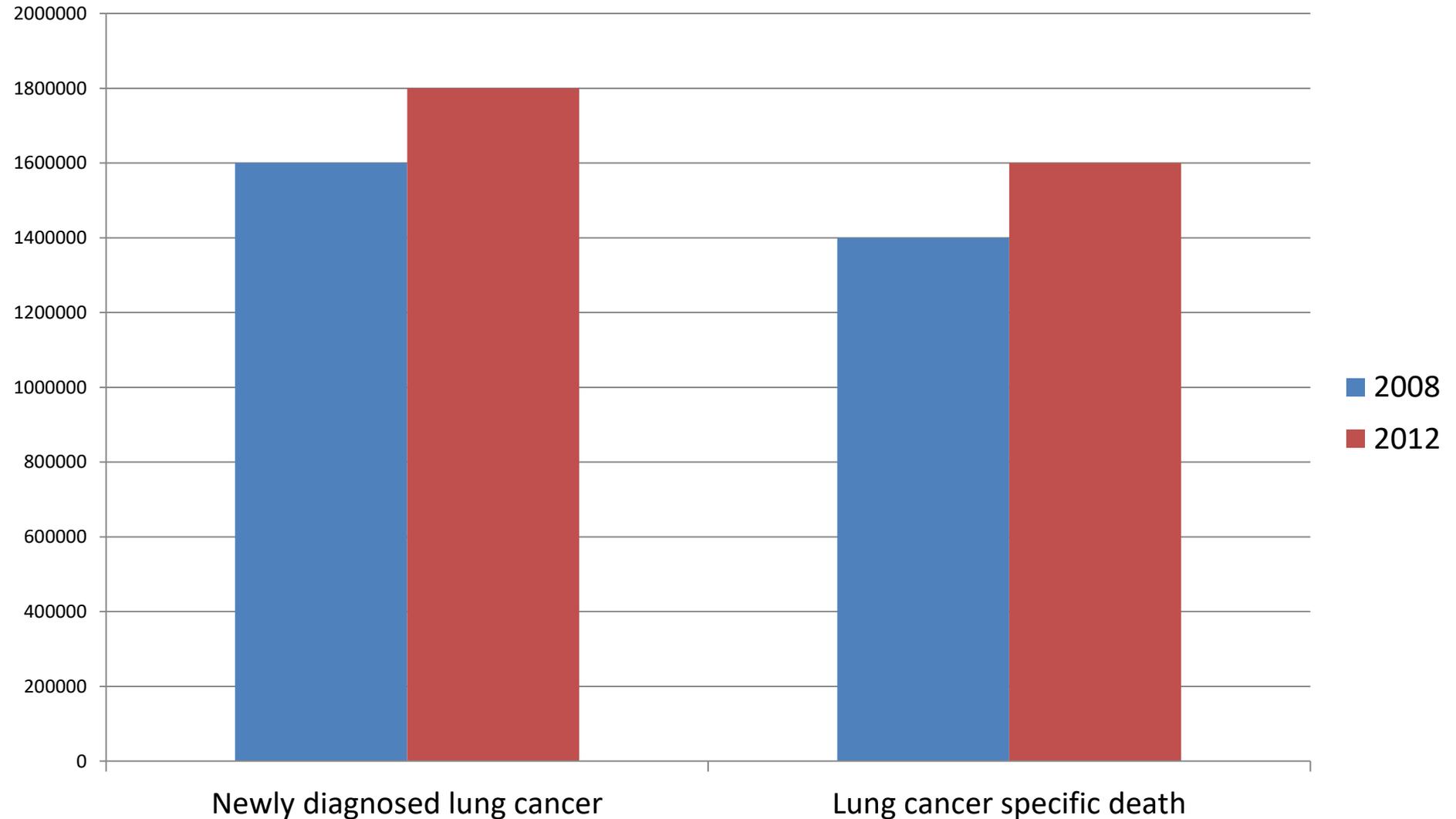


Lymphadenectomy is Unnecessary for Pure Ground Glass Opacity Pulmonary Nodules

Presenter: Yi-Han Lin

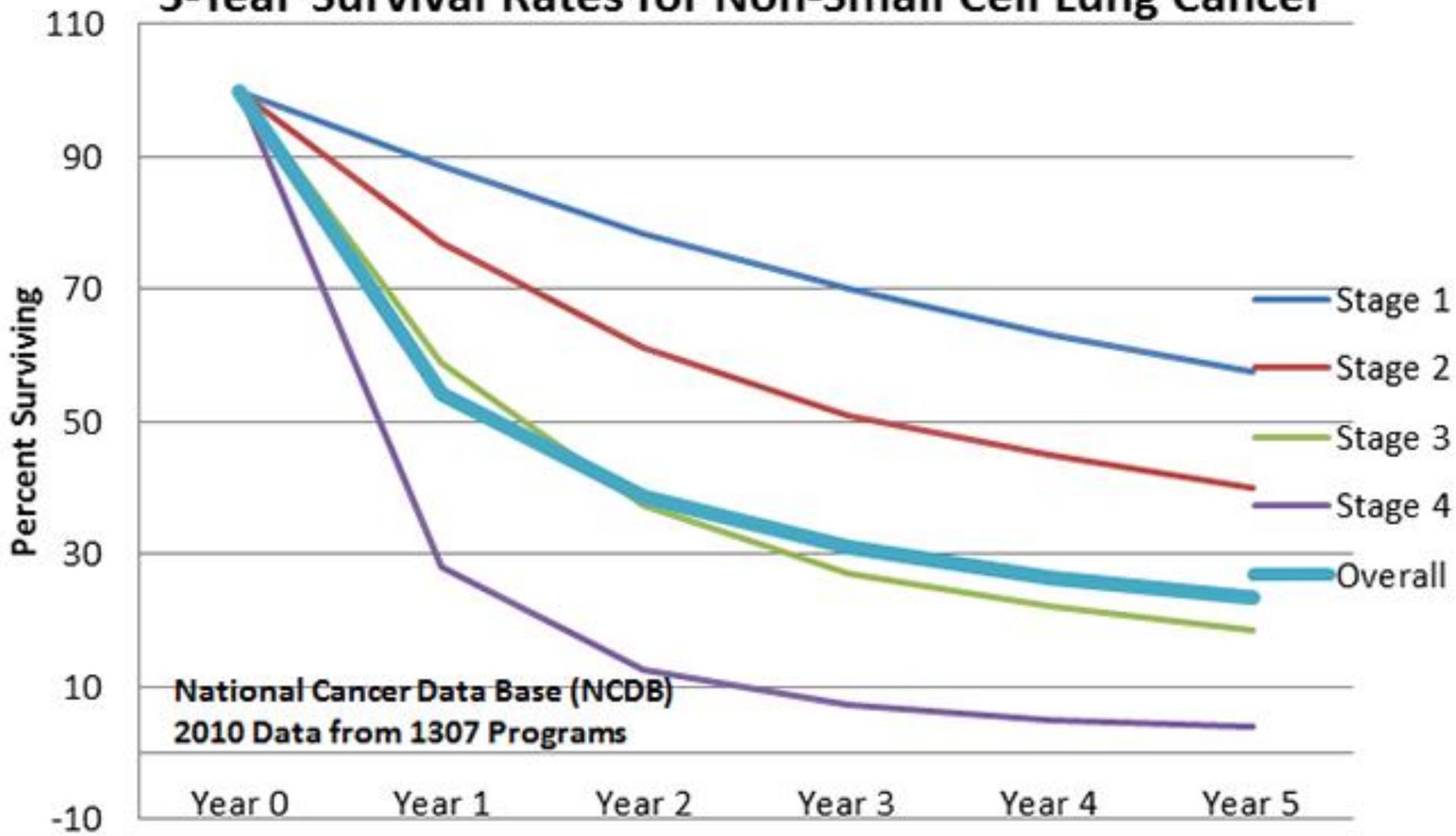
