

P1.07: Impact of High-Grade Histologic Pattern Proportion on Surgical Complexity and Procedural Outcomes in Pathologic Stage IA Lung Adenocarcinoma

Jeffrey Zhu¹, Wenchao Ma¹, Lauren Lentini¹, Min Liang¹, Rowena Yip¹, David F. Yankelevitz¹, Claudia I. Henschke¹

¹Icahn School of Medicine at Mount Sinai, New York, NY, USA

Correspondence: jeffrey.zhu@mountsinai.org



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INTRODUCTION

Survival outcomes from resected stage IA lung adenocarcinoma can vary greatly due to differing histologic patterns. Numerous studies have shown that adenocarcinoma with predominant high-grade patterns demonstrate higher rates of recurrence, more frequent nodal metastases, higher rates of lymphovascular invasion, and poorer survival, compared to predominantly low or moderate-grade patterns.^{1,2} An unexplored area is whether the proportion of high-grade patterns in an adenocarcinoma result in longer procedure times or changes in surgical approach. The goal of this research is to explore whether high-grade patterns influence surgical complexity and procedural outcomes.

METHODS

We analyzed data from the Initiative for Early Lung Cancer Research on Treatment (IELCART) study at Mount Sinai Hospital. Eligible patients underwent curative-intent lung cancer surgery for pathological stage IA ($\leq 30\text{mm}$; pT1a-cN0M0, 9th ed TNM) lung adenocarcinoma, after study launch in March 2016. Surgical pathology reports were analyzed to determine the histologic patterns present for each patient, which mention the predominant histologic pattern, and list secondary patterns. The mention of a histologic pattern in the report confirms $\geq 5\%$ of the specimen. $\geq 20\%$ high-grade patterns would classify an adenocarcinoma as “poorly differentiated.”³ With this information, a scale of high-grade patterns was created: $<5\%$ (none to minimal), ≥ 5 but $<20\%$ (minor component), $\geq 20\%$ but $<50\%$ (significant but not predominant), and $\geq 50\%$ (predominant).

The primary outcomes measures of interest from the surgery include procedure time, conversion from VATS to thoracotomy, completion lobectomies, and blood loss. Demographic information, patient comorbidities, radiologic tumor features, as well as other post-operative outcomes were prospectively collected.

Continuous variables were summarized using medians and interquartile ranges (IQRs), and categorical variables were summarized using frequencies and percentages. Patient, tumor, surgical, and pathologic characteristics were compared across high-grade histologic pattern groups. The Kruskal–Wallis test was used for comparisons of continuous variables, and the chi-square test or Fisher's exact test, as appropriate, was used for categorical variables.

DISCUSSION AND CONCLUSION

No statistically significant correlation between proportion of high-grade patterns and surgical complexity

- Patients with lung adenocarcinoma with $<5\%$ high-grade components did show shorter procedure times, less blood loss, and fewer conversions from VATS to open, compared to those with $\geq 50\%$ high-grade components.

Our findings regarding high-grade components are consistent with those in existing literature

- The greater presence high-grade components was shown to be correlated with solid nodule consistency, and nodules less likely to be part-solid or non-solid.
- Rates of angiolymphatic and vascular invasion increased with a higher proportion of high-grade components.
- Nodule size on CT and size of resected tumor were smallest in the group with least high-grade components.
- Female patients and patients who have never smoked were less likely to have a higher proportion of high-grade patterns.

Future direction for research

- Unify our knowledge regarding adenocarcinoma histology with molecular alterations to optimize personalized lung cancer treatment plans to improve survival outcomes.
- Find ways to utilize CT screening to aid in the detection of high-grade features through radiologic features.

