

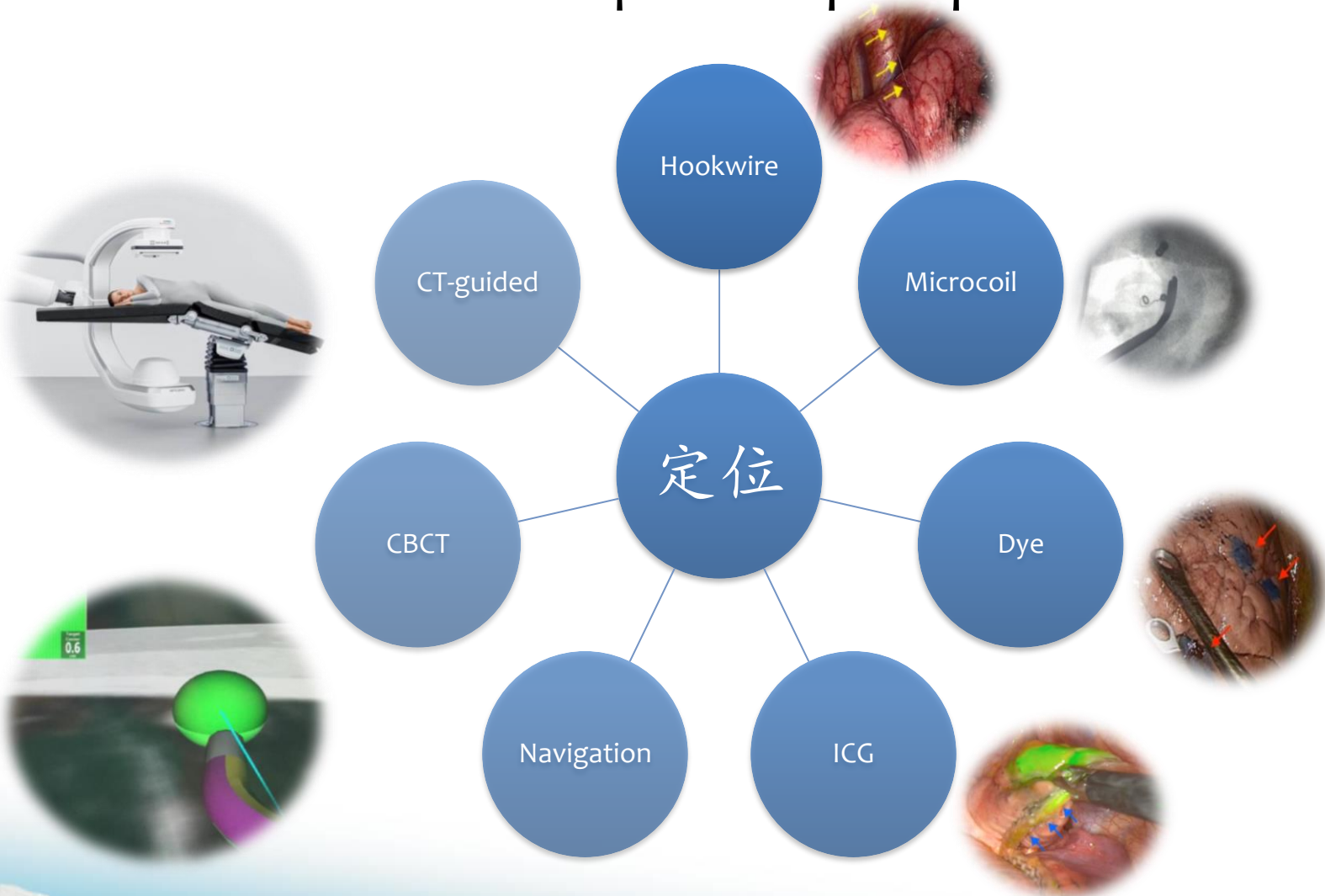
Percutaneous Localization of Small Lung Nodules: 北榮經驗

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There are various techniques for preoperative localization



But limited **comparative studies** have been done

Aim

- Compare the preoperative localization techniques in Taipei Veterans General Hospital.



