Effectiveness of Small-Bore Pigtail Catheters for Management of Spontaneous Pneumothoraxes: A Meta-Analysis

Mei-Chin Huang, BSN, RN[1]; Yueh-Yen Fang, PhD, RN[2]; Chih-Hsing Shen, BSN, RN[1]; Hui-Chuan Chen, BSN, RN[1]
Department of Nursing, Kaohsiung Municipal Ta-Tung Hospital, Kaohsiung Medical University Hospital, Kaohsiung Medical University [1]
School of Nursing, Fooyin University[2]
Kaohsiung, Taiwan

Introduction

■Spontaneous pneumothorax (SP) can be a life-threatening condition. It can be primary and caused by unknown reason, or secondary from acute or chronic lung diseases. It was estimated that the spontaneous pneumothorax affected over 20,000 patients and accounted $130 million health-care costs in the United States.

■The primary management of spontaneous pneumothorax is to remove air from the pleural space. The recommendations of spontaneous pneumothorax management differ across guidelines. Though the trend tends to suggest the use of less invasive small catheters, applying a large chest tube is still common.

Purpose

■ Compared the effectiveness of a small-bore pigtail catheter with the traditional chest tube in the management of spontaneous pneumothorax .

Method

■ Meta-analyses were performed by the random effect model. Pooled effects of drainage failure and length of hospitalization were calculated to present the effectiveness of tubing methods.

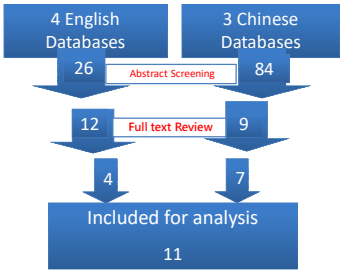
■ We searched "(spontaneous pneumothorax) AND (chest tube OR pigtail catheter) " to collect English and Chinese studies published up to April, 2016 via Four English databases (Medline, PubMed, CINAHL, and Cochrane Central Register of Controlled Trials) and Three Chinese databases (CEPS, the Chinese Journal database, and the Chinese Thesis/Dissertation database).

■Evaluations of study quality were conducted by the 2011 Oxford Centre for Evidence-Based Medicine-Levels of Evidence and the Cochrane Collaboration's tool for assessing risk of bias.

Inclusion and Exclusion Criteria

	Inclusion Criteria	Exclusion Criteria
P	■ Primary or secondary spontaneous pneumothorax	■ Latrogenic pneumothorax ■ Pneumothorax caused by penetrating trauma or blunt injury
I	■ small-bore pigtail catheter	
C	■ chest tube	
O	■ drainage failure ■ length of hospitalization	

Results: Search Result



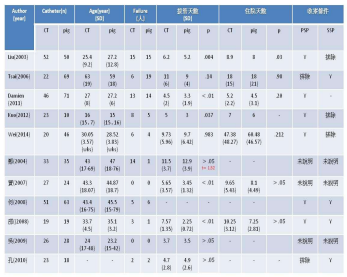
Results: Study Quality of Primary Studies

Author (year)	Oxford	Random Sequence generation	Allocation concealment	Blinding of participants And personnel	Blinding of outcome assessment	Incomplete Outcome data	Selective reporting
Liu(2003)	LEVEL4	H	H	H	L	L	L
Tsai(2006)	LEVEL4	H	H	H	L	L	L
Damien(2011)	LEVEL4	H	H	H	L	L	L
Kuo(2012)	LEVEL4	H	H	H	L	L	L
Wei(2014)	LEVEL4	H	H	H	L	L	L
鄭(2004)	LEVEL2	U	U	U	U	L	L
賈(2007)	LEVEL2	U	U	U	U	L	L
何(2008)	-	U	U	U	U	L	L
郭(2008)	LEVEL2	U	U	U	U	L	L
吳(2009)	LEVEL4	H	H	H	L	L	L
孔(2010)	LEVEL4	H	H	H	L	L	L

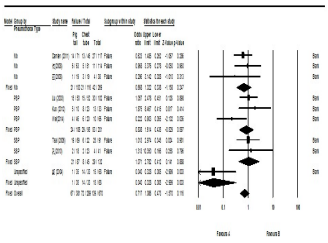
Results: Characteristics of Primary Studies

