

Preferences of the Thoracic-Surgery Academic Teaching Staff on Thoracotomy Opening/Closure and Post-Thoracotomy Pain Management

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Abstract

Background: A survey was conducted on preferences for thoracotomy opening and closure as well as post-thoracotomy pain management among academic teaching staff of thoracic surgeons in Turkey. It was aimed to assess the attitudes of the thoracic surgery training-center academicians on aforesaid topic. **Methods:** A 7-question questionnaire was performed by face-to-face interview or online by e-mail to the academic professionals working at resident-training centers. Eighty-eight randomly selected academicians were invited to complete the questionnaire, and 48 of them answered. Based on the complete and valid responses, the methods for opening and closure of thorax, the number of chest drains placed, the method of analgesia in per-or postoperative period and the analgesic agents used commonly were assessed. **Results:** Thirty-three (68.8%) of 48 were working at university hospitals and 24 (50.0%) were in age group of 40 - 49 years. Muscle-sparing (41.7%) and standard posterolateral thoracotomies (41.7%) were the most preferred incision. The most used method for closing thorax was pericostal sutures. Per-or postoperative analgesia was stated to be performed by all of the participants, while 45 (93.75%) of them reported that they preferred to administrate more than one procedure. Intercostal/paravertebral nerve block (26.4%), epidural analgesia (24.5%), systemic parenteral non-steroid drugs (24.5%) and systemic parenteral opioid (20.9%) were the most commonly used methods. **Conclusion:** Preventing intercostal nerve injury decreased post-thoracotomy pain, as well as the necessity of post-operative analgesic use. Conversely, most of the academic staff did not prefer the methods for preserving intercostal nerve. More than one analgesia procedure were said to be used by majority of the participants.

Keywords

Thoracotomy Opening and Closure, Pain, Analgesia, Academic Teaching Staff

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1. Introduction

Post-thoracotomy pain (PP) is one of the most severe kind of postoperative pain that frequently leading to complications due to secretion retention [1]. The factors resulting with pain are: retraction due to usage of rib retractor, incidental rib fracture, separation of costovertebral junction, intercostal nerve injury or irritation of pleura with chest tube [2]. The combination of one or more of these factors determines the formation and severity of pain. Among these factors intercostal nerve injury is mentioned as the leading cause of pain [3]. Although it is known that the pain has been decreased significantly by the performance of video-assisted-thoracoscopic surgery (VATS), PP continues to be a challenging problem for thoracic surgeons in situations requiring conventional thoracotomy or in the centers not using VATS as a routine procedure [1]. Several methods are recommended to decrease PP. Some of these are associated with the technique of opening and closure of the thorax including muscle sparing thoracotomy or techniques to minimize the intercostal nerve injury. On the other side, different centers apply varied ways of administration of local or systemic analgesic agents intra or postoperatively.

In this study, we aim to assess the attitudes of the thoracic surgery training-center academicians with a questionnaire including 7 questions, for the methods to reduce PP.

2. Material and Methods

A questionnaire including 7 questions (**Table 1**) was performed by face-to-face interview or online by e-mail to the professors and associated-professors working at resident-training centers. Forty-eight academicians answered the questionnaire among 88 academicians who we could set up communication. The methods for opening and closure of thorax, the number of chest drains placed, the method of analgesia in per-or postoperative period and the analgesic agents used commonly were assessed, based on the complete and valid responses. The age group and working center (city hospital, university hospital, private hospital) were noted. The first section of the questionnaire included questions about the choice of incision for a planned lobectomy via thoracotomy and the techniques for opening and closure of the thorax (**Table 2**). The academicians of our clinic were not invited to the questionnaire in order to increase the reliability of the study.

The second section of the questionnaire included the questions about the usage of paravertebral or intercostal nerve block intra or postoperatively and the kind of anesthetic agent if used. The choice of systemic analgesic agent administered postoperatively was questioned (**Table 3**).

The data was grouped and the percentage of distribution was calculated without any further statistical analyses.

3. Results

The distribution according to working place of 48 academicians who completed the questionnaire was 37 (77.0%) at university hospital, 9 (18.8%) at city hospital and 2 (4.2%) at private hospital. Five (10.4%) of the academicians were in the age group of 30 - 39 years, 24 (50.0%) in 40 - 49 years, 17 (35.4%) in 50 - 59 years and 2 (4.2%) in 60 - 69 years.

The answers of questions in the first section were presented in **Table 4**. While thirty-two (66.7%) academicians reported that they had preferred placing two chest tubes after all type of lobectomies, 15 (31.3%) reported that they had preferred placing one chest tube after all types lobectomies and 1 (2.1%) reported that he had preferred placing two chest tubes after upper lobectomy and one chest tube after lower or middle lobectomies.

