

Factors in the Selection and Management of Chest Tubes After Pulmonary Lobectomy: Results of a National Survey of Thoracic Surgeons

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Background. This study determined patterns of chest tube (CT) selection and management after open lobectomy and minimally invasive lobectomy by thoracic surgeons.

Methods. Surveys were sent electronically to 5,175 thoracic surgeons, and 475 were completed. Responses, blinded so individuals could not be identified, were analyzed and compared according to surgeon characteristics (academic/private practice, years in practice, lobectomy volume, and geographic region). All indicated differences were statistically significant ($p < 0.05$ by χ^2 tests).

Results. CT selection: Most surgeons prefer rigid tubes, and the size most commonly used was 28F. Most place 2 CTs after open lobectomy and 1 CT after minimally invasive lobectomy. Academic surgeons are more likely than private surgeons to use 1 tube after open lobectomy, but both prefer 1 tube after minimally invasive lobectomy. Younger surgeons and high-volume surgeons are more likely to use 1 CT than senior surgeons and

low-volume surgeons after both open lobectomy and minimally invasive lobectomy. CT management: Academic and younger surgeons remove the CT sooner after open lobectomy. Younger and high-volume surgeons remove the CT with greater drainage amounts. All groups remove CTs sooner after minimally invasive lobectomy than after open lobectomy. Approximately half of surgeons get a daily chest roentgenogram. Younger and low-volume surgeons are most likely to discharge patients with Heimlich valves, although overall use was in less than 5% (49 of 475) of respondents. Most surgeons believe clinical experience rather than training or the literature determined their CT strategy.

Conclusions. This survey determined the difference in CT management among various groups of surgeons. Clinical experience was the most important factor in determining their CT strategy.

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The use of chest tubes (CTs) after pulmonary lobectomy is routine and a universal practice; yet, there are distinct differences among surgeons in the types and sizes of CTs that are used and in how they are managed [1–4]. For such an important component of thoracic surgical practice, there is scant literature that deals with these considerations. Despite efforts by thoracic surgical communities to address the ambiguities regarding CT management and nomenclatures [5], the best practice remains undefined.

With the belief that the necessary start in addressing best practices is to understand current practice patterns, the aim of this study was to identify the current practice patterns and factors that influence the use and management of CTs and to compare use and management strategies among various thoracic surgeon groups.

Material and Methods

We developed a questionnaire that was sent to 5,175 cardiothoracic surgeons. The survey was sent by e-mail on February 1, 2013, and concluded on April 1, 2013. A reminder e-mail was sent 4 weeks after the initial e-mail. A total of 475 surgeons responded by completing the questionnaires. The survey questionnaires (online Appendix) contained 33 questions that queried surgeons' preferences in choosing the types and size of the CTs placed after lobectomy and their postoperative management strategies. The factors that influenced the choice of the CT and the management were assessed. Demographic characteristics of the responding surgeons were gathered and correlated with CT choices and management.

Responses, blinded so individual surgeons could not be identified, were analyzed and compared according

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to surgeon characteristics (academic/private practice, years in practice, lobectomy volume, and geographic region). Surgeons who performed 1 to 30 lobectomies were defined as low-volume surgeons, and those who performed 31 to 75 lobectomies and more than 75 lobectomies were defined as medium-volume and high-volume surgeons, respectively. Surgeons were also divided into four subgroups based on years in practice: fewer than 10 practice years (youngest), 10 to 20 years, 20 to 30 years, and 30 or more years (oldest).

For comparison, the Society of Thoracic Surgeons (STS) General Thoracic Surgery Database was similarly queried from 2004 to 2011 for patterns of CT use after lobectomy. Limited comparisons were possible (duration of CTs for open and video-assisted thoracic surgery [VATS] lobectomy and discharge home with CT) because the database addressed fewer of the CT issues than did the questionnaire.

Statistical comparisons were performed using IBM SPSS 20.0 software (IBM Corp, Armonk, NY). All indicated differences are statistically significant ($p < 0.05$ by Pearson χ^2 tests).

Results

Demographics

The surgeons who replied to the survey represent a heterogeneous mixture of backgrounds and experiences (Table 1). Of the 475 surgeons who replied, 222 described their practice as academic, and 253 identified themselves as in private practice, and 64.4% indicated they perform minimally invasive lobectomy. More academic, high-volume, and younger surgeons perform minimally invasive lobectomy than private practice, low-volume, or older surgeons. Furthermore, a higher percentage of lobectomies performed by the former group are minimally invasive ($p = 0.01$).

CT Selection: Number, Type, and Size

Number of CTs: When open lobectomy was performed, academic surgeons and private surgeons were both more likely to use 2 CTs than 1 (Table 2). This was true independently of the lobe removed. When only 1 tube was placed, compared with private surgeons, more academic surgeons used 1 CT in upper lobectomy (49.1% vs 35.2%, $p = 0.01$) and in lower lobectomy (48.6% vs 33.9%, $p = 0.01$).

The youngest surgeons (<10 practice years) were more likely to use 1 CT (55.2%) after open upper lobectomy compared with surgeons who had 10 to 20 practice years (46.6%), 20 to 30 practice years (32%), and 30 or more practice years (24.1%, $p = 0.01$). Similarly, young surgeons were also more likely to use 1 CT after open lower lobectomy ($p = 0.01$). High-volume surgeons were more likely to use 1 CT compared with medium-volume and low-volume surgeons after open upper lobectomy (52.2% vs 46.3% and 30.3%, respectively; $p = 0.01$) and open lower lobectomy (51% vs 43.9% and 30.3%, respectively; $p = 0.01$).

Table 1. Characteristics of 475 Surgeons Who Responded to the 2013 Survey

Characteristics	Response (N = 475) No. (%)
Type of practice	
Academic	222 (46.7)
Private	253 (53.3)
Years in practice	
<10	143 (30.1)
10–19	131 (27.6)
20–29	122 (25.7)
≥30	79 (16.6)
Lobectomies per year, No.	
0–10	55 (11.6)
11–30	140 (29.5)
31–50	123 (25.9)
51–75	81 (17.1)
76–100	39 (8.2)
>100	37 (7.8)
Geographic location	
West	84 (17.7)
North	109 (22.9)
South	138 (29.1)
East	79 (16.6)
World	63 (13.3)
Perform minimally invasive lobectomy?	
Yes	306 (64.4)
No	169 (35.6)
Minimally invasive lobectomies, %	
0	40 (8.4)
<10	27 (5.7)
10–25	44 (9.3)
25–50	40 (8.4)
50–75	91 (19.2)
>75	104 (21.9)

For minimally invasive lobectomy, academic and private surgeons both preferred to use 1 CT rather than 2 after both upper and lower lobectomy (Table 2). Surgeons did not differ geographically (West, North, South, East, World), because the overall preference was 2 CTs for open lobectomy and 1 CT for minimally invasive lobectomy.

Type and size of CT: Most surgeons prefer rigid tubes (Table 2) regardless of the type of practice, years of experience, volume, and geographic location. A range of sizes is used, but 28F is the most common (297 of 475). The next most popular size was 24F (113 of 475), followed by 32F (91 of 475).

CT Management

The mean day of CT removal after open lobectomy for all surgeons was 2.8 days (Table 3). Academic surgeons remove the CTs sooner than private practice surgeons (2.64 vs 2.94 days, $p = 0.04$). The younger surgeons (<10 practice years) removed CTs sooner than surgeons who

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