Anesthesia in Thoracic Surgery in Catalonia: Results of a Survey Carried Out in 2003

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OBJECTIVE: To determine the anesthetic, surgical, and postoperative characteristics of patients who underwent thoracic surgery in Catalonia, Spain, in 2003.

MATERIAL AND METHODS: A prospective, cross-sectional survey was carried out on 14 randomly chosen days in 2003. All hospitals performing thoracic surgery in Catalonia took part. Data were collected on patient characteristics, anesthetic techniques, procedures, analgesia, and postoperative care.

RESULTS: Data on 171 anesthetic procedures in thoracic surgery were collected from 27 hospitals; these procedures represented 0.7% of the total anesthetic workload. Extrapolation from the collected data indicated that 4458 anesthetic procedures were performed in thoracic surgery in 2003 (95% confidence interval, 3624-4823 procedures). Of these procedures, 75.4% were performed in public hospitals and 24.6% in private hospitals. The median age of patients was 55 years (10th-90th percentiles, 22.4-73 years) and 63.9% were men. Surgical procedures were scheduled in 92.8% of the cases. The most common interventions were lung and bronchial surgery other than resection (36.8%), lung and/or bronchial resection (24.6%), and thoracoscopy and mediastinoscopy (20.5%). The median duration of pneumonectomies and lobectomies was 180 minutes (10th-90th percentiles, 90-221 minutes). General anesthesia was the most commonly used procedure (74.3%). Postoperative recovery took place in a conventional recovery room in 54.4% of cases, in a postanesthetic intensive care unit in 33.3% of cases, and in an intensive care unit in 12.3% of cases.

CONCLUSIONS: This survey provided information on anesthesia in thoracic surgery, which represented 0.7% of all anesthesia procedures in an area with a population of 7 million.

Key words: *Thoracic Surgery. Anesthesia. Catalonia, Spain. Procedures. Survey.*

Actividad anestésica en cirugía torácica en Cataluña. Resultados de una encuesta realizada durante 2003

OBJETIVO: Conocer las características anestésicas, quirúrgicas y postoperatorias de los pacientes a los que se realizó cirugía torácica en Cataluña en 2003.

MATERIAL Y MÉTODOS: Se ha llevado a cabo un estudio prospectivo y transversal en forma de encuesta realizada en 14 días aleatorios de 2003. Participaron todos los hospitales que efectuaban cirugía torácica en Cataluña. Se recabaron datos sobre las características de los pacientes, técnicas anestésicas, procedimiento, analgesia y control postoperatorio.

RESULTADOS: Se recogieron 171 procedimientos anestésicos en cirugía torácica en 27 centros, lo que representa el 0,7% de toda la actividad anestésica. Los datos permiten extrapolar que durante 2003 se realizaron 4.458 procedimientos anestésicos por cirugía torácica en Cataluña (intervalo de confianza del 95%, 3.624-4.823). El 75,4% se llevó a cabo en hospitales públicos y el 24,6% en centros privados. La mediana de edad de los pacientes fue de 55 años (percentiles 10-90: 22,4-73) y el 63,9% fueron varones. Los procedimientos quirúrgicos programados representaron el 92,8%. Las intervenciones más frecuentes fueron: cirugía de pulmón y bronquio distinta de la resección (36,8%), resección pulmonar y/o bronquial (24,6%), toracoscopia y mediastinoscopia (20,5%). La mediana de duración de las neumonectomías o lobectomías pulmonares fue de 180 min (percentiles 10-90: 90-291). La anestesia general fue el procedimiento anestésico más frecuente (74,3%). El postoperatorio se realizó en una sala de recuperación convencional en el 54,4% de los casos, en una unidad de reanimación en el 33,3% y en cuidados intensivos en el 12,3% restante.

CONCLUSIONES: El estudio permite conocer la actividad anestésica en cirugía torácica en un área poblacional de 7 millones de habitantes, que representa el 0,7% del total de la actividad anestésica.

