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Initial Experience With Segmentectomy via the Pulmonary Ligament Approach Using Da Vinci SP

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2026 World Conference on Lung Cancer COI Disclosure

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Introduction

da Vinci SP (Single-Port) System Benefits

All instruments enter via one subcostal incision, eliminating intercostal nerve compression and reducing postoperative pain.

Bottom-Up Vector

Ideal for caudal-to-cranial dissection.

The camera directly faces the inferior hilum with linear axial alignment.



we investigated **the pulmonary ligament approach** as a technique that maximizes the inherent advantages of the SP system.

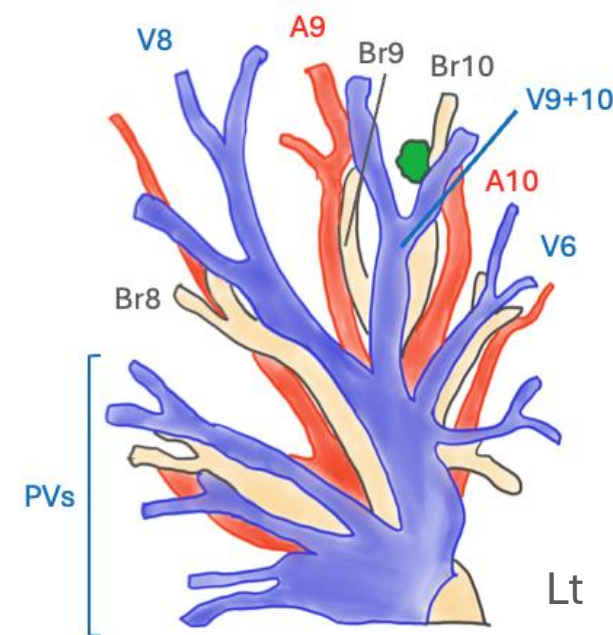


The pulmonary ligament approach

- This method is an approach for posterior basal segmentectomy (ex. S9+10, S10), in which the pulmonary ligament is dissected, followed by the pulmonary veins (PV), bronchi, and pulmonary arteries (PA).

Liu C et al. The Journal of Thoracic and Cardiovascular Surgery. 2020.

- This approach avoids interlobar fissure dissection, reducing air leaks and surgical complexity in incomplete fissures.



Challenging

- limited visualization
- difficult instrument manipulation



da Vinci SP

- Bottom-up perspective
- Multi-Joited arm & flexible scope

Methods



Patient Cohort

- Retrospective analysis
- 13 patients undergoing SP robotic posterior basal segmentectomy
- Feb 2024 - Feb 2026
- Mie University Hospital



Surgical Team

- 2 certified da Vinci proctors (>80 multiport RATS experience)
- Assistants board-certified thoracic surgery staff.



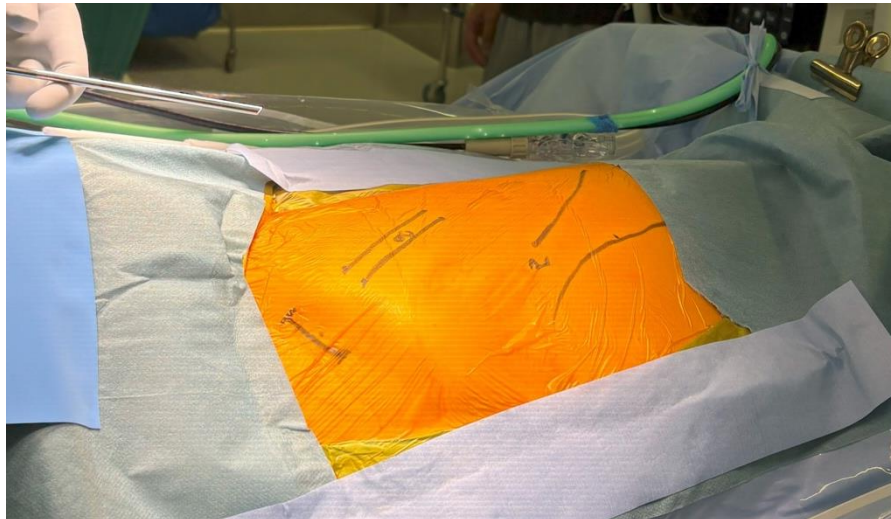
Inclusion Criteria

- cStage I primary NSCLC
- metastatic lung tumors
- Central two-thirds requiring R0 segmentectomy.

