EDITORIAL COMMENT ON ONCE-DAILY INTRAMUSCULAR CEFTRIAXONE

The Use of Ceftriaxone for Bacterial Pneumonia in Pediatric Patients

Streptococcus pneumoniae and Hemophilus influenzae type b are the major pathogens responsible for bacterial pneumonia in children beyond the neonatal period. Ceftriaxone (Rocephin®) is an injectable third generation cephalosporin with excellent in vitro activity against these organisms, and a half life of six to eight hours. Consequently, it is not surprising that ceftriaxone, when given in a single daily injection, was effective for pediatric patients presumed to have a bacterial pneumonia. Ceftriaxone has been found to be effective when used in a similar fashion in a variety of pediatric infections including meningitis, sepsis, and musculo-skeletal infection.\(^1,2\)

The ability to dose ceftriaxone once daily makes this an ideal agent for outpatient use. Leibovitz et al. initially used ceftriaxone for hospitalized patients and continued this drug after the patients were discharged on an ambulatory basis.\(^3\) Ceftriaxone has been used by several investigators in a similar way to treat a wide variety of infections including even meningitis. Using the drug intramuscularly as opposed to intravenously as Leibovitz et al. did avoids the need to maintain intravenous access. This is especially significant for pediatric patients. Ceftriaxone can then certainly be used effectively for selected pediatric patients with bacterial pneumonia. It does not follow, however, that this drug by this route for this duration is the therapy of choice for bacterial pneumonia. Several points need to be considered in this regard when approaching the pediatric patient with pneumonia.

There are some specific circumstances where ceftriaxone alone would not be adequate therapy for bacterial pneumonia. Infections in the neonate most often include pathogens other than Streptococcus pneumoniae or Hemophilus. Most empiric antibiotic regimens in the neonate therefore include ampicillin. In addition, in any pediatric patient, the presence of certain clinical features such as pneumatoceles or pleural effusion necessitates considering other pathogens including Staphylococcus aureus. Treating for these possibilities would necessitate use of a drug other than ceftriaxone.

In the study cited, ceftriaxone was well tolerated in addition to being effective. While it has the safety profile of a cephalosporin, it has several unique features that occasionally result in adverse effects. Most notable is the diarrhea that is seen in 20% or more of patients. Most often this does not necessitate discontinuation of the drug. Ceftriaxone has also rarely been associated with sludging in the biliary tract. Being highly protein bound, its use in neonates presents the theoretical possibility of bilirubin displacement. Repeated intramuscular injections may be painful and the physician needs to examine injection sites daily for induration.

The majority of lower respiratory tract infections (LRTI) including pneumonia are non-bacterial (i.e. viral or Mycoplasma). Ceftriaxone and other cell wall active antibiotics are not effective for these infections. Moreover, establishing the etiology of a LRTI in children is difficult. Positive blood cultures are seen in a minority of patients. Leibovitz et al. recovered organisms from the blood in only 11.6% of their population.\(^3\) Rarely then does the physician know for certain what specific is being treated. Lack of a favorable clinical response may be due to several factors other than having selected a drug that is not active against the specific organism. The physician must always consider alternative etiologies including viruses or Mycoplasma, infectious material needing drainage such as in the pleural space, infections outside the respiratory tract, drug fever and even thrombophlebitis.

In summary, for only a few pediatric infections is there a consensus as to selection of the drug(s), dose, route, and duration of therapy. To an extent such a consensus does exist for streptococcal pharyngitis, bacterial meningitis, endocarditis, tuberculosis and musculo-skeletal infections.
For other infections including pneumonia, a consensus does not exist as to what specific drug should be used initially, and for how long and by what route. I suspect that some of the patients involved in the study by Leibovitz et al. could have been treated orally and at even a greater cost savings. When approaching the pediatric patient with pneumonia several guidelines are helpful, but therapy needs to be individualized. First consider the most likely etiologies based on clinical grounds and the age of the patient. Cultures or antigen detection from normally sterile sites such as blood or pleural fluid are helpful in establishing the etiology but are rarely encountered. If the patient fails to respond in an appropriate fashion consider the reasons mentioned above rather than simply switching antibiotics. When the patient is clinically improved, the physician may consider a switch to oral therapy provided that compliance and absorption are not major concerns.

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References