Oncology
and Radiotherapy©
18(8) 2024: 001-006 • RESEARCH ARTICLE

An investigation of the differences in long-term patient survival rates between robotic and thoracoscopic lobectomy

Rashmi Gudur[1], Devanshu J. Patel[2], Guntaj J[3], Parag Amin[4], Jagtej Singh[5], Malathi H[6]

[1] Department of Oncology, Krishna Hospital & Medical Research Centre, Bangalore, India
[2] Department of Pharmacology, Parul University, Vadodara, Gujarat, India
[3] Centre of Research Impact and Outcome, Chitkara University, Rajpura, Punjab, India
[4] Department of ISME, ATLAS Skill Tech University, Mumbai, Maharashtra, India
[5] Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, India
[6] Department of Life Science, School of Sciences, Jain (Deemed to be University) JC Road, Bangalore, India

ABSTRACT

Objective: Robotic surgery or thoracoscopic surgery are both options for minimally invasive lobectomy. While the two strategies are said to have comparable short-term results, it is unknown whether the strategy is more successful against cancer. This study's goal is to examine variations in the long-term patient endurance rates for robotic and thoracoscopic lobectomies.

Methods: Non-Small Cell Lung Cancer (NSCLC) sufferers who had a robotic-assisted (n=42) and thoracoscopic lobectomy (n=387), were analyzed using chance matching. The several groups were identical in every way, including the illnesses they experienced, the treatments they received and the qualities they shared. We analyzed the rates of Cancer Specific Mortality (CSM) and Overall Survival (OS) in the two distinct cohorts.

Results: The median follow-up time after surgical treatment was 35 months, and the middle age at operation was 72 (65-91). The OS and CSM of the robotic aided and thoracoscopic groups were identical.

Conclusions: The greater tendency research shows that, in comparison to patients who received Thoracoscopic Lobectomy (TL), both OS and CSM were similar for those who received robotic-assisted lobectomy compared to those who did not. There is no significant distinction between the two minimally invasive techniques in terms of oncologic outcomes. These results suggest that more study, such as a randomized control experiment or its differences or further important data analysis, is needed to corroborate these outcomes.

Keywords: long-term patient, robotic, Thoracoscopic Lobectomy (TL), SEER-Medicare, Cancer-Specific Mortality (CSM), Overall Survival (OS)

Address for correspondence:

Rashmi Gudur

Department of Oncology, Krishna Hospital & Medical Research Centre, Bangalore, India

E-mail: rashmiagudur@gmail.com

Word count: 3403 **Tables:** 02 **Figures:** 02 **References:** 17

Received: 14 August, 2024, Manuscript No. OAR-24-145457
Editor Assigned: 17 August, 2024, Pre-QC No. OAR-24-145457(PQ)
Reviewed: 01 September, 2024, QC No. OAR-24-145457(Q)
Revised: 08 September, 2024, Manuscript No. OAR-24-145457(R)
Published: 16 September, 2024, Invoice No. J-145457

INTRODUCTION

The guideline for the removal of starting-level Non-Small-Cell Lung Cancer (NSCLS) is a lobectomy. Unfortunately, certain elderly individuals or those with a low cardiopulmonary reserve cannot use this technique. For these individuals, raw materials or parts of lung organization divides, such as architectural attributes that define its properties and wedges removal, have been recommended [1]. The most common kind of cancer that results in mortality is lung cancer. The highest likelihood of recovery comes from surgically removing illness in its early stages. Susceptible individuals have always been the method used to perform lobectomies. As they have been used for more than 20 years, microsurgical techniques like surgical treatment lobectomy have become established as the preferred procedure for the removal of malignancy in many centers [2]. The five men endured twelve different radiation regiments, and three had reconstructive surgery, all of which added significantly to the values obtained. Intramuscular injection toxicity was very hazardous in three cases. After the failure of all chemotherapy and surgical procedures, one individual passed away from prostate cancer that had progressed [3]. This risk assessment is conducted expressed worry about the little evidence proving the utilization of science and technology surgical procedures for the treatment associated with specific malignancies, which can be connected to higher long-term death risk than an alternate solution microsurgical procedure [4].