Taipei Veterans General Hospital

Introduction

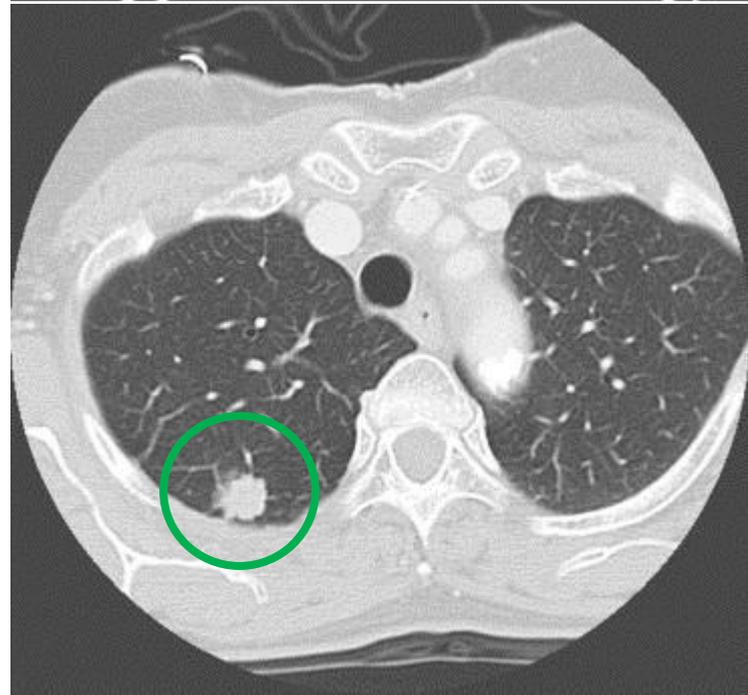
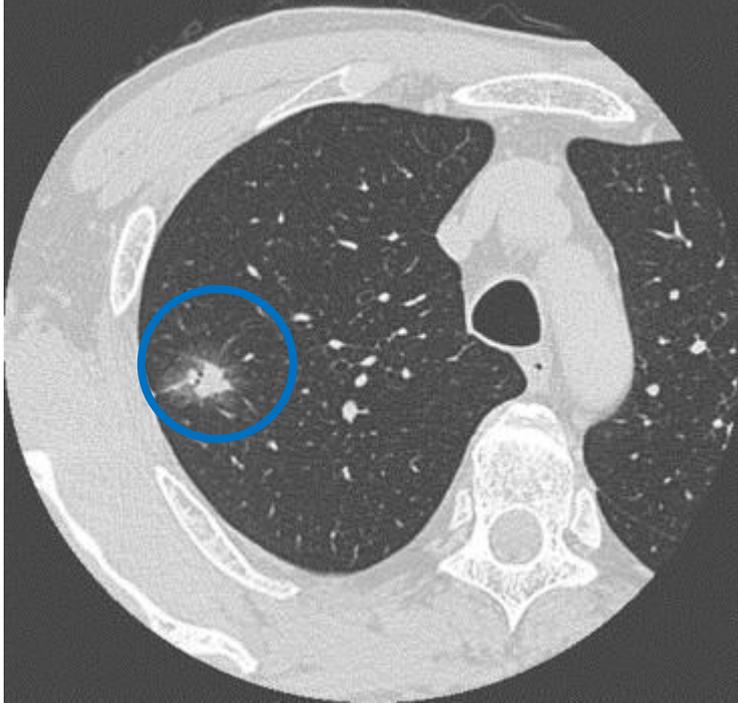
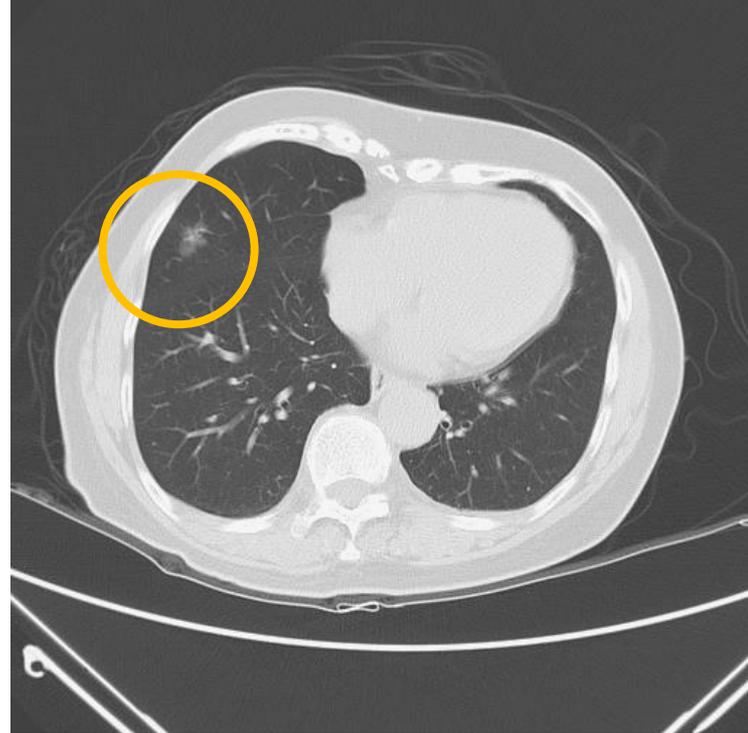
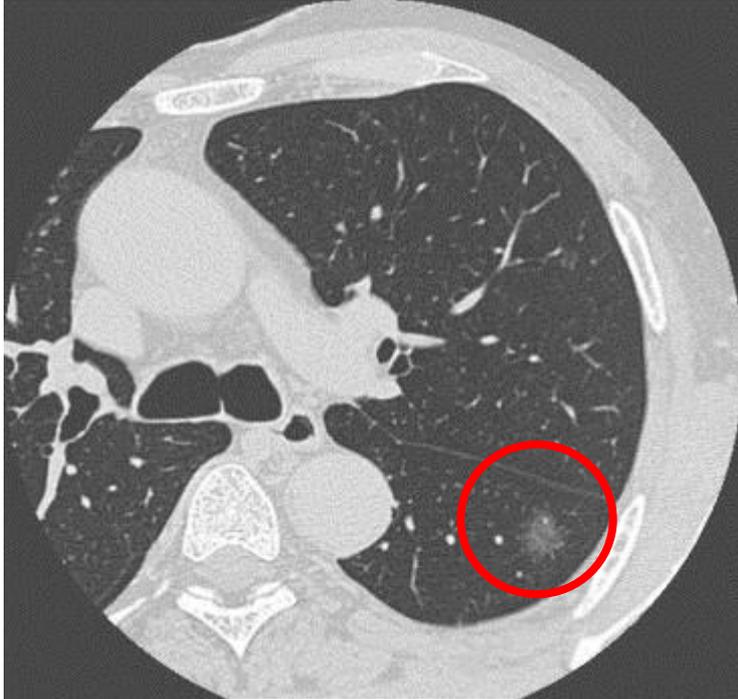




5-Year Survival Rates for Non-Small Cell Lung Cancer







NCCN Guideline

- Lymphadenectomy
 - A minimum of three N2 stations sampled or complete lymph node dissection

