Immunogenicity of Pneumococcal Vaccine in Persons with Spinal Cord Injury

by

Ken Waites, M.D.

Individuals with spinal cord injury (SCI) are pre-disposed to develop pneumonia because of respiratory muscle paralysis and loss of neural control mechanisms. In fact, respiratory complications have now replaced urinary tract disease as the most common cause of death following SCI, and pneumonia is the leading cause of death at any time following spinal cord injury. Respiratory complications also have an important impact because of the excessive cost of care and the loss in individual productivity. Thus, prevention and proper treatment of respiratory complications in individuals with SCI are major challenges to the clinicians to reduce morbidity and mortality.

Specifically, Streptococcus pneumoniae is the most common cause of community-acquired pneumonia in the general population and accounts for more deaths than any other vaccine-preventable bacterial disease. This is extremely significant, especially in view of the availability of an effective vaccine that protects almost 90% of the strains of S. pneumoniae responsible for serious pneumococcal disease. Despite its widespread availability and written guidelines for use published by the Centers for Disease Control and Prevention, this vaccine is under utilized in practically every group for which it is recommended. Likewise, we know that a lot of individuals with SCI get pneumonia, and the majority of cases are likely to be pneumococcal.

As part of an effort toward prevention of pneumococcal infections, researchers at UAB recently studied the Immunogenicity of Pneumococcal Vaccine in Persons with Spinal Cord Injury1. The study sought to determine (1) the ability of the pneumococcal vaccine to stimulate the immune response to develop protective antibodies against Streptococcus pneumoniae, the most common cause of bacterial pneumonia, and (2) the optimum time that the vaccine could be given post-SCI to assure adequate immunization.

The study involved randomly assigning newly injured individuals with SCI to one of 4 groups following their entry into the UAB Hospital care system. In these 4 groups participants received either the pneumococcal vaccine or a placebo at 3 weeks or 4-6 months after SCI. Following enrollment, four blood samples were collected. The first sample was taken at the time of vaccination or administration of the placebo; the second sample was taken 1 month later; the third was taken 2 months later; and the fourth sample of blood was taken 1 year later. The blood samples taken post-vaccination were tested to determine antibody concentrations to specified pneumococcal strains to assess how well the vaccine is likely to protect the individual from invasive pneumococcal infection.

The study showed that most persons developed protective antibody levels against representative types of S. pneumoniae and maintained these levels for up to 1 year at the end of the follow-up period. Magnitude of the immune response was unrelated to timing of vaccination post-injury. Based on these findings, we recommend that all persons with SCI receive the pneumococcal vaccine...
CURRENT RELATED RESEARCH:

As a result of the study, the UAB RRTC on Secondary Conditions of SCI recently received a grant that allows researchers to continue the study of the **Immunogenicity of Pneumococcal Vaccine in Persons with Spinal Cord Injury**. This next phase, *Duration of Protective Antibody and Effect of Revaccination*, will determine (1) how long an individual keeps a protective antibody level by monitoring for up to five years, (2) is there a benefit to re-vaccination, and (3) are there any adverse effects to revaccination. Limited studies done at the CDC indicate that the incidence of side effects for revaccination, if at least three years have elapsed, is no greater than in the initial vaccination. However, no one has looked at the effects in persons with SCI, and there have not been many revaccination studies done in any type of adult population. This second phase of the study will examine those data.

RESEARCHER COMMENTS:

A lot of people with SCI can maintain very good health, other than they may not have the use of their extremities, provided they take proper care of themselves. However, SCI is a systemic condition that ultimately affects the entire body. In persons with higher cervical injuries, the cough mechanism and ability to clear respiratory secretions can be impaired, placing the individual at greater risk for infections of the lower respiratory tract such as bacterial pneumonia.

In this pneumococcal vaccine study we have documented that there is an antibody response in persons with SCI and it lasts for at least a year. We have proven that it does not matter if the vaccination is three weeks or six months after the injury. When these results became apparent, our first step was to make sure that the participants in the study who received a placebo got the active pneumococcal vaccine. Now, I would like to see everyone with SCI vaccinated. The vaccine costs only about $10, so compared with the cost of treating a single case of pneumonia that requires hospitalization, it is a good medical investment. What I want to emphasize is that vaccination soon after injury should protect the individual to some degree against bacterial pneumonia due to S. pneumoniae if correlations between antibody levels and protective efficacy from other populations can be applied to persons with SCI. If the vaccine is not given during the initial hospital stay, it should be offered the first time these individuals return to their doctors or clinics. Pneumococcal vaccine can be given with the influenza vaccine, which people with SCI should also get. I think the results of the study have made a very strong case and there is no reason for persons with SCI not to be vaccinated. Therefore, it is my hope that, after physicians see the results of the study in the Archives of Physical Medicine and Rehabilitation, everyone with SCI will be vaccinated.

At the end of the two studies, some of the participants will have been followed for 10 years. This will provide our researchers with a great deal of information, more than for any other population of persons with SCI anywhere in the United States. The next 4 years of work will mainly involve data collection and running laboratory tests. Although I am impatient and would like to have results of the antibody levels now, it will be some time before we have another chapter to add in this study.

Ken B. Waites, M.D.

Dr. Waites is the Director of the Clinical Microbiology Laboratory at University of Alabama at Birmingham Hospital, an Associate Professor in the Departments of Microbiology, Pathology, and Rehabilitation Medicine, and Coordinator of Urologic Research at the Spain Rehabilitation Center.