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SIMONS
FOUNDATION

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RESULTS

Characteristic	Overall N = 479 ¹	<5% N = 248 ¹	$\geq 5\%$ but <20% N = 94 ¹	$\geq 20\%$ but <50% N = 43 ¹	$\geq 50\%$ N = 94 ¹	p-value ²
Age, median (IQR)	71 (64 - 76)	70 (65 - 76)	72 (65 - 78)	71 (63 - 76)	71 (63 - 77)	0.6
Sex						0.031
Female	291 (61%)	156 (63%)	65 (69%)	21 (49%)	49 (52%)	
Male	187 (39%)	91 (37%)	29 (31%)	22 (51%)	45 (48%)	
BMI	25.5 (22.3 - 28.9)	25.2 (22.3 - 28.5)	25.6 (22.1 - 29.6)	26.3 (23.4 - 29.9)	25.6 (22.8 - 29.3)	0.5
Race						0.3
Black or African American	62 (13%)	29 (12%)	10 (11%)	10 (23%)	13 (14%)	
Asian	63 (13%)	30 (12%)	15 (16%)	5 (12%)	13 (14%)	
Others	47 (9.9%)	25 (10%)	6 (6.4%)	2 (4.7%)	14 (15%)	
White	304 (64%)	161 (66%)	63 (67%)	26 (60%)	54 (57%)	
Ethnicity						0.5
Hispanic or Latino	67 (14%)	33 (13%)	13 (14%)	4 (9.3%)	17 (18%)	
Not Hispanic or Latino	411 (86%)	214 (87%)	81 (86%)	39 (91%)	77 (82%)	
Smoking Status						0.014
Current	54 (11%)	23 (9.3%)	6 (6.4%)	8 (19%)	17 (18%)	
Former	303 (63%)	150 (61%)	68 (72%)	24 (56%)	61 (65%)	
Never	121 (25%)	74 (30%)	20 (21%)	11 (26%)	16 (17%)	
Pack-years among smokers, median (IQR)	28 (12 - 44)	28 (11 - 43)	23 (11 - 47)	29 (16 - 39)	30 (15 - 45)	0.5
Cardiac	56 (12%)	28 (11%)	6 (6.4%)	7 (16%)	15 (16%)	0.2
Hypertension	232 (48%)	109 (44%)	48 (51%)	19 (44%)	56 (60%)	0.065
COPD	83 (17%)	34 (14%)	21 (22%)	7 (16%)	21 (22%)	0.13
Diabetes	86 (18%)	45 (18%)	14 (15%)	9 (21%)	18 (19%)	0.8
Family history of lung cancer	92 (19%)	43 (17%)	21 (22%)	7 (16%)	21 (22%)	0.6

¹Median (Q1 - Q3); n (%)

²Kruskal-Wallis rank sum test; Pearson's Chi-squared test

Table 1. Baseline characteristics and self-reported comorbidities

Characteristic	Overall N = 479 ¹	<5 N = 248 ¹	≥ 5 but <20% N = 94 ¹	$\geq 20\%$ but <50% N = 43 ¹	$\geq 50\%$ N = 94 ¹	p-value ²
Procedure Duration (min), median (IQR)	118 (87 - 178)	115 (89 - 171)	117 (80 - 165)	118 (84 - 189)	129 (87 - 203)	0.6
Blood Loss (ml)	25 (20 - 50)	25 (25 - 50)	30 (23 - 50)	28 (20 - 100)	30 (20 - 50)	0.8
Completion Lobectomy	22 (4.6%)	14 (5.6%)	3 (3.2%)	1 (2.3%)	4 (4.3%)	0.8
Conversion of VATS to open	60 (13%)	26 (10%)	15 (16%)	7 (16%)	12 (13%)	0.5
Length of Stay (Days)	3.00 (2.00, 4.00)	3.00 (2.00, 4.00)	3.00 (3.00, 4.00)	3.00 (3.00, 4.00)	3.00 (2.00, 4.00)	0.2
ICU Care Required	6 (5.2%)	4 (6.7%)	1 (3.6%)	0 (0%)	1 (5.0%)	>0.9
Postoperative Complications	118 (25%)	60 (25%)	29 (32%)	8 (19%)	21 (23%)	0.4
30-day readmission after surgery	26 (5.5%)	13 (5.3%)	5 (5.3%)	3 (7.1%)	5 (5.4%)	>0.9

¹Median (Q1 - Q3); n (%); Median (Q1, Q3)

²Kruskal-Wallis rank sum test; Fisher's exact test; Pearson's Chi-squared test

Table 3. Postoperative outcomes and complications

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Characteristic	Overall N = 479 ¹	<5 % N = 248 ¹	$\geq 5\%$ but <20% N = 94 ¹	$\geq 20\%$ but <50% N = 43 ¹	$\geq 50\%$ N = 94 ¹	p-value ²
Nodule Consistency						<0.001
Solid	293 (61%)	103 (42%)	66 (70%)	36 (84%)	88 (94%)	
Part-solid	143 (30%)	108 (44%)	24 (26%)	6 (14%)	5 (5.3%)	
Non-solid	41 (8.6%)	35 (14%)	4 (4.3%)	1 (2.3%)	1 (1.1%)	
Nodule size (mm), median (IQR)	14 (9 - 19)	12 (8 - 18)	16 (11 - 21)	16 (13 - 20)	14 (11 - 21)	<0.001
Nodule Location						0.7
Lower lobes	142 (30%)	75 (30%)	25 (27%)	11 (26%)	31 (33%)	
Upper/Middle lobes	337 (70%)	173 (70%)	69 (73%)	32 (74%)	63 (67%)	
Surgery Approach						0.3
Robotic-Assisted	69 (14%)	37 (15%)	8 (8.6%)	4 (9.3%)	20 (21%)	
Thoracotomy	56 (12%)	26 (10%)	13 (14%)	6 (14%)	11 (12%)	
VATS	353 (74%)	185 (75%)	72 (77%)	33 (77%)	63 (67%)	
Surgical Extent						0.7
Bilobectomy	1 (0.2%)	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	
Lobectomy	134 (28%)	60 (24%)	28 (30%)	14 (33%)	32 (34%)	
Other	1 (0.2%)	0 (0%)	1 (1.1%)	0 (0%)	0 (0%)	
Segmentectomy	37 (7.7%)	20 (8.1%)	7 (7.4%)	3 (7.0%)	7 (7.4%)	
Wedge Resection	306 (64%)	167 (67%)	58 (62%)	26 (60%)	55 (59%)	
Size of resected tumors (mm)	16 (12 - 20)	15 (12 - 20)	17 (12 - 22)	17 (13 - 21)	16 (11 - 20)	0.045
Angiolymphatic Invasion	143 (30%)	30 (12%)	35 (37%)	23 (53%)	55 (59%)	<0.001
Vascular Invasion	20 (4.2%)	4 (1.6%)	4 (4.3%)	5 (12%)	7 (7.4%)	0.006
Margin (mm)	15 (10 - 25)	15 (9 - 25)	15 (9 - 25)	19 (10 - 25)	17 (10 - 22)	0.8

