Risk factors for nosocomial lower respiratory tract infections in acute respiratory distress syndrome associated with influenza.

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Abstract:
The morbidity and mortality rates for patients suffering from severe influenza-related acute respiratory distress syndrome (ARDS) are high. Additionally, nosocomial lower respiratory tract infections (NLRTI) make clinical management more difficult and may even make their results worse. Examining the clinical characteristics and effects of NLRTI in patients with severe influenza-related acute respiratory distress syndrome was the goal of this study.
Methods: This retrospective observational study was approved by the institutional review board and was carried out in eight Taiwanese medical centers. Participants were recruited from intensive care units (ICUs) with influenza pneumonia that was virology-proven between January 1 and March 31, 2016. All ARDS patients who needed invasive mechanical ventilation but did not have bacterial community-acquired pneumonia (CAP) were also examined. Clinical outcomes, critical illness data, and baseline characteristics were documented.
In conclusion, we discovered that NLRTI in influenza-related ARDS is independently predicted by the use of immunosuppressants prior to influenza infection, ECMO use, and higher steroid dosage following ARDS. Additionally, patients with severe influenza who have NLRTI have worse outcomes.
Keywords: acute respiratory distress syndrome, influenza, mortality, nosocomial lower respiratory tract infection.

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Introduction:

When influenza patients have bacterial co-infection, their clinical course and outcome deteriorate. 95.8% of the lung cultures tested positive for bacteria, and postmortem examination of histopathological samples taken during the 1918 Spanish pandemic influenza showed typical signs of acute bacterial pneumonia. 18–34% of patients admitted to intensive care units (ICUs) during the 2009 global pandemic H1N1 influenza A virus infection experienced bacterial coinfection, and their in-hospital mortality rate reached 30.9% (Morens, 2008).

In addition to extending hospital stays, ventilator-associated pneumonia (VAP) and hospital-acquired pneumonia significantly increase the use of health care resources. According to a meta-analysis, VAP lengthened hospital and intensive care unit stays by 11.5 and 8.7 days,

respectively. Gram-negative bacteria (GNB), including Pseudomonas aeruginosa, Acinetobacter baumannii, and Stenotrophomonas maltophilia, accounted for 47% of the isolated pathogens in patients with acute respiratory failure who developed subsequent VAP. The most frequently found pathogens were GNB, such as A. baumannii and aeruginosa, and 26% of patients with influenza pneumonia and acute respiratory failure went on to develop VAP (Estenssoro , 2010).

However, little information is currently available regarding the clinical impact of nosocomial lower respiratory tract infections (NLRTI) and severe influenza infections in patients. Determining the clinical features, risk factors, and outcomes of patients with severe influenza-related acute respiratory distress syndrome (ARDS) who also had NLRTI was the goal of the current study.

The Clinical Characteristics of NLRTI in severe influenza- related ARDS:

Investigating the clinical characteristics of NLRTI in severe influenza- related ARDS was the goal of this study. NLRTI was predicted by immunosuppressant use prior to influenza infection, ECMO use following ARDS, and higher steroid dosage following influenza-related ARDS, according to multivariate regression analysis. Additionally, we discovered that patients with NLRTI had worse outcomes, such as increased mortality, longer hospital and intensive care unit stays, and longer periods of mechanical ventilation. As far as we are aware, this is the first study to list the risk factors for NLRTI in cases of severe influenza-related acute respiratory distress syndrome. The prevalence of nosocomial infections in patients with severe influenza has not been extensively studied to date. According to a report on the 2009 H1N1 pandemic in Argentina, 26% of patients developed VAP and 25% of patients had pneumonia at admission. The VAP group had a 45.2% mortality rate. In a similar vein, our multicenter data revealed that the in-hospital mortality rate for influenza-related ARDS was 47.2% and that 28.8% of patients had NLRTI (Kumar, 2009).