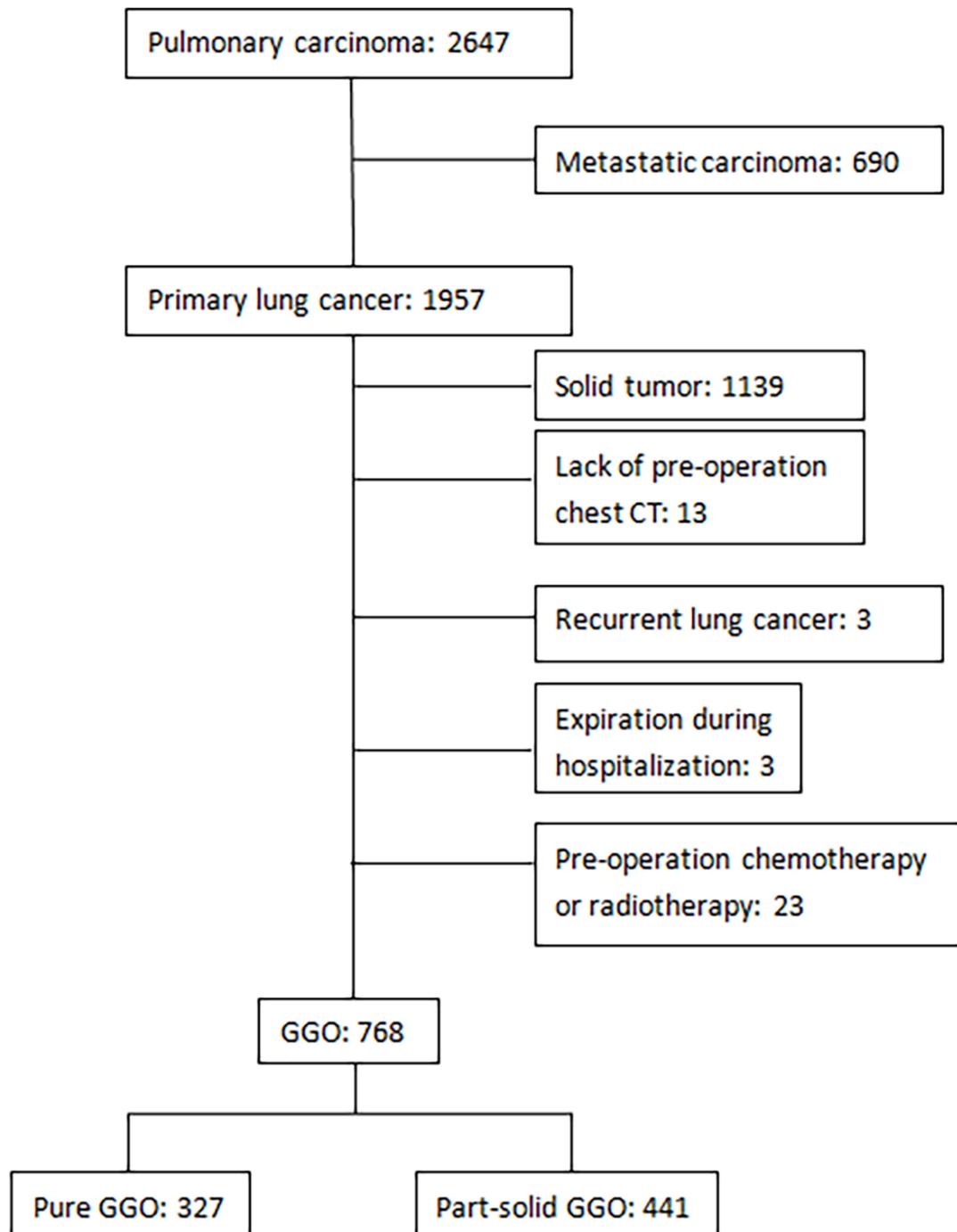
	IASLC/ATS/ERS 2011	CT findings
	AAH (Atypical adenomatous hyperplasia)	Ground glass
 BAC (Bronchiolo- alveolar carcinoma) 	AIS (Adenocarcinoma in situ) ≤ 3 cm diameter	Ground glass, possible small solid component or bubble-like lucencies
	MIA (Minimally invasive adenocarcinoma) ≤ 3 cm diameter ≤ 5 mm invasion	Ground glass or part solid nodule; < 5 mm central solid component
	Invasive adenocarcinoma (non-mucinous or mucinous)	Part solid or solid; occasionally ground glass or bubble-like lucencies


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NCCN Guideline

- Lymphadenectomy
 - A minimum of three N2 stations sampled or complete lymph node dissection





