The Incidence, Characteristics and Outcomes of Pneumothorax in Thai Surgical Intensive Care Units (Thai-SICU Study)

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Objective: *To identify incidence, characteristics, and outcomes of pneumothorax among patients who specifically stayed in surgical intensive care units (SICUs).*
Material and Method: *This was a multicenter prospective cohort study conducted in 9 University-affiliated SICUs in Thailand. Incidence of pneumothorax and its outcomes were evaluated from April 2011 to January 2013.*
Results: *4,652 patients who were admitted to SICU were enrolled. The incidence of pneumothorax was 0.5% (25 cases) in our study. Significant characteristics were found in the pneumothorax group, including: lower BMI, underlying malignancy and COPD, higher APACHE-II and SOFA score within 24 hours of first ICU admission, pulmonary infiltration pattern of chest imaging and usage of mechanical ventilation. In terms of outcome, there were higher SICU mortality and 28-day hospital mortality in pneumothorax than non-pneumothorax patients at 28.0% vs. 9.6%, p = 0.002 and at 44.0% vs. 13.6%, p<0.001, respectively.*
Conclusion: *Patients admitted to surgical intensive care units who developed pneumothorax had higher risk of intensive care unit mortality and 28-day hospital mortality than non-pneumothorax patients, as well as a longer intensive care unit and hospital length of stays.*

Keywords: *Pneumothorax, Surgical intensive care unit, Characteristics, Outcomes*

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Pneumothorax is one of the most serious complications of pleural diseases. Massive pneumothorax or pneumothorax in critically ill patients results in a life threatening condition which requires emergency pleural drainage, either from an immediate life saving needle aspiration or tube thoracostomy. However, this problem may be very difficult to diagnose among patients staying in the intensive care unit (ICU) due to the limitations of imaging studies as patients lay supine on their beds or from interference from various ICU equipment.

Most data on the incidence of pneumothorax in the ICU were collected retrospectively[1-3] and likely to be studied in mixed ICU[4] or only medical ICU[1-3] which had an incidence of about 4-15%[1-6]. Many clinical characteristics of patients were postulated to be risk factors for pneumothorax in the ICU: body weight less than 80 kg[4]; history of immunodeficiency syndrome[4]; diagnosis of acute respiratory distress syndrome[1,4]; central vein or pulmonary artery catheter insertion, or from other medical procedures (thoracentesis, bronchoscopy, pericardiocentesis, and others)[3,4,7]; use of an inotropic agent in first 24 hours[4]; or it can occur from a barotrauma during positive pressure ventilation[1,4]. Furthermore, tension pneumothorax can happen in the ICU and is a life-threatening condition that can compromise hemodynamics or lead to cardiac arrest[9]. If tension pneumothorax occurs, it needs immediate emergency treatment [5,6].

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Data on the incidence of surgical ICU pneumothorax are limited; therefore, the objective of our study was to identify the incidence of pneumothorax in surgical ICU in Thailand. This study collected baseline characteristics of patients and tried to identify risk factors that caused patients to have pneumothorax, and the outcome of critically ill patients who had pneumothorax during a SICU stay compared with patients who had no pneumothorax.

Material and Method

The authors enrolled surgical patients from the THAI-SICU multi-center study[8], which is a collaborative study project of 9 University-affiliated SICUs in Thailand. Data were collected using prospective cohort from April 2011 to January 2013. The study protocols were submitted to and approved by individual ethics and research committees at each institution.

Patient age, sex, body mass index (BMI), smoking history, preexisting co-morbidity reason for SICU admission, severity of patients at SICU admission (evaluated by APACHE-II and SOFA day-1 score) were collected when patients were admitted to SICUs. Basic laboratory investigations were performed: PaO_2, FiO_2, PaO_2/FiO_2, hemoglobin, serum albumin, and blood sugar. Chest x-ray classification as normal, focal or diffuse pulmonary infiltration was also recorded as well as usage of mechanical ventilator.

