

Surgical Outcome of Robotic and Video Assisted Thoracoscopic Surgery for Patients With Pathological Stage II and III Lung Cancer

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Background

Historically, open thoracotomy has been considered the gold standard for pulmonary resection, especially for complex cases involving locally advanced tumors including nodal disease. The introduction of minimally invasive techniques, particularly video-assisted thoracoscopic surgery (VATS), revolutionized thoracic surgery.

In recent years, robotic assisted thoracoscopic surgery (RATS) has emerged as an alternative minimally invasive approach that may overcome some of the limitations of VATS.

However, most of the existing literature on RATS has focused on early-stage NSCLC, with relatively few studies specifically addressing its role in stage II and III disease.

Aim

We retrospectively evaluated the surgical outcomes to compare the perioperative and oncological outcomes of between VATS and RATS for locally advanced NSCLC defined as stage II and III patients.

Patients and methods

【Patients】

Whole patients: Primary lung cancer, pStage II and III, Radical resection

Exclusion: Open thoracotomy, neoadjuvant therapy, other than NSCLC, etc.

【Period】

10/1/2011 – 9/30/2025

【Approach】

VATS: 74 cases

RATS: 75 cases

【Statistical analysis】

Software : JMP version 14.0 and EZR version 1.70

Propensity score matching

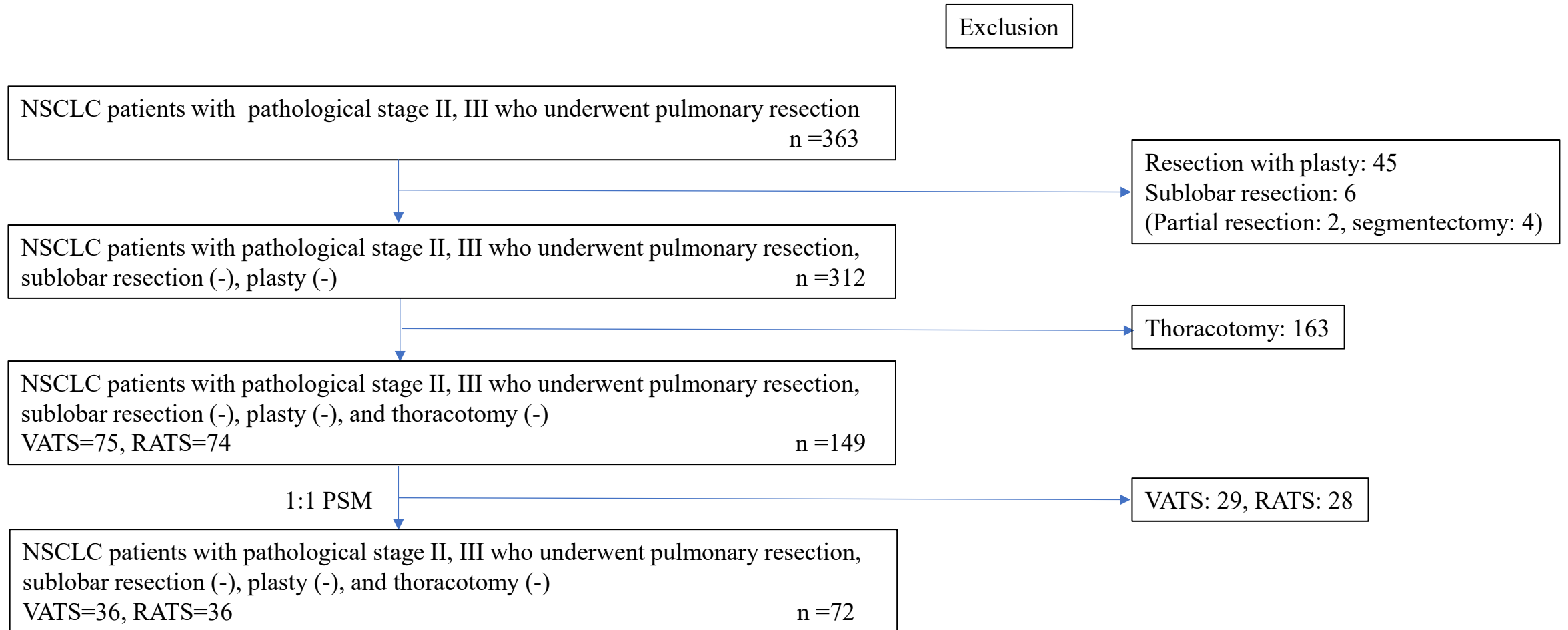
Matched with age, gender, smoking, performance status,
preoperative complications, pathological stage, and histology

