The 1st Joint Scientific Congress of TSCCM, TSECCM, and JSICM

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Part 1. COVID-19 – how did we manage the onslaught in the ICU?

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1. Strategies of COVID-19 control in Taiwan

Kuang-Yao Yang

TBD

2. Ethical issues in COVID-19 pandemic

Asako Matsushima
Department of Emergency and Critical Care at Nagoya City University.

TBD

3. Prognostic analysis of patients with severe COVID-19 receiving mechanical ventilation with or without ECMO: An interim analysis of Japan national registry

Shinichiro Ohshimo
Japan ECMO net

Introduction: Coronavirus disease-19 (COVID-19) is a severe disease that may require mechanical respiratory support. The aim of this study was to evaluate the epidemiology and outcome of patients with severe COVID-19 receiving mechanical ventilation with/without extracorporeal membrane oxygenation (ECMO) in Japan.
Methods: We have developed a web-based national registry covering more than 80% of the intensive care units in Japan, and have been prospectively updating it throughout the coronavirus pandemic. This interim analysis evaluated epidemiology and prognostic factors in patients treated between February 2020 and September 2021. Survival was evaluated by Cox regression analysis.
Results: A total of 9688 patients were ventilated during the study period, of which 734 patients received concurrent ECMO. The overall survival rate of patients who received mechanical ventilation alone was 78%, and that of patients who received ECMO was 64%. The proportion of patients shifting from mechanical ventilation to ECMO decreased over time from 40% to 10%. During the study period, there were 4 outbreaks of COVID-19 in Japan. The overall survival rate improved over time from 71% to 80%. Older age (>59 years), longer ventilator days before starting ECMO (>2 days), and smaller number of ECMO experience at each hospital (<12 cases/overall) were the poor prognostic factors in patients with severe COVID-19 who underwent ECMO. In the multivariate analysis, older age (hazard ratio [HR], 2.8; 95% confidence interval [CI], 2.0-4.0; $p<0.001$) and longer ventilator days before starting ECMO (HR,1.7; 95%CI, 1.3-2.2; $p<0.001$) were the independent prognostic factors for overall mortality in patients with severe COVID-19 who underwent ECMO.
Conclusions: The outcome of patients with severe COVID-19 in Japan was better than global reports, with a trend toward improvement over time. Older age and longer ventilator days before starting ECMO were the independent prognostic factors in patients with severe COVID-19 who received ECMO.

4. Efficacy of National Early Warning Score on admission to predict severe status of COVID-19 Delta variant

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Introduction: It has been reported that National Early Warning Score (NEWS) on admission predicts the severity of COVID-19 with high accuracy. However, there is no report regarding Delta variant which emerged late and differed in a clinical course from the wild type. We specifically verified the prediction accuracy of NEWS on admission with Delta variant.

Methods: COVID-19 Delta variant patients' relevant individual clinical data were retrospectively collected from June to July 2021 at a hospital in Narita, Chiba prefecture. We scored NEWS and other clinical risk scores (qSOFA, CRB-65 and Kanagawa prefecture's triage score) for each patient. Severe status was defined as a composite measure of ventilatory management or death during hospitalization. We assessed the discriminatory ability of the continuous scale to predict severe status using receiver operating characteristic curve and the area under curve (AUC). AUCs of each clinical score were compared using DeLong's test. Sensitivity and specificity with recommended cut-off value were also calculated.

Results: A total of 65 patients were included (50.3±13.9 years, Male 70.8%, BMI 25.4±4.1 kg/m2). Of those, 5 patients were classified as severe. Discriminatory ability of NEWS (AUC 0.94, 95% CI 0.85-0.98) was superior to qSOFA (AUC 0.74, DeLong's test $p<0.01$) and CRB-65 (AUC 0.65, DeLong's test $p=0.01$). There was no significant difference between NEWS and Kanagawa prefecture's triage score (AUC 0.86, DeLong's test $p=0.46$). NEWS≧8 was recommended as a cut-off value in this study and predicted severe status with 80.0% sensitivity and 83.3% specificity.

Conclusion: NEWS on admission predicted the severity of COVID-19 Delta variant with high accuracy and was superior to other clinical risk scores. This study was a single center retrospective study; thus, the findings may not be generalizable. A multicenter study is needed to validate the usefulness of NEWS in the prediction of COVID-19 severity.

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Part 2. Non COVID-19 Hot Topics

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1. Should we prescribe fludrocortisone in combination with hydrocortisone for adults with septic shock?

