |
| | No | 11 (11) |
| | Others | 12 (12.0) |
| Anesthesia modality preferred for thoracoscopy | Local anesthesia with intravenous Sedation | 76 (76.0) |
| | General anesthesia | 18 (18.0) |
| | Local anesthesia without intravenous sedation | 4 (4.0) |
| | Others | 2 (2.0) |
| Oxygen administration during thoracoscopy (when?) | Continuously during procedure | 60 (61.2) |
| | Only when desaturation occurs | 34 (34.7) |
| | Others | 4 (4.1) |
| Prophylactic LMWH administration to patients undergoing thoracoscopy who are at high risk of thromboembolism | Sometimes | 36 (36.0) |
| | Never | 32 (32.0) |
| | Most of the times | 19 (19.0) |
| | Always | 13 (13.0) |
| Premedication with NSAIDs before starting the procedure | Never | 57 (57.0) |
| | Sometimes | 35 (35.0) |
| | Most of the times | 7 (7.0) |
| | Always | 1 (1.0) |
| Administer prophylactic antibiotics (before beginning the procedure) | Never | 35 (35) |
| | Always | 24 (24) |
| | Sometimes | 22 (22) |
| | Most of the times | 17 (17) |
| | Only with empyema and parapneumonic effusions | 2 (2) |
| Administer antibiotics after procedure completion | Always | 41 (41) |
| | Sometimes | 26 (26) |
| | Most of the times | 18 (18) |
| | Never | 12 (12) |
| | Others | 3 (3) |
| Duration of patient observation following thoracoscopy | <30 min | 7 (7.0) |
| | 30 min-1 h | 18 (18.0) |
| | 1-2 h | 43 (43.0) |
| | >2 h | 28 (28.0) |
| | Others | 4 (4.0) |
| Parameters routinely monitored during thoracoscopy (%) | | |
| Oxygen saturation | | 100 |
| Blood pressure | | 86 |
| ECG monitoring | | 74 |
| End-tidal $CO_2$ | | 10 |
| Heart rate | | 91 |
| Respiratory rate | | 2 |
| Equipment available in the procedure area (%) | | |
| Height adjustable table | | 84 |
| Resuscitation cart/trolley | | 94 |
| Oxygen source | | 97 |
| Suction equipment | | 97 |
| Cardiac monitor with facility for monitoring noninvasive BP, $SpO_2$, and ECG | | 95 |
| X-ray view box | | 94 |
| Trolley for holding all instruments | | 98 |
| Thoracoscope warmer | | 22 |
| Formaldehyde chamber | | 1 |
| Electrocautery | | 1 |

LMWH: Low-molecular-weight heparin, NSAID: Nonsteroidal anti-inflammatory drug, BP: Blood pressure, ECG: Electrocardiogram, SpO2: Oxygen saturation, CT: Computed tomography

was that only 32% of the respondents regularly administered prophylactic low-molecular-weight heparin to patients at high risk of venous thromboembolism. Preprocedure nonsteroidal anti-inflammatory drug administration is recommended as an aid to analgesia in local anesthetic thoracoscopy; however, this was practiced routinely only by 8% of the respondents. The use of thoracic ultrasound to decide the entry port is preferable best practice, but this was not routine in the survey. Another important observation was that only 9.3% of the respondents used lignocaine in recommended concentrations (0.5%–1%), and most (84.5%) used 2% lignocaine for local anesthesia. This is important because a higher dose of lignocaine may be associated with adverse consequences.[11] An upper limit of 3 mg/kg for infiltration of lignocaine has been suggested to avoid toxicity; however, more than one-third of the respondents did not document cumulative lignocaine dose. A relatively large proportion used prophylactic antibiotics as a routine. However, this practice has not been found to reduce the risk of infectious complications following thoracoscopy.[12] Pleural cryobiopsy is another commonly utilized method in pleuroscopy, which is safe, albeit without a significant increase in diagnostic yield.[13,14] The use of pleural cryobiopsy in our survey was less as compared to another survey of flexi-rigid thoracoscopy use.[6] In our survey, only 9.2% of the respondents discharged patients on the same day postprocedure. This is different from practice elsewhere, wherein thoracoscopy is largely performed as a day-care procedure.[6,8]