Screening for pneumothorax was done every day during the SICU stay and before thoracic procedures occurred. These included: thoracentesis; central venous catheter insertion; bronchoscopy/ Broncho alveolar lavage (BAL); and pericaridocentesis. Furthermore, mechanical ventilation usage was recorded. When pneumothorax was diagnosed we recorded more data about type of pneumothorax: tension or non-tension; insertion of chest drainage; number of thoracostomy tubes; addition of external suction; and number of days on thoracostomy tubes. To determine patient outcomes, we evaluated SICU mortality and 28-day hospital mortality (calculated from day 1 of SICU admission). Data were compared between pneumothorax and non-pneumothorax patients and analyzed by statistical methods.

"Pneumothorax" was diagnosed by the presence of free air on chest x-ray and/or the presence of air drainage during thoracostomy tube insertion. "Pneumothorax in the SICU" was defined as an occurrence of pneumothorax during SICU stay; therefore, an occurrence of pneumothorax prior to a SICU stay was excluded. "Tension pneumothorax" was defined as the presence of pneumothorax that caused contralateral mediastinal shift on chest x-ray coincident with hemodynamic compromise. "Duration of tube thoracostomy insertion" was counted from the first day of chest tube drainage insertion to date of removal. Pneumothorax treatment was considered successful with full lung expansion and no free air was identified on chest x-ray, or no further drainage from tube thoracostomy. "Procedural related pneumothorax" was considered to be a cause of pneumothorax when it happened after any thoracic procedure within the preceding 24 hours; otherwise, barotrauma was postulated to be the cause of pneumothorax if the patients using mechanical ventilation.

Statistical analysis

The authors used STATA, version 11.0 (STATA Inc., College Station, TX) for statistical analysis. Descriptive data were reported as number count, percentage, mean and standard deviation; median and interquartile range depended on their distribution when there were continuous data. Categorical or nominal data were described by number count and percentage. The difference in patient characteristics and mortality (SICU mortality and 28-day hospital mortality) were analyzed by Chi-square test or Fisher's exact test when they were categorical data. Continuous data was analyzed by student's t-test or Mann-Whitney U test when appropriate. Statistical significant was considered when *p*-value less than 0.05.

Results

From April 2011 to January 2013, 4,652 patients were admitted to the SICUs of 9 university hospitals in Thailand. We found an incidence of pneumothorax in 25 (0.5%) cases in our cohort. Mean age of pneumothorax patients was at 63.5 ± 17.8 years old. Most pneumothorax patients were male (13 of 25, 52.0%). The average BMI in pneumothorax patients was lower at 20.02 ± 5.22 kg/m^2, but 23.02 ± 5.64 kg/m^2 in non-pneumothorax patients at $p = 0.01$. Current smoker history was equal between the two groups of patients, 2 of 25 pneumothorax patients were smokers (8.0%) versus 555 of 4,627 cases in non-pneumothorax patients (12.0%). However, severity of patients at SICU admission was significantly different between pneumothorax and non-pneumothorax patients when evaluated by APACHE-II score at 16 (12-20) versus 10 (7-15), $p = 0.001$ and SOFA day-1 at 4 (2-6) versus 2

(1-5), $p = 0.01$. The three most common preexisting co-morbidity of our cohort were hypertension, diabetes mellitus, and malignancy at 48.8%, 21.9%, and 15.6%, respectively. The incidence of preexisting co-morbidity between pneumothorax and non-pneumothorax patients showed no significant difference, except underlying malignancy 32.0% (8 cases) versus 15.5% (719 cases) and chronic obstructive pulmonary disease 16.0% (4 cases) versus 4.5% (208 cases) (Table 1).

Reason for SICU admission of our patients was categorized (Table 2). Most pneumothorax patients were admitted principally due to abdominal diseases (12 cases, 48.0%), followed by cardiovascular problems, respiratory problems, sepsis, and trauma, which occurred equally in 3 cases (12.0%). The last group was obstetric and gynecological patients, which had only 1 case (4.0%). Compared to non-pneumothorax patients, there was no statistical difference in reason for SICU admission at $p = 0.320$.

