

Utilization of biopsy prior lung resection: A retrospective analysis using Japan’s Medical Data Vision (MDV) database

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OBJECTIVE

- Lung cancer is one of the leading causes of death in Japan. Early and accurate diagnosis is essential for effective treatment
- Lung biopsy plays a key role in diagnostic process, though utilization varies by clinical practices and accessibility.
- We examined the real-world biopsy utilization pattern before lung resection and identified factors associated with biopsy use.

METHODS

- A nationwide Japanese claim database (Medial Data Vision Data) ,which covers 23% of hospitals in Japan, was used.
- Adult patients who underwent lung resection between January 2008 to September 2023 were included
- Patients with age below 18, missing in cancer stage and having other malignant disease were excluded
- Patients who had biopsy before the date of surgery were defined as prior biopsy group (PB), and the others as non-prior biopsy group (NPB)
- Student t-test for continuous variable, and chi-square tests for categorical variables were used to compare between PB and NPB. Multivariate logistic regression was performed to identify factors associated with biopsy before surgery.

RESULTS

- A total of 37,102 lung resection patients were identified. 17,956 (48.4%) were PB and 19,146 (51.6%) were NPB.
- PB patients were more male patients (52.2%) and had more comorbidities including COPD and other metastatic diseases (61.0%).
- PB patients had more advanced stages (Stage IV: 3.0%), while NPB patients had lower stage (Stage I: 78.5%) and Tis ~ T1 tumor size mostly (Tis~T1: 77.7%).
- NPB patients had higher benign diagnoses (2.23%), and no prior lung cancer confirmation before surgery (39.5%)

Table1. Patients’ characteristics

		PB	NPB	p-value
N (%)		17,956	19,146	
Sex	Male	11160 (62.2)	11132 (58.1)	<0.001
	Female	6796 (37.8)	8014 (41.9)	
Age	18 ~ 59	2038 (11.3)	2355 (12.3)	0.007
	60 ~ 74	9449 (52.6)	10090 (52.7)	
	75 ~	6469 (36.0)	6701 (35.0)	
	Normal	12040 (67.2)	12632 (66.2)	
BMI	Underweight	1420 (7.9)	1411 (7.4)	0.001
	Overweight	4446 (24.8)	5040 (26.4)	
Cancer Stage	Stage I	12047 (67.1)	15038 (78.5)	<0.001
	Stage II	3112 (17.3)	1414 (7.4)	
	Stage III	2056 (11.5)	906 (4.7)	
	Stage IV	547 (3.0)	616 (3.2)	
T Stage (Tumor size)	Tis ~ T1	9925 (55.4)	14856 (77.7)	<0.001
	T2	5643 (31.4)	2973 (15.5)	
	T3	1703 (9.5)	765 (4.0)	
	T4	583 (3.2)	335 (1.8)	
Comorbidities	Overall	10960 (61.0)	10375 (54.2)	<0.001
	COPD	3655 (20.4)	3277 (17.1)	
	Diabetes mellitus	4124 (23.0)	4076 (21.3)	
	Metastatic tumor	1176 (6.5)	585 (3.1)	
	Arterial hypertension	6174 (34.4)	5808 (30.3)	
	Cardiovascular Diseases	300 (1.7)	335 (1.7)	
Hospital Scale	<500 beds	10161 (56.5)	9710 (50.8)	<0.001
	>=500 beds	7795 (43.4)	9436 (49.3)	
Smoking Status	Nonsmoker	6666 (37.1)	7939 (41.5)	<0.001
	Smoker	11290 (72.9)	11209 (58.5)	
Cancer hospital	Yes	16132 (89.8)	16658 (87.0)	<0.001
	No	1824 (10.2)	2488 (13.0)	
Preoperative Neoadjuvant Therapy	Yes	581 (3.2)	254 (1.3)	<0.001
	No	17375 (96.8)	18892 (98.7)	
Adjuvant therapy	Yes	6567 (36.6)	3695 (19.3)	<0.001
	No	11389 (63.4)	15451 (80.7)	
Main diagnosis	Malignant lung diseases (C34.0-C34.9, C78.0)	17511 (99.02)	18264 (96.89)	<0.001
	Other malignant Diseases	47 (0.27)	165 (0.88)	
	Benign diseases	126 (0.71)	421 (2.23)	
Prior lung cancer confirmation	Yes	14631 (81.5)	11587 (60.5)	<0.001
	No	3325 (18.5)	7559 (39.5)	