**Table 4: Sedation and local anesthesia during thoracoscopy**

| Question | Responses | *n* (%) |
|---|---|---|
| The preferred agent for sedation during thoracoscopy | Midazolam | 18 (18.2) |
| | Midazolam + fentanyl | 54 (54.5) |
| | Midazolam + pentazocine | 7 (7.1) |
| | Propofol | 7 (7.1) |
| | Fentanyl | 2 (2.1) |
| | Dexmedetomidine | 2 (2.1) |
| | Midazolam + tramadol | 1 (1.0) |
| | Do not administer sedation | 1 (1.0) |
| | General anesthesia always | 7 (7.1) |
| Preference for single agent or combination sedation | Combination | 65 (65.7) |
| | Single drug | 28 (28.3) |
| | Do not use sedation | 6 (6.1) |
| Availability of naloxone or flumazenil in the procedure area | None available | 34 (35.8) |
| | Both available | 42 (44.2) |
| | Only naloxone available | 13 (13.7) |
| | Only flumazenil available | 1 (1.0) |
| | I don't know | 5 (5.3) |
| Sedation administrator | Anesthesiologist | 49 (50.0) |
| | Assisting doctor | 16 (16.3) |
| | Assisting technician | 9 (9.2) |
| | Bronchoscopy nurse | 24 (24.5) |
| The concentration of lignocaine solution for local anesthesia | 0.5% | 1 (1.0) |
| | 1% | 8 (8.3) |
| | 2% | 82 (84.5) |
| | 4% | 5 (5.2) |
| | I don't know | 1 (1.0) |
| Monitor and document the total dose of lignocaine | Yes | 61 (63.5) |
| Encountered possible signs of lignocaine toxicity after thoracoscopy | Yes | 7 (7.2) |
| | No | 89 (91.8) |
| | Not aware of the signs of lignocaine toxicity | 1 (1.0) |

**Table 5: Procedural and technical aspects of thoracoscopy**

| Question | Responses | *n* (%) |
|---|---|---|
| Routinely administer an intercostal nerve block | Yes | 21 (21.2) |
| | No | 78 (78.8) |
| Secure intravenous access on which hand | Same side of thoracoscopy | 34 (34.0) |
| | The side opposite of thoracoscopy | 38 (38.0) |
| | No specific preference | 26 (26.0) |
| | Decided by anesthesiologist | 2 (2.0) |
| Routinely perform chest ultrasound just before the start of the procedure | Yes | 54 (55.1) |
| | No | 44 (44.9) |
| Create pneumothorax before port creation/pleural entry | Always | 19 (20.0) |
| | Most of the times | 16 (16.8) |
| | Sometimes | 32 (33.7) |
| | Never | 28 (29.5) |
| Patient position during the procedure | Lateral decubitus with the affected side up | 95 (97.9) |
| | Depending according to indication | 2 (2.1) |
| The agent used for skin preparation at the incision site | Povidone-iodine | 86 (86.9) |
| | Chlorhexidine | 13 (13.1) |
| Type of trocar and cannula | Metallic with blunt conical tip trocar | 44 (44.9) |
| | Metallic with sharp triangular tip trocar | 13 (13.3) |
| | Plastic trocar and cannula | 40 (40.8) |
| | Disposable laparoscopy trocar | 1 (1.0) |
| Approximate length of incision for trocar introduction (cm) | ≤1 | 20 (20.0) |
| | 1-2 | 79 (79.0) |
| | >2 | 1 (1.0) |
| The preferred site for the creation of the thoracoscopy port | Fourth or fifth intercostal space in the Mid-axillary line (triangle of safety) | 54 (54.6) |
| | Variable depending on the chest Ultrasound findings | 43 (43.4) |
| | Others | 2 (2.0) |
| Create a second entry port during the procedure | Always | 1 (1.0) |
| | Most of the times | 7 (7.2) |
| | Sometimes | 35 (35.7) |
| | Never | 55 (56.1) |
| Number of pleural biopsies taken | 4-8 | 70 (72.9) |
| | 2-3 | 15 (15.6) |
| | >8 | 11 (11.4) |
| | IQR | 5 (4-6.5) |
| Amount of talc used for pleurodesis in case of pneumothorax (g) | 1-2 | 23 (23) |
| | 3-5 | 50 (50) |
| Amount of talc used for pleurodesis in case of pleural effusion (g) | 1-2 | 14 (14.4) |
| | 3-5 | 62 (63.9) |
| Postprocedure intercostal drain size (Fr) | 16-20 | 11 (11.2) |
| | 22-26 | 46 (46.9) |
| | 28-32 | 40 (40.8) |
| | Variable | 1 (1.0) |
| Suction application following thoracoscopy | Never | 45 (45.4) |
| | Sometimes | 48 (48.5) |
| | Most of the times | 6 (6.1) |
| Chest radiography following thoracoscopy | Always | 53 (53.5) |