Yen-Ta Huang

TBD

2. Japanese national ICU database, JIPAD

Hiroshi Okamoto

TBD

3. The Application of Quality Improve-ment program and Artificial Intelligence on the Impact of Patients with Unplanned-Extubation

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Introduction: It has been considered as an important quality indicator of care in the intensive care unit (ICU) among patients with mechanical ventilator (MV)experienced unplanned extubation (UE). The application of effective strategy may improve the quality of MV and prevent the further morbidity and mortality of patients associated with UE.
Objectives: A continuous quality improvement (CQI) concept had been promoted in reducing the incidence of UE since 2001 in a Medical center in Southern Taiwan.
Furthermore, we started to use big data and artificial intelligence (AI)/machine learning technologies to establish new predictive models of the optimal timing to MV weaning in 2020.
Methods
The CQI concept had initiated since year 2001 and was promoted in all 6 ICUs (96 beds) in Chi-Mei Medical center in southern Taiwan. The CQI concept, focusing on serial intervention tools including standardization of procedures, improvement of communication, revision of sedation and weaning protocols, changing strategy for physical restriction, establishment of task force for identification and management of high-risk patients, implementation of quality improvement models including Breakthrough Series (BTS) and Team Resource Management (TRM), was launched to reduce the incidence of UE in MV patients. The performance of AI also helped clinicians to shorten the MV duration.
Result
During a 20-year period, with the promotion of this CQI concept and AI program, the overall incidence rate of unplanned endotracheal extubation (defined as number of new UEs per total amount of MV patients during the same period) decreased gradually from 6.82% (188/2785) in 2001, 2.04% (58/2849) in 2010, and finally to 0.58% (13/2245) in 2020. With the intervention of AI in 2020, the MV time was shorter (153.5 hours vs. 172.0 hours), and a weaning rate was also better (96.5 vs. 95.7%) than those in 2019.
Conclusions: The integration of AI with CQI can effectively reduce the overall incidence of UE. We will apply the successful experiences to the other ICUs in our hospital, and may serve as a benchmarking for other hospitals in Taiwan.
Keywords: unplanned extubation, ventilator, quality improvement, artificial intelligence

4. Improving Lung Protection Implementation and Outcome Through a Real-time Visualized Data-driven Inter-professional Cooperation and Education

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Introduction:
Acute respiratory distress syndrome (ARDS) is a life-threatening disease. The mortality rate could even as high as 80% in the elderly patients. Fewer than two-thirds of patients were treated with a low tidal volume in the LUNG-SAFE study. Therefore, we use a visualized data-integrating panel to help interprofessional communication and timely application of lung protection.

Method:
All the staff were educated with ARDS diagnosis criteria and therapeutic protocol after interprofessional education. Besides, the interventional group used a real-time visualized panel to integrate information in clinical discussion and behavior monitor, including list of patients and their advanced life support devices in the intensive care unit (ICU), trend of hypoxemia and tidal volume (evaluated in milliliter per kilogram of predicted body weight [PBW]) in each patient, etc. We assessed the tidal volume (Vt) at 24 hours after fulfilled with ARDS diagnosis and the mortality in the ICU and hospital.

Result
The entire 137 patient cohort had a median (interquartile range) age of 68 (59-80) years and Acute Physiology and Chronic Health Evaluation II score of 31 (26-32), 75.2% with septic shock, and 44.5% with cancer. The base-line characteristics were similar in each group. In the interventional group, the tidal volume at 24 hours was significantly lower than usual group (7.2 ± 1.8 ml/kg vs. 8.0 ± 2.1 ml/kg, p=0.002), and the compliance of low tidal volume was higher than usual group (Vt/PBW≤8ml/kg, 72.8% vs. 60.7%, p=0.135; Vt/PBW≤7ml/kg, 55.6% vs. 35.7%, p=0.022). The analysis showed significant better survival in intervention group in the ICU (39.5% vs. 58.9%, p=0.025) and hospital (49.4% vs. 67.9%, p=0.032).

Conclusion
Among critically ill patients with ARDS in this study, the real-time visualized integrating panel improved the timely lung protection implementation and was associated with better survival. Visualized data-integration is a key issue in interprofessional communication and cooperation.

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Oral Session1　Respiratory and Others

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1-1

Evaluation of abnormal respiratory sound index using a continuous respiratory sound monitoring system in the use of supraglottic airway device

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Introduction

Auscultation of breath sound is an important tool for the diagnosis of respiratory abnormalities, but their evaluation is left to the listener and is not an objective measure. We have developed a continuous respiratory sound monitoring system to identify abnormal sounds in real time and investigated its usefulness especially in cases of general anesthesia using supraglottic airway devices (SGA).

Methods

Seventy orthopedic or plastic surgery patients who were scheduled to undergo general anesthesia with SGA and who consented to participate in this study were included in this study. Respiratory sounds were continuously recorded with 3 sensors attached to the neck and chests and abnormal breath sound index was calculated. The index was compared with other signs obtained by conventional respiratory monitors and respiratory abnormalities requiring interventions.