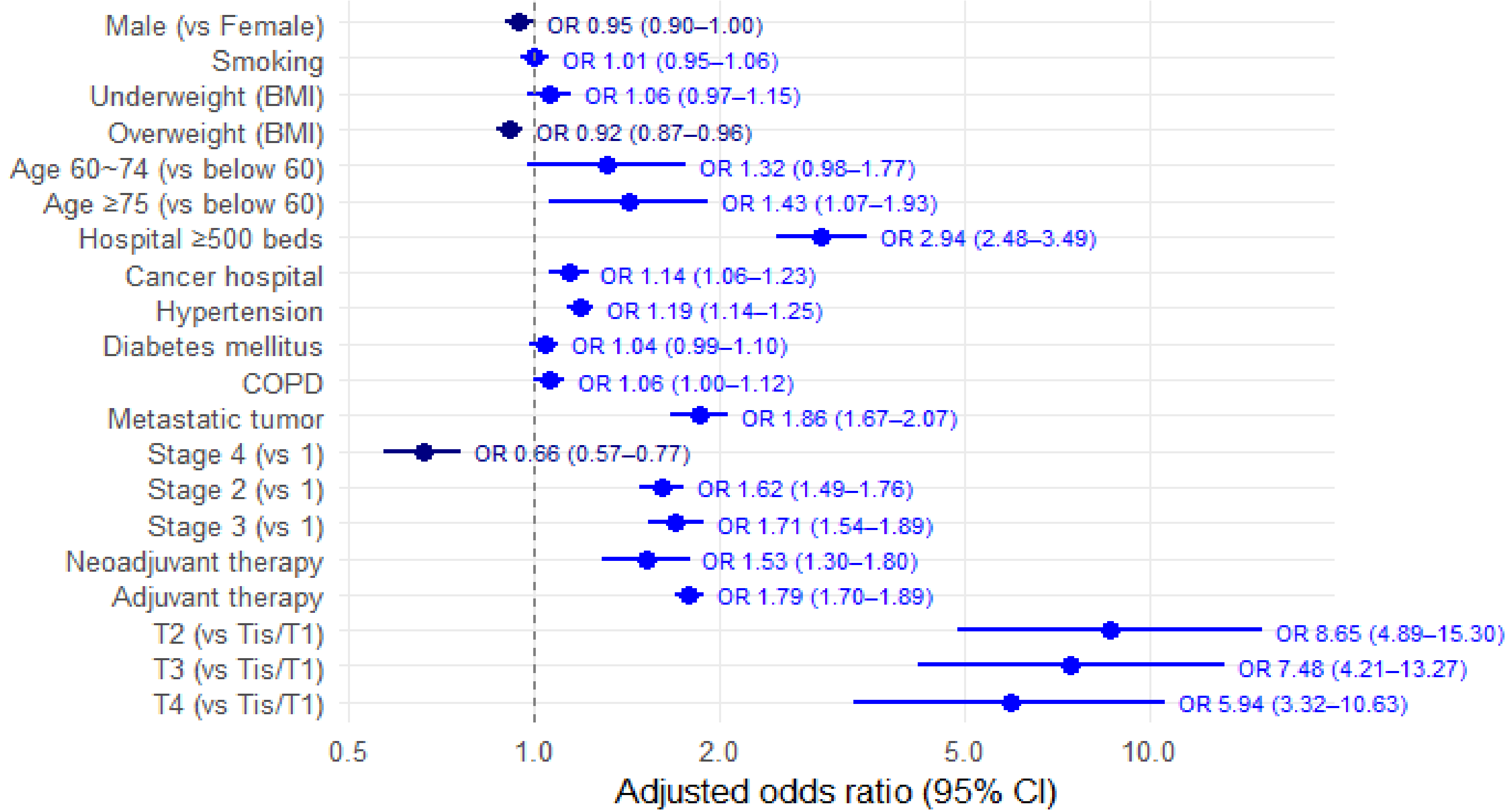
- PB patients had a shorter mean interval from first chest imaging to surgery (PB: 402.65 days vs. NPB: 480.08 days, p<0.001) and from first chest imaging to lung cancer confirmation (PB: 392.39 days vs. NPB: 461.11 days, p<0.001).
- Among PB patients, the average number of prior biopsies was 1.08 (SD: 0.3), with transbronchial lung biopsy (TBB) being the predominant modality (84.3%).
- Compared with PB patients, NPB patients were more likely to undergo sub-lobar resection, including wedge resection (NPB: 22.7% vs. PB: 8%) or segmentectomy (NPB:15.2% vs. PB: 6.3%)