*Contd...*

**Table 5: Contd...**

| Question | Responses | *n* (%) |
|---|---|---|
| | Most of the times | 22 (22.2) |
| | Sometimes | 16 (16.2) |
| | Never | 8 (8.1) |
| When to remove the chest drain | Day after lung expansion | 59 (59.6) |
| | The same day of lung expansion | 23 (23.2) |
| | Day after the procedure, irrespective of lung expansion | 4 ((4.0) |
| | After the histopathology report | 9 (9.1) |
| | Drain <50 ml in the last 24 hours | 2 (2.0) |
| | Once the drain is <100 ml | 1 (1.0) |
| | Individualized | 1 (1.0) |
| Chest radiography before intercostal drain removal after thoracoscopy | Always | 79 (79.8) |
| | Most of the times | 12 (12.1) |
| | Sometimes | 5 (5.1) |
| | Never | 3 (3.0) |
| Approach to nonexpanding lung post thoracoscopy | Discharge patient with a chest tube and intercostal drainage bag | 65 (67.0) |
| | Use IPC | 11 (11.3) |
| | Remove chest tube anyway | 6 (6.2) |
| | Surgical opinion | 4 (4.1) |
| | Negative suction | 1 (1.0) |
| | Computed tomography chest | (1.0) |
| Discharge after thoracoscopy | Same day | 9 (9.2) |
| | Next day | 57 (58.2) |
| | 3rd to 4th day | 6 (6.1) |
| | After lung expansion and chest tube removal | 14 (14.3) |
| | Case to case basis | 9 (9.2) |

IPC: Indwelling pleural catheter, IQR: Interquartile range

Our study had certain limitations. Despite using various databases and personal contacts, we may have missed contacting potential respondents. Electronic surveying methodology could potentially have caused the exclusion of some respondents and could introduce a selection bias. We did not cover certain areas such as utilization of thoracoscopy checklist, thoracoscope cleaning and storage practices, modification of anticoagulation before the procedure, and management of complications. However, a more elaborate questionnaire might have reduced response rates or increased frequency of incomplete responses.

## CONCLUSION

MT is a rapidly evolving interventional pulmonology procedure in India, with an increasing number of centers and pulmonologists beginning to perform the procedure over the past few years. There is a need to enhance the availability of formal thoracoscopy training programs in India. National guidelines on MT are required to standardize the technical and procedural aspects of thoracoscopy.

**Table 6: Complications of thoracoscopy encountered by respondents**

| Question | Responses | *n* (%) |
|---|---|---|
| Encountered any complications during thoracoscopy in the last 1 year | Yes | 64 (65.3) |
| Complications of thoracoscopy | Empyema | 14 (21.5) |
| | Extensive subcutaneous emphysema | 13 (20.0) |
| | Persistent air leak (>48 h) | 11 (16.9) |
| | Pulmonary edema | 11 (16.9) |
| | Failure of lung expansion | 9 (13.8) |
| | Re-expansion pulmonary edema | 6 (9.2) |
| | Bleeding from the biopsy site | 6 (9.2) |
| | Bleeding from port site | 5 (7.7) |
| | Incision site or port-site infection | 5 (7.7) |
| | Mortality/death | 5 (7.7) |
| | Vasovagal attack | 3 (4.6) |
| | Acute coronary syndrome | 2 (3.1) |
| | Arrhythmia | 2 (3.1) |
| | Convulsions | 1 (1.5) |
| | Hemoptysis | 1 (1.5) |
| | Fever | 1 (1.5) |
| | Respiratory depression | 1 (1.5) |
| | Xylocaine reaction | 1 (1.5) |

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