Results

The system was able to detect all abnormalities found in the conventional respiratory monitors (apnea, decreased minute volume, or arterial hypoxemia). Time to the detection for the abnormalities were quicker by 40-69 seconds. The average index was significantly increased from 43±26 in stable phase to 81±24 when the respiratory abnormality was detected. The index was decreased from 99±2 to 74±32 after SGA re-positioning.

Conclusion

A newly-developed respiratory sound index by the continuous respiratory sound monitoring system can objectively and immediately evaluate respiratory abnormalities during the use of supraglottic devices.

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1-2

The Exploration of Patients with Unplanned Extubation—the predictive factors of re-intubation and mortality

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Objectives: To explore the outcomes and prognostic factors of unplanned extubation (UE) among patients in 5 adult intensive care units (ICUs) in Chi Mei Medical Center.
Methods: We prospectively registered the UE patients and retrospectively reviewed the electrical medical records (EMR) in 96-beds ICUs between Jan 1, 2009 and Dec 31, 2020.Total 392 patients experienced UE, and 234 patients (59.7%) were ≧ 65 years (elderly group).
Results: There were 126 female patients (32.1%), and the mean age was 65.8 years (range: 18–101 years). The mean Acute Physiology and Chronic Health Evaluation (APACHE) II score was 17.7 and mean Glasgow coma scale score was 9.9. Two hundred and five patients (52.3%) were re-intubated within 48 h (failed UE), and seventy-five patients (19.1%) died during hospitalization. Compared with elderly group, the younger patients (< 65 years old) had a significantly lower mean ICU (13.6 vs. 16.9 days) and hospital stays (35.0 vs. 40.3 days), but similar hospital costs (54.3 vs. 47.7 X 10000 New Taiwan Dollars), failed UE (53.8% vs. 51.3%) and hospital mortality (18.4% vs. 19.7%). Multivariate analyses were performed to evaluate those factors predicting failed UE and mortality, and they showed higher positive end-expiratory pressure (PEEP) before extubation and admission APACHE II predicted failed UE, and higher fraction of inspiration O 2 (FiO 2) and minute ventilation (MV), lower hemoglobin (Hb), liver cirrhosis, cancer and failed UE were independently associated with hospital mortality.
Conclusions: Among UE patients, elderly patients group had higher ICU and hospital stays, but similar hospital expenditures. After adjusting for confounding factors, elderly patents were not associated with hospital mortality nor failed UE. Those who had higher APACHE II and PEEP were associated with failed UE. Higher FiO2 and MV, lower Hb, liver cirrhosis, cancer and failed UE—were associated with higher mortality in patients who underwent UE.
Key Words: unplanned extubation, outcome, mortality, re-intubation

1-3

Risk factors associated with peri-intubation cardiac arrest in the emergency department

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Introduction

Peri-intubation cardiac arrest (PICA) is an uncommon, serious complication following endotracheal intubation in the emergency department (ED). Although several risk factors were previously identified, this study aimed to identify more comprehensive risk factors associated with PICA.

Method

In this retrospective, nested case-control study from 1, January 2016, to 31 December, 2020., variables including demographic characteristics, triage and pre-intubation vital signs, medications, and laboratory data were analysed. Univariate analysis and multiple logistic regression model were used to compare clinical factors between the PICA group and controls.

Result

In total, 6983 patients were intubated during the study period, and 5130 patients met the inclusion criteria.: 92 patients (1.8%) met the criteria for PICA, and 276 patients were matched to the non-PICA group based on age and gender. We found that before intubation, systolic blood pressure (SBP; -13.65 ± 4.2) and diastolic blood pressure (DBP; -8.23 ± 2.78) were lower before $p < 0.01$ and $p < 0.01$, respectively) and shock index (0.01 ± 0.04) was higher among the PICA group ($p = 0.02$). Cardiogenic pulmonary edema as an indication for intubation (adjusted odds ratio [aOR]: 5.921, 95% confidence interval [CI] 1.044-33.57, $p = 0.04$), SBP < 90 mmHg before intubation (aOR: 5.217, 95% CI 1.484-18.34, $p = 0.01$), and elevated lactate level (aOR: 1.012, 95% CI 1.002-1.022, $p = 0.01$) were independent risk factors of PICA.

Conclusion

Patients with shock status before intubation have a higher risk of PICA in the ED. Future studies are needed to evaluate the influence of resuscitation before intubation and establish airway management strategies to avoid such serious complications.