All of the academicians reported that they had performed analgesia per-or postoperatively for the first question of the second section (**Table 5**). Forty-five (93.8%) of participants mentioned that they had preferred more than one methods for analgesia. These methods included 29 (26.4%) peroperative intercostal/paravertebral nerve block, 27 (24.5%) epidural analgesia, 27 (24.5%) systemic parenteral non-steroids, 23 (20.9%) systemic parenteral opioid, 3 (2.7%) analgesic agent infusion by pleural catheter and 1 (0.9%) spinal analgesia.

Two academicians for the question “The local anesthetic agent that you prefer if you perform per-or post-thoracotomy block?”, 19 academicians for the question “The anesthetic agent that you prefer if you perform parenteral systemic analgesia postoperatively?” and 9 academicians for the question “The anesthetic agent that you prefer if you perform parenteral systemic non-steroidal anti-inflammatory analgesia postoperatively?” reported that they had preferred more than one anesthetic or analgesic agent.

Table 1. The questionnaire performed to academicians.

General Information
The hospital that you work?
City (state) hospital
University hospital
Private hospital
Other (please specify)
Your age?
30 - 39
40 - 49
50 - 59
60 and older
Section 1
1. The incision that you prefer for a planned lobectomy (except extended resections)?
Standard posterolateral thoracotomy
Anterolateral thoracotomy
Anterior thoracotomy
Muscle-sparing thoracotomy
Other (please specify)
2. The technique preferred for the opening of thorax?
By the dissection of intercostal muscle
Subperiostally (by the dissection of intercostal muscle from the rib using electrocotary or rougin)
Harvesting of a intercostal muscle flep
By the performance of second and third choices
3. The technique preferred for the closure of thorax?
Pericostal sutures (contuining or separated sutures passing round the upper and lower ribs of the intercostal space that you entered to thorax)
Sutures passing through the intercostal bundle dissected supperiostally and the lower intercostal bundle
Intracostal sutures (sutures passing from the holes drilled on the upper on lower ribs)
By the performance of second and third choices
4. Number of chest tubes that you placed after lobectomy?
Two chest tubes for all types of lobectomy
One chest tube for all types of lobectomy
Two chest tubes for upper lobectomy, one for middle or lower lobectomies
Section 2
1. The preferred anesthetic agent if you perform per-or post-thoracotomy block?
I don't perform
Bupivacaine
Lidocaine
Prilocaine
Levobupivacaine
2. The preferred analgesic agent if you perform postoperative systemic parenteral analgesia?
Non-steroidal anti-inflammatory agent
Opioid derives
3. The agent preferred if you perform postoperative systemic parenteral analgesia with non-steroidal anti-inflammatory agents?
I don't
Diclofenac sodium/potasium
Naproxen
Asetaminofen
Ibuprofen
Ketoprofen
Tenoxicam

Table 2. The preferences of academicians for thoracotomy incision type and technique for opening and closure of thorax.

The incision that you preferred for a lobectomy (except extended resections)?

The technique for the opening of thorax?

The technique for the closure of thorax?

Number of chest tubes placed after lobectomy?

Table 3. The methods preferred for the management of postoperative pain.

The local anesthetic agent that you preferred frequently if you perform per-or post-thoracotomy nerve block?

The analgesic agent that you preferred frequently if you perform postoperative systemic parenteral analgesia?

The analgesic agent that you preferred frequently if you perform postoperative systemic parenteral non-steroidal anti-inflammatory analgesia?

Table 4. The distribution of the preferred thoracotomy incision and thecnique for the opening and closure of thorax.

	n	%
The incision that preferred for a planned lobectomy (except extended resections?)		
Muscle sparing thoracotomy	20	41.7
Standard posterolateral thoracotomy	20	41.7
Antero-lateral thoracotomy	7	14.6
Anterior thoracotomy	1	2.1
The technique for the opening of thorax?		
By the dissection of intercostal muscle	31	64.6
Subperiostally (by the dissection of intercostal muscle from the rib using electrocotary or rougin)	15	31.3
Harvesting of a intercostal muscle flep	1	2.1
By the performance of second and third choices	1	2.1
The technique for the closure of thorax?		
Pericostal sutures (contuining or separated sutures passing round the upper and lower ribs of the intercostal space that you entered to thorax)	36	75.0
Sutures passing through the intercostal bundle dissected supperiostally and the lower intercostal bundle	6	12.5
Intracostal sutures (sutures passing from the holes drilled on the upper on lower ribs)	5	10.4
By the performance of second and third choices	1	2.1
Number of chest tubes that you placed after lobectomy?		
Two chest tubes for all types of lobectomy	32	66.7
One chest tube for all types of lobectomy	15	31.3
Two chest tubes for upper lobectomy, one for middle or lower lobectomies	1	2.1