Similar features, including gender, age, pulmonary function, malignancy histology, smoking status, and clinical stage, were present in all of the groups of patients. The outcome of the investigation showed that robotic-assisted and thoracoscopic lobectomy have parallel long-term diagnostic and therapeutic benefits. Major surgery in the fields of science and technology benefits from the entire amount of lymph nodes removed during the laparoscopic technique [5]. The maximum scores on the symptomatic scale and international development condition questionnaire matched those of the general population and did not substantially vary across categories while switching from thoracoscopic to robotic lobectomy results in higher operating and overall hospital costs, comparable surgical results, hospital stay duration and protracted living standards can be preserved throughout this transition [6]. The findings were validated by the protracted follow-up. The parameters of the good health sample population were somewhat surpassed by long-term postoperative HRQoL and personality. Minimal operational shock by

automatic techniques evaluated in dramatically declining muscle disabilities while enhancing HRQoL and personality, particularly over a lengthy. More long-term findings are desirable to support this encouraging learning, nevertheless [7]. They have chosen 64 individuals who had TRRH therapy and 128 individuals who had received RARH treatment using the propensity score matching method. There was good agreement between the two groups' preliminary pathological symptoms. No discernible variations in postoperative pathological outcomes were seen here between the two different groups [8]. Few individuals with stage 1 NSCLC had VATS lobectomy. In comparison to the open laparoscopic procedures, quicker hospitalization and non-inferior lengthy survivability were associated with VATS laparoscopic procedures. These consequences of more constraints showed that VATS do not negatively impact oncologic evolution when applied to starting-level lung cancer and highlighted the requirement for VATS treatments to be used more widely [9]. The patient history of 450 patients who got RPD at the Beijing Sources and Put Clinic between May 2010 and December 2018 was subjected to estimation. The gradual incline was established through an analysis of the operational hours and Estimated Blood Loss (EBL). The pivotal turning points were located using a Cumulative Sum (CUSUM) technique. Long-term adoption, major surgery and other intra-operative consequences are also examined [10]. A reduced proportion of diabetic patients in the robot control have explained the robot group's apparent somewhat superior overall survival. The overall survival remained comparable in non-diabetic individuals who received either operation, according to further analyses. A similar finding was observed with diabetic people as well [11]. The sector for robotic systems is continually expanding. The number of surgeries performed has experienced a tremendous increase at universities and surgical institutions across the country as a consequence of the broad marketing of Salvador Dali and also its help to enhance minimally invasive methods. Unfortunately, modern devices have significant upfront costs as well as ongoing costs that are quite high. Not with standing, research has not yet shown that robotic surgery is superior to the conventional procedure for the preponderance of surgeries [12].

The rest of the study is structured as follows: The suggested approach is obtainable in Section 2. Section 3 contains the research findings. The conversation is covered in Section 4. See Section 5 for the conclusion.

MATERIALS AND METHODS

Data collection

This study gathered 429 patients diagnosed with lung cancer who underwent surgical treatment and agreed to participate. The participants were randomly selected and categorized based on the type of surgery they received. 42 patients undergo robotic-assisted lobectomy and 387 patients undergo thoracoscopic lobectomy. This structure was used to comprehensively evaluate and compare the efficacy and outcomes of treating lung cancer.

Inclusion criteria

Participants were required to have a minimum age of 65 years and be Medicare recipients who underwent a single lobectomy for primary NSCLC. The selection was based on the ICD-9-CM codes for robotic assistance (code 17.4) and TL (code 32.41).

Exclusion criteria

OS is defined as the time interval from operation to death or loss to follow-up. The causes of death particular to each disease were used to calculate Cancer-Specific Mortality (CSM). This research focused on the main result calculated to contrast robotic-assisted lobectomy with Thoracoscopic Lobectomy (TL) to distinguish between open and minimally invasive surgery. As previously mentioned, immediate postoperative results were assessed as secondary outcomes.

Factors

Patients were categorized based on several variables, like type of disease, surgical site, patient's demographics and specifics about the surgery, such as the patient's age on the day of the procedure, race, gender, pathological stage, histology, side, number of nodes examined, tumor size (mm), and marital status at diagnosis. In cases where the entire number of inspected nodes (n=40, 9.3%) was unknown or unrecorded, the median number of nodes discovered was employed. Chronic illnesses such as diabetes, bronchitis, antihypertensive medication use, cardiogenic shock, cardiovascular disease, peripheral artery disease, and other cardiovascular disorders were discovered during postpartum hospital stays. When appropriate, records of various therapies were made within 180 days before, during, or following the lobectomy, including cancer treatment, radiation therapy, or a combination of the two. Due to the limited availability of the diagnosis month and year, patients with unclear diagnosis months or years were omitted, and the diagnosis date was standardized to the first day of the month.