1-4

Changes in brain allopregnanolone levels after abdominal surgery in rats—agerelated differences pertaining to postoperative delirium

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[Introduction]
Postoperative delirium is a common and serious complication in elderly patients that affects their long-term prognosis. Neuroinflammation has been reported as a pathogenic mechanism for postoperative delirium, however, there is no specific medication for treatment. Allopregnanolone (ALLO) is a neurosteroid with sedative and analgesic effects, approved for clinical use for postpartum depression in the United States. We have previously shown that ALLO can suppress neuroinflammation after abdominal surgery in aged rats. However, no study to date has focused on the age-related differences in ALLO brain levels. In this study, we compared the changes in ALLO concentration in the brain before and after abdominal surgery.
[Methods]
Adult and aged rats were randomly assigned to control and surgical groups (n = 8 per group). The surgical group underwent a laparotomy procedure, consisting of exposing the small intestine and manipulating it with the fingers for 3 min under general anesthesia, while the control group only received anesthesia. Brain tissue was removed 48 hours after surgery and ALLO levels were measured by radioimmunoassay. Statistical analysis consisted of one-way analysis of variance followed by Holm tests for post-hoc comparisons. $P<0.05$ was considered significant.
[Results]
In the adult group, there were no significant differences in brain ALLO levels between the control and surgical sub-groups. However, in the aged group, ALLO levels decreased significantly in the surgical group, compared to the controls. Notably, the ALLO concentrations in the brains of aged control rats were significantly lower than those of adult control rats.
[Conclusion]
The brain ALLO levels in aged rats is lower than in adult rats and is further significantly decreased after surgery. This result supports the findings of previous studies that ALLO suppresses neuroinflammation in the brain in aged rats.

1-5

Prognostic value of procalcitonin after elective non-cardiac surgery: a cohort study

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Introduction: Procalcitonin is a prognostic marker after elective cardiac surgery, but the prognostic value of procalcitonin after elective non-cardiac surgery remains unknown. We investigated whether procalcitonin is useful for predicting the risk of delayed complications after elective non-cardiac surgery.

Methods: A single-center, prospective, observational study was conducted studied. Serum procalcitonin concentrations were measured in the morning after surgery. All patients were screened for the occurrence of delayed complications (in-hospital death, intensive care unit readmission, or a prolonged hospital stay). We evaluated whether procalcitonin concentrations ≥ 0.5 ng/ml are useful for predicting the risk of delayed complications.

Results: Among 1913 patients with abdominal or thoracic surgery (men: 739 [38.6%], age: 56.8 ± 16.6 years), 173 developed delayed complications. procalcitonin concentrations were significantly higher in these 173 patients than in the remaining 1740 patients (0.14 [0.06, 0.34] vs. 0.27 [0.11, 0.78] ng/ml; $p<0.001$). We divided the patients into two groups using the normal cutoff level for procalcitonin (0.5 ng/ml). Patients with procalcitonin concentrations ≥ 0.5 mg/ml on the first postoperative day had a greatly increased risk of delayed complications (adjusted odds ratio, 2.23; 95% confidence interval, 1.56–3.19; $p<0.0001$).

Conclusions: In this study, a single measurement of procalcitonin appears to be a useful marker to identify patients at risk of all-cause delayed complications after non-cardiac surgery. Detection of procalcitonin concentrations ≥ 0.5 ng/ml in the morning after elective surgery with an uneventful postoperative course has an odds ratio of 2.23 for delayed complications.

1-6

Short Term Medical Needs for 921 Earthquake - A Nationwide Population Based Study in Taiwan

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Introduction

There were several times of earthquakes in Taiwan in recent years that induced lots of discussion after the quakes. Many things can be improved by the Department of Health for the acute and subacute phase reactions. But we need more data analysis to enhance more guidance for giving better medical care in different phases.

Method

By analyzing claims data from National Health Insurance Data Bank during 921 earthquakes, we may find out the medical needs for all the victims after the disasters.

Our research applied the CD files, OO files, DD files, DO files, and the hospital levels for analysis. For comparing the medical utilities before and after the quake, we use the mix model for adjusting all the variables, and analyze the results in different diseases.

Result

For the first week data, we recognize five major diagnoses are injury, respiratory and circulatory diseases, skeletomuscular and the gastrointestinal diseases. It could be better to dispatch surgeons and emergency doctors for the earthquakes.

During the subacute phase (to the ninth months after the earthquake), based on the literature review, we set up six diseases (including myocardial infarction, stroke, suicidal attempt, depression, pneumonia and asthma) for further research. We found all the six diseases increase the medical utility of medical services nine months after the quake. In a mix model, after adjusting all the variables, comparing nine months before and after the quake, the odds ratio for the six diseases are significantly higher (Depression:1.46, Suicidal attempt:1.61, Myocardia infaction:1.41, Stroke:1.22, Pneumonia:1.40, Asthma:1.46, $p<0.001$). Our research demonstrates the special medical needs short term after the quake. And our results could be useful for the health care planning for the next disaster.