Fisher's exact test

Kaplan-Meier method

Log-lank t test

Flow chart of the study population



Abbreviations)

NSCLC: Non-small cell lung cancer

VATS: Video-assisted thoracoscopic surgery

RATS: Robotic-assisted thoracoscopic surgery

PSM: Propensity score matching

Clinical characteristics in patients with locally advanced lung cancer

	VATS (n=74)	RATS (n=75)	p value
Age	70.5 ± 10.8	71.4 ± 8.9	0.564
Gender			
Male	42 (56.8%)	58 (77.3%)	0.0075 *
Female	32 (43.2%)	17 (22.7%)	
Smoking			
None	24 (32.4%)	16 (21.3%)	0.193
Mild	5 (6.8%)	2 (2.7%)	
Moderate	12 (16.2%)	12 (16.0%)	
Sever	33 (44.6%)	45 (60.0%)	
Performance status			
PS 0	67 (90.5%)	70 (93.3%)	0.760
PS 1	5 (6.8%)	4 (5.3%)	
PS 2	1 (1.35%)	1 (1.3%)	
PS 3	1 (1.35%)	0 (0.0%)	
Preoperative complication			
Presence	57 (77.0%)	65 (86.7%)	0.127
Absence	17 (23.0%)	10 (13.3%)	
Clinical stage (9 th edition)			
IA1	2 (2.7%)	0 (0.0%)	0.065
IA2	12 (16.2%)	8 (10.7%)	
IA3	13 (17.6%)	5 (6.7%)	
IB	12 (16.2%)	7 (9.3%)	
IIA	6 (8.1%)	9 (12.0%)	
IIB	19 (25.7%)	30 (40.0%)	
IIIA	6 (8.1%)	0 (0.0%)	
IIIB	3 (4.1%)	11 (14.7%)	
IIIC	0 (0.0%)	1 (1.3%)	

Pathological characteristics in patients with locally advanced lung cancer

	VATS (n=74)	RATS (n=75)	p value
Histology			
Adenocarcinoma	55 (74.3%)	48 (64.0%)	0.382
Squamous cell carcinoma	16 (21.6%)	22 (29.3%)	
Others	3 (4.1%)	5 (6.7%)	
Total size (cm)	4.0 ± 1.9	4.1 ± 1.9	0.792
Invasive size (cm)	3.6 ± 1.8	3.8 ± 1.6	0.507
Pathological T factor			
T1	16 (21.6%)	17 (22.7%)	0.717
T2	32 (43.2%)	36 (48.0%)	
T3	23 (31.1%)	21 (28.0%)	
T4	3 (4.2%)	1 (1.3%)	
Pathological N factor			
N0	30 (40.5%)	30 (40.0%)	0.729
N1	28 (37.8%)	24 (32.0%)	
N2a	10 (13.5%)	15 (20.0%)	
N2b	6 (8.1%)	6 (8.0%)	
Pathological stage (9 th edition)			
IIA	23 (31.1%)	16 (21.3%)	0.357
IIB	32 (43.2%)	43 (57.3%)	
IIIA	14 (18.9%)	11 (14.7%)	
IIIB	5 (6.8%)	5 (6.7%)	