Statistical analysis

Patients in the thoracoscopic and automated machines operations categories were matched using instrumental variable screening, a caliper of 0.2% points and nearest neighbor aligning. It also took the medical throughput and average pay. The standardized variance was used to compare physician and treatment variables throughout categories. OS was considered with the Kaplan-Meier technique and group variations were evaluated utilizing the Log-Rank test. To quantify CSM, non-cancer-related mortality was taken into consideration as a competitive risk and Gray's test was employed to assess distinctions.

RESULTS ANALYSIS

Patients

There was a total of 430 individuals who had been identified as receiving a lobectomy (thoracoscopic n=387, robotic aided n=43). Table 1 details the whole cohort's characteristics, co-morbidities and tumor features, respectively.

Age, sex, wealth and location of operation were comparable for patients receiving thoracoscopic and robotic-assisted lobectomy. Peripheral vascular disease was more common in people who had had lobectomies than coronary artery disease. The majority of patients in both groups had adenocarcinoma or a subtype of adenocarcinoma as their primary tumor (Table 1).

Tab. 1. Basic features for robotic-assisted lobectomy and thoracoscopic

Factor	Average			Evaluation in Terms of a Confidence Interval
	Type of Surgery			
	Group	Robotic	Thoracoscopic	
Age		74(65, 91)	73 (65, 94)	0.014
	65-71	116(26.9)	1.39(26.7)	0.096
	70-75	135 (31.5)	110 (28.5)	
	76-79	94 (21.8)	99 (25.6)	
	81+	86 (20.0)	74 (19.1)	
Location	Metropolitan	383 (89.7)	353 (91.0)	0.046
	non-metropolitan	45 (10.3)	34 (9.0)	
sex*	female	231 (54.0)	214 (55.2)	0.024
	male	197 (46.0)	173 (44.8)	
Married	no	171 (41.8)	150 (40.6)	0.025
	yes	238 (58.2)	220 (59.4)	
Revenue quartile based on the ACS for 2019	(12.5,45.5)	12 (28.8)	95 (24.6)	0.148
	(45.5,63.2)	9 (22.0)	98 (25.3)	
	(63.2,85.4)	10 (24.3)	97 (25.1)	
	(85.4,250)	10 (24.8)	96 (25.0)	
Coronary artery Disease	no	30 (70.4)	298 (76.9)	0.07
	yes	12 (29.6)	89 (23.1)	
Diabetes	No	33 (77.9)	313 (80.8)	
	yes	93 (22.2)	74 (19.3)	
Hypertension	no	159 (37.3)	1648 (42.5)	0.105
	yes	267 (62.7)	2233 (57.5)	
The disease of the peripheral vessels	No	387 (90.8)	3439 (88.6)	0.074
	yes	39 (9.2)	442 (11.4)	
Heart failure with congestion	no	401 (94.1)	3728 (96.1)	0.089
	yes	25 (5.9)	153 (3.9)	
Persistent lung disease	no	201 (47.2)	2097 (54.0)	0.137
	yes	225 (52.8)	1784 (46.0)	
Race	white	362 (85.0)	3390 (87.5)	0.122
	black	26 (6.1)	261 (6.7)	
	other	38 (8.9)	224 (5.8)	

Nevertheless, thoracoscopic lobectomy resulted in the removal of more adenocarcinoma and fewer squamous carcinomas than robotic-assisted lobectomy. Neo-adjuvant treatment was administered to 3.8% of the patients in the thoracoscopic cohort and 18.6% of patients in the robotic cohort; patients in the robotic cohort also had a higher likelihood of receiving combination therapy and immunotherapy. Adjuvant and neo-adjuvant chemotherapy constituted the cornerstones of the regimen. In the matched cohort, there were 40 patients in total 40 in the matching group and 40 in the control cohort, and parity was achieved with the variables at hand.