Baseline laboratory investigations showed PaO_2 was lower in pneumothorax versus non-pneumothorax patients at 125±6 mmHg and 164±8 mmHg, respectively, and therefore, statistically significant at $p = 0.012$. However, there was no statistical significance in FiO_2; and PaO_2/FiO_2 (0.46±0.18 versus 0.48±0.19, $p = 0.431$; and 291±164 versus 351±204, $p = 0.094$, respectively). Other parameters (hemoglobin, albumin and blood sugar) also showed no statistical

Table 1. Characteristics of critically ill patients with pneumothorax and non-pneumothorax in Thai-SICU study

Patient characteristics	All patients (n = 4,652)	Pneumothorax (n = 25)	Non-pneumothorax (n = 4,627)	*p*-value
Demographic data of enrolled patients				
Age (mean age ± SD)	61.80±17.30	63.50±17.80	61.70±17.30	0.579
Male (n, %)	2,729 (58.8)	13 (52.0)	2,716 (58.7)	0.498
BMI* (kg/m^2)	23.00±5.64	20.02±5.22	23.02±5.64	0.001
Smoking history, (no.,%)				
None	2,947 (63.4)	16 (64.0)	2,931 (63.4)	0.800
Current smoker	557 (12.0)	2 (8.0)	555 (12.0)	
Ex-smoker	1,148 (25.0)	7 (28.0)	1,141 (25.0)	
Severity score at SICU admission				
APACHE-II score*	10 (7-15)	16 (12-20)	10 (7-15)	0.001
SOFA day-1*	2 (1-5)	4 (2-6)	2 (1-5)	0.010
Preexisting co-morbidity** (n, %)				
Hypertension	2,268 (48.8)	10 (40.0)	2,258 (48.8)	0.380
Diabetes mellitus	1,108 (21.9)	2 (8.0)	1,016 (22.0)	0.092
Malignancy	727 (15.6)	8 (32.0)	719 (15.5)	0.024
Coronary artery disease	460 (9.9)	2 (8.0)	458 (9.9)	0.751
Chronic kidney disease	442 (9.5)	1 (4.0)	441 (9.5)	0.347
Other Cardiovascular disease	371 (8.0)	1 (4.0)	370 (8.0)	0.462
Previous stroke	276 (5.9)	2 (8.0)	274 (5.9)	0.661
Vascular disorder	268 (5.8)	1 (4.0)	267 (5.8)	0.705
COPD	212 (4.6)	4 (16.0)	208 (4.5)	0.006
Other respiratory diseases	134 (2.9)	2 (8.0)	132 (2.9)	0.125
Congestive heart failure	107 (2.3)	1 (4.0)	106 (2.3)	0.570
Asthma	75 (1.6)	0 (0.0)	75 (1.6)	0.521
Immunological disease	56 (1.2)	1 (4.0)	55 (1.2)	0.199
Organ transplantation	25 (0.5)	0 (0.0)	25 (0.5)	0.712
AIDS	18 (0.4)	0 (0.0)	18 (0.4)	0.755
Unknown	224 (4.8)	1 (4.0)	223 (4.8)	0.849
N/A	1,176 (25.3)	7 (28.0)	1,169 (25.3)	0.754

* Median (IQR1-3), ** May be more than one diagnoses

SD = standard deviation; BMI = body mass index; APACHE-II score = acute physiology and chronic health evaluation-II score; SOFA score = sequential organ failure assessment score; COPD = chronic obstructive pulmonary disease; AIDS = acquire immune deficiency syndrome

difference between the two groups (Table 2).