Operation procedure

1. Insert Access port

- Lateral decubitus position
- 4.0 cm subcostal skin incision below 8th rib
- Diaphragm sutured to skin for access



Operation procedure

2. Ligament & PV

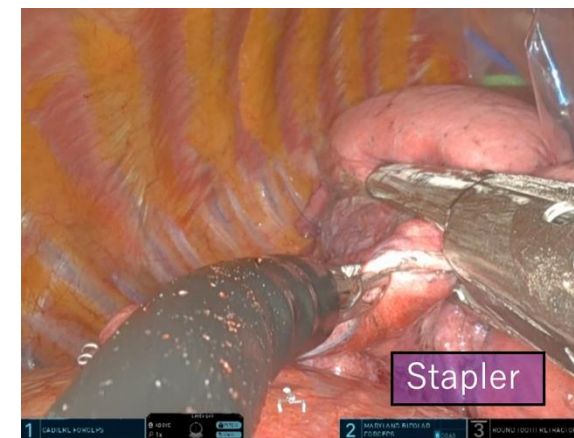
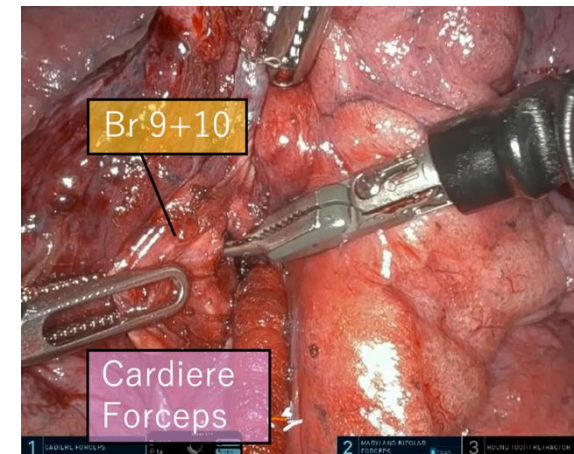
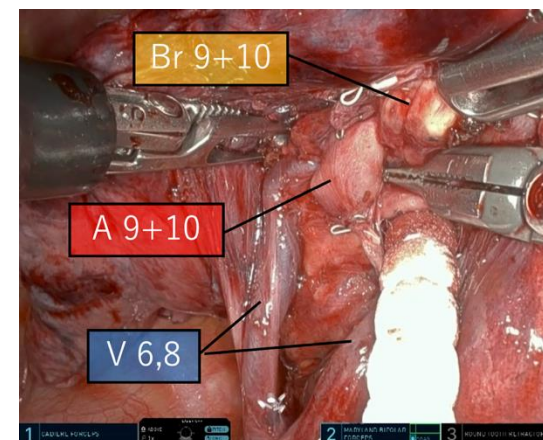
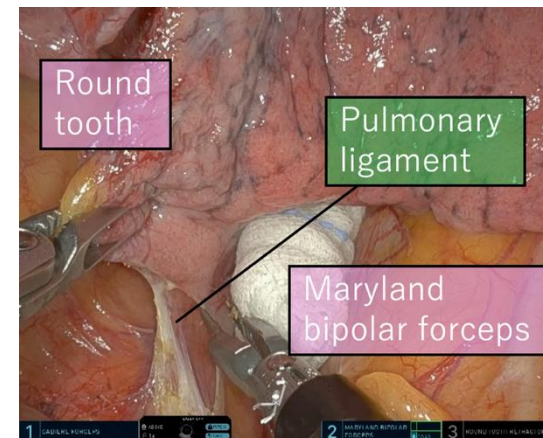
Cranial traction with organ retractor; divide pulmonary ligament and dissect inferior pulmonary vein.

3. Bronchus & PA

Hierarchical transection of target segmental bronchus followed by segmental pulmonary artery.

4. Intersegmental Plane

Intravenous ICG administration for boundary visualization and stapler division.



