

Perioperative Efficacy and Survival Prognosis of Subxiphoid Versus Intercostal Thoracoscopic Surgery for Large-Sized Thymoma: A Multicenter Retrospective Study

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Background & Methods

Background

- Thymoma is the most prevalent malignant tumor of the anterior mediastinum; surgical resection is the cornerstone of treatment.
- Intercostal VATS (IVATS) is the mainstream minimally invasive approach, but may cause intercostal nerve injury and chronic pain.
- Subxiphoid VATS (SVATS) avoids intercostal nerve injury and offers a superior view of the innominate vein and SVC.
- **Evidence comparing SVATS vs. IVATS specifically for large thymomas (≥ 5 cm) remains scarce.**

Methods

Design: Multicenter retrospective, two hospitals (Sir Run Run Shaw & First Affiliated), Jan 2018–Jan 2023.

Inclusion: Thymoma ≥ 5.0 and ≤ 10.0 cm; ASA I–II; age 18–80; with/without pericardium/lung/innominate vein invasion.

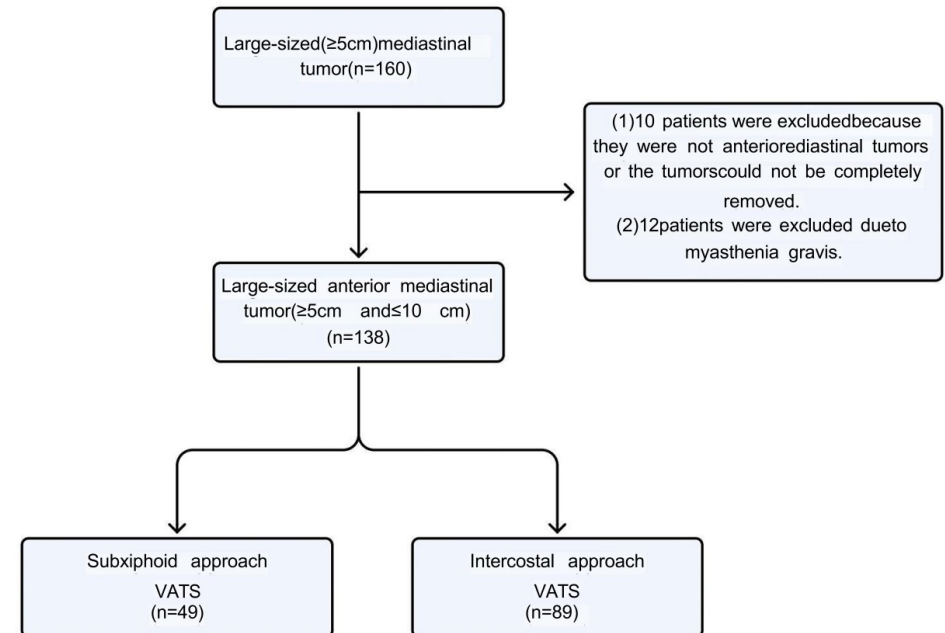
Exclusion: Myasthenia gravis, bleeding disorders, distant metastasis, other significant malignancies.

Groups: SVATS (n=49) vs. IVATS (n=89), total 138 patients.

Endpoints: Primary: OS, blood loss, analgesic duration. Secondary: drainage, op time, hospital stay, complications.

Follow-up: Minimum 36 months postoperatively.

Patient Enrollment Flowchart



Representative CT Scans (Tumor ≥ 5 cm)



Results: Baseline Characteristics & Perioperative Outcomes

Baseline Characteristics (n=138)			
Variable	SVATS (n=49)	IVATS (n=89)	P
Age (yr, mean±SD)	53.5 ± 13.5	52.7 ± 15.2	0.750
Male / Female, n (%)	30 (61.2) / 19 (38.8)	45 (50.6) / 44 (49.4)	0.229
BMI (kg/m², mean±SD)	24.55 ± 2.93	23.69 ± 3.62	0.418
Smoking (ever), n (%)	10 (20.4)	23 (25.8)	0.474
Comorbidity, n (%)	17 (34.7)	21 (23.6)	0.721
Tumor diameter (cm)	6.3 ± 1.4 (5–10)	6.24 ± 1.3 (5–10)	0.547
Masaoka I / II / III, n (%)	15 / 24 / 10	12 / 58 / 19	0.102
Thymic carcinoma, n (%)	11 (22.4)	13 (14.6)	0.492
ASA I / II, n (%)	18 / 31	30 / 59	0.163

Perioperative Outcomes			
Variable	SVATS (n=49)	IVATS (n=89)	P
Operation time (min)	120.96 ± 30.47	106.99 ± 45.74	0.058
Blood loss (ml)	35.51 ± 48.12	31.96 ± 42.21	0.653
Drainage duration (days)	3.69 ± 2.41	3.35 ± 1.99	0.368
Drainage volume (ml)	437.09 ± 410.75	662.71 ± 690.83	0.017*
Hospital stay (days)	5.14 ± 2.62	4.61 ± 1.86	0.157
Analgesic duration (days)	2.11 ± 1.27	3.88 ± 1.04	<0.001*
ICU stay, n (%)	4 (8.1)	3 (3.3)	0.220
R0 resection, n (%)	49 (100)	89 (100)	NA
Conversion to open, n (%)	0 (0)	0 (0)	NA

All baseline variables well balanced between groups (all P > 0.05).