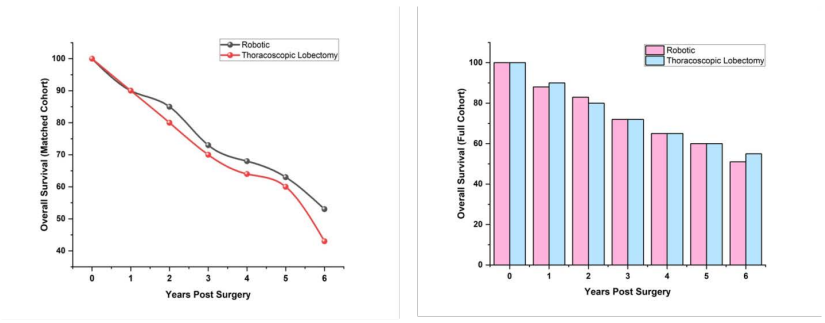
Causes of death and illness

Postoperative complications and in-hospital mortality were comparable across robotic-assisted lobectomy and thoracoscopic patients in both the matched and mismatched cohorts (Table 2).

Statistics on overall survival are shown in figure 1. Overall survival rates are determined by analyzing data from all patients diagnosed with a certain illness type. The rates of survival throughout various historical periods can be used to characterize those times. Nonetheless, statistics on diseases are sometimes shown as a relative survival rate over 5 years. Differences in unadjusted independence from influences in practically every aspect of mortality across diameter groups persisted for 1 year. The unadjusted 5-year survival rates also varied significantly among the different groups. The 5-year overall survival rates after robotic surgery are improved than those after thoracoscopic lobectomy for the whole cohort.

Tab. 2. Assessment of robotic-assisted lobectomy and thoracoscopic results in the hospital

Factors	Average Surgery Type			Evaluation in Terms of a Confidence Interval
	group	Robotic	Thoracoscopic	
Nodes quartile	(0,5)	97 (22.9)	102 (26.6)	0.12
	(5,9)	152 (35.9)	118 (30.7)	
	(9,14)	70 (16.5)	72 (18.7)	
	(14,90)	104 (24.6)	92 (24.0)	
Arrhythmia	No	333 (78.2)	308 (79.4)	0.03
	Yes	93 (21.8)	79(20.6)	
Pneumonia	No	404 (94.8)	365(94.2)	0.02
	Yes	22 (5.2)	22 (5.8)	
Sepsis	No	>415 (>97.4)	382(98.5)	0.02
	Yes	<11	5(1.5)	
Ventilation	No	408 (95.8)	369 (95.1)	0.03
	Yes	18 (4.2)	19 (4.9)	
Pneumothorax	No	>41 (>97.4)	32 (84.6)	0.003
	Yes	<10	5 (15.4)	
Stroke	No	41 (97.4)	37(97.6)	0.009
	Yes	11 (2.6)	9 (2.4)	
Coronary artery disease heart attack	No	>41 (>97.4)	382 (98.6)	0.03
	Yes	<11	5 (1.4)	
Puncture	No	>41 (>97.4)	384 (99.1)	0.032
	Yes	<11	3 (0.9)	
Bleeding	No	40 (94.6)	382 (98.6)	0.012
	Yes	2 (5.4)	5 (1.4)	
In-hospital mortality	No	>41 (>97.4)	381 (98.3)	0.11
	Yes	<11	6 (1.7)	
Renal failure	No	42 (100.0)	360 (92.9)	0.016
	Yes	<11	27 (7.1)	
Period of stays (days)		5 (1, 45)	5 (1, 79)	0.012
Atelectasis	No	37 (88.7)	349 (90.0)	0.03
	Yes	48 (11.3)	39 (10.0)	
Pulmonary Edema	No	36 (84.7)	38 (99.7)	0.07
	Yes	65 (15.3)	1 (0.3)	
Nodes		9 (0, 57)	1(0, 90)	0.01



(a) (b)

Fig. 1. Overall survival

Figure 2 depict cancer-specific mortality. The proportion of patients in an investigation or therapy group who are still alive after a certain amount of time despite having a particular condition. The beginning of the period is often considered to be the instance of analysis or the beginning of handling, and the conclusion of the period is considered to be the moment of death. Both the entire and selected groups had 35-month median follow-ups. The research showed that both thoracoscopic and robotic approaches resulted in comparable rates of overall survival and death due to malignancy. The 5-year cancer-specific rates after robotic surgery are improved than that after thoracoscopic lobectomy for the whole cohort.

