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BRONCHIAL RESPONSIVENESS IN WHEEZY INFANTS.

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The relationship between recurrent wheeze in infants and asthma in childhood still remains unclear. Since bronchial reactivity plays a central role in asthma the aim of this study was to measure bronchial responsiveness in infants suffering from either recurrent wheeze or after an isolated upper respiratory tract infection (URTI). Bronchial inhalation challenge tests with carbachol were performed in 25 infants aged 6-24 months, 16 with recurrent wheezing and 9 URTI without wheezing. A control solution and varying concentrations of carbachol were administered by face mask from a nebuliser. Before and after each nebulisation airway resistance (Raw) and thoracic gas volume (TGV) were measured in constant-volume plethysmograph. Specific airway resistance (SRaw) was derived. The cumulative dose of carbachol causing 50% increase of SRaw was calculated (PD₅₀ SRaw). Wheezy infants were slightly hyperinflated (mean TGV predicted) compared with non-wheezy group (mean TGV 98% predicted). There was a significant difference in PD₅₀ SRaw between wheezy infants and URTI group (t-test on logarithmic transformations of PD₅₀ SRaw; $t=4.12$; $p<0.001$). We have described a new technique for measuring bronchial responsiveness in infants and shown that wheezy infants had greater responsiveness than a control group.

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COUGH: AN INDICATOR OF AIRWAY FUNCTION

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The flow-volume loop obtained during coughing resembles that during a forced vital capacity manoeuvre, with the maximal flow rate during forced expiration being exceeded by the peak flow of each cough effort. The extent by which maximum expiratory flow could be exceeded by coughing was investigated as a non-dimensional means of quantifying the degree of airflow limitation.

Fifty subjects over the age range 3 to 56 years were investigated. Subjects breathed through a pneumotachograph and signals of flow and volume were recorded and plotted using a Jaeger Bodytest. Each subject was asked to inspire to total lung capacity and cough out as forcefully as possible to residual volume. In addition each subject performed a forced vital capacity manoeuvre, and plethysmographic measurements of thoracic gas volume and airways resistance were made. The slope of expiratory peak flow during coughing showed a linear relationship with airway conductance measured plethysmographically in the 10 normal subjects below the age of 21 years ($r = 0.854$). The cough flow rates therefore provide information about airway function independently of plethysmographic measurements.

The ratio of maximal expired airflow (conventionally thought to be related to dynamic compression of airways) to peak airflow induced by coughing (i.e. release of static compression) at the same lung volume may represent a non-dimensional means of quantifying airflow limitation in individual subjects. This cough ratio was found to decrease during adult life, possibly reflecting the change in elastic properties of the airways with age.

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STUDIES OF BREATHING PATTERNS IN EARLY WHOOPING COUGH IN INFANCY

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Twenty-four ECG and respiration (chest and abdominal movements) records were obtained on 9 occasions in 6 infants with suspected whooping cough. The group comprised 3 males and 3 females born at term and aged between 2 and 6 months. Two presented with choking during feeds without cough, 1 with repetitive paroxysmal cough, 4 with symptoms of upper respiratory tract infection and minimal cough. All were known contacts and had not been immunised against pertussis.

Several patterns of abnormality were noted, (i) brief (< 10 seconds) or prolonged (> 15 seconds) central apnoea associated with bradycardia and proceeding to 'obstructive' apnoea and progressive bradycardia prior to clinical recovery. Cyanosis and hypoxaemia (PtcO₂ ↓) were invariable and early in appearance. Audible cough was usually absent; (ii) brief or prolonged central apnoea with moderate bradycardia which did not proceed to obstructive apnoea or cough; (iii) obstructive apnoea, bradycardia, and hypoxaemia without preceding central apnoea, with or without cough prior to recovery; (iv) cough unrelated to central or obstructive apnoea without marked bradycardia or hypoxaemia. The most severe patterns were observed in the youngest infants who presented with recurrent cyanotic episodes rather than cough. Paired observations suggest that the risk of hypoxaemia is great, even in the catarrhal phase of the disease.

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The occurrence of hypoxia during the night or exercise in CF patients

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In order to detect periods of hypoxemia, which eventually induce pulmonary hypertension, we measured O₂ saturation by earoximetry in 2 consecutive nights and in a cycle exercise test, during which also a number of ventilatory and circulatory variables were registered. The chance on hypoxemia was considered in relation to baseline pulmonary (BPT) and exercise variables. A group of 22 CF patients (12 males, 10 females, aged 10-20 years, baseline condition) were studied.

Nocturnal and exercise-induced hypoxemia were not related to BPT variables, but O₂ sat < 90% seems to occur only if FEV₁ < 50% of expected and/or trapped air > 20% of TLC. Nocturnal and exercise-induced hypoxemia were mutually related ($r = 0.72$, $P<0.001$). Both had a relationship with either V_{O₂ max ($r = 0.72$, $P<0.001$ and $r = 0.58$, $P<0.01$ respectively), O₂ pulse ($r = 0.62$, $P<0.01$ and $r = 0.61$, $P<0.01$ respectively) at maximal exercise as well as anaerobic threshold ($r = 0.67$, $P<0.001$ and $r = 0.45$, $P<0.05$).}

We concluded that the risk on hypoxemia can not be predicted on the basis of BPT alone and should be measured by earoximetry either during the night or exercise. An exercise test reveals rapid obtainable and useful information on the risk on hypoxemia. In patients at risk, additional O₂ sat measurement during the night is needed.

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CHILDHOOD ORIGINS OF CHRONIC OBSTRUCTIVE LUNG DISEASE

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There is evidence that significant respiratory illnesses in early childhood are associated with persistent lung function abnormalities and may predispose to the development of chronic obstructive lung disease in adult life. We measured lung function (volumes, spirometry and gas transfer) and physically examined 842 school children. A health questionnaire was also sent to the children's parents. Proportionately more boys (15%) than girls (11%) had a history of recurrent symptoms 'bronchitis, frequent chest infections, wheeze or asthma'. Reported incidences of croup were 14 and 10% and for pertussis 21 and 18%. When stature was accounted for, unpaired t tests and Mann Whitney u tests failed to detect any significant differences between children with no previous significant illnesses and those with a history of croup or pertussis. Children with recurrent symptoms however, had reduced airflow, particularly at low lung volumes. These differences were significant at the 5% level for flow at 25% of remaining vital capacity. We conclude that in the general population, croup and pertussis are not associated with residual abnormalities of lung function. More attention should however be directed to the large reservoir of subclinical airflow obstruction.

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ACUTE BRONCHIOLITIS IN INFANCY. CHARACTERIZATION OF FACTORS PREDISPOSING TO ILLNESS.

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Based upon an epidemiological follow-up study of 51 infants hospitalized due to bronchiolitis and 24 controls from two health care centres, single factors predisposing to acute bronchiolitis is reported (subm. abstract). We reports infants with bronchiolitis to have recurrent obstructive lung disease in 60% of cases, and therefore the identification of infants at risk of contracting bronchiolitis is important both as regards the acute illness of infancy and the continuing respiratory illness. Discriminant analysis was therefore carried out in order to characterize infants at risk of contracting acute bronchiolitis.

The discriminant function characterized 47 out of 51 infants with bronchiolitis to be at risk, and 20 of 24 controls not to be at risk of contracting bronchiolitis. By using the leaving out technique 19 controls and 44 infants with bronchiolitis were still correctly classified, and the probability of erroneously classifying a patient increased from about 11 to 16% by this correction.

Discriminant analysis thus seem to be a valuable tool in characterizing patients at risk of contracting bronchiolitis, and thus at risk of further development of obstructive lung disease.