Patients

- 2018/1 - 2019/5
- Preoperative localization before uniportal VATS
 - CT-guided localization (**CTGL**)
 - Electromagnetic navigation-guided localization (**EMNGL**)



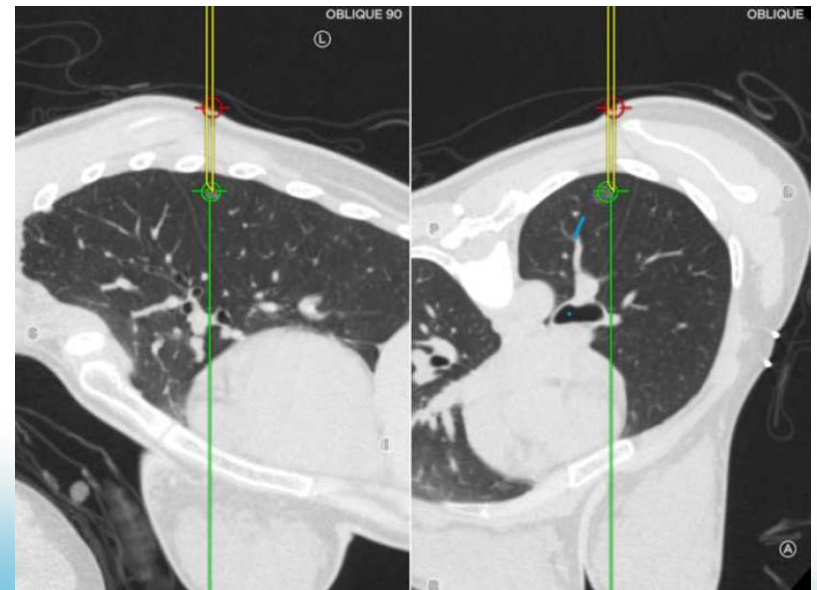
Computed Tomography-guided Percutaneous Localization (CTGL)

1. Patient sent to CT room
2. Pre-procedural CT
3. Local anesthesia
4. A 20 or 21-gauge guiding needle
5. Post-procedural CT
6. Patient sent back to ward
7. Patient sent to operation room for VATS



Electromagnetic Navigation-guided Percutaneous Localization (EMNGL)

1. Patient sent to operation room
2. General anesthesia
3. Thoracic Navigation System
4. A 19-gauge Chiba needle with electromagnetic tip-tracked needle stylet
5. Proceed to VATS

