Outpatient thoracic surgical programme in 300 patients: clinical results and economic impact

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Abstract

Objective: To evaluate clinical aspects, results and the economic impact of the outpatient thoracic surgery programme (OTSP) developed in our Department. Methods: Prospective study of 300 patients who entered in the OTSP from April 2001 to March 2005. The procedures performed were videomediastinoscopy (MC), videothoracoscopic lung biopsy (LB) and videothoracoscopic bilateral thoracic sympathectomy (TS). All procedures were performed under general anaesthesia and patients were discharged in 4–6 h. We analyse demographic data, the substitution index (SI), the admission rate (AR) and readmission rate (RR) after the procedure. We calculate the economic impact of stay expenses on our hospital and on other Spanish hospitals. Results: The female/male ratio of the 300 patients was 83/217, with a mean age of 58.1 years (range: 15–85 years). There were no deaths. Mediastinoscopy was performed as outpatient procedure in 210 patients (mean age: 65.6 years) out of 244 total MC (SI = 86.1%). Two patients were admitted (AR = 0.9%) to observe a minimal pneumothorax and because of late night end. There were no readmissions after MC (RR = 0%). We included 32 ambulatory patients for lung biopsy (mean age: 61.5 years) out of 64 total LB (SI = 50.0%). One patient was admitted because of air leak (AR = 3.1%) and there were no readmissions after LB (RR = 0%). Fifty-eight patients were included in the OTSP for bilateral sympathectomy (mean age: 27.1 years) out of 83 total TS (SI = 69.9%); there were no admissions (AR = 0%) and one patient was readmitted after 9 days because of a hemothorax (RR = 1.7%). Sixty-four patients out of the 91 not included in the OTSP were included in an ‘afternoon surgical programme’ and dismissed the morning after surgery, without contraindication for their inclusion in the OTSP. The hospital’s total stay saving was €12,668 (€88,226 if performed elsewhere), €42 per patient (€294 per patient if performed elsewhere). Conclusion: Video-assisted mediastinoscopy, lung biopsy and bilateral sympathectomy can be included safely in outpatient thoracic surgical programmes. The impact of the economic benefit of OTSP over the conventional hospitalisation depends on the Department’s previous policy on hospital stays. Further experience is needed to increase the substitution index and expand the OTSP to other procedures.

Keywords: Ambulatory surgical procedures; Thoracic surgery; Day-case surgery; Mediastinoscopy; Thoracoscopic lung biopsy; Thoracic sympathectomy

1. Introduction

From the various alternatives to conventional hospitalisation developed in the last decades, outpatient surgery has been the one with the greatest growth. However, only few studies have been reported on thoracic surgery. The feasibility of performing outpatient mediastinoscopy has been proven in several studies with a good degree of success [1–5] but it is still widely performed in an inpatient setting. Videothoracoscopic lung biopsy (LB) has become an increasingly accepted approach for the diagnosis of patients with both diffuse interstitial lung disease [6] and pulmonary nodules [7] but, to date, very little has been published on outpatient lung biopsy [8,9]. In recent years, thoracoscopic sympathectomy has become the most widely used approach to thoracic sympathectomy (TS) in the management of primary hyperhidrosis and facial blushing. Some authors conclude that thoracoscopic sympathectomy is a safe and effective outpatient procedure [10–17]. The aim of this study was to evaluate the clinical aspects, results and economic impact of the outpatient thoracic surgery programme (OTSP) developed in our Department.