4,475 chest x-rays were available for analysis. There were 22 cases of pneumothorax and 4,453 cases in the non-pneumothorax group. Types of pulmonary infiltration between these two groups were different at $p = 0.004$, where pneumothorax patients frequently had focal infiltration while non-pneumothorax patients had no pulmonary infiltration (Table 2). Finally, we found 23 out of 25 pneumothorax patients (92.0%) used mechanical ventilation, while only 2,868 from 4,627 cases of non-pneumothorax patients (62.0%) used it, which had a statistical significance of $p = 0.002$.

Outcomes of our study are shown in Table 3. The mortality rate from Thai-SICU study was 9.6% (447/

Table 2. Reason for admission and baseline investigation at SICU admission of critically ill patients with pneumothorax and without pneumothorax in Thai-SICU Study

Patients characteristics	All patients (n = 4,652)	Pneumothorax (n = 25)	Non-pneumothorax (n = 4,627)	*p*-value
Reason for SICUs admission				0.320
Abdominal disease (GI-HBP)	1,869 (40.2)	12 (48.0)	1,857 (40.1)	
Cardiovascular disease	739 (15.9)	3 (12.0)	736 (15.9)	
Genitourinary tract	373 (8.0)	0 (0.0)	373 (8.1)	
Respiratory disease	361 (7.8)	3 (12.0)	361 (7.7)	
Trauma	327 (7.0)	3 (12.0)	324 (7.0)	
Musculo skeletal/Skin	310 (6.7)	0 (0.0)	310 (6.7)	
Neuro/Head/Neck	236 (5.1)	0 (0.0)	236 (5.1)	
Sepsis	172 (3.7)	3 (12.0)	169 (3.7)	
Ob-Gyne	124 (2.7)	1 (4.0)	123 (2.7)	
Metabolic disease	82 (1.8)	0 (0.0)	82 (1.8)	
Hematolic disease	2 (0.0)	0 (0.0)	2 (0.0)	
Other classification	57 (1.2)	0 (0.0)	57 (1.2)	
Baseline laboratory data (mean $\pm$ SD				
PaO_2 (mmHg)	164$\pm$8	125$\pm$6	164$\pm$8	0.012
FiO_2	0.48$\pm$0.2	0.46$\pm$0.2	0.48$\pm$0.2	0.431
PaO_2/FiO_2	350$\pm$204	291$\pm$164	351$\pm$204	0.094
Hemoglobin (g/dL)	10.6$\pm$2.2	10.5$\pm$2.4	10.6$\pm$2.2	0.885
Serum albumin (g/dL)	2.76$\pm$0.8	2.44$\pm$0.8	2.77$\pm$0.8	0.058
Blood sugar (mg/dL)	163$\pm$59	152$\pm$42	163$\pm$59	0.597
Mechanical ventilator used	2,891	23	2,868	0.002
Chest x-ray data** (n, %)	4,475 cases	22 cases	4,453 cases	
No infiltration	3,443	11	3,432	0.004
Focal infiltration	509	7	502	
Diffuse infiltration	523	4	519	

* Median (IQR1-3), ** Data available only in 4,475 cases
GI-HBP = gastrointestinal hepatobiliary and pancreas disease; Ob-Gyne = obstetric and gynecological disease

Table 3. Outcome of critically ill patients with pneumothorax and non-pneumothorax in Thai-SICUs study

Patients characteristics	All patients (n = 4,652)	Pneumothorax (n = 25)	Non-pneumothorax (n = 4,627)	*p*-value
Outcome of SICUs patients				
SICUs mortality (n, %)	447/4,652 (9.6)	7/25 (28.0)	440/4,627 (9.6)	0.002
28-day hospital mortality (n, %)	642/4,652 (13.8)	11/25 (44.0)	631/4,627 (13.6)	<0.001
Length of ICU stay (days, IQR)	2 (1-4)	7 (4-15)	2 (1-4)	<0.001
Length of hospital stay (days, IQR)	15 (9-26)	19 (17-25)	15 (9-26)	0.047

