Value of acetylated haemoglobin assay in fetal assessment

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Summary

Acetylation of fetal haemoglobin, probably a post-translational, intracellular, enzyme-mediated reaction, depends upon an adequate supply of glucose and oxygen to the fetus and the nature of the diabetes (if present) in the mother. These complicating factors limit the general usefulness of acetylated fetal haemoglobin assay in fetal assessment.

Unlike the formation of glycosylated or acetylated haemoglobin in the adult, the formation of acetylated fetal haemoglobin (Hb F\(\text{I}\)) appears to be enzyme-mediated.\(^1\) It has been suggested that Hb F\(\text{I}\) be used to assess gestational age in newborns from normal mothers,\(^5\) or to assess fetal exposure to glucose during the last weeks of pregnancy.\(^9\)

A Whatman DE52 cellulose column procedure,\(^2,3,6\) which separates acetylated from glycosylated fetal haemoglobin (Hb F\(\text{I}\)), was used to investigate factors influencing the formation of Hb F\(\text{I}\) in non-diabetic, gestational diabetic (GD) and established diabetic (ED) pregnant women.

Subjects, methods and results

Maternal and mixed cord blood samples were obtained from 12 non-diabetic, 12 GD and 8 ED mothers and their neonates immediately after delivery.\(^4\) Maternal total glycosylated haemoglobin (Hb Al) was determined by a previously documented gradient elution procedure\(^7\) and percentage oxygen saturation of cord blood haemoglobin on an IL-co-oximeter (model 282). There was no significant difference in gestational age at delivery (Dobowitz examination),\(^8\) maternal Hb Al at delivery, or cord blood Hb F\(\text{I}\) and percentage O\(_2\) saturation between the three groups of patients\(^6\) (and unpublished data). Birth weight ratio (calculated using charts appropriate for our patient population) was significantly higher \((P < 0.05); Student's t-test\) in our GD patients.\(^6\) Hb F\(\text{I}\) correlated with cord blood percentage O\(_2\) saturation (Fig. 1A) in a combined group of non-diabetic and ED patients. There was no correlation in GD patients \((N = 9; r = 0.2; P = \text{NS})\). Hb F\(\text{I}\) also correlated with maternal Hb Al \((N = 10; r = 0.48; P < 0.05; \text{linear regression})\). There was no correlation between Hb F\(\text{I}\) and major fetal haemoglobin component at term \((\text{Hb F}_{\text{a}})\) or birth weight ratio in any of the patient groups studied.

The correlation of Hb F\(\text{I}\) with maternal Hb Al in non-diabetic subjects agrees with the findings of Poon \textit{et al.},\(^3\) whose patients were either non-diabetic \((N = 14)\) or established diabetics \((N = 10)\), i.e. not gestational diabetics. Glucosylated haemoglobin (Hb A\(_1c\)) was determined by immuno-electrophoresis \((N = 24; r = 0.4; P < 0.05)\). Our own results showed a significant correlation in non-diabetics \((N = 10)\), but no correlation with ED patients either in isolation \((N = 7)\), or when plotted with non-diabetics \((N = 17)\). We could not demonstrate a significant correlation of the cord blood Hb F\(\text{I}\) ratio with gestational age in any of the patient groups studied.

Comment

While an excellent correlation \((N = 17; r^2 = 0.80)\) of the Hb F\(\text{I}\) ratio to gestational age (days) was demonstrated by Hb F\(\text{I}\) + Hb A\(_1c\),\(^5\) our results and those of Poon \textit{et al.}\(^3\) suggest...
that other factors may affect this correlation and limit the usefulness of this approach in diabetic pregnancy. The fetal exposure to glucose would appear to influence the formation of Hb F, as shown by the correlation of Hb F, with maternal Hb A, (Fig. 1B, correlation significant in non-diabetic group) and the correlation of Hb F, with cord C-peptide in ED patients. Furthermore, the oxygenation status of the fetus would also appear to influence formation of Hb F, in neonates born to ED and non-diabetic mothers (Fig. 1A). Since a general reduction in oxygen levels of cord blood has been shown as an approach, and we demonstrated a direct correlation between Hb F, and percentage O saturation in ED and non-diabetic patients, this may explain the negative correlation of Hb F, with gestational age shown by Peterson et al. in non-diabetic patients. The formation of Hb F, in our non-diabetic and ED patients would seem to depend on the presence of glucose (Fig. 2), insulin (Hb F, versus cord C-peptide; P < 0.001 in our ED patients) and an adequate oxygen supply (Fig. 1). This is consistent with the suggestion that the formation of Hb F, in fetal erythrocytes is enzyme-mediated and uses glucose as a precursor for the acetyl moiety in Hb F, The usefulness of Hb F, as a measure of gestational age or of fetal exposure to glucose appears to be limited by these complicating factors and by the nature of diabetes in the mother, as the correlations shown were absent in our GD patients.

REFERENCES

Chronic cough and cough mixtures in a private paediatric practice

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Summary
A survey of 256 private practice paediatric patients with chronic cough revealed that 50% were asthmatic, 28% had upper respiratory infections including bronchiolitis and bronchopneumonia, while 22% had whooping cough despite being fully immunised. Diagnosis and management are discussed. The only cough mixture of real value appears to be a bronchodilator.


Chronic cough is a common problem in private paediatric practice. The patient usually presents after a number of cough mixtures and often antibiotics have been found to be ineffective. It is therefore of value to determine the causes and management. Chronic cough is defined as a cough of at least 3 weeks' duration.

Patients and methods
A retrospective survey for 1984-1985 from examination of patients' records was undertaken in a private practice in Cape Town, which caters mainly for patients in the southern suburbs who are virtually all from the coloured and white race groups.

Results
The study group consisted of 256 patients aged 3 months to 15 years with chronic cough. Of these 129 (50%) were asthmatic; 71 (28%) had recurrent upper respiratory tract (URT) infections including bronchiolitis and bronchopneumonia; and 56 (22%) had whooping cough. Of the asthmatics 55% were under 4 years of age, of the recurrent URT infections 63% were aged 6 months-4 years and 61% of the whooping cough patients were 1-4 years old.

The 256 patients included 1 case of pulmonary tuberculosis, 1 of bronchiectasis following whooping cough and 1 patient with a persistently atelectatic right middle lobe. There were no cases of inhaled foreign body, cystic fibrosis or psychogenic cough.

Diagnosis
This was made in most instances clinically from the nature of the cough, a detailed history and examination. Although asthmatics typically cough and wheeze recurrently, they often present with a