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original article

Postoperative complications, pain and quality of life after thoracoscopic or thoracotomic lobectomy for lung cancer

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SUMMARY: **Postoperative complications, pain and quality of life after thoracoscopic or thoracotomic lobectomy for lung cancer.**

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Aim. *Thoracoscopic lobectomy is superior to thoracotomy, but the evidence for this assumption is low. We present a comparison between thoracotomy and thoracoscopy in term of postoperative complications, mortality, postoperative pain, hospital stay and quality of life.*

Patients and methods. *This is a retrospective analysis of 224 lobectomies in 24-months. 128 patients (57.1%) were operated by thoracotomy; 96 patients (42.9%) by videothoracoscopy.*

Results. *Major complications were observed in 4/128 (3.1%) in thoracotomy group and in 1/96 (1%) in thoracoscopy. Minor complications were observed in 38/128 patients (29.7%) in the thoracotomy, and in 16/96 (16.7%) thoracoscopy. Thoracoscopy patients had a shorter hospital stay.*

Conclusion. *Our study shows an advantage of thoracoscopy over thoracotomy but further studies are needed.*

KEY WORDS: Lobectomy - Thoracoscopy - Thoracotomy - Lung cancer - Quality of life - Complications.

Introduction

The current conventional approach for lobectomy is thoracotomy, both posterolateral or lateral (1). Respiratory complications are the main complications after lobectomies performed by thoracotomy, affecting around 12% of patients according to the results from the National North-American Thoracic Surgery database (2). In the last two decades, video-assisted thoracoscopic surgical (VATS) lobectomy for NSCLC has emerged as a minimally invasive alternative for advanced resections, including lobectomy (3). A general assumption among the surgical community is that lobectomy via VATS is superior to lobectomy via thoracotomy, but the quality of evidence for this assumption is low. In a recent randomized controlled trial (RCT) the major benefit of this minimally invasive procedure is to reduce postoperative pain and improve the quality of life (4). The RCT involved 206 patients and compared the postoperative pain and the quality of life in patients undergoing VATS and thoracotomy. During the first year of follow-up it showed a benefit from VATS. The Authors highlighted a major decrease in the number of episodes of moderate-to-severe pain and an improvement in the quality of life scores during the 52 weeks of follow-up (5). Lobectomy is a major surgery for patients and it is considered a high

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morbidity surgery. Many studies have shown that long-term survival and locoregional recurrence in patients operated on by VATS were comparable to those in patients who underwent lobectomy by thoracotomy. Moreover, VATS leads to a reduction in the length of hospital stay and a decrease in postoperative complications, such as atelectasis or pneumonia (5-9). To date, we know only three RCTs in English comparing VATS lobectomy with thoracotomy for the treatment of lung cancer, in terms of complications and overall survival (10-12). These trials included fewer than 100 patients each and were all conducted in a single center, thus more studies and a multicenter RCTs could help to assess the usefulness of new technologies.

We present a large single high volume center experience about major lung resection conducted via thoracotomy and VATS, to compare open access and VATS in term of postoperative complications, mortality, postoperative pain, length of hospitalization and quality of life.

Patients and methods

This is a retrospective analysis of 224 consecutive lobectomies performed in 24-months period at Thoracic Surgery Unit of "Ospedali Maggiore-Bellaria" in Bologna for elective radical resection of pulmonary lesions. This study was approved by the "Ospedali Maggiore-Bellaria" Institutional Review Board. More than 95% of patients underwent surgery for primitive malignant neoplasms of the lung. A minority of patients has been subjected to lobectomy for bronchiectasis or for secondary neoplasms non-technically resectable with sublobar resections. Patients treated by pneumonectomy, bilobectomy, or anatomic resections (segmentectomy) were excluded from case series. 128 patients (57.1%) were operated by the thoracotomic approach and 96 patients (42.9%) by the multiportal video-assisted thoracic surgery (VATS). In 1 patient (1%) conversion was needed due to technical difficulty related to an anatomical vascular variant and extensive fibrous adhesions (13) (Table 1).