Risk factors:

There are a number of known risk factors for bacterial co-infection in influenza patients. Bacterial coinfection was more likely to occur in elderly patients (over 65), preschoolers, pregnant women, patients with obesity, cardiovascular disorders, chronic pulmonary diseases, hepatic

dysfunction, renal insufficiency, diabetes, and immunocompromised status. Older patients with higher APACHE II and SOFA scores were more likely to experience bacterial coinfection during the 2009 H1N1 influenza pandemic in Spain. Additionally, we observed that the use of immunosuppressants prior to influenza infection raised the risk of NLRTI in our cohort (Martin, 2009).

Pneumonia and other infections in patients:

Among patients on ECMO, the incidence of VAP varied from 15.8% to 74%. In patients undergoing heart transplantation, ECMO was a risk factor in and of itself for pneumonia and other infections. The reduced monocyte response to infections brought on by extracorporeal support may be the mechanism behind infection linked to ECMO. Longer ECMO duration and higher mortality were among the effects of VAP on ECMO patients. The association between ECMO and NLRTI in patients with severe influenza-related ARDS was first demonstrated in our study (Rice, 2012).

Glucocorticoid adjunctive therapy was detrimental to influenza patients, according to a meta-analysis. In influenza patients, steroid use was linked to a higher risk of death (OR, 3.06; 95% CI, 1.58–5.92). Experiences treating H1N1 influenza-related ARDS showed that early corticosteroid use is strongly associated with mortality, despite the fact that no randomized trials have yet evaluated the effect of glucocorticoids on influenza-related ARDS. Steroid-using patients tended to require mechanical ventilation for longer periods of time and experienced nosocomial pneumonia more frequently. In our research, we also discovered that patients who received higher steroid dosages following influenza-related ARDS had a higher risk of developing NLRTI (Muscedere, 2010).

Nosocomial infection and community-acquired bacterial co-infection are caused by different pathogens. The most frequent bacteria found in a community setting were Staphylococcus aureus, P. aeruginosa, and Streptococcus pneumoniae. On the other hand, A. baumannii and P. aeruginosa were the most common causative organisms in patients with severe influenza who developed subsequent VAP. A. baumannii was the most frequently detected microorganism in our patients and was isolated from 29 respiratory specimens obtained from our NLRTI group.

Interestingly, almost every isolated A. baumannii bacterium in our series exhibited carbapenem resistance. When prescribing appropriate empirical antibiotics to patients in the NLRTI group, this presents a significant challenge for our clinicians (Force, 2012).

Recommendations:

- First, some medical data may be missing because this was a retrospective cohort study. For instance, our cohort's comparatively low percentage of sedative use was a result of incomplete medication records. Antipsychotics or painkillers may be used to treat certain patients.
- Second, it's still unclear how common nosocomial pneumonia really is. It was challenging to confirm hospital-acquired pneumonia because this study was retrospective in nature. In our cohort, quantitative cultures from respiratory specimens were not entirely accessible. Nonetheless, NLRTI may act as a stand-in for physicians in order to help them identify patients who are at a high risk of contracting a bacterial infection and to better understand the course of severe influenza.
- Third, even though the focus of our study was bacterial NLRTI, new opportunistic infections like those brought on by Aspergillus or Candida should also be taken into account, and early detection and treatment ought to be required.
- Fourth, it was impossible to determine whether the steroid treatment given to some patients during their hospital stay was for ARDS or for other purposes.
- Fifth, different study sites may have different approaches to managing influenza-related acute respiratory distress syndrome.
- Lastly, it is unclear if the findings of our study can be extrapolated to patients with less severe influenza because it focused on patients with influenza-related ARDS who needed invasive mechanical ventilation. A carefully planned prospective clinical study is required to learn more about nosocomial bacterial infections.

Conclusion:

According to this study, NLRTI in influenza-related ARDS is independently predicted by the use of immunosuppressants prior to influenza infection, ECMO use, and higher steroid dosage following influenza-related ARDS. Additionally, patients with severe influenza who have NLRTI have worse outcomes.

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