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Original Article

Use of corticosteroids in acute respiratory distress syndrome: Perspective from an Indian intensive care unit

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ARTICLE INFO

Article history:

Received 9 December 2015

Accepted 23 October 2016

Available online xxx

Keywords:

Acute respiratory distress syndrome

Corticosteroids

Sepsis

Mortality

Intensive care unit

ABSTRACT

Background: Acute respiratory distress syndrome (ARDS) causes overwhelming inflammation, which serves as a potential target for corticosteroids. Despite extensive Western literature, there are no Indian studies evaluating steroids in ARDS.

Methods: This was a retrospective study at an Indian intensive care unit (ICU) on ARDS patients. Demographic, clinical, laboratory, and imaging parameters were collected. Patients were divided into cohorts based on steroid use, and some received high-dose (2 mg/kg/day), whereas others received low-dose (1 mg/kg/day) steroids. Primary outcomes were in-hospital mortality and secondary outcomes included need for and duration of invasive mechanical ventilation (IMV), IMV-free days, ICU length of stay (LOS), and total LOS. Two-tailed $p < 0.05$ was considered statistically significant.

Results: During the 20-month period, 95 patients [median age 37 (30–47) years; 48 (50.5%) males] met our inclusion criteria. Steroid use was noted in 48 (50.5%) patients [11 (22.9%) low-dose and 37 (77.1%) high-dose]. Baseline characteristics of the cohorts, including ARDS severity indices, were comparable. Of these 95 patients, 70 (73.7%) had sepsis, but microbiological diagnosis was positive only in 17 (17.9%) patients. Steroid use did not significantly influence mortality [odds ratio (OR) 0.6 (0.3–1.4)] or need for IMV [OR 1.0 (0.4–2.6)]. There were no differences in outcomes of IMV-free days, ICU LOS, or total LOS. These outcomes were comparable between the high-dose and low-dose steroid users.

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<http://dx.doi.org/10.1016/j.mjafi.2016.10.012>

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Conclusions: Steroid use and comparison of low-dose vs. high-dose steroids did not influence outcomes associated with ARDS in the Indian population.

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Introduction

Acute respiratory distress syndrome (ARDS) is characterized by inflammatory injury of the lungs progressing through early exudative phase, fibroproliferative phase, and late fibrotic phase.¹ The evolution of this systemic and pulmonary inflammation serves as a determinant of outcomes in the disease process.² Clinically, ARDS has a high-mortality rate of 40–60%, and multiple studies have evaluated newer targets for therapy for this life-threatening disease process.^{2,3} Glucocorticoids gained prominence as a therapeutic strategy in the late 1990s⁴ following which the National Heart, Lung and Blood Institute (NHLBI) ARDS Clinical Trials Network conducted a randomized controlled trial in 2006,⁵ which did not demonstrate efficacy in ARDS.

Over the last 10 years since the publication of the NHLBI study, there has been a renewed interest in corticosteroids with multiple studies and meta-analysis published in literature.^{1–3,6–9} However, there are no documented studies in the Indian population evaluating the efficacy of this group of medications. The Indian ARDS population^{10,11} is clinically distinct from reports published by our Western colleagues prompting us to evaluate the role of corticosteroids in ARDS in an Indian intensive care unit (ICU).

Material and methods

This was a retrospective cohort study at the medical ICU of a tertiary care academic medical center in southern India from September 2006 to April 2008. The procedures followed were in accordance with the ethics standards as detailed in the Helsinki Declaration. The Institutional Ethics Committee permission was sought and obtained for this study. All patients who met the inclusion criteria of ARDS as per the revised American/European consensus statement,¹² including (a) acute onset, (b) bilateral infiltrates on chest radiography, (c) Carrico index or P/F ratio [ratio of partial pressure of arterial oxygen (PaO₂) and fraction of inspired oxygen (FiO₂)] ≤ 200 , and (d) absence of clinical signs of left atrial hypertension, left heart failure, or pulmonary capillary wedge pressure < 18 mmHg (if pulmonary artery catheter is present in situ), were included in our study. Patients with significant underlying lung disease, age < 16 years, active pregnancy, and those discharged against medical advice were excluded from our study. Patient details related to the index admission were collected, including demographic information, comorbidities, clinical data, laboratory parameters, and imaging studies, and were assessed. Severity of illness was measured using Acute Physiology and Chronic Health Evaluation 2 (APACHE-2) score, and presence of sepsis was documented using the American College of Chest Physicians/Society

of Critical Care Medicine consensus definition¹³ on the day of ARDS onset. Patients were retrospectively followed for the duration of their hospital stay and treatment regimens, including sources of infection, microbiological etiology, antimicrobial use, and invasive mechanical ventilation (IMV), were documented. Methylprednisolone use was divided into low-dose and high-dose categories defined as 1 mg/kg/day and 2 mg/kg/day respectively for 3–5 days followed by tapering over 48 h. Steroids were initiated within 72 h of ARDS diagnosis during the hospital stay. We assessed the role of steroid therapy and low- vs. high-dose of steroids on the primary outcome of in-hospital mortality. Secondary outcomes assessed included need for IMV, duration of IMV, IMV-free days, ICU length of stay (LOS), ICU-free days, and total LOS.

Statistical analysis

Statistical analysis was performed with JMP version 9.0.1 (SAS Institute, Cary, NC). Descriptive data are detailed as median \pm interquartile range (IQR) or number (percentage). Chi-square test or Fisher's exact test was used to compare categorical variables, and unpaired t-test or Mann-Whitney U test was used for continuous variables. Outcomes are presented as odds ratio (OR) with 95% confidence interval (CI) for categorical variables. Multiple regression analysis was performed for dependent variable of in-hospital mortality. Independent variables of age, gender, APACHE-2 score, and P/F ratio were selected after univariate and correlational analysis. OR with their corresponding 95% CI was used to report categorical variables in univariate and multiple analyses. Two-tailed p-value of < 0.05 was considered statistically significant.

Results

During the period between September 2006 and April 2008, 95 patients with ARDS were admitted to the ICU with median age of 37 (30–47) years and 48 (50.5%) males. Of the 95 patients, corticosteroids were administered to 48 (50.5%) patients of whom 11 (22.9%) received low-dose and 37 (77.1%) high-dose therapy. Baseline patient characteristics between steroid users and non-users were not significantly different (Table 1). Baseline characteristics were not different within the steroid group between low- and high-dose steroid users (not detailed). Only 60 (63.2%) had an obvious etiology for the ARDS as follows: leptospirosis 15 (15.7%), dengue 14 (14.6%), community-acquired pneumonia 11 (11.5%), and falciparum and mixed malaria 8 (8.4%). Minor causes included pancreatitis, drowning, organophosphate poisoning, cholangitis [2 patients (2.1%) each] and Fournier's gangrene, postpartum intra-abdominal infection, appendicular abscess rupture/peritonitis, and femoral venous catheter tip infection [1 patient (1.1%) each].

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