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PNEUMOCOCCAL VACCINATION IN PATIENTS WITH HIGH RISK FOR INVASIVE PNEUMOCOCCAL DISEASE

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Abstract. Streptococcus pneumoniae is a major pathogen involved in nasopharyngeal colonization and severe invasive disease like meningitis, bacteremia and pneumonia, especially in children < 5 years of age and adults ≥ 65 years of age, for whom routine pneumococcal vaccination is recommended. Other patients with high risk for invasive pneumococcal disease are those with congenital or acquired immunodeficiency, CSF fistula, cochlear implant, chronic diseases or malignancy, for whom specific and well defined pneumococcal vaccination is recommended. In 2013 the Advisory Committee on Immunization Practices (ACIP) recommended the expanded use of PCV 13 for children aged 6-18 years with immunocompromising conditions, functional or anatomical asplenia, CSF fistulas or cochlear implants. For children aged 2-5 years with these conditions the recommendation for the use of PCV 13 was published in 2010.
Keywords: acute poisoning with methanol, alcohool dehydrogenase, formic acid, ethanol, hemodialysis

Introduction

Streptococcus pneumoniae is a major pathogen involved in nasopharyngeal colonization and severe invasive disease like meningitis, bacteremia and pneumonia associated with bacteremia, especially in children < 5 years of age and adults ≥ 65 years of age, for whom routine pneumococcal vaccination is recommended.

Before the introduction of pneumococcal conjugate vaccines (PCV), the overall mean annual incidence of IPD in European countries in children less than 2 years of age was 44.4/100.000[1]. The introduction of PCV led to a substantial decline in the rate of invasive pneumococcal disease (IPD), in both children and adults, with the largest decline seen in children less than 2 years of age[2].

In the United States, PCV vaccination has reduced pneumococcal infections in children directly and indirectly among children and adults through herd immunity. The incidence of IPD caused by serotypes unique to PCV13 among adults aged ≥65 years had declined by approximately 50% compared with 2010, when PCV13 replaced PCV7 in the pediatric immunization schedule[3].

Children with functional or anatomic asplenia, particularly those with sickle cell disease, and children with human immunodeficiency virus (HIV) infection have a very high risk for invasive disease, with rates in some studies more than 50 times higher than those among children of the same age without these conditions[4].

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Risk factors for invasive pneumococcal disease

Risk factors for IPD are primary immunodeficiencies: (hipogammaglobulinemia, agammaglobulinemia, complement deficiencies, Ig G subclass deficiency, phagocytic disorders, cyclic neutropenia, congenital asplenia), immunosuppressive conditions (HIV, chronic kidney disease, malignancy, sickle cell disease, functional or post-traumatic asplenia, iatrogenic immunosupression) and also chronic diseases (chronic heart disease, chronic lung disease, diabetes mellitus, chronic liver disease, cigarette smoking). A special group of patients with high risk for IPD are those with CSF fistulas and cochlear implants[5].

Pneumococcal vaccines and recommendations

Currently there are 2 types of pneumococcal vaccines recommended by the Advisory Committee on Immunization Practices (ACIP) for routine and special vaccination recommendations: 23 valent polysaccharide vaccine (PPSV23) (serotypes included 1, 2, 3, 4, 6B, 7F, 8, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, 33F) and 13 valent conjugated vaccine (PCV13) (serotypes 1, 3, 4, 5, 6A, 6B,7F, 9V, 14, 18C, 19A, 19F and 23F).

Pneumococcal polysaccharide vaccine (PPSV 23) is effective in preventing IPD in adults with a reported

Age at first dose (months)	Primary PCV 13 series	PCV 13 booster dose
2-6	3 doses	1 dose at 12-15 months
7-11	2 doses	1 dose at 12-15 months
12-23	2 doses	-
24-59	1 dose	-
24-71 in children with certain chronic diseases or immunocompromising conditions*	2 doses	-

**See Table 2 for complete list of conditions*

Table I. Recommended schedule for use of 13-valent pneumococcal conjugate vaccine (PCV13) among previously unvaccinated infants and children by age at time of first vaccination (ACIP)[5].