1-7

Association of door to operation time with the prognosis in colorectal perforation.

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Introduction

Delay of a surgery start time for upper gastrointestinal perforation has been reported to be associated with increased mortality. However, the relationship between surgery start time and prognosis in colorectal perforation has not been fully investigated. Therefore, we investigated the relationship between door-to-operation time (DTOT) and prognosis in patients with colorectal perforation.

Methods

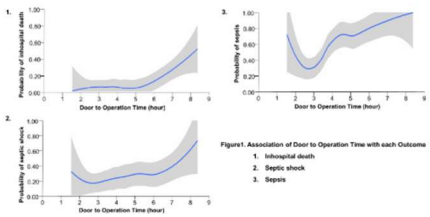
Patients with colorectal perforation admitted to the Shonan Kamakura General Hospital between April 2013 and May 2021 were included in the study. Inclusion criteria were patients who visited the hospital within 12 hours of the onset of abdominal pain, received antibiotics within 30 minutes of diagnosis, and were admitted to the ICU after surgery; patients referred from other hospitals were excluded. Outcomes were in-hospital death, septic shock, and sepsis, and the association with DTOT was examined using a logistic regression model. In multivariable analysis, we adjusted for age, gender, BMI, Charlson Comorbidity Index, and SOFA score at the time of visit.

Results

Among 114 patients with colorectal perforation, the median age was 72 years, and 58% were male; the sigmoid colon was the most common part (63%). The leading causes of the perforation were tumor (30%), diverticulum (32%), and fecal obstruction (9%). The median DTOT was 3.8 hours (quartile, 3.0-5.2 hours). The relationship between DTOT and outcome is shown in Figure 1. The adjusted odds ratios of death, septic shock, and sepsis for prolonged DTOT of 1 hour were 4.78 (95% CI 1.13-9.09), 1.36 (95% CI 0.91-2.13), and 2.23 (95% CI 1.55-3.44), respectively.

Conclusions

In colorectal perforation, increased DTOT was associated with a worse patient prognosis.



1-8

Non-susceptibilities to antibiotics against important Gram-negative bacteria, and imipenem-relebactam, meropenem-vaborbactam against carbapenem nonsusceptible Enterobacterales and Pseudomonas aeruginosa isolates implicated in complicated intra-abdominal and urinary tract infections in Taiwan, 2019

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Running title: Non-susceptibilities of imipenem-relebactam and meropenem-vaborbactam against GNB

Susceptibility of isolates of top-ranking Enterobacterales species and Pseudomonas aeruginosa implicated in complicated intra-abdominal infections (cIAI) and urinary tract infections (cUTI) to important antibiotics, including imipenem-relebactam (IMR) and meropenem-vaborbactam (MVB), in Taiwan in 2019 were evaluated. Minimum inhibitory concentrations (MICs) to various antibiotics were determined using broth microdilution method. Susceptibility results were interpreted mainly based on the MIC breakpoints of the CLSI 2021, but susceptibilities of IMR and MVB were interpreted based on the CLSI and EUCAST 2021. Resistance genes amongst carbapenem-non-susceptible (NS) Gram-negative bacteria (GNB) were investigated using multiplex PCR. Isolates of Escherichia coli (n=356), Klebsiella pneumoniae (n=165) and Enterobacter cloacae complex (n=42) accounted for 85.3% of the 660 Enterobacterales isolates. Non-susceptibility rates of imipenem (IPM), IMR against isolates of non-Morganellaceae Enterobacterales, and meropenem (MEM), MVB against all Enterobacterales isolates were 92.2%/94.8%, 98.4%-98.7%/98.4%-99%, 95%/98.2%, and 98.8%-100%/99.4%-100% for the cIAI/cUTI subgroups, respectively. Amongst the 40 IPM-NS-non-Morganellaceae Enterobacterales isolates, when the CLSI 2021 criteria were applied, ten were NS to IMR, and four K. pneumoniae isolates (harbouring bla KPC but neither bla MBL nor bla OXA-48 -like genes) were NS to IMR and MVB. Amongst the 93 P. aeruginosa isolates under evaluation, relebactam (4 mg/L) addition resulted in a 4-to-16-fold reduction in the MICs of IPM in all 15 IPM-NS-P. aeruginosa isolates (including 10 porin-deficient ones) not harbouring bla MBL /bla OXA-48 -like genes. Contrastingly, vaborbactam (8 mg/L) addition improved the non-susceptibility to MEM in only one (20%) of five IPM/MEM-NS P. aeruginosa isolates. Continuous monitoring of susceptibility to clinically important GNB is warranted.