Table 2. Healthcare resource utilization

		PB	NPB	p-value
N (%)		17,956	19,146	
Chest imaging utilization	First chest imaging to surgery date (mean, SD)	402.65 (707.72)	480.08 (762.75)	<0.001
	First chest imaging to lung cancer confirmation (mean, SD)	392.39 (718.59)	461.11 (761.14)	<0.001
	Frequency of chest imaging	9.66 (8.25)	8.24 (7.16)	<0.001
	Frequency of CT	3.08 (2.69)	3.10 (2.95)	0.367
	Frequency of chest radiography	5.34 (5.86)	4.23 (4.68)	<0.001
	Frequency of MRI	1.00 (1.01)	0.76 (1.06)	<0.001
	Frequency of PET	0.23 (0.45)	0.15 (0.41)	<0.001
Frequencies of biopsy	Frequencies of prior biopsy (mean, SD)	1.08 (0.30)	-	
	1 time	16649 (92.7)	-	
	2 or more times	1307 (7.3)	-	
Types of biopsy	TTNA	1501 (8.4)	-	
	TBB	15142 (84.3)	-	
	EBUS-TBNA	921 (5.1)	-	
	TBB with navigation	1007 (5.3)	-	
	TBB- cryobiopsy	83 (04)	-	
Types of lung resection	Segmentectomy	1134 (6.3)	2908 (15.2)	<0.001
	Wedge resection	1435 (8.0)	4342 (22.7)	
	Lobectomy	14885 (82.9)	11502 (60.1)	
	Pneumonectomy	138 (0.8)	47 (0.2)	
	Bullectomy	36 (0.2)	47 (0.2)	
	Exploratory thoracotomy	423 (2.4)	395 (2.1)	

- Patients with larger or more invasive tumors were more likely to undergo biopsy (T2: OR = 8.65, p<0.001; T3: OR = 7.48, p<0.001).
- By stage, patients with stage II or III disease had higher odds of receiving a prior biopsy, whereas stage IV patients had lower odds (Stage II: OR = 1.62, p<0.001; Stage III: OR = 1.71, p<0.001; Stage IV: OR = 0.66, p<0.001).
- Older age (≥70 years: OR = 1.43, p<0.001) and the presence of metastatic tumors (OR = 1.86, p<0.001) were also associated with undergoing biopsy prior to surgery.
- Patients who visited hospital with larger bed capacity (OR: 2.94, p<0.001) and cancer therapeutics (OR:1.14, p<0.001) were likely to received biopsy prior to surgery.

Figure 1. Factors associated with prior biopsy



CONCLUSIONS

- Lung biopsy use before lung resection was associated with advanced cancer, comorbidities, and larger hospitals.
- Higher benign diagnoses in the non- prior biopsy group highlight the need for improved strategies in early-stage lung cancer.
- Optimizing biopsy use may improve early-stage diagnosis and reduce unnecessary surgeries.