Results

Patient characteristics

	Total Cohort (N = 13)	Percentage / IQR
Age (years)	62	(55 – 76)
Sex (Male / Female)	3 / 10	23.1% / 76.9%
Body Mass Index (kg/m ²)	22.7	(19.9 – 26.6)
ASA Physical Status (Class 1 / 2 / 3)	8 / 4 / 1	61.5% / 30.8% / 7.7%
Smoking Status (Ever / Never)	4 / 9	30.8% / 69.2%
Primary Diagnosis (NSCLC / Metastasis)	8 / 5	61.5% / 38.5%
Clinical Stage (Primary: 0 / IA1 / IA3 / IB)	2 / 3 / 2 / 1	25% / 37.5% / 25% / 12.5%

Operative outcomes

	Total Cohort (N = 13)	Percentage / IQR
Segmentectomy Rt S10 / 9+10	3 / 3	23.1 / 23.1 %
Lt S 10 / 9+10	5 / 2	38.4 / 15.4 %
Total operative time (min)	177	(164 - 221)
Console time (min)	141	(120.5 - 169)
Blood loss (ml)	10	(10.00 - 10.00)
Adding a port	0	0 %
Conversion to thoracotomy	0	0 %
Duration of chest drainage (days)	2	(2 - 3)
Length of hospital stay (days)	5	(5 - 7)
Post operative complications within 30 days	1	7.7 %

Pathological outcomes

	Total Cohort (N = 13)	Percentage / IQR
Histology		
Primary	7	53.8%
Adenocarcinoma	6	46.1%
Squamous	1	7.7%
Metastasis	5	38.5%
Other	1	7.7%
Tumor Size (cm)	1.3	1.0 – 1.8
Pathological stage (Primary: 0 / IA1 / IA2 / IA3 / IIA)	1 / 2 / 1 / 1 / 2	14.3 / 28.6 / 14.3 / 14.3 / 28.6 %
R0	13	100%

Surgical Discussion

▷ Axial Alignment

Positioning the camera facing cranially aligns with the SP instruments, enabling clear visualization of segmental anatomy.

▷ Space Optimization

Internal organ retractors provide steady lung elevation, preserving working channels for "Cobra-drive" articulation.

▷ Assistant Coordination

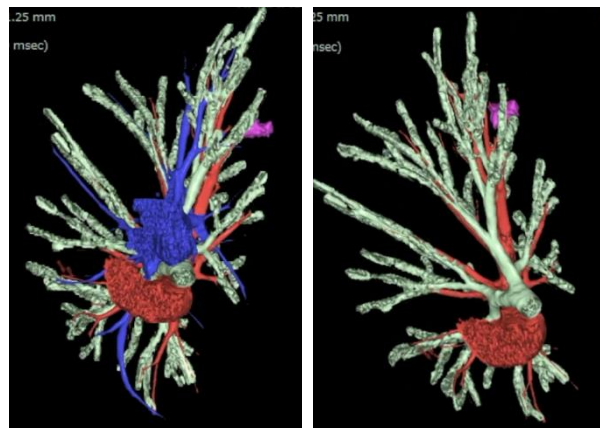
Curved VATS instruments (e.g. Schwarz swab holder) via assistant port effectively resolve external arm clashing.



Clinical Implication

Safe Surgery

It is important to have a thorough understanding of anatomy before surgery. For example, using 3D CT to reconstruct blood vessels.



The 3D-CT image was created inverted to make it easier to visualize the anatomy when the lungs are pulled towards the head.

Patient Selection

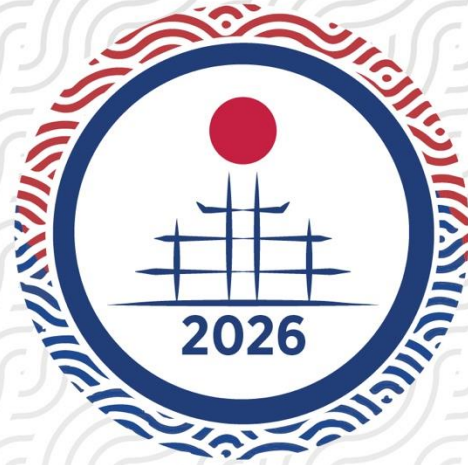
Ideal for early-stage NSCLC and solitary metastases where systematic interlobar lymphadenectomy is not required.

Study Limitations

Single-center retrospective design, modest sample size (N=13), and short follow-up warrant ongoing multi-center validation.

Conclusion

The inferior pulmonary ligament approach via the da Vinci SP system provides a safe, feasible, and reproducible strategy for posterior basal segmentectomies.



Thank You.●