Palabras clave: *Cirugía torácica. Anestesia. Cataluña. Procedimientos. Encuesta.*

Introduction

Due to the increase in the anesthesia workload and the shortage of anesthesiologists, health care planning and provision for anesthesia requirements needs precise

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information on the workload in Catalonia, Spain. The anesthesia workload was analyzed in other European countries, such as France and Italy in 1996 and 1999,[1,2] respectively, using epidemiological surveys to quantify the type and number of anesthesias performed. The results showed a low rate of anesthesia procedures in thoracic surgery: 0.6% in France and 2.2% in Italy.

Anesthetic management in thoracic surgery differs in certain respects from that of other surgical specialties. These differences, together with the low incidence of procedures, mean that it is more difficult to plan for anesthesia requirements and that more detailed knowledge and analysis of the anesthesia workload is needed.

In 2003, the Catalan Society of Anesthesiology, Critical Care, and Pain Therapy (SCARTD) designed a survey on anesthesia in Catalonia (ANESCAT) to determine the practice workload in Catalonia, Spain.[3,4] This article describes the results of the ANESCAT survey with regard to the characteristics of anesthesia and postoperative care in thoracic surgery. These are the first available data for Catalonia and may be of use as a starting point for future epidemiological studies.

Materials and Methods

Study Design

The ANESCAT survey[3,4] was designed as a prospective, cross-sectional study in the form of a survey carried out over 14 randomly-chosen days in 2003. The study was carried out by the SCARTD, which provided methodological and logistical support. It was approved by the ethics committee of the Barcelona College of Medical Practitioners in order to guarantee the confidentiality of the patient data. The project was jointly funded by the Catalan Health Service and the SCARTD.

Organization of the Survey

An expert committee consisting of anesthesiologists, epidemiologists, and statisticians developed the method and the organized the implementation of the survey. Each hospital assigned a coordinator responsible for completing the questionnaires and monitoring the study. The coordinator in each hospital collected the questionnaires on the survey days, checking for lost or incomplete data, and sending the questionnaires to the SCARTD offices. An intern received the questionnaires and checked them again in order to prevent as much data loss as possible. The expert committee then established a system for checking all the questionnaires for incomplete or inconsistent data.

A total of 131 public and private hospitals—100% of those that performed anesthesia in 2003—took part. A total of 23 136 questionnaires on anesthesia procedures were collected.

Questionnaire and Variables of Interest

Procedures relating to anesthesia in thoracic surgery were specifically analyzed and the following variables were studied: demographic parameters (age and sex), surgical procedure, type of anesthesia, American Society of Anesthesiologists (ASA) classification, duration of interventions, and characteristics of postoperative recovery. Anesthetic procedures performed outside the hospital context, such as procedures carried out under local anesthesia without the supervision of an anesthesiologist, were excluded.

Sample Size

The representative sample size for the population was calculated for an α level of .05 and a precision of 5%. The minimum number of questionnaires required to obtain a random population sample was 12 288, based on a population of 6 343 110 inhabitants (2001 census). The official estimate of the number of surgical interventions in Catalonia in 2001 was 350 000. Using this number as a reference, it was necessary to gather information on the anesthesia workload on 12.8 days of the year in order to obtain the calculated sample. Finally, 14 days (24-hour periods) were chosen randomly to ensure that the minimum required number of anesthesias would be obtained. The data were stratified according to sex, age brackets, and ASA physical status class.

Statistical Analysis

The data were entered into a database created using MS Access (Microsoft Corporation, Redmond, West Virginia, USA). Data from the questionnaires were input twice and a quality check was carried out after every 2000 patients. When an inconsistency was discovered, the information was verified by a telephone call to the participating hospital.[3] Data were analyzed using version 11.5. of the statistical software package SPSS (SPSS Inc, Chicago, Illinois, USA).

The results of the descriptive statistical analysis were expressed in the form of absolute and relative frequencies, means, medians, ranges, percentiles, and 95% confidence intervals (CI) of the means, medians, and estimated prevalence rates. Because the amount of lost data was so small, it was assumed to behave in the same way as the known values.