Results

Major complications were observed in 4/128 (3.1%) patients operated by open access and in 1/96 (1%) patient operated by VATS (Table 2 shows the major complications in detail). Minor complications were observed in 38/128 patients (29.7%) in the thoracotomic group, and in 16/96 (16.7%) patients operated by VATS (Tables 3 and 4 show minor complications in detail). No significant differences were observed in the incidence of major complications ($p = 0.19$) among open and VATS patients, while for minor complications the difference is quite significant ($p = 0.08$; Pearson chi-square test).

Regarding the incidence of minor complications relate to the site of the resection (upper, middle or lower lobes), not significant relationship was observed among the VATS procedures ($p = 0.78$; Pearson chi-square test). Conversely we found significant association among the open procedures, between higher lobectomies and minor complications ($p < 0.01$).

Perioperative mortality (within 30 days from surgery) was 2.3%: 3 patients treated with thoracothomy, and 0 patients operated by VATS.

The average postoperative hospitalization was 9.1 days for the thoracotomy group patients (range

Table 1 - PATIENT'S FEATURES AND TYPE OF SURGERY.

	OPEN	VATS	*p*
n = 224	128 (5,1%)	96 (42,9%)	
Conversion	-	1 (1%)	
Superior lobectomy	69 (53,9%)	45 (46,9%)	
Middle lobectomy	11 (8,6%)	10 (10,4%)	
Inferior lobectomy	48 (37,5%)	41 (42,7)	
Postoperative hospital stay (days) range	9,1 (4-66)	6,4 (4-32)	< 0,01
Pain at discharge NRS (range)	3 (1-4)	2,9 (2,4)	0,63

TABLE 2 - TYPE OF MAJOR POSTOPERATIVE COMPLICATIONS.

Major complications	OPEN	VATS	*p*
n = 5	4 (3,1%)	1 (1%)	0,19
Emotorax	1 (0,8%)	-	
Bronchopleural fistula and esophageal perforation	1 (0,8%)	-	
Myocardial infarction and pneumonia	1 (0,8%)	-	
Sepsis	1 (0,8%)	-	
TIA	1 (0,8%)	-	
Pain at discharge NRS (range)	-	1 (1%)	

TABLE 3 - TYPE OF MINOR POSTOPERATIVE COMPLICATIONS.

Minor complications	OPEN	VATS	*p*
n = 54	38 (29,7%)	16 (16,7%)	0,08
Persistent air leak	10 (7,8%)	2 (2,1%)	
Atrial fibrillation	9 (7%)	7(7%)	
Bronchial secretions	7 (5,5%)	2 (2,1%)	
Transitory respiratory failure	5 (3,9%)	2 (2,1%)	
Transitory dysphonia/ recurrent palsy	4 (3,1%)	2 (2,1%)	
Tachyarrhythmia	1 (0,8%)	-	
Hypotension	1 (0,8%)	-	
Omolateral diaphragmatic overlay	1 (0,8%)	-	
Urological complications	4 (3,1%)	2 (2,1%)	
Wound infection / dehiscence	1 (0,8%)	-	
Pleural effusion in hepatopatic patient	1 (0,8%)	-	
Deep vein thrombosis	-	1(1%)	

TABLE 4 - MINOR POSTOPERATIVE COMPLICATIONS RELATED TO TYPE OF SURGERY.

Minor complication	OPEN	VATS
Superior lobes	27	7
Middle lobes	4	7
Inferior lobes	1	1
	$p < 0,01$	*p = 0,78*

= 4-66), and 6.4 days for patients operated by VATS (range = 4-32). The univariate analysis (Mann-Whitney U test) showed a statistically significant ($p < 0.01$) difference between the two approaches. We measured pain at time of discharge expressed in Numeric Rating Scale (NRS). The mean value was 3 in thorathomic patients (range = 1-4) and 2.9 in patients operated by VATS (range = 2-4). At univariate analysis, the difference was not statistically significant ($p = 0.63$).