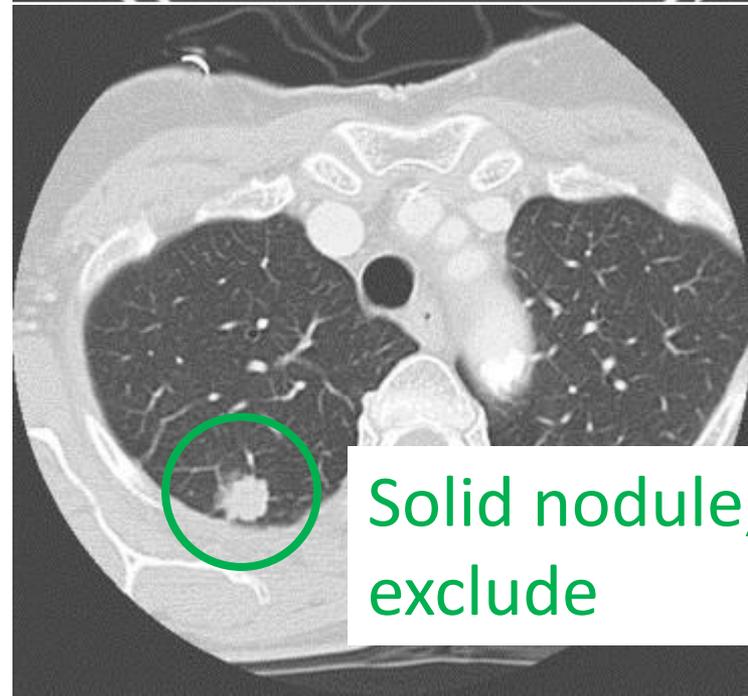
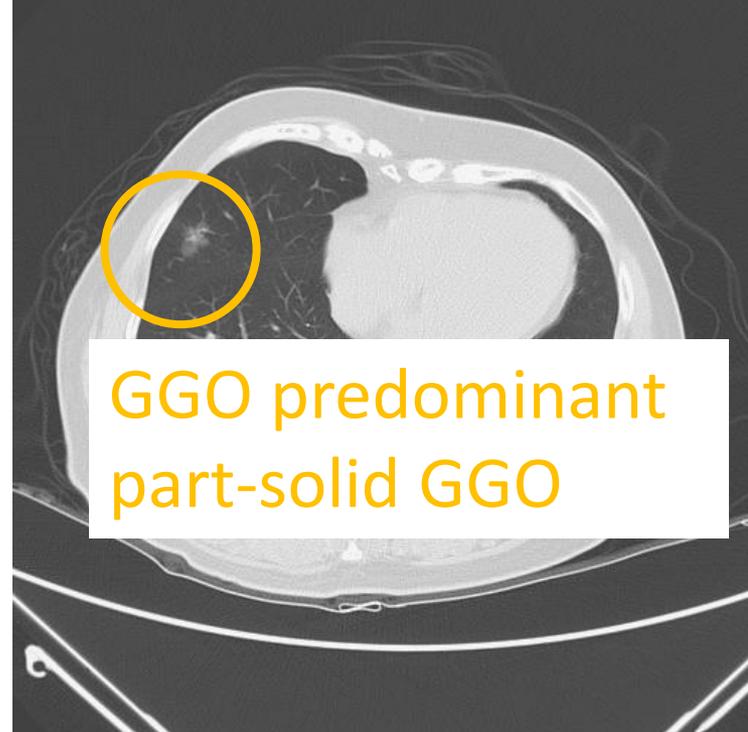
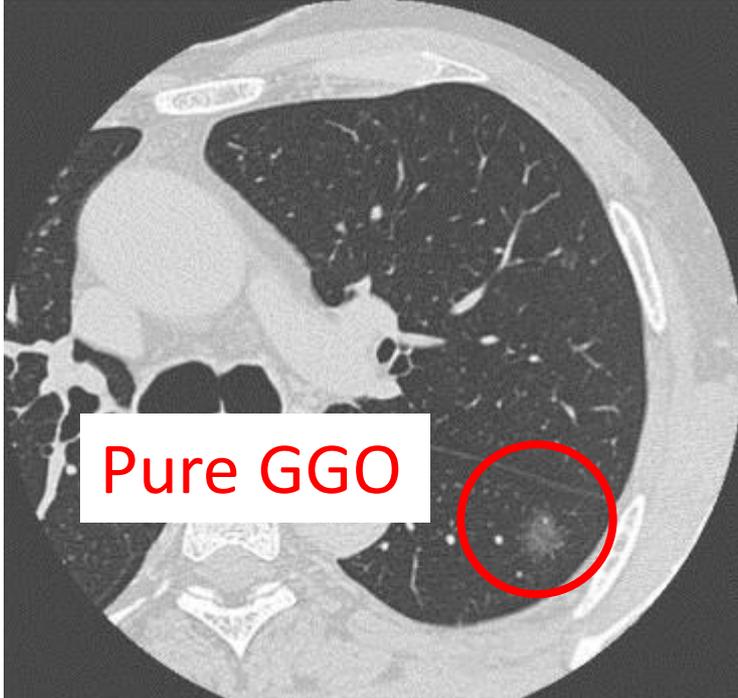