4,652 cases), consisting of 28.0% (7/25 cases) in the pneumothorax group, and 9.6% (440/4,627 cases) in the non-pneumothorax group, which was a statistically significant difference at $p = 0.002$. Overall 28-day hospital mortality rate was 13.8% (642/4,652 cases); there was a 44.0% mortality rate (11/25 cases) among pneumothorax cases versus 13.6% (631/4,627 cases) in the non-pneumothorax group, which was statistically significant at $p<0.001$. The other aspects of patient outcomes were length of ICU stay and hospital stay. Duration of ICU stay in pneumothorax patients was 7 (4-15) days, which was longer than non-pneumothorax patients at 2 (1-4) days by a statistically significant $p<0.001$. There was also longer length of hospital stay in pneumothorax patients at 19 (17-25) days versus 15 (9-26) days in non-pneumothorax patients at statistical level $p = 0.05$.

Our prospective cohort had 25 pneumothorax patients (Table 4). Seventeen cases were accounted for by iatrogenic mechanism (medical procedure) and 4 cases were caused by barotrauma. However, in the remaining four of them, we cannot find the cause of pneumothorax so we classified these as of unknown etiology. Moreover, we also found 7 cases presenting with tension type pneumothorax while 4 of these cases had seriously coincident cardiac arrest due to hemodynamic compromise. Medical procedure, which was a leading cause of pneumothorax, occurred following central line catheter insertion (7 cases were from subclavian site and 6 cases were from internal jugular site). The other procedure that caused pneumothorax was thoracentesis with 2 cases.

For a treatment of pneumothorax, insertion of thoracostomy tube was performed in 20 cases. Unfortunately, we could not identify this detail in another 5 cases. Further data about thoracostomy tube usage per patient: 1 line thoracostomy tube insertion was used in 16 cases, 2 lines insertion in 3 cases, and more than 2 lines were used in 1 case. Moreover, 3 of 20 cases of thoracostomy tube insertion were connected with external suction drainage devices. Finally, duration of thoracostomy tube use in patients, where data were available (14 cases), showed there were 8 cases of thoracostomy tube inserted for 1-5 days, 2 cases 6-10 days, and 4 cases where thoracostomy tube remained in situ longer than 10 days (Table 4).

Table 4. Data about SICU pneumothorax patients

Data of SICUs pneumothorax patients	Results (n)
Number of pneumothorax patients	25
Tension type pneumothorax	7
Arrest due to hemodynamic compromise	4
Causes*	
Procedural related pneumothorax	17
Central line catheterization	13
Thoracentesis	2
Others	2
Barotrauma	4
Unknown etiology	4
Intercostal drainage (ICD) insertion (n)*	
1-ICD inserted	16
More than 1-ICDs inserted	4
External suction drainage applied*	3
Duration of ICDs insertion (days)**	
1-5 days	8
6-10 days	2
>10 days	4

* Data available from 20 cases, ** Data available from 14 cases

Discussion

Pneumothorax is one of the most serious pleural diseases in an intensive care unit. From our multicenter study, which collected data only from surgical based intensive care units, we found only 0.5% of pneumothorax incidence in our cohort (25 cases from totally collected in 4,652 cases). This percentage was lower than other studies. Data from de Lassence A et al[4] had shown that incidence of pneumothorax was 1.4% on day 5 and 3.0% on day 30 in 3,430 combined-ICU admissions. Studies from Chen KY et al[3] and Kim WC et al[1] showed markedly higher incidence of pneumothorax at 3.0% (60 from 1,955 cases) and 4.6% (15 from 326 cases), respectively. This lower incidence of pneumothorax in surgical ICUs might be explained by, firstly, a difference in the type of ICU. Secondly, it might be caused by a lower severity among our ICU patients. There were only 10 (7-15) when evaluated by APACHE-II score in our cohort. From Kim WC et al[1] there was higher APACHE-II score at 15.4$\pm$7.3. However, severity of pneumothorax patients, were comparable with our data, Kao JH et al[2] and Chen KC et al[3] at 16 (12-20), 18.7$\pm$6.1 and 22.0$\pm$6.1, respectively. Thirdly, it might be explained by the reason for ICU admission and patients' underlying diseases. For medically based ICUs, most patients were admitted to an ICU for respiratory distress syndrome, or severe sepsis or septic shock that usually had underlying respiratory causes. However, most SICU patients were admitted post operatively.

