Table S1 Univariate analysis of lobectomy patients with untreated COPD and ACO

Characteristic	Untreated (n=19)	Intervention (n=49)	P value
Age (year), median [IQR]	72 [64–80]	70 [67–77]	0.96
Sex, male, n (%)	17 (89.5)	40 (81.6)	0.72
BMI, median [IQR]	22.6 [20.6–24.0]	22.7 [20.5–24.3]	0.80
Hypertension, n (%)	12 (63.2)	18 (36.7)	0.061
Hyperlipidemia, n (%)	2 (10.5)	12 (24.5)	0.32
Hyperuricemia, n (%)	1 (5.3)	8 (16.3)	0.43
Diabetes, n (%)	4 (21.1)	12 (24.5)	0.73
Steroid exposure, n (%)	1 (5.3)	3 (6.2)	0.74
Smoking history, n (%)	15 (79.0)	39 (80.0)	0.66
Brinkman index, median [IQR]	870 [750–1,200]	970 [750–1,170]	0.77
Comorbidities, n (%)			
Osteoporosis	1 (5.3)	1 (2.0)	0.48
Gastroesophageal reflux	5 (26.3)	3 (6.1)	0.034
Cardiovascular diseases	3 (15.8)	14 (28.9)	0.36
Anxiety and depression	3 (15.8)	7 (14.3)	0.57
Interstitial pneumonia	3 (15.8)	5 (10.2)	0.68
GOLD classification, n (%)			
2	15 (79.0)	44 (89.8)	0.25
3	4 (21.0)	5 (10.2)	
Spirometry			
FVC (L), median [IQR]	3.51 [3.04–3.71]	3.18 [2.65–3.76]	0.29
%FVC (%), median [IQR]	102.7 [87.5–115.0]	98.5 [87.5–111.0]	0.40
FEV_1/FVC (%), median [IQR]	61.5 [54.0–66.8]	63.9 [58.5–66.5]	0.37
FEV_1 (L), median [IQR]	2.18 [1.66–2.40]	1.95 [1.52–2.38]	0.50
Diseased side, right, n (%)	13 (68.4)	31 (63.3)	0.78
Tumor size (mm), median [IQR]	31 [19–36]	22 [18–40]	0.28
Clinical N1/2, n (%)	7 (36.8)	10 (20.4)	0.21
Location, upper segments, n (%)	14 (73.7)	27 (55.1)	0.18
VATS, n (%)	14 (73.7)	45 (91.8)	0.10
Number of resected segments (n), median [IQR]	3 [3–5]	4 [3–5]	0.12
Intraoperative bleeding (mL), median [IQR]	145 [65–350]	75 [18–156]	0.016
Operative time (min), median [IQR]	206 [173–270]	196 [165–253]	0.61
Chest tube duration (day), median [IQR]	3 [2–6]	1 [1–3]	0.0004

Table S1 (*continued*)

Table S1 (*continued*)

Characteristic	Untreated (n=19)	Intervention (n=49)	P value
Complications, n (%)			
Total	9 (47.4)	15 (30.6)	0.26
Prolonged air leak	4 (21.1)	5 (10.2)	0.25
Pneumonia	1 (5.3)	3 (6.1)	0.69
Atelectasis	1 (5.3)	1 (2.0)	0.48
Arrhythmia	4 (21.1)	5 (10.2)	0.25
Delirium	1 (5.3)	1 (2.0)	0.48
Postoperative bleeding	0 (0)	1 (2.0)	0.72
Others	0 (0)	0 (0)	
Postoperative hospitalization (day), median [IQR]	10 [8–13]	8 [6–11]	0.049

COPD, chronic obstructive pulmonary disease; ACO, Asthma-COPD overlap; IQR, interquartile range; BMI, body mass index; GOLD, Global Initiative for Chronic Obstructive Lung Disease; FVC, forced vital capacity; FEV_1, forced expiratory volume in 1 second; N, lymph nodes; VATS, video-assisted thoracoscopic surgery.