* P < 0.05. SVATS: less drainage, shorter analgesic use.

Key Findings: SVATS was associated with significantly less drainage volume (437 vs 663 ml, P=0.017) and shorter postoperative analgesic duration (2.1 vs 3.9 days, P<0.001). Operation time showed a trend toward longer in SVATS (121 vs 107 min, P=0.058), likely due to learning curve. 100% R0 resection and no conversion in both groups.

Results: Postoperative Complications & Overall Survival

Postoperative Complications

Complication	SVATS (n=49)	IVATS (n=89)	P
Pleural effusion	5 (10.2%)	5 (5.6%)	0.322
Pulmonary infection	2 (4.1%)	0 (0%)	0.551
Chylothorax	2 (4.1%)	0 (0%)	0.551
Subcutaneous emphysema	1 (2.1%)	4 (4.5%)	0.463
Arrhythmia	1 (2.1%)	0 (0%)	0.176
Phrenic nerve palsy	0 (0%)	2 (2.2%)	0.290
Postoperative bleeding	5 (10.2%)	7 (7.9%)	0.443
Any complication	~16 (32.7%)	~18 (20.2%)	NS

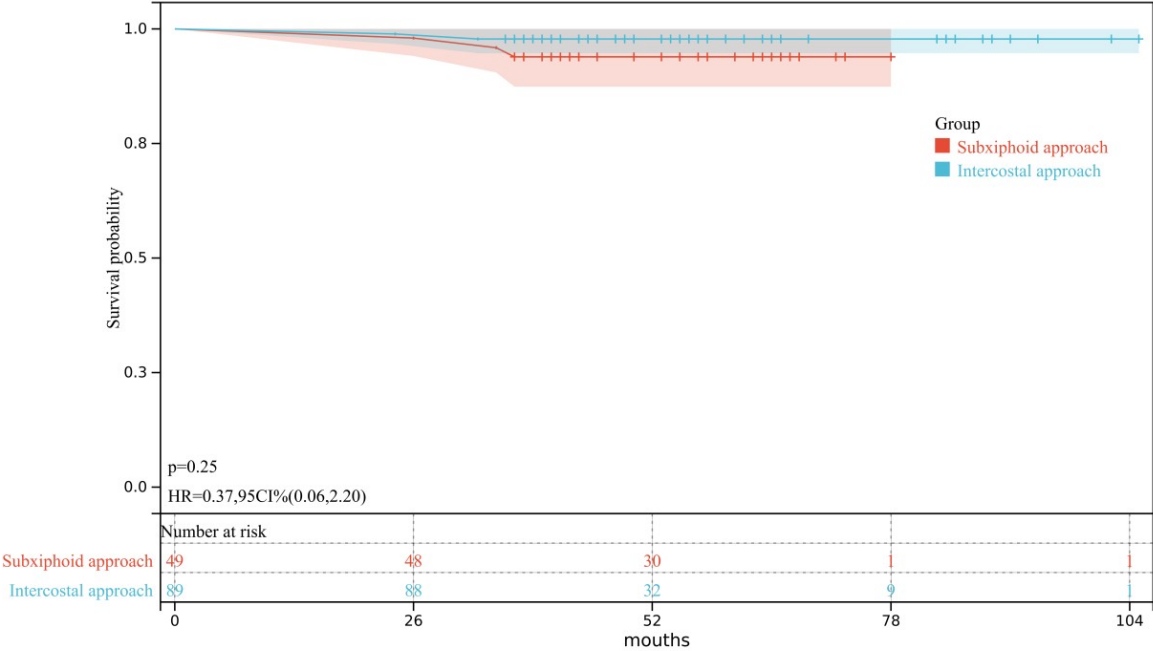
No significant differences in any postoperative complication.

Overall Survival (3-year):

HR = 0.37 (95% CI: 0.06–2.20), P = 0.25

No significant difference in OS between SVATS and IVATS.

Overall Survival (Kaplan-Meier)



SVATS (red) vs. IVATS (blue). Minimum follow-up: 36 months.

Survival Interpretation:

- Both groups showed excellent survival outcomes for large thymomas.
- The lower HR (0.37) suggests a potential survival trend favoring SVATS, but did not reach statistical significance (P=0.25), likely due to limited sample size and few events.
- Larger multicenter prospective studies with longer follow-up are needed.

For large-sized thymomas (≥ 5 cm), SVATS demonstrates superior short-term perioperative efficacy with comparable survival to IVATS.

Better Perioperative Outcomes

Less drainage volume:
437 vs 663 ml ($P=0.017$)
Shorter analgesic duration:
2.1 vs 3.9 days ($P<0.001$)
Avoids intercostal nerve injury,
reducing postoperative pain

Comparable Safety & Survival

100% R0 resection in both groups
No conversion to open surgery
Similar complication rates
OS: HR 0.37 (0.06–2.20), $P=0.25$
No significant survival difference
Minimum 36-month follow-up

→ Clinical Implication

SVATS is a safe and feasible
alternative for large thymomas
Longer operation time ($P=0.058$)
likely reflects learning curve
Supports ERAS principles in
anterior mediastinal tumor surgery

Study Limitations: Retrospective multicenter design; limited sample size (138 patients); non-randomized group allocation; relatively short follow-up for thymoma survival. Future large-scale prospective RCTs are warranted.

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