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Oral Session2　COVID and Others

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2-1

Clinical implications of the targeted temperature management for the fever burden in aneurysmal subarachnoid hemorrhage

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Purpose:

Fever is an independent risk factor of poor outcome in aSAH (aneurysmal subarachnoid hemorrhage) patients in previous studies. In addition, the efficacy of targeted temperature management (TTM) on the fever burden needs more experimental results to validate. Therefore, the aim of this study is to evaluate the effectiveness of TTM on the fever control of patients with aSAH, and the neurologic outcome relative to the conventional method.

Materials and Methods:

This was a single-center, retrospective study. 53 patients diagnosed with aSAH admitted to our Neurosurgical Intensive Care Unit from January 2013 to December 2014 and January 2018 to December 1, 2019 were enrolled. TTM on normothermia (36.5° C-37.5° C) were used during 2018-2019 while conventional fever control (below 38.3° C) strategy was adopted during 2013-2014. We defined fever burden as time multiplied by extent of temperature more than 38° C (hour x ° C) and calculated since post-bleeding day to day 14.

Results:

TTM normothermia (TTM-N) group has significantly smaller fever burden in comparison with conventional fever control group. The amount of change about modified Rankin Scale between the first and the sixth months is much more in TTM- N group with initial image presentation of modified fisher grade 4 (P=.039). TTM-N group was associated with trend of lower early infarction rate but showed no difference in overall incidence cerebral infarction. There is no difference in the rates of infection, tracheostomy and other medical complication between the two groups.

Conclusion:

The implementation of the TTM-N was associated with smaller range of fever burden and significant improvement in the functional outcome and trend of lower early infarction rate than under conventional method. Aggressive fever control in the aSAH patients with TTM-N should be considered as a clinical management strategy in the neurocritical care unit.

2-2

Clinical characteristics of SARS-CoV-2 associated myocardial injury and fulminant myocarditis

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Introduction: SARS-CoV-2 and its vaccine have been reported to occasionally induce myocardial injury and/or myocarditis. We aimed to elucidate the characteristics of myocardial injuries associated with SARS-CoV-2 infection and vaccination.
Methods: We performed a single-center subanalysis of two prospective observational cohorts; cohort 1, severe COVID-19 cohort (2021/03-10); cohort 2, fulminant myocarditis cohort (2018-2021). Cohort 1 was used to analyze the clinical impact of myocardial injury (troponin T > 0.014 ng/mL at any point during ICU stay) in severe COVID-19, and cohort 2 was used to determine the association between clinical outcome of fulminant myocarditis and recent SARS-CoV-2 infection/vaccination. Longitudinal laboratory biomarkers were compared between groups with and without myocardial injury in cohort 1. Man- Whitney U test was used for the comparison of continuous variables.
Results: Among 53 mechanically ventilated COVID-19 in cohort 1, 30 patients (57%) developed myocardial injury. The presence of myocardial injury was associated with decreased 28-day ventilator-free days (VFDs) (median VFDs; 17 vs. 21 days, p=0.001). Patients with myocardial injury showed a significant surge in KL-6, BNP, D-dimer, and a significant reduction in complement C3 and platelet count, compared with those without myocardial injury. In cohort 2, 4 out of 26 cases (15%) of fulminant myocarditis had a history of SARS-CoV-2 infection/vaccination within 28 days. The episode of SARS-CoV-2 infection/ vaccination was associated with a favorable outcome (median 28-day mechanical-circulatory-support free days: 23 vs. 16 days, p=0.005).
Conclusions: Myocardial injury in COVID-19 is combined with pulmonary thrombotic microangiopathy probably triggered by alternative pathway activation in the complement cascade and may require prolonged ICU treatment. Recent SARS-CoV-2 infection/vaccination in patients with fulminant myocarditis is not rare and is associated with quicker resolution. Further discovery in their pathogenesis to develop a safer vaccine and/or phenotype-specific treatment strategies is warranted.

2-3

Repurposing the PICU for adult patients with COVID-19 in a Japanese women's and children's hospital: patient characteristics and outcomes.

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Introduction

In response to the shortage of adult ICU beds due to a pandemic of coronavirus disease 2019 (COVID-19), several hospitals in the world have repurposed their PICUs to care for critically ill adults with COVID-19. Similarly, at Osaka Women's and Children's Hospital in Japan, we admitted adult patients with COVID-19 who met certain acceptance criteria to the PICU from November 2020 to May 2021. The current study describes the characteristics and outcomes of the adult patients with COVID-19 admitted to the PICU.

Methods

Patients aged 20 years or older who were treated for COIVD-19 in the PICU from November 2020 to May 2021 were included in this study. Those who receive primary care in our hospital without the transition to adult service systems were excluded. We reviewed the medical records for patient characteristics, clinical courses, and outcomes. The data were presented as medians with interquartile ranges.