Clinical characteristics in patients with locally advanced lung cancer after PSM

	VATS (n=36)	RATS (n=36)	p value
Age	70.7 ± 9.3	70.6 ± 7.8	0.956
Gender			
Male	27 (75.0%)	25 (69.4%)	0.6000
Female	9 (25.0%)	11 (30.6%)	
Smoking			
None	8 (22.2%)	8 (22.2%)	0.222
Mild	3 (8.3%)	0 (0.0%)	
Moderate	7 (19.4%)	7 (19.4%)	
Sever	18 (50.0%)	21 (58.3%)	
Performance status			
PS 0	32 (88.9%)	35 (97.2%)	0.151
PS 1	4 (11.1%)	1 (2.8%)	
Preoperative complication			
Presence	34 (94.4%)	29 (80.6%)	0.068
Absence	2 (5.6%)	7 (19.4%)	
Clinical stage (9 th edition)			
IA1	0 (0.0%)	0 (0.0%)	0.840
IA2	3 (8.3%)	4 (11.1%)	
IA3	5 (13.9%)	3(8.3%)	
IB	6 (16.7%)	3 (8.3%)	
IIA	4 (11.1%)	4(11.1%)	
IIB	12 (33.3%)	15 (41.7%)	
IIIA	4 (11.1%)	6 (16.7%)	
IIIB	2 (5.6%)	1 (2.8%)	

Pathological characteristics in patients with locally advanced lung cancer after PSM

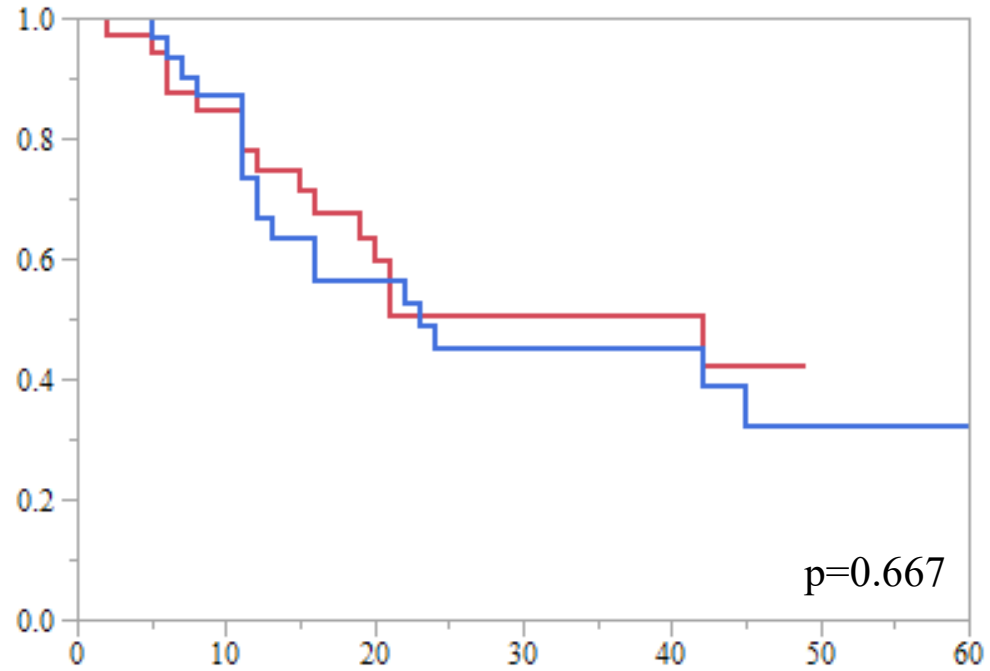
	VATS (n=36)	RATS (n=36)	p value
Histology			
Adenocarcinoma	24 (66.7%)	24 (66.7%)	
Squamous cell carcinoma	11 (30.6%)	9 (25.0%)	
Others	1 (2.8%)	3 (8.3%)	0.536
Total size (cm)	4.3 ± 1.8	4.0 ± 2.1	0.594
Invasive size (cm)	3.8 ± 1.7	3.8 ± 1.6	0.876
Pathological T factor			
T1	5 (13.9%)	8 (22.2%)	
T2	17 (47.2%)	21 (58.3%)	
T3	12 (33.3%)	6 (16.7%)	
T4	2 (5.6%)	1 (2.8%)	0.321
Pathological N factor			
N0	17 (47.2%)	13 (36.1%)	
N1	13 (36.1%)	13 (36.1%)	
N2a	4 (11.1%)	9 (11.1%)	
N2b	2 (5.6%)	1 (5.7%)	0.416
Pathological stage (9 th edition)			
IIA	12 (33.3%)	9 (25.0%)	
IIB	15 (41.7%)	19 (52.8%)	
IIIA	7 (19.4%)	8 (22.2%)	
IIIB	2 (5.6%)	0 (0.0%)	0.291