Table 1. Patient demographics for pure GGO and part-solid GGO groups

	Pure GGO(327)	Part-solid GGO(441)	pvalue		Pure GGO(327)	Part-solid GGO(441)	pvalue
Age(Year)	57.24±10.40	63.29±10.03	<0.01	Histology (%)			<0.01
Gender (%)			0.01	AIS	145 (44.34)	20 (4.54)	
Male	112 (34.25)	191 (43.31)		MIA	99 (30.28)	39 (8.84)	
Female	215 (65.75)	250 (56.69)		LPA	46 (14.07)	96 (21.77)	
Cardiopulmonary disease (%)	127 (38.84)	198 (44.90)	0.09	IPA	37 (11.31)	272 (61.68)	
Smoking (%)	53 (16.21)	82 (18.59)	0.39	SQC	0	2 (0.45)	
Family history (%)	69 (21.10)	38 (8.62)	<0.01	Other cancer	0	12 (2.72)	
Cancer history	51 (15.60)	61 (13.83)	0.49	T Stage (%)			<0.01
Tumor size (cm)				0	145 (44.34)	20 (4.54)	
GGO part	1.09±0.49	2.06±0.87	<0.01	1a	142 (43.43)	146 (33.1)	
Solid part	0	1.08±0.75	<0.01	1b	3 (0.92)	52 (11.79)	
Operative method (%)			< 0.01	2a	37 (11.31)	217 (49.21)	
Wedge resection	217 (66.36)	120 (27.21)		2b	0	1 (0.23)	
Segmentectomy	19 (5.81)	30 (6.80)		3	0	0	
Lobectomy	91 (27.83)	289 (65.53)		4	0	5 (1.13)	
Bilobectomy	0 (0)	2 (0.45)		N stage (%)			<0.01
Lymph node stations	3.42±1.60	4.44±1.60	<0.01	0	324 (99.08)	411 (93.20)	
N2 stations	2.31±0.91	2.54±0.88	<0.01	1	0	9 (2.04)	
N1 stations	1.12±1.18	1.93±1.26	<0.01	2	0	15 (3.40)	
Lymph node number	10.78±7.82	14.80±8.15	<0.01	No lymphadenectomy	3 (0.92)	6 (1.36)	
N2 stations	7.60±6.25	8.79±5.88	<0.01	Chylothorax (%)	7 (2.14)	14 (3.17)	0.386
N1 stations	3.12±3.85	6.02±4.77	<0.01	Recurrence (%)	0	28 (6.35)	<0.01
				Disease related Death (%)	0	13 (2.95)	<0.01

GGO: Ground glass opacity; AIS: Adenocarcinoma in situ; MIA: Minimally invasive adenocarcinoma; LPA: Lepidic-predominant adenocarcinoma; IPA: Invasive-predominant adenocarcinoma; SQC: Squamous cell carcinoma

Table 2. Patient demographics for GGO-predominant and solid-predominant part-solid GGO nodules

	GGO-predominant part-solid GGO(207)	Solid-predominant part-solid GGO(234)	p value		GGO-predominant part-solid GGO(207)	Solid-predominant part-solid GGO(234)	p value
Age(Year)	62.01±9.82	64.43±10.10	0.01	Histology (%)			<0.01
Gender (%)			0.61	AIS	20 (9.66)	0	
Male	87 (42.03)	104 (44.44)		MIA	29 (14.01)	10 (4.27)	
Female	120 (57.97)	130 (55.56)		LPA	61 (29.47)	35 (14.96)	
Cardiopulmonary disease (%)	88 (42.51)	110 (47.01)	0.35	IPA	94 (45.41)	178 (76.07)	
Smoking (%)	32 (15.46)	50 (21.37)	0.11	SQC	0	2 (0.85)	
Family history (%)	21 (10.14)	17 (7.26)	0.29	Other cancer	3 (1.45)	9 (3.85)	
Cancer history	28 (13.53)	33 (14.10)	0.86	T Stage (%)			<0.01
Tumor size (cm)				0	20 (9.66)	0	
GGO part	1.89±0.84	2.22±0.86	<0.01	1a	90 (43.48)	56 (23.93)	
Solid part	0.54±0.39	1.55±0.66	<0.01	1b	21 (10.14)	31 (13.25)	
Operative method (%)			<0.01	2a	74 (35.75)	143 (61.11)	
Wedge resection	69 (33.33)	51 (21.79)		2b	1 (0.48)	1 (0.43)	
Segmentectomy	16 (7.73)	14 (5.98)		3	0	0	
Lobectomy	121 (58.45)	168 (71.79)		4	1 (0.48)	4 (1.71)	
Bilobectomy	1 (0.48)	1 (0.43)		N stage (%)			0.78
Lymph node stations	4.29±1.68	4.57±1.52	0.07	0	195 (94.20)	216 (92.31)	
N2 stations	2.51±0.91	2.56±0.85	0.50	1	3 (1.45)	6 (2.56)	
N1 stations	1.83±1.33	2.03±1.20	0.10	2	5 (2.42)	10 (4.27)	
Lymph node number	13.43±7.17	16.01±8.77	<0.01	No	4 (1.93)	2 (1.71)	
N2 stations	8.14±5.24	9.38±6.36	0.03	lymphadenectomy			
N1 stations	5.29±4.53	6.68±4.88	<0.01	Chylothorax (%)	6 (2.90)	8 (3.42)	0.82
				Recurrence (%)	5 (2.42)	23 (9.83)	<0.01
				Disease related Death (%)	2 (0.96)	11 (4.70)	0.02

GGO: Ground glass opacity; AIS: Adenocarcinoma in situ; MIA: Minimally invasive adenocarcinoma; LPA: Lepidic-predominant adenocarcinoma; IPA: Invasive-predominant adenocarcinoma; SQC: Squamous cell carcinoma

Table 3. Patient demographics for patients receiving lobectomy or bilobectomy for small nodules with GGO component.