Pneumothorax had some significant characteristics when comparing with non-pneumothorax, including: lower BMI, higher APACHE-II and SOFA score within 24 hours of first ICU admission, underlying malignancy and COPD, pulmonary infiltration pattern of chest imaging and usage of mechanical ventilation. A lower in BMI was identified as one of risk factor of pneumothorax in our cohort, which was the same reported as de Lassence A et al[4] (body weight less than 80 kg was identified as a risk factor of iatrogenic pneumothorax). AIDS, cardiogenic pulmonary edema and acute respiratory distress syndrome were independent risk factors of pneumothorax in de Lassence A et al[4] study, however, this publication data collected form medical ICU or mixed ICU. The comorbidities that prone to have pneumothorax in our surgical ICUs study were pre-existing malignancy and COPD. Moreover, pulmonary infiltration on chest x-ray and mechanical ventilation usage can be another two pneumothorax predictors. Pneumothorax was found in 23 from 25 cases (92.0%) in respiratory support with mechanical ventilation in our cohort, while data from Chen KY et al[3] found nearly the same rate as our study (56 from 60 cases, 93.3%). On the other hand, only 69.1% (65 form 94 cases) in de Lassence A et al[4] was identified.

There was markedly higher SICU mortality rate and 28-day hospital mortality rate in pneumothorax than non-pneumothorax patients (28.0% versus 9.6%, p = 0.002 and 44.0% versus 13.6%, p<0.001, respectively. Data from Kao JH et al[2] also showed higher ICU mortality and hospital mortality in pneumothorax patients than non-pneumothorax than our study. The study from Kao JH et al[2] found the death rate at 23.8% in the ICU and 38.1% in hospital among pneumothorax patients. However, for ICU and hospital stay our data differed from Kao JH et al, it was only 7 (4-15) days of ICU stay in our study but was 35.9$\pm$18.8 days in Kao JH et al. And the length of hospital stay was also longer in Kao JH et al studied at 85.9$\pm$118.6 days versus only 19 (17-25) days in our study.

Serious tension pneumothorax was found in 7 of 25 pneumothorax patients (28.0%). The study by Chen KY et al[3] found 18 in 60 pneumothorax cases (30.0%). Medical procedures were a major cause of pneumothorax in our cohort at 17/25 cases (68.0%), and it was nearly the same percentage as the study from Chen KY et al[3] 35/60 cases (58.0%). Central line catheter insertion was the main cause of pneumothorax in our cohort 13/25 cases (52.0%), comparable with 72/164 (43.9%) from Celik B et al[10]. On the other hand, thoracentesis was the leader cause of pneumothorax in Chen KY et al[3] 19/43 cases (44.2%).

The present study had some limitations. Firstly, it cannot show mechanical ventilator settings before or during the occurrence of pneumothorax, so peak airway and plateau pressure monitoring were not available for analyzing. Secondly, it does not show other complications from pneumothorax, such as subcutaneous emphysema, infection from intercostal tube insertion or severity at onset of pneumothorax. Furthermore, there was no analysis of risk factors for pneumothorax by univariate and multivariate analysis because we were aware of false statistical significance from a few pneumothorax patients when forced into a statistical model.

Conclusion

Significant characteristics were found in the pneumothorax group, including: lower BMI, underlying malignancy and COPD, higher APACHE-II and a SOFA score within 24 hours of first ICU admission, pulmonary infiltration pattern of chest imaging and usage of mechanical ventilation. Patients admitted to surgical an intensive care unit who develop pneumothorax have a higher risk of intensive care unit mortality and 28-day hospital mortality, as well as longer intensive care unit and hospital length of stays when compared with non-pneumothorax patients. Moreover, the pneumothorax incidence in surgical intensive care units was lower than combined medical surgical or medical intensive care units.

