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Cao, Christopher

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European questionnaire on the clinical use of video-assisted thoracoscopic surgery

Christopher Cao, Anna E. Frick, Ilkka Ilonen, Phil McElnay, Francesco Guerrera, David H. Tian, Eric Lim and Gaetano Rocco

INTRODUCTION

Since its introduction more than two decades ago, video-assisted thoracoscopic surgery (VATS) has emerged as a safe and effective alternative approach to traditional thoracotomy for selected patients with non-small-cell lung cancer [1–3]. Systematic reviews of the literature involving matched patients have demonstrated improved perioperative outcomes and shorter hospitalization periods for patients who underwent VATS compared to open thoracotomy [4, 5]. More recently, the uniportal VATS technique has evolved to provide an even less invasive alternative to the conventional multiportal VATS approach [6]. Since the introduction of this technique, selected retrospective studies have shown reductions in hospitalization, postoperative drainage and overall morbidities for the uniportal approach, although these findings were less apparent when propensity-matched patients were assessed, and there remains a relative paucity of long-term clinical data [7].

Despite these encouraging findings, there remains some persistent doubt among some members of the thoracic community about the minimally invasive approaches, and only a small proportion of lung resections are currently performed through VATS.
in Europe [8]. The purpose of the present study was to assess the current clinical practice of VATS in European institutions and the adoption of the multiportal and uniportal approaches for various thoracic surgical procedures.

MATERIALS AND METHODS

Thoracic surgeons involved in the present study were identified from the European Society of Thoracic Surgeons (ESTS) mailing list. The study was a collaborative effort sponsored by the ESTS Executive Committee, and no incentives were offered for participation. A link to an online questionnaire was emailed to all members of the ESTS on 18 March 2016. The survey was conducted by using a Google questionnaire web form, which included data on different sections: demographics, use of multiportal or uniportal VATS, institutional experience with VATS procedures and proportion of operations performed by different approaches. In order to continue in the questionnaire, all items had to be answered. Duplicated responses from the same institutions were excluded from data analysis. The list of questions included in the survey can be found within the Supplementary Material.

Statistical analysis

Samples were all analysed using non-parametric test, Mann-Whitney U-test or Kruskal-Wallis as parameters were not distributed normally. Correlation was assessed using the Pearson's coefficient or Spearman's rank, as appropriate. Analysis was done using IBM SPSS 23.0 statistical software.

RESULTS

Demographics

Within a 3-month period in 2016, we received 100 complete responses from 100 institutions in 31 countries. Of these, 94 were from Europe, 3 were from Asia and 3 were from North America. From the 100 responding institutions, the characteristics of the clinical practice of 461 board-certified surgeons were recorded, with a median number of 4 surgeons per institution. The geographic distribution of the participating institutions is presented in Fig. 1.

Use of multiportal and uniportal video-assisted thoracoscopic surgery

From the participating 100 institutions, all but one institution performed some form of VATS procedures. Overall, 324 of the 461 (70%) thoracic surgeons claimed to perform anatomical VATS resections, including segmentectomies, lobectomies, bilobectomies or pneumonectomies, with a total estimated caseload of 9519 resections per year. Two hundred and thirty-one (50%) surgeons reported to have performed lobectomies primarily through VATS. The types of primary access incision for a range of thoracic procedures are summarized in Fig. 2. In brief, participating surgeons reported that the primary access route for lung biopsy, pleural biopsy and pleurodesis were through multiportal or uniportal VATS, while decortication and lobectomy procedures were most commonly performed through multiportal VATS or thoracotomy. Moreover, extended procedures such as bilobectomies and pneumonectomies were primarily performed through an open thoracotomy. The proportion of cases performed through each approach within each institution is summarized in Fig. 3A–I.

The size of the thoracic unit, reflected by the total number of general thoracic surgeons, correlated neither with the likelihood of performing VATS anatomical resections (P = 0.341) nor with the volume of VATS anatomical resections (r = 0.035, P = 0.747). However, the case volume was significantly correlated with the number (r = 0.859, P = 0.019) and proportion (r = 0.339, P = 0.001) of surgeons who performed VATS anatomical resections. Overall, 47% of the centres performing anatomical VATS resections reported some use of uniportal access approach. The median number of VATS anatomical resections by centres that performed the uniportal technique was 73, compared to 50 in centres that only performed multiportal VATS (P = 0.503). No association was found between the number of thoracic surgeons within an institution and the likelihood of performing uniportal VATS lobectomy (P = 0.620).

DISCUSSION

Although widespread acceptance of the VATS technique has been slow since its introduction more than two decades ago, there has been a growing interest and adoption in recent years. Scepticism towards the VATS approach by the surgical community was demonstrated by a survey performed by Mack et al. [9] in 1995, when 189 members of the General Thoracic Surgery Club completed a survey on their clinical practice and attitude towards thoracoscopic surgery. At that time, >60% of the participating surgeons performed <20% of their procedures through the VATS approach—and yet, 38% of the respondents believed it was overused. Anatomical resections such as VATS lobectomies were considered to be ‘unacceptable’ or ‘investigational’ by 84% of the participating surgeons, with the greatest concerns related to oncological efficacy, lack of specialized instrumentation and prolonged operating time. In 2012, the Cross-sectional Survey On Lobectomy Approach (X-SOLA study) was completed. The study involved 838 international thoracic surgeons as one of the largest surgical surveys to date [10]. The key findings of this study pointed towards a paradigm shift in the inclination of surgeons regarding VATS procedures, as 92% of 416 surgeons who did not perform VATS lobectomy procedures reported that they wanted to learn the technique [10]. Of the 8% who did not perform VATS lobectomy and were not prepared to learn this technique, the biggest obstacles were limited resources and lack of exposure and/or mentoring, rather than concerns regarding safety or oncological efficacy [10].