Author (year)	Nation	N	TYPE	sex		Age (year)
				M	F	
Liu(2003)	Taiwan	102	chart	79	23	23.3±11.1
Tsai(2006)	Taiwan	91	chart	76	15	60±19
Damien(2011)	France	117	chart	-	-	-
Kuo(2012)	Taiwan	41	chart	34	7	<18
Wei(2014)	Taiwan	66	chart	41	25	<AP 37wks
鄭(2004)	China	68	RCT	59	9	-
賈(2007)	China	51	RCT	-	-	44.87±18.72
何(2008)	China	114	-	-	-	-
郭(2008)	China	38	RCT	30	8	34.2±5.7
吳(2009)	China	54	chart	40	14	-
孔(2010)	China	41	chart	40	1	44-75

Results: Characteristics of Primary Studies



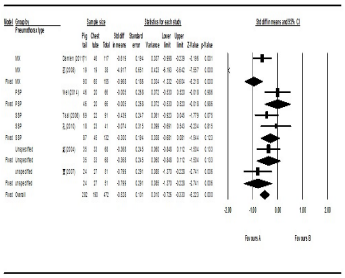
Meta-Analysis: Risk of drainage failure Forest Plot



Meta-Analysis: Risk of drainage failure

Analysis	N (n)	WES (OR) (95% CI)	P	Heterogeneity Q	Heterogeneity P	Heterogeneity I-squared
PSP	3 (201)	.779 (.258, 2.354)	.658	4.824	.09	58.537
SSP	2 (132)	1.071 (.412-2.782)	.888	.047	.828	0
MIX	3 (269)	.668 (.338, 1.322)	.247	.819	.664	0
Unspecified	1 (68)	.04 (.005-.328)	.003	0	1	0
Overall	9 (670)	.669 (.413-1.085)	.103	13.858	.086	42.274

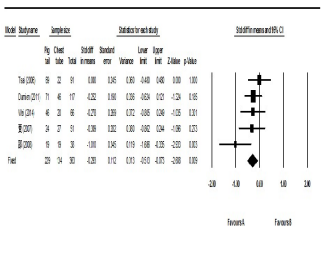
Meta-Analysis: Extubation days Forest Plot



Meta-Analysis: Extubation days

Analysis	N (n)	WES (OR) (95% CI)	P	Heterogeneity Q	Heterogeneity P	Heterogeneity I-squared
PSP	1 (66)	-.005 (-.530, .520)	.986	0	1	0
SSP	2 (132)	-.300 (-.681-.081)	.123	.835	.361	0
MIX	2 (155)	-2.723 (-6.935, 1.489)	.205	40.095	<.001	97.506
Unspecified	1 (68)	-.368 (-.848-.112)	.133	0	1	0
Overall	7 (472)	-.349 (-.585 - -.114)	.004	53.041	<.001	88.688

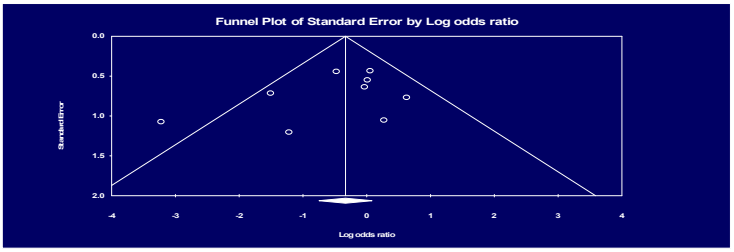
Meta-Analysis: Hospital stay Forest Plot



Meta-Analysis: Hospital stay

Analysis	N (n)	WES (OR) (95% CI)	P	Heterogeneity Q	Heterogeneity P	Heterogeneity I-squared
Overall	5 (363)	-.311 (-.583 - -.039)	.025	5.822	.213	31.298

Results: Publication Bias



Discussion

■There is no difference in effect between using small-bore pigtail catheters or chest tube for spontaneous pneumothorax treatment.
■Including secondary spontaneous pneumothorax cases in the primary studies may influence the outcome of small-bore pigtail catheters due to comorbidity status.

Conclusion

■Findings of this study support the use of small-bore pigtail catheters to manage spontaneous pneumothorax . Application of small-bore pigtail catheters may promote patient compliance and comfort.