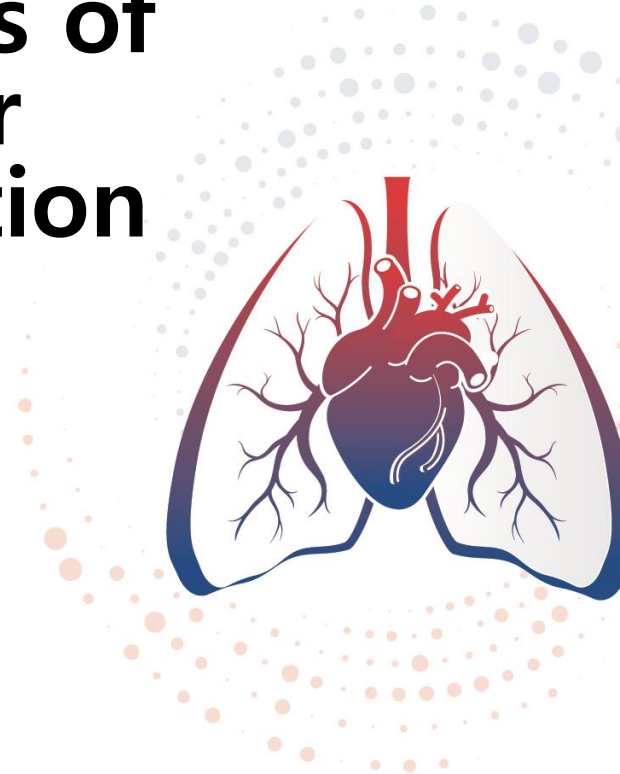


2023 대한심장혈관흉부외과학회

제55차 추계학술대회 & APELSO 2023

2023. 11. 02 (Thu) - 11. 04 (Sat), 그랜드 인터컨티넨탈 파르나스 서울

Recurrence rates and risk factors of Pneumothorax Surgery under One-Lung vs. Two-Lung Ventilation



- Pneumothorax surgery is generally performed under one-lung ventilation for
 - Achievement of optimal surgical view
 - Safe and easy lung manipulation, and prevention of unintentional parenchymal injury during lung operation
- However, one-lung ventilation may require longer procedure time and its success depends heavily on proficiency of anesthesiologist.
- Recently, lung operation under two-lung ventilation is gaining its interests considering its simplified induction procedure and possibly shorter induction time
- We seek to compare the postoperative results including recurrence rate and complications of pneumothorax surgery performed under two different ventilation strategies and define risk factors associated with pneumothorax recurrence.



- Retrospective review
- Single tertiary center from Jan. 2018 – Dec. 2022
- Patient who underwent operation primarily for pneumothorax and have record of at least single outpatient department follow up.
- Total inclusion = 288 patients
 - One-lung ventilation group = 247 patients
 - Two-lung ventilation group = 41 patients
- Pneumothorax at any side of pleural cavity after receiving operation was defined as recurrence
- Any available medical record and radiologic exams were analyzed to confirm post OP recurrence of pneumothorax
- Recurrent free survival (RFS) and risk factor analysis is analyzed

Table 1. Characteristics by types of ventilation

		One-Lung (N=247)	Two-Lung (N=41)	p value
Age,yr		36.68 (14-85)	24.20 (13-73)	0.0013
Gender, n(%)	Male	218(88.26%)	35(85.37%)	0.6067
	Female	29(11.74%)	6(14.63%)	
BMI, kg/m²		20.45 (14.7-37.1)	19.17 (14.9-30.1)	0.0078
Tobacco Exposure, n	Never smoker	139(56.28%)	29(70.73%)	0.0576
	Current smoker	59(23.89%)	10(24.39%)	
	Ex-smoker	49(19.83%)	2(4.88%)	
Past PNX, n		150(60.73%)	22(53.66%)	0.4947
PNX OP History, n	None	182(73.68%)	33(80.49%)	0.5669
	Yes, Ipsilateral	32(12.96%)	4(9.76%)	
	Yes, Contralateral	21(8.50%)	4(9.76%)	
	Yes, bilateral	12(4.86%)	0(0.00%)	
Indications for OP, n	Tension PNX	2 (0.81%)	0 (0%)	0.544
	Recurrent	117 (47.37%)	17 (41.46%)	
	Prolonged airleakage	94 (38.06%)	22 (53.66%)	
	Hemothorax	12 (4.86%)	0 (0%)	
	Giant bulla	5 (2.02%)	0 (0%)	
	Prior Contralateral PNX	16 (6.48%)	2 (4.88%)	
	Occupational factor	1 (0.4%)	0 (0%)	
Pre-OP treatment, n	None, observation	5(2.02%)	0 (0%)	0.1239
	Oxygen therapy	24(9.72%)	10(24.39%)	
	Thoracostomy	215(87.04%)	31(75.61%)	
	OP	2(0.81%)	0 (0%)	
	Pleurodesis	1(0.40%)	0 (0%)	
Number of Bulla, n	Single	56(22.67%)	5(12.20%)	0.1888
	Multiple	191(77.33%)	36(87.80%)	
Emphysema, n		79(31.98%)	3(7.32%)	0.0023
Pleural Adhesion, n		111(44.94%)	9(21.95%)	0.0095

