Measles Pneumonia

Treatment of a Near-Fatal Case With Corticosteroids and Vitamin A

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A 29-year-old woman experienced overwhelming rubeola pneumonia requiring endotracheal intubation and mechanical ventilation. Treatment with high-dose corticosteroids and vitamin A was accompanied by a prompt clinical response. Further investigation of this novel therapy is needed.

ELISA = enzyme-linked immunosorbent assay

Although severe pneumonia is an uncommon complication of measles, when it occurs it is serious, accounting for 60 percent of the mortality from this disease.1 Due to the increasing incidence of measles in the United States, in both unvaccinated children and inadequately vaccinated juveniles and adults, clinicians can expect to see increased numbers of patients with rubeola pneumonia. Currently, there is no treatment proven to be effective for this disease. We report a case of severe measles pneumonia treated successfully with high-dose corticosteroids and vitamin A.

CASE REPORT

A 29-year-old woman presented with complaints of fever, cough, myalgias, malaise, nausea, and vomiting of 5 days' duration. Approximately 2 days prior to presentation, she noted the development of a maculopapular rash on her face and torso. A viral exanthem was diagnosed and a skin biopsy was performed, the results of which were consistent with a viral exanthem of unknown etiology. Serologic studies for rubeola were obtained, and the patient was instructed to return home for convalescence. However, over the ensuing 48 h, increasing dyspnea developed and she presented to the emergency department in respiratory distress.

Physical examination on hospital admission revealed a toxic-appearing woman with a temperature of 40°C, pulse rate of 148/min, blood pressure of 110/70 mm Hg, and respiratory rate of 34/min. A maculopapular rash was noted on her face and chest. There were no Koplik's spots noted. Chest examination revealed clear breath sounds with poor inspiratory effort.

Laboratory studies revealed a hemoglobin value of 11.7 g/dl and a white blood cell count of 14,200/mm³ with 80 percent neutrophils, 10 percent lymphocytes, and 10 percent monocytes. Room-air arterial blood gases were PO₂ of 41 mm Hg, PCO₂ of 39 mm Hg, and a pH of 7.44. A chest roentgenogram demonstrated bilateral dense interstitial infiltrates (Fig 1). Sputum Gram stain revealed many polymorphonuclear leukocytes with a paucity of bacterial organisms.

The patient underwent endotracheal intubation and mechanical ventilation with a FiO₂ of 100 percent and 17 cm H₂O of positive end-expiratory pressure (PEEP). Empiric therapy with erythromycin, ceftriaxone, and trimethoprim-sulfamethoxazole was initiated. Sputum stains and cultures were negative for bacterial, fungal, and mycobacterial pathogens. Tests for cold agglutinins, hepatitis A and B serology, antinuclear antibodies, and rheumatoid factor were negative. Complement levels were also normal. An enzyme-linked immunosorbent assay (ELISA) for antibodies to human immunodeficiency virus was negative. Serologic studies using the hemagglutination inhibition assay revealed a rubeola IgM titer of 1:40 and acute and convalescent serum revealed a fourfold rise in rubeola IgG titer from 1:64 to 1:256.

Despite 48 h of maximal supportive therapy, the patient's respiratory status failed to improve. One gram of methylprednisolone was administered intravenously on hospital days 3 and 4 with a tapering dose thereafter. A serum retinol level, determined by high-pressure liquid chromatography (American Medical Laboratories, Fairfax, Va) revealed an abnormally low value of 184 μg/L (normal range, 300 to 750 μg/L), and 200,000 U of vitamin A was administered orally on hospital days 5 and 6. Prior to therapy, on hospital day 3, arterial blood gases were PO₂ of 110 mm Hg, PCO₂ of 37 mm Hg, and a pH of 7.49 while requiring a FiO₂ of 100 percent and 17 cm H₂O of PEEP. By hospital day 7, 2 days after administering vitamin A, the patient's respiratory status and chest radiograph had markedly improved. Her arterial blood gases on an FiO₂ of 40 percent and 8 cm H₂O of PEEP were PO₂ of 80 mm Hg, PCO₂ of 35 mm Hg, and a pH of 7.52. Over the ensuing 3 days, she was weaned from the ventilator and was extubated on hospital day 10. The patient was discharged from the hospital on day 15.