What is already known on this topic?

Pneumothorax is one of the most serious complications that can occur in critically ill patients. Most of the prior studies of pneumothorax were done retrospectively in medical or combined medical surgical intensive care units. In Thailand, the study of pneumothorax in surgical intensive care unit has never been done.

What this study adds?

This present study demonstrated the incidence, characteristics and outcomes of pneumothorax in surgical intensive care units in Thailand.

The THAI-SICU study group is listed below

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Potential conflicts of interest

None.

References

1. Kim CW, Jin SJ, Kim KY, Lee SJ, Cho YJ, Jeong YY, et al. Clinical characteristics of the development of pneumothorax in mechaniclaly ventilated patients in Intensive Care Units. Korean J Crit Care Med 2014; 29: 13-8.
2. Kao JH, Kao HK, Chen YW, Yu WK, Pan SW, Wang JH, et al. Impact and predictors of prolonged chest tube duration in mechanically ventilated patients with acquired pneumothorax. Respir Care 2013; 58: 2093-100.
3. Chen KY, Jerng JS, Liao WY, Ding LW, Kuo LC, Wang JY, et al. Pneumothorax in the ICU: patient outcomes and prognostic factors. Chest 2002; 122: 678-83.
4. de Lassence A, Timsit JF, Tafflet M, Azoulay E, Jamali S, Vincent F, et al. Pneumothorax in the intensive care unit: incidence, risk factors, and outcome. Anesthesiology 2006; 104: 5-13.
5. Yarmus L, Feller-Kopman D. Pneumothorax in the critically ill patient. Chest 2012; 141: 1098-105.
6. Woodside KJ, van Sonnenberg E, Chon KS, Loran DB, Tocino IM, Zwischenberger JB. Pneumothorax in patients with acute respiratory distress syndrome: pathophysiology, detection, and treatment. J Intensive Care Med 2003; 18: 9-20.
7. Lefrant JY, Muller L, De La Coussaye JE, Prudhomme M, Ripart J, Gouzes C, et al. Risk factors of failure and immediate complication of subclavian vein catheterization in critically ill patients. Intensive Care Med 2002; 28: 1036-41.
8. Chittawatanarat K, Chaiwat O, Morakul S, Pipanmekaporn T, Thawitsri T, Wacharasint P, et al. A multi-center Thai university-based surgical intensive care units study (THAI-SICU study): methodology and ICU characteristics. J Med Assoc Thai 2014; 97 (Suppl 1): S45-54.
9. Hsu CW, Sun SF, Lee DL, Chu KA, Lin HS. Clinical characteristics, hospital outcome and prognostic factors of patients with ventilator-related pneumothorax. Minerva Anestesiol 2014; 80: 29-38.
10. Celik B, Sahin E, Nadir A, Kaptanoglu M. Iatrogenic pneumothorax: etiology, incidence and risk factors. Thorac Cardiovasc Surg 2009; 57: 286-90.

อุบัติการณ์, คุณลักษณะและผลลัพธ์ของผู้ป่วยที่มีภาวะโพรงเยื่อหุ้มปอดมีอากาศขณะเข้ารับการรักษาในหออภิบาลผู้ป่วยภาวะวิกฤตทางศัลยกรรม

สุจารีย์ ภู่พิพัฒน์ภาพ, ชมพูนุท ปธนสมิทธิ์, ศิริพร ศิระเกล้า, กลวิชย์ ตรองตระกูล, พลอยนภัส ลิ้มพันธ์อุดม, กวีศักดิ์ จิตตวัฒนรัตน์, กลุ่มศึกษา THAI-SICU