Table S2 Perioperative respiratory function of lobectomy patients with untreated COPD and ACO

Parameter	FEV_1 (L), median [IQR]		P value
	Untreated (n=31)	Intervention (n=61)	
Before surgery			
FEV_1	2.18 [1.66–2.40]	1.95 [1.52–2.38]	0.50
Postint FEV_1		2.02 [1.71–2.46]	
Postint – Preint FEV_1		0.12 [0.06–0.26]	
Predicted postop FEV_1	1.73 [1.33–2.04]	1.51 [1.15–1.90]	0.25
Predicted postop after postint FEV_1		1.60 [1.37–2.02]	
After surgery			
Postop FEV_1	1.64 [1.40–1.88]	1.89 [1.54–2.25]	0.099
Postop – Preop FEV_1	−0.21 [−0.47−−0.03]	−0.07 [−0.33–0.17]	0.021
Postop – Predicted FEV_1	0.09 [−0.11–0.23]	0.38 [0.12–0.55]	0.0008
Postop – Predicted after postint FEV_1		0.28 [0.04–0.46]	

COPD, chronic obstructive pulmonary disease; ACO, Asthma-COPD overlap; FEV_1, forced expiratory volume in 1 second; IQR, interquartile range; int, intervention; op, operative.

Table S3 Univariate analysis of segmentectomy patients with untreated COPD and ACO

Characteristic	Untreated (n=12)	Intervention (n=12)	P value
Age (year), median [IQR]	73 [64–78]	73 [69–79]	0.39
Sex, male, n (%)	10 (83.3)	11 (91.7)	0.89
BMI, median [IQR]	24.2 [20.8–26.2]	22.5 [21.1–24.9]	0.44
Hypertension, n (%)	9 (75.0)	6 (50.0)	0.40
Hyperlipidemia, n (%)	1 (8.3)	2 (16.7)	0.89
Hyperuricemia, n (%)	0 (0)	0 (0)	
Diabetes, n (%)	2 (16.7)	0 (0)	0.48
Steroid exposure, n (%)	0 (0)	1 (8.3)	0.50
Smoking history, n (%)	11 (91.7)	9 (75.0)	0.59
Brinkman index, median [IQR]	880 [550–1,350]	860 [56–1,038]	0.25
Comorbidities, n (%)			
Osteoporosis	1 (8.3)	2 (16.7)	0.89
Gastroesophageal reflux	0 (0)	1 (8.3)	0.50
Cardiovascular diseases	3 (25.0)	1 (8.3)	0.59
Anxiety and depression	7 (58.3)	7 (58.3)	0.66
Interstitial pneumonia, n (%)	1 (8.3)	3 (25.0)	0.59
GOLD classification, n (%)			
2	9 (75.0)	12 (100.0)	0.21
3	3 (25.0)	0 (0)	
Spirometry			
FVC (L), median [IQR]	3.84 [3.25–4.76]	3.12 [2.70–3.97]	0.061
%FVC (%), median [IQR]	108.2 [98.8–118.5]	99.4 [82.1–122.1]	0.30
FEV_1/FVC (%), median [IQR]	64.2 [50.6–68.4]	66.9 [58.2–68.7]	0.45
FEV_1 (L), median [IQR]	2.31 [1.46–2.79]	1.99 [1.44–2.43]	0.39
Diseased side, right, n (%)	5 (41.7)	3 (25.0)	0.67
Tumor size (mm), median [IQR]	24 [16–36]	15 [19–22]	0.10
Clinical N1/2, n (%)	0 (0)	1 (8.3)	0.50
Location, upper segments, n (%)	8 (66.7)	11 (91.7)	0.32
VATS, n (%)	6 (50.0)	1 (91.7)	0.069
Number of resected segments (n), median [IQR]	3 [3–4]	3 [1–3]	0.062
Intraoperative bleeding (mL), median [IQR]	120 [50–219]	53 [1–118]	0.087
Operative time (min), median [IQR]	183 [146–233]	208 [180–251]	0.31
Chest tube duration (day), median [IQR]	3 [2–6]	1 [1–4]	0.12

Table S3 (*continued*)

Table S3 (*continued*)