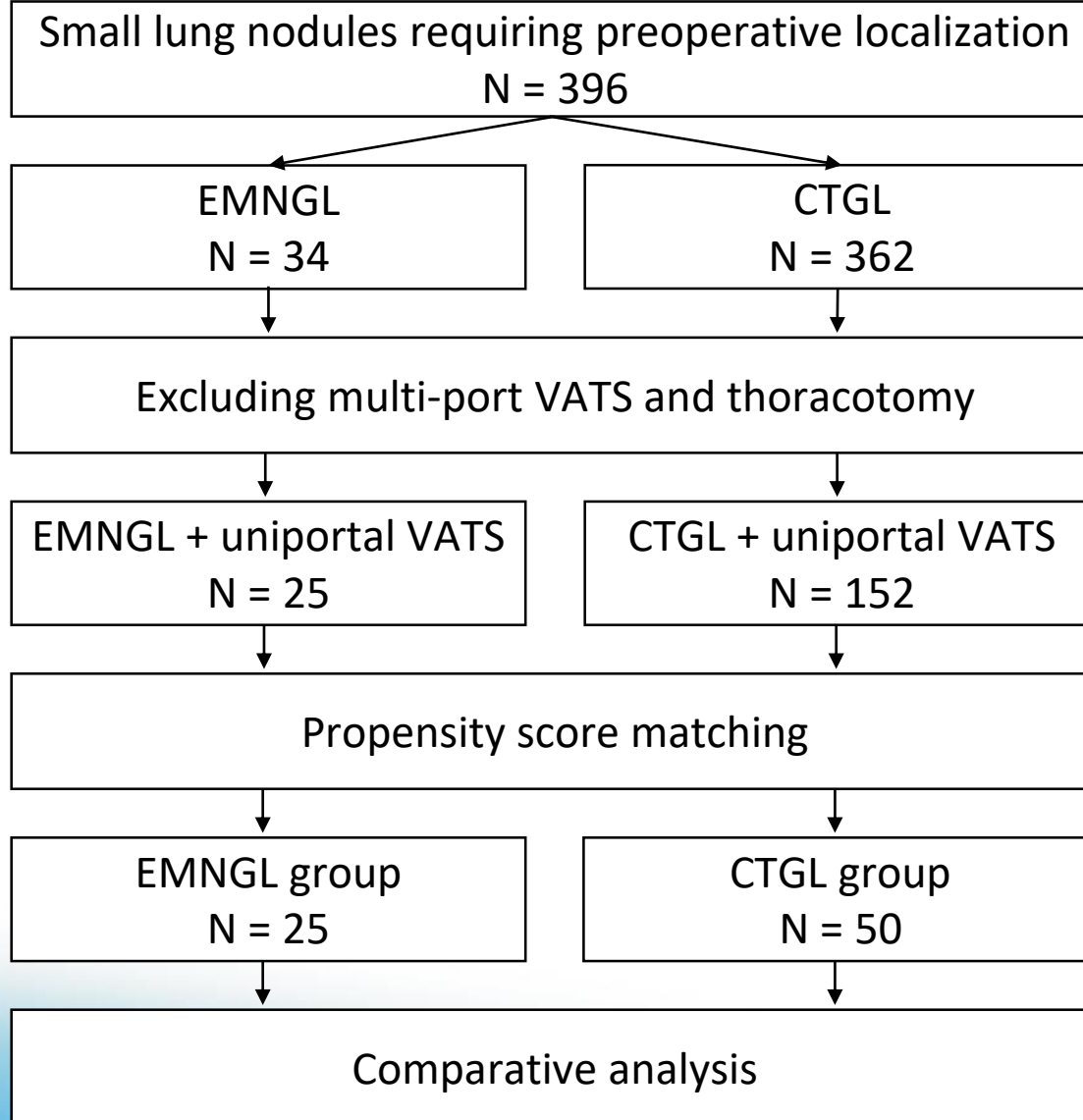


Surgical Techniques

- Marker identification
 - Hookwire: Direct visualization
 - Dye: Direct visualization
 - ICG: Near-infrared fluorescence imaging system
 - Microcoil: C-arm fluoroscopy
- Localization failure
 - Inability to identify the target lesion
 - **Finger palpation** to find the target lesion



Results



Results

Variables	EMNGL group (n = 25)	CTGL group (n = 50)
Age (years, median (IQR))	57 (50-69)	59 (53-67)
Sex, n (%)		
Male	12 (48)	25 (50)
Female	13 (52)	25 (50)
FEV ₁ (l, median (IQR))	2.14 (1.72-2.93)	2.37 (1.95-2.99)
DLCO (% , median (IQR))	72.0 (63.0-84.0)	70.0 (64.5-77.5)



Results

Variables	EMNGL group (n = 25)	CTGL group (n = 50)
Location, n (%)		
Left side	14 (56)	26 (52)
Right side	11 (44)	24 (48)
Nodule size (cm, median (IQR))	1.00 (0.80-1.25)	0.80 (0.70-1.13)
Nodule number, n (%)		
1	22 (88)	43 (86)
>1	3 (12)	7 (14)
Nature, n (%)		
Pure GGO	8 (32)	20 (40)
Part solid	9 (36)	14 (28)
Solid	8 (32)	16 (32)
Pleural distance (cm, median (IQR))	1.30 (0.70-1.90)	1.15 (0.50-1.65)



Results

Variables	EMNGL group (n = 25)	CTGL group (n = 50)	p value
CT time (min, median (IQR))		58.5 (45.0-74.8)	
CT room to OR interval (min, median (IQR))		110.0 (67.0-171.0)	
Localization method, n (%)			0.015
Single-marker localization	12 (48)	38 (76)	
Hookwire	0 (0)	26 (52)	
Patent blue dye	7 (28)	9 (18)	
Microcoil	3 (12)	2 (4)	
Indocyanine green	2 (8)	1 (2)	
Dual-marker localization	13 (52)	12 (24)	
Hookwire + patent blue dye	0 (0)	11 (22)	
Microcoil + patent blue dye	12 (48)	1 (2)	
Microcoil + indocyanine green	1 (4)	0 (0)	