	Pure GGO(91)	GGO-predominant part-solid GGO(122)	Solid-predominant part-solid GGO(169)	pvalue		Pure GGO(91)	GGO-predominant part-solid GGO(122)	Solid-predominant part-solid GGO(169)	pvalue
Age(Year)	57.88±9.00	62.21±9.89	63.47±9.54	<0.01	Histology (%)				<0.01
Gender (%)				0.28	AIS	21 (23.08)	4 (3.28)	0	
Male	29 (31.87)	52 (42.62)	69 (40.83)		MIA	27 (29.67)	13 (10.66)	3 (1.78)	
Female	62 (68.13)	70 (57.38)	100 (59.17)		LPA	16 (17.58)	44 (36.07)	24 (14.20)	
Cardiopulmonary disease (%)	31 (34.07)	47 (38.52)	69 (40.83)	0.57	IPA	27 (29.67)	61 (50)	134 (79.29)	
Smoking (%)	19 (20.88)	19 (15.57)	33 (19.53)	0.57	SQC	0	0	2 (1.18)	
Family history (%)	19 (20.88)	12 (9.84)	12 (7.10)	<0.01	Other cancer	0	0	6 (3.55)	
Cancer history (%)	13 (14.29)	11 (9.02)	21 (12.43)	0.47	T Stage (%)				<0.01
Tumor size (cm)					0	21 (23.08)	4 (3.28)	0	
GGO part	1.35±0.56	2.11±0.91	2.43±0.87	<0.01	1a	53 (58.24)	48 (39.34)	29 (17.16)	
Solid part	0	0.61±0.43	1.70±0.67	<0.01	1b	2 (2.20)	15 (12.30)	26 (15.38)	
Operative method (%)				0.71	2a	15 (16.48)	53 (43.44)	112(66.27)	
Lobectomy	91(100)	121 (99.18)	168 (99.41)		2b	0	0	0	
Bilobectomy	0	1 (0.82)	1 (0.59)		3	0	1 (0.82)	0	
Lymph node stations				0.08	4	0	1 (0.82)	2 (1.18)	
N2 stations	4.75±1.31	5.12±1.17	4.94±1.20	0.11	N stage (%)				0.02
N1 stations	2.40±0.85	2.61±0.82	2.59±0.84	0.09	0	91 (100)	117 (95.90)	155 (91.72)	
Lymph node number				0.01	1	0	2 (1.64)	6 (3.55)	
N2 number	17.03±8.00	15.71±5.84	18.34±8.34	0.03	2	0	3 (2.46)	8 (4.73)	
N1 number	10.04±7.15	8.34±4.55	10.21±6.82	0.05	Chylothorax (%)	1 (1.10)	3 (2.46)	8 (4.73)	0.24
	6.93±3.64	7.36±3.77	8.15±4.37		Recurrence (%)	0	1 (0.82)	19 (11.24)	<0.01
					Disease related				
					Death (%)	0	1 (0.82)	11 (6.51)	0.01
					Cancer specific				
					Survival (Month)	56.40±21.76	45.52±20.92	48.20±21.75	<0.01

GGO: Ground glass opacity; AIS: Adenocarcinoma in situ; MIA: Minimally invasive adenocarcinoma; LPA: Lepidic-predominant adenocarcinoma; IPA: Invasive-predominant adenocarcinoma; SQC: Squamous cell carcinoma

Table 4. Multivariate analysis for the lobectomy patients with lymph node metastasis

Variables	HR	95% CI	pvalue
Gender			
Female	1		
Male	2.75	1.07~7.09	0.04
Age			
≤60 years	1		
>60 years	0.73	0.30~1.83	0.51
Cardiopulmonary disease			
No	1		
Yes	1.22	0.48~3.12	0.68
Smoking			
No	1		
Yes	0.486	0.13~1.81	0.28
Family History			
No	1		
Yes	1.01	0.22~4.57	0.99
Cancer History			
No	1		
Yes	0.45	0.06~3.47	0.45
GGO property			
Solid-predominant part-solid GGO	1		
GGO-predominant part-solid GGO	0.60	0.23~1.60	0.31
Pure GGO	0	0~5.26x10 ¹⁴⁵	<0.01
Lymph node stations			
≤4	1		
>4	0.443	0.18~1.11	0.08
Lymph node numbers			
≤15	1		
>15	3.885	1.27~11.86	0.02

GGO: Ground Glass Opacity. All the variables in the table were included Age, Gender, Cardiopulmonary disease, Smoking, Family history, Cancer History, GGO property, Lymph node stations and Lymph node numbers.