Characteristic	Untreated (n=12)	Intervention (n=12)	P value
Complications, n (%)			
Total	4 (33.3)	5 (41.7)	0.80
Prolonged air leak	2 (16.7)	1 (8.3)	0.89
Pneumonia	0 (0)	0 (0)	
Atelectasis	0 (0)	0 (0)	
Arrhythmia	1 (8.3)	2 (16.7)	0.89
Delirium	1 (8.3)	1 (8.3)	0.76
Postoperative bleeding	1 (8.3)	0 (0)	0.50
Others	0 (0)	1 (8.3)	0.50
Postoperative hospitalization (day), median [IQR]	10 [7–13]	8 [7–10]	0.39

COPD, chronic obstructive pulmonary disease; ACO, Asthma-COPD overlap; IQR, interquartile range; BMI, body mass index; GOLD, Global Initiative for Chronic Obstructive Lung Disease; FVC, forced vital capacity; FEV_1, forced expiratory volume in 1 second; N, lymph nodes; VATS, video-assisted thoracoscopic surgery.

Table S4 Perioperative respiratory function of segmentectomy patients with untreated COPD and ACO

Parameter	FEV_1 (L), median [IQR]		P value
	Untreated (n=12)	Intervention (n=12)	
Before surgery			
FEV_1	2.31 [1.46–2.79]	1.99 [1.44–2.43]	0.39
Postint FEV_1		2.26 [1.59–2.56]	
Postint – Preint FEV_1		0.13 [0.05–0.24]	
Predicted postop FEV_1	1.91 [1.17–2.56]	1.68 [1.30–2.16]	0.62
Predicted postop after postint FEV_1		1.89 [1.44–2.32]	
After surgery			
Postop FEV_1	1.78 [1.26–2.52]	2.02 [1.70–2.27]	0.72
Postop – Preop FEV_1	–0.29 [–0.36––0.16]	0.00 [–0.22–0.32]	0.033
Postop – Predicted FEV_1	0.03 [–0.20–0.25]	0.25 [0.09–0.45]	0.036
Postop – Predicted after postint FEV_1		0.13 [0.11–0.38]	

COPD, chronic obstructive pulmonary disease; ACO, Asthma-COPD overlap; FEV_1, forced expiratory volume in 1 second; IQR, interquartile range; int, intervention; op, operative.

Table S5 Univariate analysis of anatomical lung resection patients with untreated COPD and ACO: TIO *vs.* UMEC/VI

Characteristic	TIO (n=16)	UMEC/VI (n=45)	P value
Age (year), median [IQR]	71 [67–78]	70 [67–77]	0.75
Sex, male, n (%)	15 (93.8)	36 (80.0)	0.27
BMI, median [IQR]	22.2 [20.3–23.9]	22.8 [20.7–24.6]	0.34
Hypertension, n (%)	6 (37.5)	18 (40.0)	0.68
Hyperlipidemia, n (%)	3 (18.8)	11 (24.4)	0.74
Hyperuricemia, n (%)	1 (6.3)	7 (15.6)	0.67
Diabetes, n (%)	3 (18.8)	9 (20.0)	0.67
Steroid exposure, n (%)	1 (6.3)	3 (6.7)	0.71
Smoking history, n (%)	15 (93.8)	38 (84.4)	0.67
Brinkman index, median [IQR]	960 [800–1,400]	980 [544–1,123]	0.46
Comorbidities, n (%)			
Osteoporosis	1 (6.3)	2 (4.4)	0.83
Gastroesophageal reflux	3 (18.8)	1 (2.2)	0.052
Cardiovascular diseases	6 (37.5)	9 (20.0)	0.19
Anxiety and depression	2 (12.5)	12 (26.7)	0.32
Interstitial pneumonia, n (%)	1 (6.3)	7 (15.6)	0.67
GOLD classification, n (%)			
2	15 (93.7)	41 (91.1)	0.79
3	1 (6.3)	4 (8.9)	
Spirometry			
FVC (L), median [IQR]	3.34 [2.55–3.96]	3.13 [2.65–3.73]	0.64
%FVC (%), median [IQR]	99.1 [81.0–112.8]	98.5 [87.7–111.0]	0.86
FEV$_1$/FVC (%), median [IQR]	64.5 [57.3–66.7]	64.5 [59.2–68.0]	0.69
FEV$_1$ (L), median [IQR]	1.84 [1.41–2.44]	1.96 [1.63–2.34]	0.95
Diseased side, right, n (%)	10 (62.5)	24 (53.3)	0.57
Tumor size (mm), median [IQR]	30 [15–40]	20 [17–27]	0.28
Clinical N1/2, n (%)	2 (12.5)	9 (20.0)	0.71
Location, upper segments, n (%)	12 (75.0)	26 (57.8)	0.25
VATS, n (%)	15 (93.8)	41 (91.1)	0.79
Procedure, n (%)			
Segmentectomy	3 (18.8)	9 (20.0)	0.67
Lobectomy	13 (81.2)	36 (80.0)	
Number of resected segments (n), median [IQR]	3 [3–4]	3 [3–5]	0.35
Intraoperative bleeding (mL), median [IQR]	94 [40–182]	65 [7–123]	0.14
Operative time (min), median [IQR]	216 [175–292]	196 [173–241]	0.36