Results

Variables	EMNGL group (n = 25)	CTGL group (n = 50)	p value
Localization-related complications, n (%)			
Pulmonary hemorrhage		28 (56)	
Pneumothorax		17 (34)	
Localization result, n (%)			0.333
Success	24 (96)	50 (100)	
Failure	1 (4)	0 (0)	
Surgical procedure, n (%)			0.013
Wedge resection	18 (72)	47 (94)	
Anatomic resection	7 (28)	3 (6)	
Segmentectomy	3 (12)	1 (2)	
Lobectomy	4 (16)	2 (4)	



Results

Variables	EMNGL group (n = 25)	CTGL group (n = 50)	p value
Conversion, n (%)			1.000
Multiportal VATS	1 (4)	1 (2)	
OR time (min, median (IQR))	205 (178-290)	143 (124-175)	<0.001
Total time (min, median (IQR))	205 (178-290)	324 (228-374)	0.002
Chest drainage duration (days, median (IQR))	2.0 (1.5-2.5)	3.9 (2.0-3.0)	0.002
Surgical complication, n (%)			0.680
Persistent air leak > 3 days	3 (12)	3 (6)	
Pneumothorax after drain removal	0 (0)	1 (2)	

Results

Diagnoses	EMNGL group (n = 30), n (%)	CTGL group (n = 57), n (%)
Benign tumor	1 (3)	14 (25)
Adenocarcinoma <i>in situ</i>	6 (20)	14 (25)
Minimally invasive adenocarcinoma	12 (40)	7 (12)
Invasive adenocarcinoma	4 (14)	10 (17)
Squamous cell carcinoma	1 (3)	0 (0)
Adenosquamous carcinoma	1 (3)	0 (0)
Metastasis	5 (17)	12 (21)



Localization-related Complication

- One patient in the CTGL group underwent additional chest drainage for localization-related pneumothorax.
- Localization-related complications **could not be assessed** in the EMNGL group.



Localization failure

- One localization failure in the EMNGL group
- Limitation of EMNGL:
No **real-time image** confirmation



Discussion



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Comparative Effectiveness and Safety of Preoperative Lung Localization for Pulmonary Nodules

A Systematic Review and Meta-analysis



Chul Hwan Park, MD; Kyunghwa Han, PhD; Jin Hur, MD, PhD; Sang Min Lee, MD; Ji Won Lee, MD, PhD; Sung Ho Hwang, MD, PhD; Jae Seung Seo, MD; Kye Ho Lee, MD; Woocheol Kwon, MD, PhD; Tae Hoon Kim, MD, PhD; and Byoung Wook Choi, MD, PhD

- Hook wire
 - Lower success rate
 - Higher pneumothorax and hemorrhage rates
- Microcoil
 - Lowest complication rate
- Lipiodol
 - Highest success rate



A comparison of efficacy and safety of preoperative versus intraoperative computed tomography-guided thoracoscopic lung resection





Yin-Kai Chao, MD,^a Kuang-Tse Pan, MD,^b Chih-Tsung Wen, MD,^a Hsin-Yueh Fang, MD,^a and Ming-Ju Hsieh, MD^a

- Single-stage intraoperative CTGL
 - Decreased time at risk (13 vs. 216 min)
 - Increased global OR utilization time (227 vs. 169 min)
- Two-stage preoperative CTGL



Article

Electromagnetic Navigation Bronchoscopy Localization versus Percutaneous CT-Guided Localization for Lung Resection via Video-Assisted Thoracoscopic Surgery: A Propensity-Matched Study

Shuenn-Wen Kuo ¹, Ying-Fan Tseng ¹, Kuan-Yu Dai ¹, Yeun-Chung Chang ²,
Ke-Cheng Chen ^{1,3,*} and Jang-Ming Lee ¹

- Electromagnetic navigation bronchoscopy-guided dye localization
 - Lower pneumothorax rate (6.7% vs. 36.7%)
 - Decreased global time (143 vs 258 min)
- Conventional percutaneous CT-guided localization



Limitations

- Criteria and selection for localization were not randomized.
- EMNGL was performed by a single surgeon.
- Only two methods were compared.



Conclusions

- Both methods had comparable results.
- EMNGL had **longer OR utilization time**, but **shorter total time**.