2. Methods

A prospective analysis of 300 patients who entered in the outpatient thoracic surgery programme from April 2001 to March 2005 was performed. The procedures initially
performed were videomediastinoscopy (MC) and videothoracoscopic LB. Since April 2003, videothoracoscopic bilateral TS was also performed. Preoperative anaesthetic evaluation was made according to a defined protocol of selected tests. No specific age criteria were applied. The surgical risk for each patient was evaluated according to the American Society for Anaesthesia (ASA) classification. As a rule, only ASA I and ASA II were accepted, but selected ASA III patients were also included in the latest period. The company of a family member or friend was requested not only on the day and night of the operation but also for the following 24 h. An informed consent signed by the surgeon, anaesthesiologist and the patient was necessary to be scheduled for surgery. Patients were admitted to the dedicated day-case surgery unit 1 or 2 h prior to the procedure. Oral diazepam (5–10 mg) was given for preoperative sedation. Surgery was performed on a morning or early afternoon operating list. All procedures were performed under general anaesthesia. Perioperative anaesthetic management was similar to that for most outpatient surgeries, with a combination of anaesthetic drugs that included inhalational agents (sevoflurane, N₂O), intravenous anaesthetic drugs (propofol), short-acting opioids (alfentanil, remifentanil) and short-acting relaxants (atracurium, succinylcholine). After surgery, the patient was observed in the recovering room for 20–40 min and transferred back to the short-stay facility. Every patient was reviewed postoperatively by a member of the operating team, but patients’ fitness for discharge was assessed between 4 and 6 h postoperatively primarily by nursing staff. Discharge criteria require that the patients have stable vital signs, can ambulate at preoperative level and have minimal postoperative nausea and vomiting, pain, and can tolerate oral fluids and void before being allowed home. Patients were discharged home with oral analgesics (mostly based on NSAID and acetaminophen) and prophylaxis against NSAID-induced gastric ulcers. Patients were given a specific telephone number which they could use in case of need. They were contacted in the morning following surgery and questioned on their postoperative course. All patients were followed up at routine 1 week and 1 month postoperative visits.

2.1. Videomediastinoscopy

MC was performed as diagnostic and/or staging procedure in patients with lung cancer and for diagnosis of mediastinal paratracheal lymph node enlargement or mass. It was performed under general anaesthesia with single endotracheal intubation. In most cases, standard videomediastinoscopic technique was used, but in four patients an extended cervical mediastinoscopy was carried on. No mediastinal tube was positioned at the end of surgery in any case. Routine chest X-ray was not performed prior to discharge unless pleural disruption was suspected during the procedure.

2.2. Videothoracoscopic lung biopsy

Prior to surgery, all patients underwent preoperative chest computed tomographic scanning. The specific inclusion criteria for LB were an ambulatory patient without continuous oxygen dependency and pulmonary function test with a FEV1 > 30%. The procedure was performed with double-lumen endotracheal tube or by selective bronchial intubation using single lumen tube. With the patient in the lateral decubitus position, three port sites were used and one or two stapled wedge resections were performed without any reinforcement of the 3.5 mm stapler. Local anaesthetic (0.5% bupivacaine with adrenaline or 0.2% ropivacaine) was systematically infiltrated into the intercostal spaces. Chest tubes were removed in the recovering room if no air leak or bleeding was present. In all patients, routine chest X-ray was performed prior to discharge and reviewed by a surgeon.

2.3. Videothorascoscopic bilateral thoracic sympathectomy

The procedure was performed with double-lumen endotracheal anaesthesia or by selective bronchial intubation using single lumen tube (repositioned during surgery). The patient was placed in semi-Fowler’s position with his/her arms gently abucted. Beginning on the right side, a 10–15 mm long incision was made for insertion of a 11-mm trocar at the third or fourth intercostal space in the midaxillary line. An operating 10 mm–0° thoracoscope (5 mm–0° in the last year) was then introduced in order to divide the sympathetic trunk with a diathermy hook at the desired level. A small-bore tube attached to a water seal device was left into the pleural cavity while performing the contralateral side. Right chest tube was removed after the left procedure was finished to be placed into the left pleural space and finally removed at the same surgical theatre or in the recovering room. Local anaesthetic (0.5% bupivacaine with adrenaline or 0.2% ropivacaine) was systematically infiltrated into the intercostal spaces. In all patients, routine chest X-ray was performed prior to discharge and reviewed by a surgeon.