Discussion

In this retrospective analysis our results are consistent with literature and are satisfactory in terms of

complications and mortality. Specifically, we found a lower overall rate of major and minor complications for video-thoracic surgery. It is interesting to note the reduction in the incidence of postoperative aerial leaks, which normally constitutes the most dangerous complication in thoracic surgery. This result is due to the constant adoption of the fissureless technique, which consists in an ilar dissection without fissure split (completed after vascular and bronchial times). Likewise, the conversion rate is at the lower limit of the range given by the literature (14, 15). The length of postoperative hospitalization has been shown to be significantly lower for patients undergoing video-thoracic surgery: this reflects a general tendency to reduce the invasiveness of the surgical treatment. Postoperative pain, albeit marginally better in VATS patients, did not show significantly different results from thoracotomy patients. As evidenced by some case studies in the literature, this aspect is influenced by numerous patient-related variables, procedure, and therapeutic treatment undertaken (16, 17). Further studies, specifically aimed at comparing analgesia techniques, will further clarify the consequences of the two surgical approaches to postoperative surgery. Long-term survival for patients who have underwent a VATS lobectomy appears at least equal to a thoracotomy approach in various comparative studies and in two meta-analyses. The National Comprehensive Cancer Network guidelines for treatment of lung cancer recognize a VATS approach as a reasonable method for the treatment of lung cancer (8, 9, 18). We have evaluated spirometric parameters (FEV1 and DLCO) at 30 days after surgery, in VATS *vs* open lobectomy patients. Preliminary results show an advantage in respiratory performance in the VATS group. Although it has been shown that open surgery can give a better control of the operatory fields and allows the surgeon to make a manual palpation of the lung and of the vascular elements to accurately delimit the neoplasm (19, 20), we are in favour of thoracoscopic surgery. This element can be a topic of future insights.

Moreover, there is already an improvement today of VATS lobectomies: the uniportal VATS. Although there are not yet prospective studies and long term oncological results, uniportal VATS for lung cancer has been demonstrated to be safe and the results are comparable with to other "classical" approaches (21-23).

Conclusion

Multiportal VATS has been demonstrated to be a safe procedure, with a lower overall rate of major and minor complications than open approach. It has been shown to present a comparable postoperative pain, albeit marginally better in VATS patients, and comparable long-term survival with thoracotomy. VATS allows to reduce both the incidence of postoperative aerial leaks, which normally constitutes the most dangerous complication in thoracic surgery, and the postoperative hospitalization. Furthermore, regarding spirometric parameters (FEV1 and DLCO) at 30 days after surgery, in VATS *vs* open lobectomy patients, advantages in respiratory performance have been noticed in the VATS group. In conclusion, although our good results, further studies, specifically aimed at comparing analgesia techniques, are necessary and they will further clarify the consequences of the two surgical approaches to postoperative surgery.

Conflict of interest

The Authors declare that they have no conflict of interest.

Acknowledgements and credits

None to declare.

References

1. Howington JA, Blum MG, Chang AC, et al. Treatment of stage I and II non-small cell lung cancer: Diagnosis and management of lung cancer. Chest. 2013(143):e278S-313.
2. Paul S, Altorki NK, Sheng S, et al. Thoracoscopic lobectomy is associated with lower morbidity than open lobectomy: a propensity matched analysis from the STS database. J Thorac Cardiovasc Surg. 2010;139:366-78.
3. Pagès PB, Delpy JP, Orsini B, et al. Epithor Project French