Results

Ten patients were included in the study. The age and BMI were 60 [48 – 69] an 24.9 [23.5 – 26.2], respectively. The APACHE II score was 11 [8.3 – 11]. All patients received mechanical ventilation with the P/F ratio and the respiratory system compliance at the start of mechanical ventilation in the PICU being 201.5 [171.6 – 225.0] and 27.9 [21.2 – 32.0] mL/cmH 2 O, respectively. We regarded an obese postpartum patient as high risk of exacerbation and complications, and therefore transferred her to the adult ICU of another tertiary hospital the day after intubation. In the remaining 9 patients, the durations of mechanical ventilation and PICU stay were 6 [6 – 7] days and 8 [7 – 11] days, respectively. All 10 patients were successfully extubated.

Conclusion

The results suggest that PICUs can provide intensive care of sufficient quality for critically ill adults if they are carefully selected.

2-4

Severe Critical Illness Polyneuropathy after ECMO Therapy in a COVID-19 Patient: A Case Report

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[Introduction]

Patients with severe COVID-19 are at risk of developing neurological complications involving both the central and peripheral nervous systems. Also, critically ill patients who require mechanical ventilation and other intensive treatments often develop critical polyneuropathy (CIP) and/or myopathy, causing ICU-acquired weakness (ICU-AW). We experienced a patient with severe ICU-AW after treatment by extracorporeal membrane oxygenation (ECMO) due to ARDS caused by COVID-19.

[Case Report]

A previously healthy 46-year-old man (174 cm, 111 kg) was admitted with high fever due to COVID-19. He developed severe ARDS, and mechanical ventilation, ECMO, pulse steroid therapy, and continuous hemodiafiltration were administered. After being weaned from ECMO, he was transferred to our hospital. He was alert, but quadriplegic (MRC score of 18) with rectal incontinence due to significantly decreased rectal sphincter tone. He also suffered from cytomegalovirus enteritis and Candida sepsis. Vigorous rehabilitation intervention was implemented. He was weaned from mechanical ventilation and the tracheostomy tube was removed, but he remains in paresis with an MRC score of 33 four months after COVID-19 infection. Neurological examination revealed peripheral nerve damage predominantly in motor nervous system and massive muscle atrophy in the lower limbs. Spinal MRI showed no abnormality responsible for the quadriplegia. Electrophysiological examinations demonstrated an absence of compound motor action potentials accompanied by reduced sensory nerve action potentials in the lower legs, indicated severe axonal degeneration.

[Conclusion]

We experienced a patient who developed severe CIP after treatment by ECMO due to COVID-19. Possible factors that contributed to the neurological impairment include severe inflammation, pharmacotherapy (muscle relaxant, steroid, vasopressor), immobilization, hypoxia and renal replacement therapy, in addition to any neuro-invasive and/or neurotropic properties that SARS-CoV-2 may possess. Physicians should be aware of this serious potential complication of COVID-19, and gather more case data so that effective preventative measures and/or treatment can be developed.

2-5

A case of successful management of thyroid storm in a patient with β-human chorionic gonadotropin (β-hCG) secreting choriocarcinoma

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Background: We present a case of thyroid storm in a patient with choriocarcinoma with a remarkably high β-hCG level. β-hCG has structural homology with thyroid- stimulating hormone (TSH). β-hCG-secreting tumors rarely develop thyroid storm.

Case presentation: A woman in her 40s with diffuse alveolar hemorrhage was admitted to the ICU. She subsequently required endotracheal intubation and mechanical ventilation. Before ICU admission, she was diagnosed with choriocarcinoma with an unknown origin which had metastasized to the lung, the brain, and a kidney. Choriocarcinoma syndrome was suspected, and chemotherapy with cisplatin plus etoposide was given as per the oncologist on the second day of ICU. However, the alveolar hemorrhage worsened two days later. She also developed tachycardia, fever, and high-output heart failure with a remarkably high β-hCG level (2,140,535 mIU/ml). Physical examination and diagnostic imaging on the thyroid were unremarkable. Thyroid function tests showed a suppressed TSH level, high free- triiodothyronine level, free-thyroxine level, and negative thyrotropin receptor auto- antibody. She met the "definite thyroid storm" criteria defined by the Japan Thyroid Association. Thiamazole, iodine solution, corticosteroid, landilol and bisoprolol were initiated. However, her conditions were refractory to that therapy. Subsequently, the second dose of cisplatin plus etoposide was given as per the oncologist on the seventh day of ICU. The next day, alveolar hemorrhage improved, and the symptoms of thyroid storm became under control with a β-hCG level of 714,759 mIU/ml. She was successfully extubated on the tenth day of ICU and discharged to the ward on the following day.