2.4. Descriptive analysis

We analyse demographic data, the substitution index (SI), the admission rate (AR) and the readmission rate (RR). The substitution index is defined as the ratio of the number of inpatients to the total number of procedures and expressed as a percentage. The admission rate is defined as the ratio of the number of unplanned admissions (due to any medical, surgical or social reason) to the total number of outpatient procedures and expressed as a percentage. The readmission rate is defined as the ratio of the number of unplanned admissions after the discharge (due to any medical, surgical or social reason related with the surgery performed) to the total number of outpatient procedures and expressed as a percentage.

The economic impact was applied to the reduction in variable hospital costs (bed, meals, energy, laundry …) over conventional hospitalisation, as fixed hospital costs (personnel …) were considered the same. We calculated our hospital’s total and per patient saving and also that of other Spanish hospitals with similar activity level, applying their median hospital stay.

3. Results

Between April 2001 and March 2005, 300 patients were operated on in our outpatient surgical unit out of 391 total...
MC, LB and TS procedures performed during the same period of time (SI = 76.7%). The mean age was 58.1 years, ranging from 15 to 85 years. The female/male ratio of the 300 patients was 83/217 (27.7%/72.3%). There was no mortality. Concerning the 91 patients not included in the OTSP, 64 (70.3%) were operated on in an 'afternoon surgical programme' and dismissed the morning after surgery with no objective contraindication for ambulatory surgery, and 27 (29.7%) had contraindication to be included in the OTSP.

The number of cases per year and by procedure during the study period is shown in Fig. 1.

Mediastinoscopy was performed as outpatient procedure in 210 patients out of 244 total MC (SI = 86.0%). There were 185 men and 25 women, mean age was 65.6 years (range: 37–85 years). One hundred and ninety MC were performed as diagnostic and/or staging procedure in patients with lung cancer and 30 for diagnosis of mediastinal paratracheal lymph node enlargement or mass. Operative mean time was 32 min. Two patients were admitted (AR = 0.95%) to observe a minimal pneumothorax (our second extended cervical mediastinoscopy) and because of late night end. There were no readmissions after outpatient mediastinoscopy (RR = 0%). Twenty-eight of the 34 inpatient mediastinoscopy were scheduled in an 'afternoon surgical programme' and dismissed the morning after surgery with no objective contraindication for ambulatory surgery. The other six patients were from out of town.

We included 32 ambulatory patients for lung biopsy out of 64 total LB performed during the same period (SI = 50.0%). There were 20 women and 12 men and mean age was 61.5 years (range: 33–79 years). Indication of LB was for the diagnosis of interstitial lung disease in 24 patients (usual and desquamative interstitial pneumonia and bronchiolitis) and multiple pulmonary nodules in 8 patients (lung cancer, metastatic disease and sarcoidosis). Operative mean time was 45 min. One patient was admitted because of air leak observed after surgery (AR = 3.1%) and required the chest tube during 6 days. There were no readmissions after LB (RR = 0%). Fourteen inpatient LB were scheduled in an 'afternoon surgical programme' and discharged the morning after surgery, with no objective contraindication for ambulatory surgery. Five patients were from out of town and 13 had contraindication to be included in the OTSP (FEV1 < 30%).

Forty-eight patients were included in the OTSP for bilateral thoracic sympathectomy out of 83 total TS (SI = 69.9%). There were 38 women and 20 men; mean age was 27.1 years (range: 15–57 years). Indication of TS was palmar hyperhidrosis in 50 patients, facial blushing in 6 and Raynaud’s syndrome in 2. Operative mean time was 40 min. There were no admissions after the procedure (AR = 0%). One patient was readmitted after 9 days because of a left hemothorax (RR = 1.7%) that was successfully resolved by chest tube thoracostomy. Twenty-two out of 25 patients not included in the OTSP were operated on in an ‘afternoon surgical programme’ and dismissed the morning after surgery with no objective contraindication for ambulatory surgery. The other three were re-sympathectomies considered as contraindication.