Results

A total of 23 136 questionnaires were collected over the 14 days of the study. It was estimated that 603 189 anesthesia procedures were carried out in Catalonia in 2003, representing an annual rate of 90 anesthesias per 1000 population (95% CI, 86-94 anesthesias/1000 population). Thoracic surgery held 12th place in the distribution by percentage of anesthesias in the 15 surgical specialties included, behind trauma surgery; ophthalmologic surgery; general surgery; gynecologic surgery; urologic surgery; ear, nose and throat surgery; vascular surgery; plastic surgery maxillofacial surgery; neurosurgery; and cardiac surgery. One hundred seventy-one anesthesias were carried out in thoracic surgery. These represented 0.9% of the surgical workload and 0.7% (95% CI, 0.6%-0.8%) of the entire anesthesia workload. These data made it possible to extrapolate that 4458 thoracic surgery procedures were carried out in Catalonia in 2003 (95% CI, 3624-4823 procedures).

Thoracic surgery was performed in only 27 of the 131 hospitals that took part in the study (20.6%); 20 of the hospitals were public and 7 private. Of the entire workload, hospitals belonging to the Catalan Institute of Health were the setting for 42%, publicly subsidized private hospitals reported doing 33.3%, and private hospitals accounted for the remaining 24.6%.

Table 1 shows the number and percentage of thoracic surgery interventions carried out. The median age of patients was 55 years (10th-90th percentiles, 22.4-73 years), with the highest concentration in the 55 to 74 years age bracket

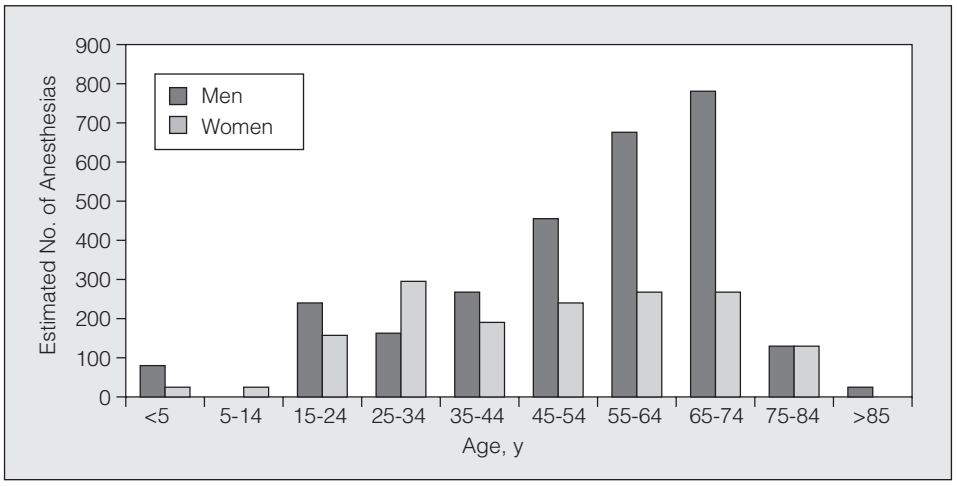

Figure. Estimated number of anesthesias for thoracic surgery, by age and sex.

TABLE 1
Total Number, Estimated Annual Number, and Percentage of Thoracic Surgery Interventions Performed in Catalonia, Spain in 2003

	Frequency	Estimated Annual Number	Percentage
Lung and bronchial surgery Other than resection	63	1643	36.8
Lung and bronchial resection	42	1095	24.6
Thoracoscopy and mediastinoscopy	35	913	20.5
Thoracic sympathectomy	12	313	7
Bronchoscopy	6	156	3.5
Interventions in the pleura. Thoracic drain	2	52	1.2
Operations on soft tissue	2	52	1.2
Thyroid and parathyroid surgery	2	52	1.2
Other operations on the larynx and trachea	1	26	0.6
Others	6	156	3.4
Total	171	4458	100

TABLE 2
American Society of Anesthesiologists (ASA) Physical Status Classifications, by Surgical Specialty, in Operations Performed in Catalonia, Spain in 2003

	ASA			
	1	2	3	>4
Orthopedic and Trauma Surgery	41.4%	35.2%	20.7%	2.7%
Ophthalmology	17.8%	42.3%	35.6%	4.3%
General and Digestive Tract Surgery	37.6%	32.3%	22.8%	7.3%
Gynecology	55.6%	29.2%	13.4%	1.8%
Urology	30.9%	31.4%	3.9%	4.8%
Ear, Nose, and Throat	66.0%	20.7%	10.4%	2.9%
Vascular Surgery	34.3%	24.8%	27.2%	13.7%
Plastic and Esthetic Surgery	64.0%	21.3%	11.3%	3.4%
Maxillofacial Surgery	66.8%	19.0%	11.2%	3.0%
Neurosurgery	22.0%	30.2%	31.0%	16.8%
Cardiac Surgery	0.5%	2.5%	23.4%	73.6%
Thoracic Surgery	14.9%	19.8%	43.1%	22.2%
Others	20.3%	32.8%	29.7%	17.2%
Total	37.9%	32.5%	23.9%	5.7%

(44.8%). Of those who underwent thoracic surgery, 63.9% were men and 36.1% women (Figure).