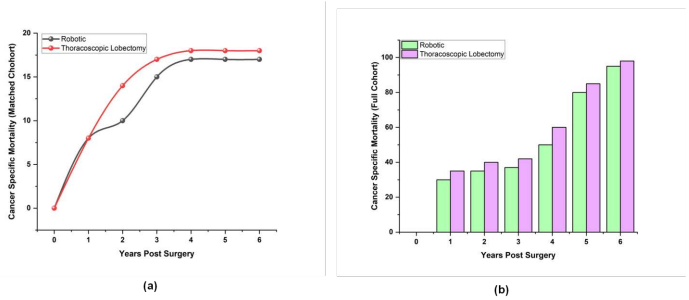


Fig. 2. Cancer specific mortality

DISCUSSION

The data demonstrate that the thoracoscopic and robotic lobectomy patients had similar short overall survival and disease mortality following lobectomy. Outcomes using these microsurgical lobectomy methods are similarly comparable, except for survival, which would have been higher in the clinical sample [13]. Although supporting previous individual institutional and policy case series, our findings diverge from those reported from non-linear and non-case series. An RCT explicitly minimizes unexplained interference, which may be the cause of the overall improvement in mortality seen in the multi-institutional dataset [14]. Although supporting previous individual institutional and policy case series, our findings diverge from those reported from non-linear and non-case series. An RCT explicitly minimizes unexplained interference it can be the cause of the overall improvement in mortality seen in the multi-institutional dataset [15]. These findings are consistent with prior demographic assessments examining lengthy survivability after thoracoscopic and thoracotomy lobectomy techniques. These trials show that when compared to lobectomy via major surgery, diagnostic and interventional lobectomy is not inferior to long-term survivability. Advocates of various approaches suggested that few provide improved lymph node extraction, a "neither any touching" procedure with less tumor handling, nor lower inflammatory cytokines resulting in enhanced long-term survival. The opinion is that regardless of the surgical approach thoracotomy, multi portal, or unimportant tool for examining, robotic-assisted as long as it follows the fundamentals of diagnostic and therapeutic surgery and pays attention to resection and proper lymphadenopathy dissection. The results might be the same. These findings can lead opponents of robotic-assisted surgical intervention or invasive procedures lobectomy to claim that there is no reason to offer such procedures at all. Implementing new technology always comes with a period of adjustment and accompanying expenditures for the robotic manipulator [16]. The poor usage of minimally invasive lobectomy calls for the promotion of any approach that is repeatable and safe for surgeons to use cost and based on the developed questions aside, as long as the short or medium curative treatment effectiveness remains the same. Robotics lobectomy has shown promising progress, with use rising from 1.0% in 2008 to 25% in 2014, according to a recent examination of the Florida hospitalized data base. It would be difficult for young consumers of invasive procedures laparoscopic procedures or the customer to want to return to open procedures from a technology standpoint. Once technology developed, microsurgical treatments could provide the advent of social, including preoperative imaging methods to locate veins and tissue planes, or they could automate a portion of the surgical procedure. Only in situations of nostalgia do technologies ever disappear into plain sight. According to the findings, a large RCT provide more information regarding whether the two strategies result in similar oncologic results [17]. Considering regards to the basic biases of both patients and surgeons in line with the majority or against the latest techniques, it is uncertain if a large-scale experiment can be finished. It is excellent that this study compared open and conceivable outcomes methods. It is necessary to use additional cutting-edge methods, such as international registrations or RCTs that cluster surgical procedures, to compare surgical techniques in real time.

CONCLUSIONS

The demographical study of Medicare data reveals that indicated patients who had lobectomy with robotic assistance had comparable long-term survival statistics to individuals who underwent lobectomy with thoracoscopic assistance. This conclusion could be reached because both kinds of methods have restrictions that are intrinsic to them. To evaluate this technology, either an RCT or any variant there or further large-scale registry analysis is needed.