The Sagrat Cor Hospital’s saving in this 300 outpatient thoracic surgical procedures over our conventional hospitalisation (1 day) was €12,668, or €42.20 per patient. Applying the median hospital stay of other Spanish hospitals with similar activity level (4 days), the hospital’s saving was €88,226, or €294.10 per patient.

4. Discussion

Outpatient surgery can be defined as the surgery performed under general, regional, sedation or local anaesthesia requiring neither intensive postoperative care nor overnight stay, the patients being discharged a few hours after the procedure. Since outpatient surgery was initiated in Spain in the early 1990s, there has been a steady increase in ambulatory surgery activity. However, outpatient thoracic surgery is almost inexistent in our country [18] and only few studies have been reported on in the medical literature.

Some advocate that the substitution index and the unplanned admission index could be valid and easy indicators of the management and quality of care in ambulatory surgery units [19,20]. A difference could be made between early admissions (patients not discharged) and late admissions (patients readmitted), and both seem to be good indicators of stable quality care in outpatient surgery. In one study [21], unplanned admission index was between 10.7% and 2% with haemorrhage as the most frequent cause (15.9%).

At present, the average substitution index of outpatient procedures in Spain is about 35% [22]. The average substitution index in our OTSP has been 76.7% (300 out of 391 patients), 86.0% for mediastinoscopy, 50.0% for lung biopsy and 69.9% for thoracic sympathectomy. Sixty-four out of 91 patients (70.3%) not included in the OTSP were operated on in an ‘afternoon surgical programme’ and dismissed the morning after surgery with no objective contraindication for ambulatory surgery. Today, these patients are operated on early in the afternoon programme and discharged the same evening. Due to the underlying pathology of the patients, we think that it would be difficult to improve LB substitution index, but MC–SI could rise to nearly 95%, and most TS could be performed as outpatient procedures as demonstrated by others [12–17].

Vallières et al. [1] describe mediastinoscopy performed in an outpatient setting on 158 patients (SI = 21% over a 9-year period). Cybulsky and Bennett [2] report 1015 ambulatory
mediastinoscopes, representing 96% of their total mediasti-
noscopy population; the AR was 9.8% and the RR 0.9%. Souilamas et al. [3] describe 20 videomediastinoscopes per-
formed on an outpatient-basis (SI = 40%); one patient re-
quired readmission due to a pneumonia (RR = 2.5%). None of them reported operative deaths. There were no deaths in our series and no serious complications were seen. The patient admitted because of pneumothorax did not require any chest tube and was discharged the next morning. Other studies report between 1% and 4% readmission rates [4,5].

Russo et al. [23], in a prospective, non-randomised trial demonstrated that chest tube removal within 90 min of VATS lung biopsy, in selected patients, could be accomplished safely. In one study, Blewett et al. [8] did not use chest tube drainage after open lung biopsy for diagnosis of interstitial lung disease. Thirty-two patients underwent outpatient open lung biopsy; no complications occurred and no patient required overnight observation or hospital admission. Chang et al. [9] report a series of patients undergoing outpatient thoracoscopic lung biopsy. Sixty-two ambulatory patients with a clinical diagnosis of either interstitial lung disease or indeterminate pulmonary nodule(s) underwent thoraco-
scop ic lung biopsy; 72.5% were discharged home within 8 h of observation on the day of operation, 22.5% were discharged within 23 h of their operation and 5% required admission for prolonged air leak (two patients) or conversion to muscle-sparing thoracotomy (one patient); one patient was readmitted for pneumothorax (RR = 1%). They con-
clude that outpatient thoracoscopic lung biopsy is safe and effective for diagnosis of either interstitial or focal lung disease. Our results confirm this statement. In our series most patients were discharged within 4 h of their operation and only one patient required admission due to air leak observed before chest tube withdrawal.