Table 2 shows ASA classifications by surgical specialty. The proportion of ASA 3 and ASA 4 or higher who underwent thoracic surgery was 65.3%.

Scheduled procedures represented 92.8% and emergencies 7.2%; of these, 3.6% were deferred emergencies and 3.6% were non-deferrable emergencies. The estimated annual number of emergency procedures in thoracic surgery was 313. Outpatient surgery accounted for 9.4% of procedures.

Most operations took place between Monday and Thursday. Monday was the day when the largest percentage of operations (26.9%) took place; 20% were performed between Tuesday and Thursday and the rate fell to 12% on Fridays. Only 1.2% of procedures were performed on weekends and these were emergency procedures.

The median duration of anesthesia (including operative time) was 165 minutes (10th-90th percentiles, 80-391 minutes).[5] Lobectomies and pneumonectomies were the longest operations, with a median duration of 180 minutes (10th-90th percentiles, 90-291 minutes). Because of the design of the survey, we cannot distinguish these 2 types of operation. In terms of duration of anesthesia, thoracic surgery was the specialty with the 4th longest duration (median duration, 19 minutes; 10th-90th percentiles, 45-228 minutes), behind cardiac surgery, neurosurgery, and plastic surgery; also notable was the considerable variability in duration of thoracic surgery procedures.

General anesthesia was the most commonly performed type at 74.3%, followed by combined anesthesia (general plus regional) at 16.4%, sedation at 8.8%, and regional anesthesia at only 0.6%. The type of regional anesthesia most commonly performed was the thoracic epidural block, which was used in 93.1% of operations; a peripheral plexus block was used in the rest of cases. A specialized postoperative analgesic technique was used in 30.6% of cases.

Balanced anesthesia was used in 63.2% of cases, total intravenous anesthesia in 32.9% of cases, and purely inhaled anesthesia in 3.9% of cases.

In all the anesthesias performed, unexpected difficult intubation was encountered in 3.1% of cases.

Postoperative monitoring of patients took place in a conventional recovery room in 54.4% of cases, in a postanesthetic intensive care unit in 33.3% of cases, and in an intensive care unit in 12.3% of cases, according to the morbidity associated with the type of surgery performed. Most patients who underwent extensive lung resection were admitted to postanesthetic intensive care units (71.4%) or to intensive care units (21.4%); the remaining patients (7.2%) were cared for in conventional recovery rooms.

Discussion

Thoracic surgery accounted for 0.9% of all operations carried out under anesthesia in Catalonia. The incidence of thoracic surgery is considerably lower than that of other specialties mainly due to the characteristics of the lung disease. Malignant neoplastic tumors are only resectable in 30% of cases and benign tumors have a low incidence and are operable in a small percentage of cases. The incidence of thoracic surgery in this study is considerably lower than the 2.2% obtained in a survey carried out in Italy in 1999.[2] Data in that study was gathered over 7 consecutive days in northern Italy in 162 public hospitals with more than 200 beds. Analyzed were a total of 12 263 anesthetic procedures, of which 269 were for thoracic surgery. We do not know which procedures were included in that category; hence some surgical interventions may have been performed by more than 1 specialty and this might explain the difference in the results. The survey conducted in France in 1996[1] collected data over only 3 consecutive days and obtained a larger number of questionnaires (64 215). The incidence of thoracic procedures, at less than 1%, was more similar to ours. In terms of distribution by age brackets, however, the largest percentage of operations were in 50-59-year-olds in all 3 countries.[3-5]