Table S5 (*continued*)

Table S5 (*continued*)

Characteristic	TIO (n=16)	UMEC/VI (n=45)	P value
Chest tube duration (day), median [IQR]	2 [1–4]	1 [1–3]	0.19
Complications, n (%)			
Total	10 (62.5)	10 (22.2)	0.0053
Prolonged air leak	2 (12.5)	4 (8.9)	0.65
Pneumonia	2 (12.5)	1 (2.2)	0.17
Atelectasis	1 (6.3)	0 (0)	0.26
Arrhythmia	4 (25.0)	3 (6.7)	0.070
Delirium	2 (6.5)	2 (3.3)	0.60
Postoperative bleeding	1 (6.3)	1 (2.2)	0.46
Others	0 (0)	1 (2.2)	0.74
Postoperative hospitalization (day), median [IQR]	10 [6–14]	8 [6–10]	0.41

COPD, chronic obstructive pulmonary disease; ACO, Asthma-COPD overlap; TIO, tiotropum; UMEC/VI, umeclidinium/vilanterol; IQR, interquartile range; BMI, body mass index; GOLD, Global Initiative for Chronic Obstructive Lung Disease; FVC, forced vital capacity; FEV_1, forced expiratory volume in 1 second; N, lymph nodes; VATS, video-assisted thoracoscopic surgery.

Table S6 Perioperative respiratory function of anatomical lung resection patients with untreated COPD and ACO: TIO *vs.* UMEC/VI

Parameter	FEV_1 (L), median [IQR]		P value
	TIO (n=16)	UMEC/VI (n=45)	
Before surgery			
FEV_1	1.84 [1.41–2.44]	1.96 [1.63–2.34]	0.95
Postint FEV_1	1.88 [1.58–2.50]	2.18 [1.78–2.49]	0.29
Postint – Preint FEV_1	0.07 [–0.09–0.12]	0.16 [0.08–0.29]	0.0005
Predicted postop FEV_1	1.55 [1.22–2.00]	1.53 [1.18–1.90]	0.88
Predicted postop after postint FEV_1	1.47 [1.25–2.05]	1.66 [1.40–2.06]	0.38
After surgery			
Postop FEV_1	1.82 [1.24–2.27]	1.97 [1.59–2.25]	0.45
Postop – Preop FEV_1	–0.08 [–0.37––0.26]	–0.05 [–0.30–0.16]	0.92
Postop – Predicted FEV_1	0.31 [0.06–0.52]	0.33 [0.11–0.57]	0.58
Postop – Predicted after postint FEV_1	0.30 [0.11–0.54]	0.22 [0.03–0.41]	0.23

COPD, chronic obstructive pulmonary disease; ACO, Asthma-COPD overlap; TIO, tiotropum; UMEC/VI, umeclidinium/vilanterol; FEV_1, forced expiratory volume in 1 second; IQR, interquartile range; int, intervention; op, operative.