Perioperative outcomes in patients with locally advanced lung cancer after PSM

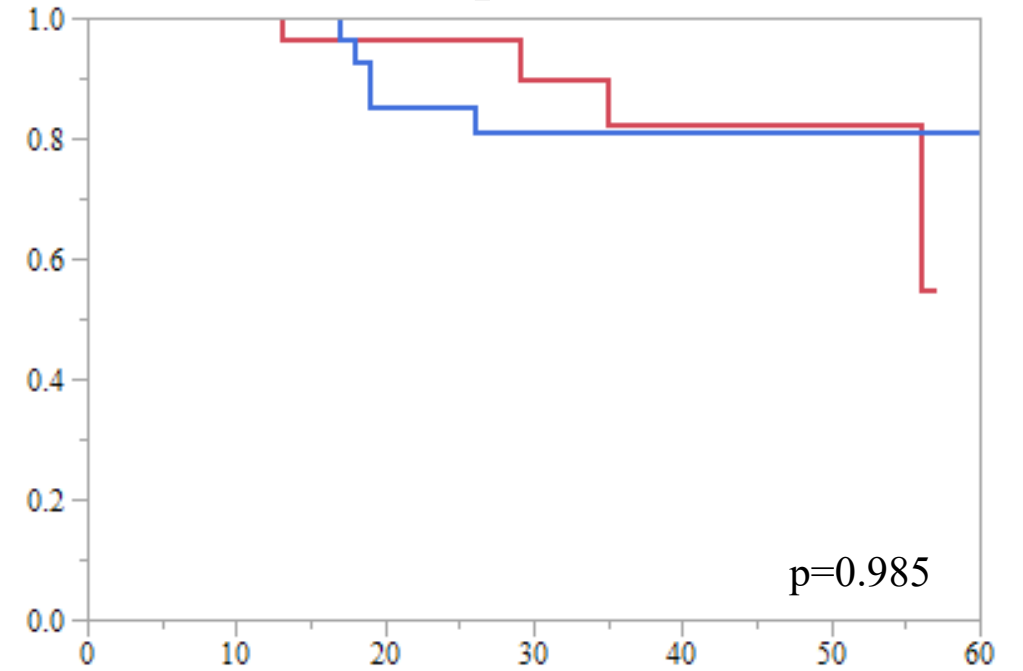
	VATS (n=36)	RATS (n=36)	p value
Operation time (min)	240.6 ± 67.1	205.7 ± 72.1	0.037 *
Blood loss (g)	147.1 ± 302.5	62.7 ± 76.9	0.109
Drainage durations (Day)	4.3 ± 2.8	3.2 ± 1.4	0.047 *
Convert			
Yes	1 (97.2%)	0 (0.0%)	0.237
No	35 (2.8%)	36 (100.0%)	
Postoperative complication			
Absence	22 (61.1%)	31 (86.1%)	0.015 *
Presence	14 (38.9%)	5 (13.9%)	

Prognosis of locally advanced NSCLC after PSM

Disease free survival



Disease specific survival



— VATS
— RATS

Discussion

Perioperative factors of locally advanced NSCLC including operation time, drainage duration, and postoperative complication were statistically superior to RATS than VATS.

The prognosis of locally advanced NSCLC was statistically equivalent between VATS and RATS.

Limitations of this study were single-center and retrospective research.

Conclusion

Although this study demonstrated the utility of RATS, a prospective trial is required to provide definitive evidence.

When introducing surgical assist robots, it is necessary to consider that disadvantages of robot such as the costs and needing the particular environment of the hospital.