Risk group	Underlying medical condition	PCV 13	PPSV23	
		Recommended	Recommended	Revaccination 5 yrs after first dose
Imunocompetent persons	Chronic heart disease*		√	
	Chronic lung disease**		√	
	Diabetes mellitus		√	
	Cerebrospinal fluid leaks	√	√	
	Cochlear implants	√	√	
	Alcoholism		√	
	Chronic liver disease		√	
	Cigarette smoking		√	
Persons with functional or anatomic asplenia	Sickle cell disease /other hemaglobinopathies	√	√	√
	Congenital or acquired asplenia	√	√	√
Immunocompromised persons	Congenital or acquired immunodeficiencies***	√	√	√
	HIV	√	√	√
	Chronic liver failure	√	√	√
	Nephritic syndrome	√	√	√
	Leukemia	√	√	√
	Lymphoma	√	√	√
	Hodgkin disease	√	√	√
	Generalized malignancy	√	√	√
	Latrogenic immunosuppression****	√	√	√
	Solid organ transplant	√	√	√
	Multiple myeloma	√	√	√

Table II. Medical conditions or other indications for administration of PCV13 and indications for PPSV23 administration and revaccination for children aged 6–18 years (ACIP)[10].

** Including congestive heart failure and cardiomyopathies.*
*** Including chronic obstructive pulmonary disease, emphysema, and asthma.*
**** Includes B-(humoral) or T-lymphocyte deficiency, complement deficiencies (particularly C1, C2, C3, and C4 deficiencies), and phagocytic disorders (excludingvchronic granulomatous disease).*
***** Diseases requiring treatment with immunosuppressive drugs, including long-term systemic corticosteroids and radiation therapy.*

efficacy varying from 56% to 86%, but his effectiveness decreases in time[6,7].

There are two major limitations of this vaccine: it is poorly imunogenic in children less than 2 years of age (because polysaccharide antigens are T lymphocyte independent, they do not induce immunologic memory) and fails to reduce nasopharingeal carriage [8,9].

It is reccomended in adults ≥65 years of age as routine immunisation and in patients with high risk factors for IPD, older than 2 years of age, after PCV13 vaccination in specific recommended situations. A second dose of PPSV 23 is recommended after 5 years from the initial dose in patients with functional or anatomic asplenia and imunocompromising conditions[5].

Pneumococcal conjugated vaccines are based on protein carriers linked to polissaharides, forming T-cell-dependent antigens that stimulate a T-helper cell response and induce an immunologic memory with immunologic response to new exposures[9].

PCV 13 is recommended since 2010 for all children aged 2 months -59 months (different numer of doses depending on age at first dose) and for children aged 24-71 months with imunocompromising conditions, chronic medical conditions, functional or anatomic asplenia, CSF leaks or cochlear implants (2 doses.) (see Table 1)[5].

Since 2013 ACIP recommends that all children aged 6-18 years with high risk of IPD because of CSF leak, cohlear implant, functional or anatomical asplenia or imunocompromising conditions should receive a single PCV13 dose first fallowed ≥8 weeks later by a dose of PPSV23 and 5 years later by a second dose of PPSV23. (see Table 2)[10].

In 2012, ACIP recommended routine use of PCV13 for adults aged ≥19 years with immunocompromising conditions, functional or anatomic asplenia, cerebrospinal fluid leak, or cochlear implants, in addition to PPSV 23[11].

Conclusion

There are many medical conditions that have to be taken in consideration when assesing the risk for IPD.

Pneumococcal conjugated vaccines have decreased the rates of IPD directly in vaccinated children and indirectly (herd protection) in unvaccinated persons[5].

Immunocompromised adults have benefitted from herd protection but still remain at high risk for invasive pneumococcal disease[5].

The use of pneumococcal conjugated vaccine had a major impact on the incidence of invasive disease among young children. The overall incidence of invasive disease among children younger than 5 years of age decreased by 99% in cases caused by the seven serotypes included in the first pneumococcal conjugated vaccine (PCV7)[12].

Also PCV 13 appears highly effective at preventing IPD among children who receive the vaccine with a 89% effectiveness of >1 dose of PCV 13 against invasive diseases due to 13 serotypes included in the vaccine[12].

Since the approval of PCV13 in adults aged≥50 years in 2011, PCV 13 is gradually being included in immunisation recommendations for adults in order to reduce the burden of invasive pneumococcal disease in adults, both through a direct effect of the vaccine and through herd immunit[13].

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