Comparison of pneumococcal serotypes with high, medium and low invasive potential to induce antibody response in patients with community-acquired pneumonia

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Background

Streptococcus pneumoniae is the major cause of morbidity and mortality in community-acquired pneumonia (CAP). The potential to cause invasive pneumococcal disease (IPD) varies between isolates with different serotypes/groups of capsular polysaccharides (CPS) (1). Depending on degree of invasiveness, serotypes could be divided into high, medium or low invasive potential (2). Serotype 1 and 7F are suggested to behave as primary pathogens with high potential to cause IPD, while less invasive serotypes behave opportunistically. Whether serotypes with different degree of invasive potential induce similar antibody responses in CAP has not yet been studied.

Objective

We compared the antibody response against the causative CPS serotype, for groups of serotypes with high, medium, and low invasive potential, in adult patients with pneumococcal CAP.

Methods

In a prospective study in Sweden, 235 adult patients hospitalised for radiologically confirmed CAP were included. In 38 patients, isolates of S. pneumoniae were cultured from blood (n = 15) or sputum (n = 23; >5 neutrophils/squamous epithelial cell). The isolates were serotyped. For antibody detection, serum was collected on admission and after approximately 4 weeks, and were analysed with ELISA for serotype-specific CPS antibodies against the identified serotype. The total immunoglobulin antibody titres were measured by optical density and calculated as percentage of a standard serum and presented in arbitrary units (3). The antibody fold changes between acute and convalescent sera were calculated. Clinical parameters for the patients were recorded. The vaccination frequency in the population was low.

Results

Serotypes with suggested high (serotype 1, n = 2; 7F, 6; from blood culture, 75%), medium (4, 2; 9V, 4; 14, 6; 18C, 1; 23%) and low (3, 7; 6B, 1; 19F, 2; 23F, 7; 35%) invasive potential were identified. The induced antibody response was greater for serotypes with high (median fold increase, 3.6) and medium (2.6), than low (1.5; p = 0.02 and p = 0.04) invasive potential (Figure 1). In 7 patients, an antibody decrease was noted. There were no significant differences of acute antibody titres (median in high, 21; medium, 31; low, 62; Figure 2). Serotypes with high invasive potential was associated with lower age (median age, 59 years) in comparison to low potential (73 years; p = 0.02). Median duration (days) from onset of illness to acute sampling was similar for the three groups (high, 3.5; medium, 2; low, 3).

Conclusions

• Serotypes with high invasive potential may induce a greater antibody response than serotypes with low potential in patients with pneumococcal CAP.
• Low age in patients with pneumococcal CAP, may be associated with high invasive potential for the causative serotype, and may support the role as primary pathogens for these serotypes.

Figure 1. Fold change in antibody response for serotypes according to invasive potential

Figure 2. Antibody titer against the causing serotype in acute serum according to invasive potential

References


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