LIMITATION

First and foremost, since this is not an RCT, selection biases are present and cannot be completely avoided. In our propensity matching, we made an effort to take apparent biases into account. This research was unable to account for unknown variations between the two groups, such as surgical technique and surgeon experience. A complete intent-to-treat analysis is not possible because of the lack of information about thoracotomy conversion rates. With Medicare, clinical staging data are not recorded. As a result, this studies unable to assess the data on pathologic upstaging. Medicare also does not include illness reappearance. Moreover, Medicare data cannot be used to infer the overall effectiveness of postoperative treatment and monitoring.

REFERENCES

1. Nguyen D, Gharagozloo F, Tempesta B, Meyer M, Gruessner A. Long-term results of robotic anatomical segmentectomy for early-stage non-small-cell lung cancer. Eur J Cardiothorac Surg. 2019;55:427-433.
2. Brassetti A, Cacciamani G, Anceschi U, Ferriero M, Tuderti G, et al. Long-term oncologic outcomes of robot-assisted radical cystectomy (RARC) with totally intracorporeal urinary diversion (ICUD): a multicenter study. World J Urol. 2020;38:837-843.
3. Calaway AC, Einhorn LH, Masterson TA, Foster RS, Cary C. Adverse surgical outcomes associated with robotic retroperitoneal lymph node dissection among patients with testicular cancer. Eur Urol. 2019;76:607-609.
4. Sheetz KH, Dimick JB. Is it time for safeguards in the adoption of robotic surgery? JAMA. 2019;321:1971-1972.
5. Merritt RE, Abdel-Rasoul M, D'Souza DM, Kneuertz PJ. Comparison of the long-term oncologic outcomes of robotic-assisted and video-assisted thoracoscopic lobectomy for resectable non-small cell lung carcinoma. J Robot Surg. 2022;16:1281-1288.
6. Worrell SG, Dedhia P, Gilbert C, James C, Chang AC, et al. The cost and quality of life outcomes in developing a robotic lobectomy program. J Robot Surg. 2019;13:239-243.
7. Mehdorn AS, Möller T, Franke F, Richter F, Kersebaum JN, et al. Long-term, health-related quality of life after open and robot-assisted Ivor-Lewis procedures—A propensity score-matched study. J Clin Med. 2020;9:3513.
8. Liu D, Li J, He P, Tang C, Lei X, et al. Short-and long-term outcomes of totally robotic versus robotic-assisted right hemicolectomy for colon cancer: a retrospective study. Medicine (Baltimore). 2019;98:5028
9. Yang CFJ, Kumar A, Klapper JA, Hartwig MG, Tong BC, et al. A national analysis of long-term survival following thoracoscopic versus open lobectomy for stage I non-small-cell lung cancer. Ann Surg. 2019;269:163-171.
10. Shi Y, Wang W, Qiu W, Zhao S, Wang J, et al. The learning curve from 450 cases of robot-assisted pancreaticoduodenectomy in a high-volume pancreatic center: optimization of the operative procedure and a retrospective study. Ann Surg. 2021;274:1277-1283.
11. Huang L, Shen Y, Onaitis M. Comparative study of anatomic lung resection by robotic vs. video-assisted thoracoscopic surgery. J Thorac Dis. 2019;11:1243-1250.
12. Perez RE, Schwaitzberg SD. Robotic surgery: finding value in 2019 and beyond. Ann Laparosc Endosc Surg. 2019;4:1-7.
13. de Groot PM, Wu CC, Carter BW, Munden RF. The epidemiology of lung cancer. Transl Lung Cancer Res. 2018;7:220-233.
14. Cerfolio RJ, Ghanim AF, Dylewski M. The long-term survival of robotic lobectomy for non-small cell lung cancer: A multi-institutional study. J Thorac Cardiovasc Surg. 2018;155:778-786.
15. Nelson DB, Mehran RJ, Mitchell KG. Robotic-Assisted Lobectomy for Non-Small Cell Lung Cancer: A Comprehensive Institutional Experience. Ann Thorac Surg. 2019;108:370-376.
16. Subramanian MP, Liu J, Chapman WC Jr. Utilization Trends, Outcomes, and Cost in Minimally Invasive Lobectomy. Ann Thorac Surg. 2019;108:1648-1655.
17. Lim E, Batchelor T, Shackcloth M. Study protocol for VIdeo assisted thoracoscopic lobectomy versus conventional Open LobEcTomy for lung cancer, a UK multicentre randomized controlled trial with an internal pilot (the VIOLET study). BMJ Open. 2019;9:029507.