Cystic fibrosis and pseudomonas aeruginosa infection-transversal study on the risk factors

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Nothing to declare

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Introduction

Cystic fibrosis (CF) is a lethal monogenic disease, frequent in Caucasian population, characterized by autosomal recessive transmitting [1] and manifested by a noticeable clinical polymorphism [2]. The clinical picture includes classically: a chronic obstructive pulmonary disease with redoubtable pulmonary infections, exocrine pancreatic insufficiency with secondary steatorrhea or related diabetes by endocrine pancreatic insufficiency. CF associated liver disease is an important problem [3], because of the dangerous complication with portal hypertension, hepatic insufficiency, despite existing treatment [4]. The bone disease, secondary to
deficit in liposoluble vitamins, meconium ileus, nasal polypsis, obstructive azoospermia, rectal prolapse, chronic sinusitis or salt loss syndrome are CF facets also [5]. While CF manifestations affect many organs, the lung is particularly affected by various degrees of defect in chloride transportation which produce a very tick secretion of the mucous cell lining the respiratory epithelium, which favors the infections [6]. The broad bacterial spectrum that particularly infect the CF lung is dominated by the Pseudomonas aeruginosa infection, besides Staphylococcus aureus, Hemophilus influenza or even more redoutable ones like Nontuberculous bacteria, Burkholderia sp. or Acromobacter sp [1]. Many studies showed an important negative effect of this Pseudomonas aeruginosa aeruginosa on the lung function and life expectancy in patients with cystic fibrosis [7] and other severe conditions like septicemia [8] or cancers [9] and no biomarkers available for monitoring like in other severe conditions like septic status [10,11].

Because of P. aeruginosa multiples protective characteristics, like hypermutability and alginate hyperproduction, resistant phenotypes are selected [12], in the meantime, the prevalence of banal microbes, like Staphylococcus aureus methicillin resistant S. aureus (MRSA) are also raising [13]. The first infection with P. aeruginosa are needed to chronic between 6-12 months, during which it is possible to eradicate the infection therapy [14]. It is therefore very important, firstly, to prevent the infection, by vigorous hygiene, and once infected, to early diagnosis it, in order to perform the eradication therapy and prolong the lives of children with cystic fibrosis (CF) [15].

For a better prevention and an early therapy we should know if there exists any preventable risk factors for the Pseudomonas aeruginosa infection, therefore the aim of this paper is to assess the possible risk for Pseudomonas aeruginosa respiratory infection among children with cystic fibrosis.

**Methods**

The cross-sectional study included patients with typical forms of cystic fibrosis who agreed to the study. The bacteriological samples (sputum sample, swab throat or hypopharyngeal aspirate) were collected, every 3 months, as our national guideline stipulated, supplementary samples were collected during exacerbations. Anthropometric measurement of weight, height and body mass index (BMI) were recorded every visit, besides evaluation of pulmonary function by spirometry. Isolation on conventional sheep blood agar, MacConkey agar, Mannitol salt agar and identification of germs were performed using the BioMerieux VITEK 2 automated microbiology system.

Data on age-at diagnosis, age at first acquisition and anthropometric measurements were collected from the center’s database. Leeds criteria were used for classification of the P.aeruginosa infection status [16]. The lung function was expressed by the forced expiratory volume in one second (FEV1), obtained by spirometry, only in children over 6 years of age, was expressed by percent predicted according to age, weight and height. Cystic fibrosis associated liver disease (CFLD) and cystic fibrosis related diabetes (CFRD) were diagnosed by existing criteria [17,18]. The patient’s parents and patients signed the informed consent and the study received the Hospital’s Ethics Committee approval.

Statistical analysis used multiple linear regressions (stepwise regression model) to investigate the risk for the infection with Pseudomonas aeruginosa, with the following variables: low BMI, gender, age, pancreatic insufficiency (PI), CFRD, CFLD presence and low age at infection.

Numerical variables were concise as mean (SD) values while qualitative variables were given as frequency and percentages. Odds ratios and 95% confidence intervals (CI) were calculated for each variable distinctly and for variables included in the logistic model. The p values of <0.05 were measured significant.

**Results**

Fifty seven patients, with a median age of 13.02 years ± 6.1 SD achieved the inclusion criteria. Most of them had severe genotypes, 49.12% were homozygous for F508del, while 7.01% patients had unknown genotypes. Pseudomonas aeruginosa was found in 38,6%, in different infection categories, more prevalent in feminine gender (12.3%) compared to males (3.5%), but the difference not reached the statistical significance (p=0.301). 17.54% of patients had coexisting bacterial infection, most frequently with Staphylococcus aureus co-infection (12.28%). Chronic Pseudomonas infection was diagnosed in 10.52%, a relatively low percent. For the age group between 12-18 years, P.aeruginosa was found in 8.8% of patients and 14.0% of adults had positive P.aeruginosa sputum culture. As for the age of first acquired infection, the median age of patients at the first positive P.aeruginosa culture was 9.41 years ± 5.4 SD compared to 6.61 years median for MRSA.
The infection with Pseudomonas aeruginosa in cystic fibrosis for this study was more prevalent in older patients and in female, although not with a statistical significance. We notice that none of the variables tested with corresponding odds are significant, using logistic regression, suggesting that in our patients the infection with Pseudomonas aeruginosa did not occur preferentially in patients with ponderal deficit or in patients with associate liver disease or diabetes, as reported by other researchers [19]. One of the study pitfalls, which was the different and patient-related, was the technique used to prevent the infection by individual hygiene, things that could not have been objectively evaluated. Another explanation would be the transversal results and we would suggest for future a longitudinal evaluation for an improved consistent detection of the risk factors for acquiring Pseudomonas among CF population.

**References**

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