DISCUSSION

This case represents a severe complication of measles. The patient presented with a constellation of clinical signs and symptoms typical of rubeola. The diagnosis was confirmed serologically.

The patient was born in 1962, and she reported being vaccinated for rubeola. Records regarding the type of vaccine and site of inoculation were unfortunately destroyed. Thus, if she received vaccine, this case represents either primary vaccine failure, in which the vaccine failed to produce protective immunity, or secondary failure, in which immu-

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Figure 1. Chest roentgenogram demonstrating diffuse interstitial infiltrates.
nity waned over time. In addition, she may have received killed vaccine, which has been associated with atypical and more severe measles. The currently used live-attenuated vaccine is associated with a primary failure rate of 1 to 5 percent and a secondary failure rate of 5 to 10 percent.

Despite aggressive supportive care, the patient's alveolar-arterial gradient remained markedly elevated, and treatment with corticosteroids and vitamin A was initiated. The patient's clinical and radiographic recovery was temporarily related to the therapy. To the best of our knowledge, this represents the first case of measles pneumonia treated with this combination of agents.

The United States is currently in the midst of a measles epidemic. Since 1983, when the incidence of measles reached an all-time low, there has been a steady increase in the number of cases. In 1990, there were 27,672 cases of rubeola reported to the Centers for Disease Control, representing a 52.1 percent increase over the previous year.6

Pneumonia complicates 3.8 percent of measles cases in the United States, although in foreign countries, the incidence has been reported to be as high as 50 percent. Clinically, these patients experience high fever, hypoxemia, and have normal white blood cell counts. The chest roentgenogram may demonstrate multifocal reticulonodular infiltrates. Pathologically, multinucleated giant cells may be seen within the alveoli and have been reported in the sputum. Treatment has been strictly supportive, and no proven effective agents have been described.

Vitamin A was first suggested to have a salutary effect on measles infection more than 50 years ago.7 Since then, a number of studies in children have supported this conclusion.4,8 Measles is known to depress serum levels of vitamin A, and it has been observed that vitamin A deficiency is associated with an increase in frequency, severity, and mortality of a variety of infectious diseases.9 Although not proven, it is assumed the effect of vitamin A is mediated by its action on epithelial cell maturation. Based on this supportive evidence, the low pretreatment vitamin A level, and the lack of significant toxicity, treatment with vitamin A was initiated.

There is precedent for treating severe nonbacterial pulmonary processes with corticosteroids, including use in overwhelming tuberculosis, 4 gastric aspiration, 10 diffuse vasculitis,10 and most recently, pneumonia due to Pneumocystis carinii in patients with AIDS.11 The ability of corticosteroids to improve pulmonary function following an inflammatory insult may be related to several mechanisms. Steroids inhibit the release of arachidonic acid,12 and ameliorate complement-induced granulocyte aggregation.13 Corticosteroids have also been shown to reduce neutrophil adherence to epithelial cells,14 alter the release of chemotactic factors,15 and reduce the bactericidal capacity of monocytes.16 In addition to influencing the inflammatory response, corticosteroids alter pulmonary hemodynamics. Toung et al.,17 demonstrated that large doses of corticosteroids blocked increased pulmonary artery pressure, mean airway pressure, and pulmonary vascular shunting, observed in the canine model of massive gastric aspiration. Thus, corticosteroids exert their marked anti-inflammatory effects by decreasing the availability of host effector cells, interfering with their cellular function when they reach the inflammatory site, and suppressing the noncellular aspects of the inflammatory response.

CONCLUSION

In summary, we report a case of severe rubeola pneumonia that was successfully treated with a combination of corticosteroids, vitamin A, and supportive therapy. Although anecdotal, the prompt clinical response this patient experienced in temporal relation to this therapy should lead to further investigation of the possible beneficial effects of these agents on the course of measles pneumonia.

REFERENCES