Videothoracoscopic bilateral thoracic sympathectomy has emerged as a viable first-line treatment for primary palmar hyperhidrosis and essential facial blushing. Although the procedure is usually performed in young healthy people, most patients stay one night because of pain, nausea or vomiting. The key to this is anaesthetic technique and premedication with analgesic and antiemetic agents [15,16]. Moreover, systematic intercostal infiltration with local anaesthetic may help in this issue. Graham et al. [10] first reported their experience with 20 day-cases unilateral transthoracic endoscopy sympathectomies. Eighteen were completed as a day-case (AR = 10%). In two different papers, Hsia et al. reported 47 patients with palmar hyperhidrosis [11] and 262 with axillary osmidrosis [12] operated on by outpatient thoracoscopic sympathectomy. All operations were carried out at an outpatient facility (AR = 0%) and all but three were bilateral procedures. Doolabh et al. [13] scheduled 180 patients to undergo video-assisted thoracoscopic sympathectomy on an outpatient basis. One hundred and seventy-seven patients were completed as an outpatient procedure (AR = 1.7%). More recently, Baumgartner and Toh [14] reported an AR = 0.3% and a RR = 1.2% in a series of 309 consecutive ambulatory sympathectomies. Our outpatient thoracoscopic sympathectomy series is quite short because it began later than the other two procedures (MC and LB), but also confirms that bilateral thoracoscopic sympathectomy is a safe outpatient procedure. One step forward is to perform the TS under local anaesthesia (LA) and spontaneous breathing, as reported by Elia et al. [17] in 15 patients.

Increasing the percentage of operations done as out-
patient surgery should save money to the healthcare system and allow us to care for more patients with the same amount of resources. The impact of the economic benefit depends on the previous policy on hospital stay for the same procedures performed by conventional hospitalisation. In our Depart-
ment, the conventional hospital stay (1 day) is clearly lower than in the other Spanish hospitals with similar activity level, so the economic impact of our OTSP was lower than expected. The economic advantage in the majority of institutions where the conventional hospital stay is longer is clearly more important. The report of Elia et al. [17] regarding TS under local or general anaesthesia, cost comparison between the two groups concerning devices, drugs, operating room time, medical personnel and hospital stay was also carried out. Costs were significantly reduced in the local anaesthesia TS group of patients by €954 per each procedure.

In summary, despite a significant increase in ambulatory surgery activity, there is still great potential for an increase in outpatient thoracic surgery. Video-assisted mediastinoscopy, lung biopsy and bilateral thoracic sympathectomy can be accomplished safely in a significant percentage as ambula-
tory patients. The impact of the economical benefit of outpatient thoracic surgical programme over the conven-
tional hospitalisation depends on the Department’s previous policy on hospital stays. Further experience is needed to increase the substitution index and expand the OTSP to other procedures.

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Appendix A. Conference discussion

**Dr G. Leschber (Berlin, Germany):** I think this is really something very inventive. I have two questions. Do you put in a thoracic drain after lung biopsy and when do you take it out?

**Dr Molins:** Yes, we put a chest tube in, we tell the anesthesiologist to reexpand the collapsed lung, and then we close the incisions and she, because she is a lady anesthesiologist, she wakes up the patient, and in the same OR room we take out the chest tube if there is no air leak. We have come from waiting three hours to take it out in two hours, move recently in the recovery room and now we take it out in the operating room.

**Dr Leschber:** And the second question is do you see any indication for a chest X-ray after mediastinoscopy?

**Dr Molins:** We usually don’t, but in two or three cases where the dissection was more extensive than usual and you can even see the lung there, then we performed this X-ray. In fact we saw a little tiny pneumothorax in one case.

**Dr P. Filosso (Torino, Italy):** I completely agree with you about the role of mediastinoscopy in outpatients: we have done this surgical procedure in these patients for some years. I would like to know your indications for lung biopsies: which types of pulmonary disorders do you think are eligible for lung biopsies in outpatients?

**Dr Molins:** Well, the indications for thoracoscopic lung biopsies should be patients on an ambulatory basis and mainly interstitial lung disease to diagnose. Of course, this slide that I showed was a very extended fibrosis and perhaps it shouldn’t need a biopsy, but usually it is a non-diagnosed interstitial lung disease.