¹n (%); Median (Q1 - Q3)

²Pearson's Chi-squared test; Kruskal-Wallis rank sum test

Table 2. Comparison of primary tumor characteristics

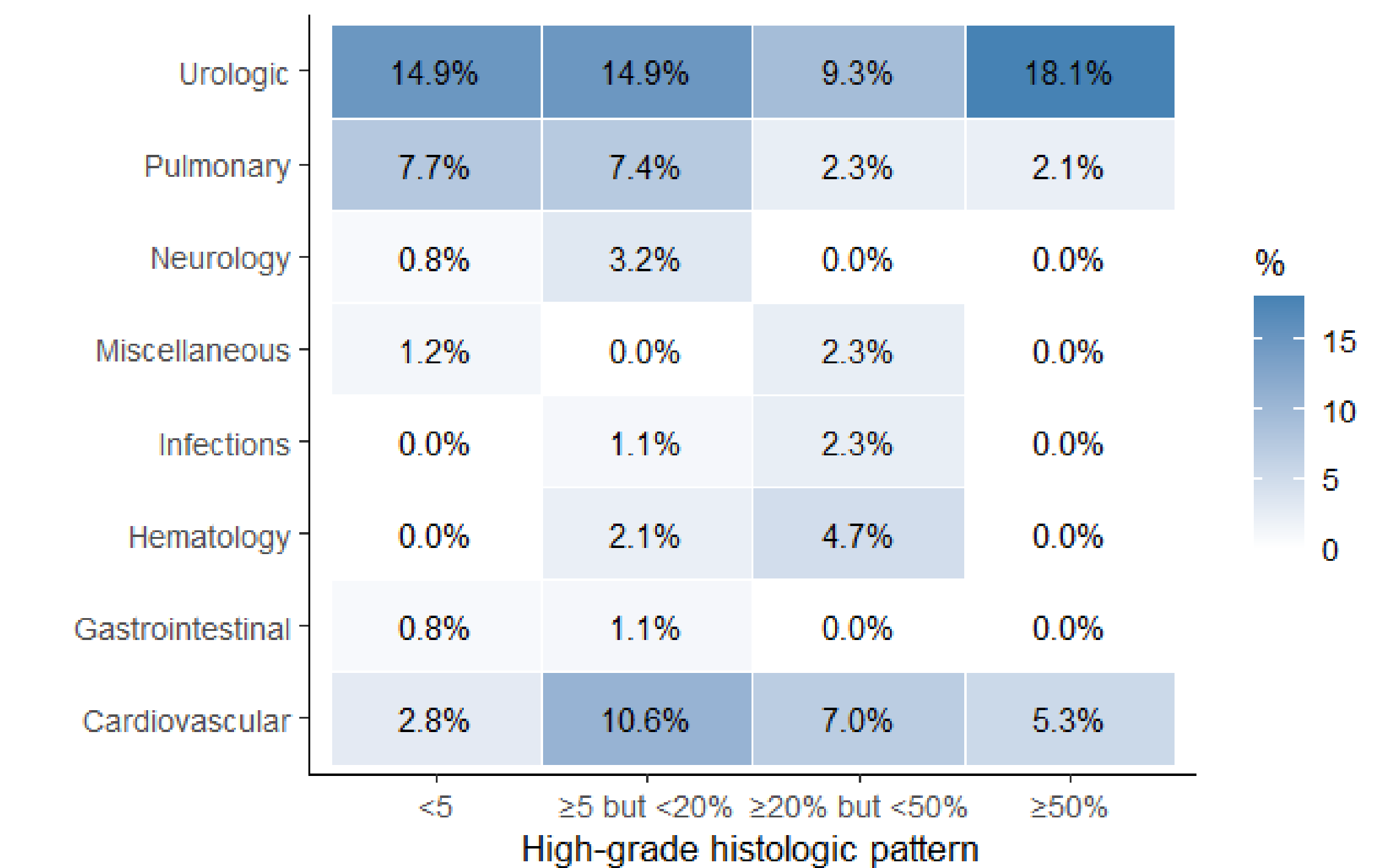


Figure 1. Proportion of high-grade patterns with categories of postoperative complications. Cardiovascular and hematologic complications were found to be significant.