Conclusion: β-hCG-producing choriocarcinoma is a rare cause of thyroid storm. Anti- tumor chemotherapy in conjunction with standard therapy appeared to effectively treat the condition in our case.

2-6

Elder patients more suffer from severe chest and abdominal injuries due to cardiopulmonary resuscitation than youngers

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Introduction: Cardiopulmonary resuscitation (CPR) is sometimes associated with chest or abdominal injuries. This seemed more likely to occur in the elderly. In the present study, we compared the prevalence and severity of CPR-induced injuries between patients younger than 65 years old (younger group) and those older than 65 years old (elder group).

Methods: This was a retrospective forensic autopsy study in a single institution. Of 885 forensic autopsies performed between 2011 and 2018, 115 patients suffering from cardiopulmonary resuscitation immediately after cardiac arrest were reviewed. Fifty-nine patients had any chest or abdominal injuries, of which 52 were older than 15 years. We divided them as younger (18 patients) and elder (34 patients) groups.

Results: Among younger group, 14 patients had rib fractures (77.8%), sternal fractures in 8 (38.9%), three or more rib fractures in 7 (44.4%), intrathoracic injuries in 6 (33.3%), and cardiac injuries in 6 (33.3%). Among elder group, 31 patients had rib fractures (91.2%), three or more rib fractures in 28 (82.4%), sternal fractures in 20 (58.8%), intrathoracic injuries in 14 (41.2%), and cardiac injuries in 10 (29.4%). Maximum Abbreviated Injury Scale (AIS) of the patients were significantly lower in younger group than in elder group (median of 2 [2-3] vs. 3 [3-3]; P=0.004).

Conclusion: Cardiopulmonary resuscitation of the elderly is likely to cause more severe chest or abdominal injuries.

2-7

The non-linearity association between the time to cooling and one-monthfavorable neurological survival after out-of-hospital cardiac arrests that wereperformed under the targeted temperature management

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Introduction: The latest guidelines from the International Liaison Committee on Resuscitation have no concrete protocol on targeted temperature management (TTM) after out-of-hospital cardiac arrest (OHCA). This study aimed to identify the appropriate time from introduction of TTM to its' reached target temperature, using the Comprehensive Registry of Intensive Care for OHCA Survival (CRITICAL) study.
Methods: This was a multicenter cohort study. We registered all consecutive OHCA patients in Osaka, Japan who, from 1 July 2012 through 31 December 2017, were transported to institutions participating in CRITICAL study. We included OHCA patients aged at least 18 years, with cardiac etiology, and who received TTM after resuscitation from emergency medical services'; personnel and medical professionals in hospitals. Primary outcome was to determine whether the time from introduction of TTM to its' reached target temperature predicts one-month favorable neurological survival which was designated according to a cerebral performance category scale of 1 or 2. A non-linear multivariable logistic regression analysis was made to assess the primary outcome, adjusting several factors: patient's age; sex; witness status; performed cardiopulmonary resuscitation by bystanders; first documented cardiac rhythm; target temperature of TTM; temperature at the introduction of TTM.
Results: Among 12,594 patients, we analyzed 483 patients. Our non-linear multivariable logistic regression analysis showed probabilities of one-month favorable neurological survival going up until reaching the peak point and then going down. In the peak of probabilities of one-month favorable neurological survival, the time from introduction of TTM to its' reached target temperature was 295 minutes. We found p for non-linearity to be less than 0.01 in the non- linear multivariable logistic regression analysis.
Conclusion: By applying non-linear multivariable logistic regression analysis, the peak of one-month favorable neurological survival was 295 minutes after the introduction of TTM.

2-8

Weekend versus weekday hospitalization and clinical outcomes in atrial fibrillation patients with and without stroke-Novel messages for intensivist

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Purpose: The relation between hospitalization timing and risk of clinical outcomes among AF patients with and without stroke remained undetermined.

Methods: Re-hospitalization due to AF, cardiovascular (CV) death and all-cause mortality were the outcomes of interest in this study. Multivariable Cox proportional hazard model was applied to estimate the adjusted hazard ratio (aHR) and 95% confidence interval (CI).

Results: While considering AF patients without stroke and hospitalized during weekdays as the reference group, AF patients with stroke and hospitalized during weekends had the risk of AF re-hospitalization, CV death and all-cause death by 1.47 (95% CI=1.43, 1.50), 1.70 (95%CI=1.63, 1.77) and 1.16 (95%CI=1.14, 1.18) times, respectively.

Conclusion: Subjects with AF with stroke and hospitalized during weekends had the worst clinical outcomes.

Key words: Atrial fibrillation, Stroke, Weekday, Weekend Running title: Hospitalization timing and outcomes in AF patients with/without stroke