Sweat testing in a tertiary clinic – reasons, results and methodology

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Objectives: Sweat testing following pilocarpin iontophoresis is the preferred method to check for cystic fibrosis. Correct measurement and interpretation of results are essential components of cystic fibrosis testing.

Methods: All sweat tests performed in the years 2005 to 2010 in our cystic fibrosis centre were analyzed retrospectively. Pilocarpin iontophoresis was in accordance to established international guidelines. All samples were analyzed using chloridometry (Chloridimeter, Kreienbaum, Germany) and conductivity measurement (SweatCheck, WesCor Inc., USA). Results were interpreted as negative, indeterminate or positive according to international guidelines (chloridometry) or manufacturer’s recommendation (conductivity measurement).

Results: 1246 sweat tests were performed on 1077 patients. 68 patients were 18 years or older. Median age at testing was 1.58 years (min. 14 days, max. 77 years). Comparison of conductivity measurement and chloridometry reveals a constantly higher NaCl equivalent in conductivity measurement (mean value of difference 24.1±10.7 mmol/L). In 91.4% the assessment of test results reveals consistent diagnoses. 0.9% of patients would not have received a second test if only conductivity measurement had been used although chloridometry revealed positive or indeterminate results.

Discussion: Sweat testing remains a particularly paediatric topic. The gold standard is chloridometry. This study underlines the inappropriate comparability of conductivity measurement and chloridometry with consequently higher values in conductivity measurement. Special reference values allow a consistent interpretation in many cases but not in all.

Direct potentiometric measurement for chloride ion using Spotchem Arkray analyser adapted to sweat samples

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Background: Sweat test measuring the chloride ion (Cl−) concentration in sweat is a tool for the cystic fibrosis (CF) diagnosis. We evaluated analytical criteria of a direct potentiometric device and compared chloride results to those obtained by coulometry from a same sweat collection.

Methods: Sweat tests were performed after pilocarpine iontophoresis (Pilogels™ and 3700 Webster Sweat Check Inducer™, Wescor, Elitech). Sweat was collected using Macroduct™ system (Wescor, Elitech). For 139 patient sweat samples collected in two laboratory hospitals, chloride ion concentration was determined by coulometry (Chloridimeter 9268 Sherwood, Dutschner) and by direct potentiometry using a Spotchem™ EL Se-1520 analyser (Arkray, Elitech) for which urine mode was selected and calibration factor modified for sweat measurements.

Results: Linearity range was demonstrated in the range 10 to 140 mmol/L Cl−. Within-run and between-run variation coefficients were 2.0% for 24 mmol/L Cl−, 1.8% for 51 mmol/L Cl− and 1.2% for 101 mmol/L Cl−. The correlation (Passing-Bablock) between chloride analyser and Spotchem™ was y = 1.026 + 1.8 (r=0.996) with a bias (Bland and Altman, p<0.001). After correction by the regression factors, only 6 (4.6%) results remained without ±5 mmol/L Cl−.

Conclusions: Our work indicates that Spotchem™ analyser presents analytical criteria satisfying international guidelines for CF diagnosis. All its process was simple, rapid and independent of operator variability. Its availability should lead to improved accuracy of sweat test results in laboratories where less reliable methods are used.

Body plethysmography for measuring nasal airway resistance: a diagnostic tool?

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Subjective sensation of nasal patency often shows large discrepancy with objective findings. Therefore it is desirable to find a technique to measure nasal patency. Body plethysmography is a validated technique to measure the airway resistance. Based on this theory, body plethysmography can be used for measuring nasal airway resistance (NAR).

Objective: Investigation of the reliability of body plethysmography for measuring nasal airway resistance.

Methods: Twenty healthy subjects (15 females and 5 males; aged 24–61 years) were included in this pilot study. The NOSE questionnaire was used to measure subjective nasal resistance.

For measuring the NAR, the subject was placed in a body box with a CPAP mask covering mouth and nose. Three measurements followed; breathing through the mouth, breathing through the nose and a second measurement through the nose after administration of the decongestant xylometazoline HCl 0.1%. This whole procedure was repeated under the same conditions after 4–39 days.

Conclusions: The intraclass correlation coefficient (ICC) of body plethysmography for measuring NAR is 0.485. This ICC indicates a low reliability of the test for measuring NAR. After administration of xylometazoline the ICC was 0.382.

In conclusion, the reliability of body plethysmography (body box) for measuring the nasal airway resistance is poor and therefore it is not useful as diagnostic tool.

NPD measurements in subjects with borderline sweat test

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Thanks to the recently developed Standard Operating Procedures of the CFFT TDN and the ECFS DNWG transepithelial nasal potential measurements (NPD) can now be performed with unprecedentedly high reproducibility and signal-to-noise ratios in subjects suspected to suffer from cystic fibrosis (CF). Of 30 subjects who had been referred to our clinic during the last year because of symptoms of sinuspulmonary and/or gastrointestinal disease and sweat chloride concentration in the range of 20–80 mmol/L, CF was excluded in the majority of subjects because of NPD tracings in the normal range. PS-CF was diagnosed in five subjects and was confirmed by the detection of two CFTR mutations including those with variable penetrance such as L260W and D1152H. Four individuals, however, could not be assigned to the established categories of PI-CF, PS CF, CFTR-RD or non-CF. These subjects exhibited a normal basal potential and amiloride response and a residual chloride conductance upon exposure to chloride-free solution and isoprotenerol in the grey zone between CF and non-CF. One subject was carrying F508del and a yet undescribed sequence variant in the acceptor splice site of intron 11 in trans. In the other three subjects no sequence variation had been identified in the CFTR coding region. We would like to conclude that the improved NPD technique can detect subjects with mild CFTR dysfunction who cannot be classified by the currently recommended global diagnostic algorithm for CF and CFTR-RD.

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