Thoracic surgery has a lower prevalence of outpatient interventions than do other surgical specialties, with the exception of cardiac surgery. The Italian survey, however, showed an even lower rate of 2.5%, compared to 9.4% in the ANESCAT survey. This lower prevalence could be explained by economic factors as, in 1999, the Italian government reimbursed a smaller sum per patient for outpatient procedures than for the same procedures performed when patients were hospitalized.[3-6] According to the ANESCAT survey, the thoracic interventions most frequently performed in Catalonia in 2003 were the following (in descending order): lung surgery other than resection, lung resection surgery, thoracoscopy, and mediastinoscopy. These 4 procedures accounted for 81.9% of surgical interventions in the chest cavity. Unfortunately, no distinction was made between types of lung resection in the survey; furthermore, the largest category of lung surgery includes a set of procedures that were not specified when entering the data. Based on our experience, we consider that these procedures would have been posterior muscle-sparing thoracotomies for open lung biopsies or axillary thoracotomies for open pleural abrasions. In some hospitals, tracheotomies are performed in the thoracic surgery department and may have been included in this specialty. It is also common for exploratory thoracotomies to be performed as a result of conversion to a different surgical strategy based on macroscopic findings.

The main objective of caring for patients in a critical care unit following thoracic surgery is to diagnose the development of complications as quickly as possible and thereby reduce morbidity and mortality. Following lobectomy or pneumonectomy, patients are usually monitored or admitted to an intensive care unit until the day after surgery. In order to be able to make provisions for bed availability in these units and thereby prevent, as far as possible, cancelation of surgery due to saturation of the different departments, it is essential to be aware of postoperative care requirements. Only 7.2% of patients who underwent extensive lung resection surgery were monitored in conventional recovery rooms and more than half of the patients who underwent thoracic surgery were monitored in units specializing in critical patients. In most cases of lung resection surgery, postoperative monitoring takes place in these units, and it is easy to deduce that stays will be shorter or longer depending on how the patient progresses and the complications that develop,[5] although studying this was not the object of the present study

Our data show that thoracic surgery represents a small percentage of the total number of interventions but that it nevertheless requires a complex structure and specialist anesthesia.

Controlling pain after thoracotomy also requires special strategies and intravenous or peridural patient-controlled analgesia techniques that require rigorous postoperative monitoring have been introduced. For these reasons, thoracic surgery, which accounts for a small percentage of all types of surgery performed, is complex in relation to the type of patient treated. It has high associated morbidity and requires expensive human and material resources that should be taken into consideration in health care planning. It would not be unreasonable to propose concentrating thoracic surgery in high-technology hospitals that have extensive experience as well as specialist surgeons, anesthesiologists, and nursing staff in the operating room and critical-care units. Carrying out few surgical procedures per year encourages higher morbidity and mortality. This has been shown in other surgical specialties, such as pediatric surgery and cardiac surgery.[7] In some countries, the inconvenience of moving patients and their family members to specialist hospitals is compensated for by providing accommodation close to the hospital. Another solution is for the entire team to travel to nonspecialist hospitals.[8]

There are also few surgical emergencies, thoracic surgery representing only 0.6% of emergency surgical procedures. The low volume of emergencies in this specialty should lead to reconsidering the need for a thoracic surgeon in each of the hospitals where this type of surgery is carried out. Mobile teams are a possible solution.[9]

Another of the topics considered in light of the results of this study is the training of specialists. The teaching capacity of a particular community becomes overstretched if all trainee specialists have to spend a certain length of time in all these surgical specialties. Given the small number of interventions in relation to other surgical specialties and the increase in both teaching units and accreditations in anesthesiology due to the shortage of specialists, it is necessary to redefine practical training in anesthesiology. The Anaesthesiology Section of the European Union of Medical Specialists is the European organization responsible for setting minimum standards in training and recruiting in this field. Its objectives are to harmonize a selection program to achieve minimum standards of training and competence in order to allow the free movement of doctors and specialists between the different member states of the European Union. In 2001, the European Board of Anaesthesiology, Recovery, and Intensive Care set down training guidelines in anesthesia that included the training requirements for general anesthesiologists but did not cover advanced training in any subspecialty.[10,11]

It is important to define the number of procedures necessary for minimum appropriate training or, alternatively to consider general basic training in all the more common surgical specialties and then plan for additional training once the trainee has attained the status of specialist.

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