Thoracostomy Ports, n	1	156(63.16%)	34(82.93%)	0.0119
	2	16(6.48%)	3(7.32%)	
	3	75(30.36%)	4(9.76%)	
Number of resections, n	1	168(68.02%)	30(73.17%)	0.5693
	2	56(22.67%)	7(17.07%)	
	3 or more	23(9.31%)	4(9.76%)	
Type of Reinforcement, n	None	44(17.81%)	0(0.00%)	<0.001
	Fibrin mesh	76(30.77%)	0(0.00%)	
	Fibrin glue	8(3.24%)	0(0.00%)	
	Both	119(48.18%)	41(100.00%)	
Paincontrol Method, n	None	8(3.24%)	0(0.00%)	<0.001
	IV-PCA	37(14.98%)	31(75.61%)	
	ON-Q painbuster	202(81.78%)	10(24.39%)	
Tidal volume, mL		434.58 (240-650)	367.8 (200-580)	<0.001
Respiratory Rate, /min		12 (11,14)	15 (13,17)	<0.001
Operation time, min		57.02 (20-245)	33.17 (20-155)	<0.001
Hospital stay, d		6 (5, 9)	5 (3, 6)	<0.001
Follow up duration, d		38 (25, 59.5)	27 (13, 56)	0.1267
Post OP complication, n		7(2.83%)	3(7.32%)	0.1572
Re-operation, n		2(0.81%)	2(4.88%)	0.0985
Recurrece, n	No	216(87.45%)	32(78.05%)	0.1147
	Yes, Ipsilateral	15(6.07%)	7(17.07%)	
	Yes, Contralateral	15(6.07%)	2(4.88%)	
	Yes, bilateral	1(0.40%)	0(0.00%)	
Chest wall deformity, n		2(0.81%)	0(0.00%)	>0.99
Comorbidities, n				
Any Lung Disease		44(17.81%)	1(2.44%)	0.0227
HTN		30(12.15%)	1(2.44%)	0.0972
DM		11(4.45%)	1(2.44%)	>0.99
Angina		10(4.05%)	0(0.00%)	0.3668

Table 2. Univariate and multivariate analyses of risk factors of pneumothorax recurrence

	Univariable		Multivariable	
	HR (95% CI)	P value	HR (95% CI)	P value
Gender				
Male	Ref			
Female	0.49(0.15 - 1.58)	0.229	NA	NA
Age	0.97(0.95 - 0.99)	<0.01	0.92(0.89 - 0.97)	<0.01
Type of Ventilation				
One-Lung	Ref			
Two-lung	2.14(1.01 - 4.53)	0.047	1.457(0.61 - 3.47)	0.396
Ventilator Tidal volume	1(0.99 - 1.01)	0.872	NA	NA
Bulla				
Single	Ref			
Multiple	0.89(0.37 - 2.16)	0.795	NA	NA
Emphysema				
Yes	0.78(0.37 - 1.68)	0.533	NA	NA
Adhesion				
Yes	0.67(0.34 - 1.29)	0.234	NA	NA
Number of Resections				
1	Ref			
2	0.76(0.31 - 1.83)	0.534	1.25(0.45 - 3.44)	0.666
3 or More	3.06(1.25 - 7.48)	0.014	7.09(1.56 - 32.29)	0.011

Parenchymal Reinforcement				
No	Ref			
Yes	0.83(0.38 - 1.79)	0.628	NA	NA
OP Duration	0.99(0.98 - 1.01)	0.467	NA	NA
Hospital Stay	1.07(1.00 - 1.13)	0.041	1.01(0.85 - 1.20)	0.934
Post OP Complication				
No	Ref			
Yes	2.9(1.12 - 7.53)	0.029	6.34(1.59 - 25.20)	0.009
Past PNX				
No	Ref			
Yes	2.85(1.26 - 6.45)	0.012	3.8(1.15 - 12.61)	0.029
PNX OP History				
No	Ref			
Yes	1.81(0.96 - 3.44)	0.067	NA	NA
Number of Prior PNX	1.49(1.16 - 1.91)	0.002	0.86(0.52 - 1.44)	0.571
BMI	0.88(0.77 - 0.99)	0.047	0.98(0.82 - 1.17)	0.816
Tabacco Exposure	0.6(0.30 - 1.21)	0.154	NA	NA
Comorbidities				
Any Lung disease	1.04(0.37 - 2.96)	0.94	NA	NA
Hypertension	2.36(0.67 - 8.26)	0.179	NA	NA
Diabetes	9.93(2.74 - 35.94)	<.001	NA	NA
angina	2.52(0.33 - 19.23)	0.373	NA	NA

CI, confidence interval; OP, operation; PNX, pneumothorax; BMI, body mass index

- Patients who underwent operation under two-lung ventilation were
 - Mostly newly diagnosed and received surgery because of prolonged air leakage.
 - Had shorter operation time and hospitalization period
- Risk factors for pneumothorax recurrences were
 - Younger ages
 - Number of pulmonary resections
 - Experience of post-operative complications
 - Prior history of pneumothorax
- Two-lung ventilation was a risk factor in only univariable analysis with hazard ratio of 2.14
- In conclusion, recurrence pattern and risk of pneumothorax is the confluence of underlying patient factor and surgical techniques.
- Anesthesia (one-lung vs two-lung ventilation) may be an influencing factor however due to several limitations including selection bias, further larger, randomized study is needed.