Table 5. The preferred analgesic agents for per-or postoperative analgesia.

	n	%
The preferred anesthetic agent if you perform per-or post-thoracotomy block?		
I don't perform	4	8.0
Bupivacaine	39	78.0
Lidocaine	4	8.0
Prilocaine	2	4.0
Levobupivacaine	1	2.0
The preferred analgesic agent if you perform postoperative systemic parenteral analgesia?		
Non-steroidal anti-inflammatory agent	36	53.7
Opioid derives	31	46.8
The agent preferred if you perform postoperative systemic paenteral analgesia with non-steroidal anti-inflammatory agents?		
I don't	2	3.3
Diclofenac sodium/potasium	38	62.3
Naproxen	8	13.1
Asetaminofen	7	11.5
Ibuprofen	3	4.9
Ketoprofen	2	3.3
Tenoxicam	1	1.6

4. Discussion

The control of pain after conventional thoracotomy that affecting the quality of life adversely is one of the basic problems of thoracic surgery. Many reasons of pain like length of the insicion, chest wall muscles insiced, rib fracture, number of chest tubes placed and intercostal nerve injury, were reported. Intercostal nerve injury during the opening and closure of the thorax is mentioned as the major factor of PP among these reasons [3]. Although the incidence of pain after lung resection has decreased by the use of VATS increasingly, lung resection is being performed via conventional thoracotomy in most of the centers. This is a result of lack of equipment and experience besides the preference of palpation of lung by some of the surgeons for oncological surgery [4].

Most of the studies are focused on the pervention of intercostal nerve injury during the opening and closure of thorax, by the opinion of that the intercostal nerve injury has been decided as the main reason of PP. Bayram and colleagues [5] reported that intercostal injury can be prevented by the partial dissection intercostal nerve together with the intercostal muscle during the closure of thoracotomy and approximation of the ribs with sutures passing through the holes in the fifth and sixth ribs drilled using a perforator. Similarly, Cerfolio and colleagues [6] mentioned that harvesting of an intercostal muscle flap during the opening and prevention of nerve during closure of thoracotomy had reduced PP and need of analgesia significantly.

Seventy-five percentage of the academicians reported that they had preferred pericostal sutures for the closure of thoracotomy, traditionally. In the study by Visagan and colleagues [7] it was mentioned that there had been 7 researches in the literature reporting the superiority of closure with intracostal sutures by the prevention of intercostal nerve to closure with pericostal sutures. It is suggested that closure of the thoracotomy with pericostal sutures leads to more PP in the early postoperative period and precipitates chronic PP due to the symphysis of the upper and lower ribs in the late postoperative period. As a confirmation of this opinion, 93.8% of academicians, preferring pericostal sutures much more, expressed that they had been using more than one methods for the management of PP.

The use of centrally effective opioid derivations for the control of pain is approximately about 31%. However

the administration of the combination of narcotic analgesics, leading to respiratory depression especially in older patients, with the non-steroidal anti-inflammatory agents is one of the results of our questionnaire.

Although the studies reporting the sufficiency of one chest tube placement for all types of lobectomies [8] [9], most of the academicians in our study indicated that they had kept placing two chest tubes for all types of lobectomies. In these studies, it is also mentioned that there had been a positive correlation between the number of chest tubes placed and PP.

Eventhough the increasing use of VATS for pulmonary lobectomies, we see that traditional methods for opening and closure of the thorax is preferred for the cases required conventional thoracotomy especially by the academicians taking place in the training of assistant doctors. Despite the significant reduction of PP and requirement of analgesia ensured with the protection of intercostal nerve by the convenient methods during the opening and closure of thorax were shown in prospective randomised studies [10], the choice of pericostal sutures inducing PP can be interrogated. The extension of operation time due to the procedures for the protection of intercostal nerve can be a probable reason for this choice. Similarly, the age can be a factor for this choice as seen in our study. Most of the academicians preferring traditional methods like pericostal sutures were older than 50 years with a percentage of 50%.

5. Conclusion

By the performance of VATS as a standard method for lung resections, the PP would be a less challenging problem for the clinicians. We hope that the techniques for the opening and closure of thorax must be considered more carefully in order to reduce PP in this transition process.

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