Society of Thoracic and Cardiovascular Surgery. Propensity score analysis comparing videothoracoscopic lobectomy with Thoracotomy: a French Nationwide Study. Ann Thorac Surg. 2016;101:1370-8.
4. Bendixen M, Jørgensen OD, Kronborg C, et al. Postoperative pain and quality of life after lobectomy via video-assisted thoracoscopic surgery or anterolateral thoracotomy for early stage lung Cancer: a randomised controlled trial. Lancet Oncol. 2016;17:836-44.
5. Li Z, Liu H, Li L. Video-assisted thoracoscopic surgery versus open lobectomy for stage I lung cancer: A meta-analysis of long-term outcomes. Exp Ther Med. 2012;3:886-92.
6. Zhang Z, Zhang Y, Feng H, et al. Is video-assisted thoracic surgery lobectomy better than thoracotomy for early-stage non-smallcell lung Cancer? A systematic review and meta-analysis. Eur J Cardiothorac Surg. 2013;44:407-14.
7. Cao C, Manganas C, Ang SC, et al. A meta-analysis of unmatched and matched patients comparing video-assisted thoracoscopic lobectomy and conventional open lobectomy. Ann Cardiothorac Surg. 2012;1:16-23.
8. Whitson BA, Groth SS, Duval SJ, et al. Surgery for early-stage non-small cell lung cancer: a systematic review of the videoassisted thoracoscopic surgery versus thoracotomy approaches to lobectomy. Ann Thorac Surg. 2008:86:2008-18.
9. Yan TD, Black D, Bannon PG, et al. Systematic review and metaanalysis of randomized and nonrandomized trials on safety and efficacy of video-assisted thoracic surgery lobectomy for early-stage non-small-cell lung Cancer. J Clin Oncol. 2009;27:2553-62.
10. Kirby TJ, Mack MJ, Landreneau RJ, et al. Lobectomy-videoassisted thoracic surgery versus muscle-sparing thoracotomy. A randomized trial. J Thorac Cardiovasc Surg. 1995; 109:997-1002.
11. Sugi K, Kaneda Y, Esato K. Video-assisted thoracoscopic lobectomy achieves a satisfactory long-term prognosis in patients with clinical stage IA lung cancer. World J Surg. 2000;24:27-31.
12. Palade E, Passlick B, Osei-Agyemang T, et al. Video-assisted vs open mediastinal lymphadenectomy for Stage I non-small-cell lung cancer: results of a prospective randomized trial. European Journal of Cardio-Thoracic Surgery. 2013;44:244-9.
13. Scerrino G, Paladino NC, Di Paola V, Morfino G, Amodio E, Gulotta G, Bonventre S. The use of haemostatic agents in thyroid surgery: efficacy and further advantages. Collagen-Fibrinogen-Thrombin Patch (CFTP) versus Cellulose Gauze. Ann Ital Chir. 2013 Sep-Oct;84(5):545-50.
14. Paul S, Sedrakyan A, Chiu YL, et al. Outcomes after lobectomy using thoracoscopy vs thoracotomy: a comparative effectiveness analysis utilizing the Nationwide Inpatien. Eur J Cardiothorac Surg. 2013 Apr;43(4):813-7.
15. Phillips JD, Merkow RP, Sherman KL, et al. Factors affecting selection of operative approach and subsequent short-term outcomes after anatomic resection for lung cancer. J Amer Coll Surg. 2012;215:206-15.
16. Mahtabifard A, Fuller CB, McKenna RJ Jr. Video-assisted thoracic surgery sleeve lobectomy: a case series. Ann Thorac Surg. 2008;85:S729-32.
17. Nicastri DG, Wisnivesky JP, Litle VR, et al. Thoracoscopic lobectomy: Report on safety, discharge independence, pain and chemotherapy tolerance. J Thorac Cardiovasc Surg. 2008;135:642-7.
18. Flores RM, Alam N. Video-assisted thoracic surgery lobectomy (VATS), open thoracotomy, and the robot for lung cancer. Ann Thorac Surg. 2008;85:S710-5.
19. Porrello C, Gullo R, Vaglica A, et al. Pulmonary Laser Metastasectomy by 1318-nm Neodymium-Doped Yttrium-Aluminum Garnet Laser: A Retrospective Study About Laser Metastasectomy of the Lung. Surg Innov. 2018 Jan 1. doi: 10.1177/1553350617752263.
20. Porrello C, Gullo R, Vaglica A, Scerrino G, Giuseppe S, Licari L, Raspanti C, Gulotta E, Gulotta G, Cocorullo G. Retrospective Analysis of 29 Patients with Multiple Pulmonary Metastases from Colorectal Carcinoma Resected by a 1318-nm Laser. Am Surg. 2018 Mar 1;84(3):460-2.
21. Migliore M, Halazeroglu S, Molins L, et al. Uniportal video-assisted thoracic surgery or single-incision video-assisted thoracic surgery for lung resection: clarifying definitions. Future Oncol. 2016;12:5-7.
22. Gonzalez-Rivas D, Damico TA, Jiang G, et al. Uniportal video-assisted thoracic surgery: a call for better evidence, not just more evidence. Eur J Cardiothorac Surg. 2016;50:416-7.
23. Migliore M. Video-assisted thoracic surgery techniques for lung cancer: which is better? Future Oncol. 2016;12:1-4.