วัตถุประสงค์: เพื่อศึกษาอุบัติการณ์, คุณลักษณะและผลลัพธ์ที่เกิดในผู้ป่วยที่มีภาวะโพรงเยื่อหุ้มปอดมีอากาศที่เข้ารับการรักษาในหออภิบาลผู้ป่วยภาวะวิกฤตทางศัลยกรรม

วัสดุและวิธีการ: การศึกษานี้เป็นการศึกษาเชิงวิเคราะห์แบบเก็บข้อมูลไปข้างหน้าในหออภิบาลผู้ป่วยภาวะวิกฤตทางศัลยกรรมของคณะแพทยศาสตร์ 9 แห่งในประเทศไทย ซึ่งต้องการศึกษาเกี่ยวกับอุบัติการณ์และผลลัพธ์ในผู้ป่วยที่มีภาวะโพรงเยื่อหุ้มปอดมีอากาศได้ถูกเก็บข้อมูลตั้งแต่ เดือนเมษายน พ.ศ. 2554 ถึง เดือนมกราคม พ.ศ. 2556

ผลการศึกษา: การศึกษานี้ได้ทำการเก็บข้อมูลผู้ป่วยจำนวน 4,652 ราย ที่เข้ารับการรักษาในหออภิบาลผู้ป่วยวิกฤตทางศัลยกรรม ผลการศึกษาพบว่ามีอุบัติการณ์การเกิดภาวะโพรงเยื่อหุ้มปอดมีอากาศในผู้ป่วย 25 ราย คิดเป็นร้อยละ 0.5 คุณลักษณะของผู้ป่วยในการเกิดภาวะโพรงเยื่อหุ้มปอดมีอากาศพบว่าสัมพันธ์กับภาวะน้ำหนักตัวน้อย, โรคมะเร็ง, โรคถุงลมโป่งพอง, ค่าการประเมินความรุนแรงของโรคค่อนข้างสูงได้แก่ APACHE-II และ SOFA score ใน 24 ชั่วโมงแรก หลังเข้ารับการรักษาในหออภิบาลผู้ป่วยภาวะวิกฤต, การตรวจพบความผิดปกติของภาพรังสีปอดและการใช้เครื่องช่วยหายใจอย่างมีความแตกต่างอย่างมีนัยสำคัญ ในส่วนของผลลัพธ์ที่เกิดขึ้นพบว่าผู้ป่วยกลุ่มที่เกิดภาวะโพรงเยื่อหุ้มปอดมีอากาศ มีอัตราเสียชีวิตในหออภิบาลผู้ป่วยวิกฤตทางศัลยกรรมคิดเป็น 28.0% เทียบกับ 9.6%, RR 2.9 (95% CI, 1.6-5.6, p = 0.002) และภายใน 28 วัน หลังเข้ารับการรักษาในโรงพยาบาลมากกว่าผู้ป่วยกลุ่มที่ไม่มีภาวะโพรงเยื่อหุ้มปอดมีอากาศคิดเป็น 44.0% เทียบกับ 13.6%, RR 3.2, (95% CI, 2.1-5.1), p<0.001.

สรุป: จากผลการศึกษาผู้ป่วยที่มีภาวะโพรงเยื่อหุ้มปอดมีอากาศ ขณะเข้ารับการรักษาในหออภิบาลผู้ป่วยภาวะวิกฤตทางศัลยกรรม พบว่ามีอัตราการเสียชีวิตในหออภิบาลผู้ป่วยวิกฤตทางศัลยกรรมและภายใน 28 วันหลังเข้ารับการรักษาในโรงพยาบาล มีค่าสูงกว่ากลุ่มผู้ป่วยที่ไม่มีภาวะโพรงเยื่อหุ้มปอดมีอากาศขณะเข้ารับการรักษา นอกจากนี้ยังพบว่าผู้ป่วยกลุ่มที่มีภาวะโพรงเยื่อหุ้มปอดมีอากาศขณะเข้ารับการรักษายังมีระยะเวลาการนอนรักษาตัวในหออภิบาลผู้ป่วยวิกฤตและโรงพยาบาลนานกว่า