In an effort to further minimize incisions, uniportal VATS lobectomy was developed as an alternative VATS approach. Since its introduction, a number of retrospective institutional reports have demonstrated the safety and feasibility of this technique [11, 12]. A recent systematic review and meta-analysis from eight series including 1850 patients compared uniportal (n = 627) with multiportal (n = 1223) VATS. This study demonstrated a significantly shorter hospitalization (6.2 vs 6.7 days, P < 0.0001) and duration of chest tube drainage (4.5 vs 5.4 days, P = 0.0006) for patients subjected to uniportal VATS, as well as a lower rate of postoperative complications (12.0% vs 13.7%, P = 0.009) [7]. It should be noted that these findings were statistically significant but unlikely to yield a clinical impact, especially because these differences were no longer significant for propensity-matched analysis. Furthermore, the authors noted a paucity of robust
long-term clinical data, indicating the need for additional studies to establish the exact role of uniportal VATS lobectomy in clinical practice [7].

The primary aim of the current study including 461 thoracic surgeons from 100 unique institutions within the ESTS was to assess the preferred surgical access for several thoracic procedures. The key findings of this study included a relatively large proportion of institutions that currently performed anatomical VATS resections, with 90% of institutions reporting at least one surgeon who performed anatomical resections through VATS. Overall, 70% of surgeons claimed to have performed anatomical VATS resections, and 50% of them had performed lobectomies primarily through the VATS approach. These proportions appeared to be higher than the ESTS database analysed by Seder et al. [13], which reported 15% of lobectomies being performed through VATS during 2010–2013. However, it should be noted that the study period was earlier and the participating European institutions were more inclusive in the Seder report compared to the present survey. Interestingly, the total number of thoracic surgeons within a unit did not correlate with the number of anatomical VATS resections. However, the number and proportion of VATS surgeons within an institution did correlate with the number of anatomical VATS resections. In addition, 47% of institutions that performed anatomical VATS resections did so via the uniportal approach for selected patients, and there was a trend to suggest these institutions had higher volumes of total anatomical VATS resections.

Figure 1: Summary of geographic origins of participating institutions, with the size of circles proportional to the number of institutions. Eight centres were from non-European countries.

Figure 2: Summary of primary access approaches for various thoracic procedures. VATS: video-assisted thoracoscopic surgery.
Figure 3: Summary of proportion of various access approaches for (A) lung biopsy, (B) pleural biopsy, (C) decortication, (D) pleurodesis, (E) wedge resection, (F) lobectomy, (G) pneumonectomy, (H) segmentectomy, and (I) sleeve resection. VATS: video-assisted thoracoscopic surgery.
resections than institutions that did not perform uniportal VATS resections, although this was not statistically significant. Overall, the results from this study suggested that the level of VATS training of individual surgeons, rather than the total number of thoracic surgeons, determined the total volume of anatomical VATS resections. It was noted that multiportal and uniportal VATS were the most common approaches for lung biopsies, pleural biopsies, pleurodesis and wedge resections. However, there was a relatively even distribution between thoracotomy and VATS for decortication and lobectomy procedures. Open thoracotomy remained the most common primary approach for complicated procedures or extensive resections such as segmentectomies, bilobectomies, pneumonectomies, sleeve resections and diaphragmatic/chest wall resections, despite recent studies reporting their safety and feasibility by VATS [14]. Finally, although uniportal VATS resections have a growing presence within the European thoracic surgical community, the proportion of surgeons who performed anatomical resections primarily through this approach was relatively low, with 13% reported for lobectomy procedures.

**Limitations**

A number of limitations to the study should be acknowledged. First, the proportion of respondents to the questionnaire was relatively low, at 10% of the ESTS members. However, this still represented a relatively large proportion of the ESTS database and was consistent with the proportion of thoracic surgeons who responded to previous surveys [10]. Second, the selection of responders may have been biased towards academic or tertiary institutions with an interest in VATS and, therefore, may differ to real-world clinical practice across Europe. Finally, reports from institutions were not independently validated, because robust verified clinical data were not required to participate in the survey. However, the results of the present study provided a useful snapshot of current clinical practice within the European thoracic community and may serve as a useful benchmark to compare with large multi-institutional databases.

**CONCLUSION**

In conclusion, compared to previous surveys, the results of the present study suggest that there is a strong trend favouring VATS for a range of thoracic procedures in the current clinical setting.

**SUPPLEMENTARY MATERIAL**

Supplementary material is available at ICVTS online.

**Conflict of interest:** none declared.

**REFERENCES**