Discussion

- Clinical early stage lung cancer
 - Lymph node metastasis rate: 9.1%~25.8%
 - Radical lymph node dissection
 - Better outcome
- Matsuguma *et.al* and Flores RM *et. al*
 - No lymph node metastasis in GGO-predominant early stage adenocarcinoma

Discussion

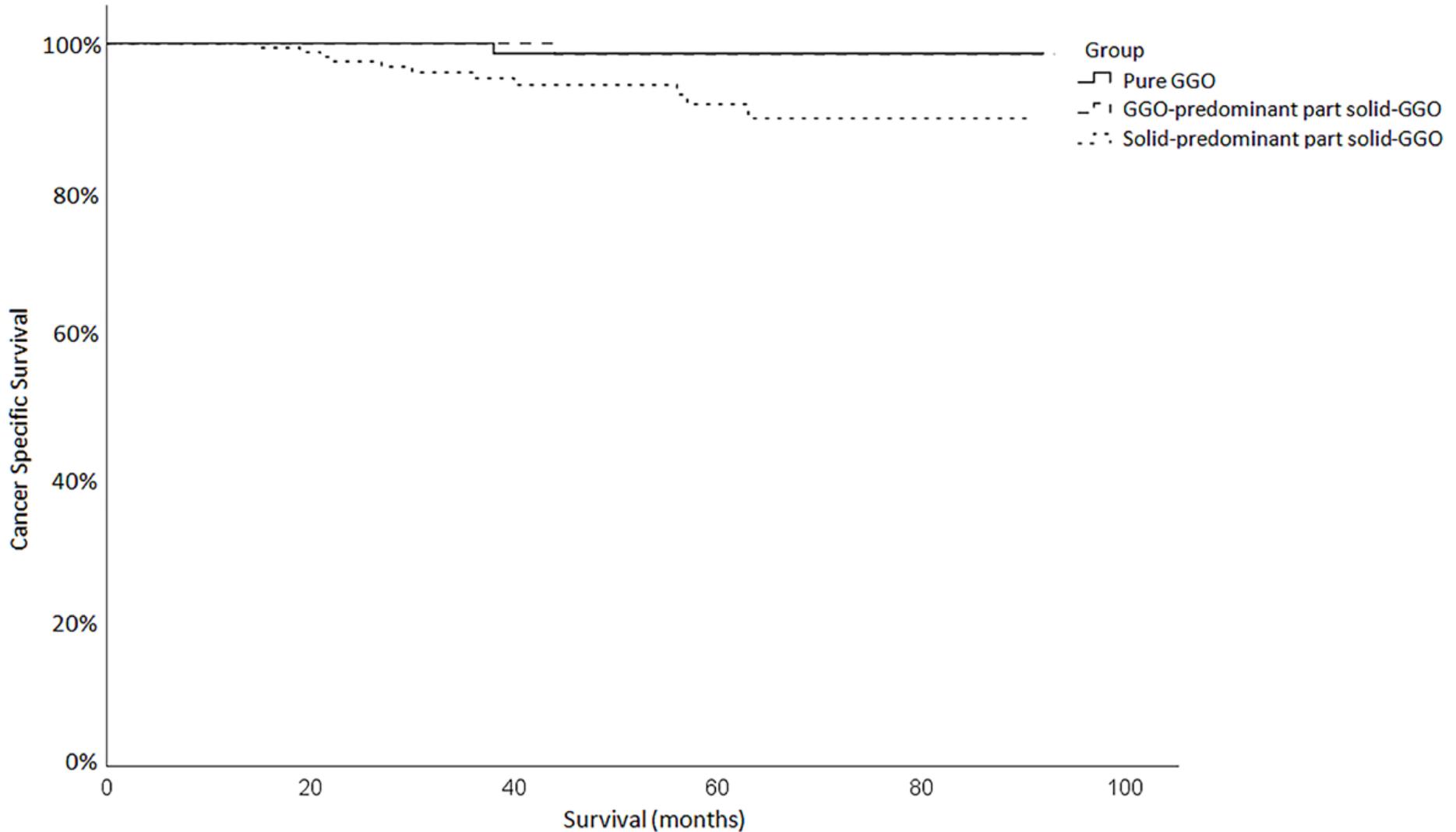
GGO with Surgical Resection

	Pure GGO	GGO-predominant part-solid GGO	Solid-predominant part-solid GGO
Lymph node metastasis rate (%)	0	3.87	6.83
AIS+MIA ratio (%)	74.62	23.67	5.12
Recurrence rate (%)	0	2.42	9.83

GGO with Lobectomy or Bilobectomy

	Pure GGO	GGO-predominant part-solid GGO	Solid-predominant part-solid GGO
Lymph node metastasis rate (%)	0	4.92	8.28
AIS+MIA ratio (%)	52.75	13.94	1.78
Recurrence rate (%)	0	0.82	11.24

Discussion



Discussion

- Risk factors for lymph node metastasis in multivariate regression
 - Male gender
 - More female in pure GGO group
 - Solid part ratio
 - Hazard ratio
 - 0:0.6:1 in pure GGO, GGO-predominant part-solid GGO and solid-predominant part-solid GGO group
 - Harvested lymph node > 15

Discussion

- Matsuguma *et.al* and Flores RM *et. al*
 - No lymph node metastasis in GGO-predominant early stage adenocarcinoma
 - Our study
 - 4.92% lymph node metastasis rate in GGO-predominant part-solid GGO group
 - Small patient number and categorized pure GGO and GGO-predominant part-solid GGO as the same group

Limitation

- Retrospective study
 - Patients being excluded due to profile missing
- Extent of lymphadenectomy
 - Depend on the surgeon's judgement

Conclusion

- Pure GGO patients
 - Do not need lymphadenectomy
- GGO-predominant part-solid GGO patients
 - Lymph node sampling
- Solid-predominant part-solid GGO patients
 - Radical lymph node dissection should be considered.