LETTERS TO THE EDITOR

ECG and echocardiographic diagnosis of pulmonary thromboembolism associated with central venous lines

EDITOR,—Pollard *et al* retrospectively studied 21 children with central venous lines for parenteral nutrition by electrocardiography and eight by echocardiography.¹ They state that ventilation perfusion (V/Q) scanning has a low sensitivity for detection of major pulmonary emboli based on the PIOPED investigators' study of 933 adult patients.² The electrocardiogram (ECG) criteria used by Pollard *et al* were based on a study of 49 adult patients of whom half were diagnosed by V/Q scan alone.³ Pollard *et al* describe their ECG findings as diagnostic of embolism and dismiss use of the V/Q scan. Their ECG based method cannot be regarded as more accurate than the technique used to validate it.

The study of Pollard *et al* presents ECG criteria for right ventricular strain as diagnostic of embolism without any validation. Corroboration of the diagnosis is available in only two children who had emboli at necropsy. In addition ECG criteria based on adult normal values were applied to paediatric patients, for example the frontal QRS axis at 5-7 years is +11 to +143 allowing a normal child to achieve a positive criterion.⁴ The V/Q scan has however been validated in paediatric populations.⁵ Pollard *et al* also suggest that the pulmonary angiogram is of limited usefulness in chronic microemboli, while most authorities regard it as the gold standard.⁶

Pollard *et al* assert that the echocardiogram is very sensitive in establishing the diagnosis of pulmonary embolism, whereas the originator of the echocardiographic criteria suggests that it is an initial investigative tool.⁷ Pollard *et al*'s reference to our own study⁸ is inaccurate in stating that 12 of 34 children had thrombosis visualised on echocardiography. In fact of the 12 children who had thromboemboli four were diagnosed only by V/Q scan with unremarkable echocardiograms, while eight had echocardiograms showing right atrial thrombus or pulmonary hypertension; in five of the eight V/Q scans showed clots. In two patients with indirect echocardiographic evidence of pulmonary hypertension as the sole abnormality pulmonary embolism was diagnosed at necropsy.

Pulmonary embolism secondary to long term parenteral nutrition has been ignored for too long. An increased awareness of this complication will improve patient care but only if a clear diagnostic and management strategy is available. Pollard *et al*'s study confuses this issue and has given inappropriate prominence to ECG and echocardiographic diagnosis. These are valuable initial investigations which should lead on to V/Q scanning and if necessary to pulmonary angiography.

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Drs Pollard, Sreeram, Wright, Beath, Booth, and Kelly comment:

We are pleased that Dollery *et al* found our paper so stimulating but are disappointed that they seemed to have missed the point and are left confused by the use of the ECG and echocardiogram. Dollery *et al* draw attention to an important study comparing the sensitivity of ventilation perfusion scanning (V/Q), ECG and ECHO.³ Further scrutiny of this paper revealed that while the V/Q scan correctly identified only 29 out of 49 patients with pulmonary embolism, ECG changes consistent with pulmonary embolism were identified in 40 patients. The nine patients with falsely normal ECGs all had evidence of tricuspid valve regurgitation and increased right ventricular end diastolic diameter. As the ECG may pick up more cases than a V/Q scan we used echocardiographic information to draw attention to the fact that pulmonary thromboembolism is common in children with long term indwelling central venous lines and to advocate evaluation of preventative strategies. This view is supported by work previously published by Dollery *et al*,⁸ although we found a greater incidence of pulmonary embolism. We are grateful for the clarification of their study.

We have not dismissed the use of V/Q scanning or pulmonary angiography as they suggest and it is our practice to use these techniques in addition to ECG and echocardiography in appropriate clinical situations to establish a diagnosis of pulmonary thromboembolism. We think that the ECG and echocardiogram is helpful and possibly more sensitive than current 'gold standards' but there have been no prospective studies comparing these techniques with V/Q scanning and pulmonary angiography in children to confirm this. Without this information, we were unable to make recommendations regarding the place of any of these tests in routine investigation of such cases. We suggest that Dollery *et al* should also await results of prospective comparative studies before pronouncing judgment on our observations.

We agree that ECG and echocardiographic diagnosis of pulmonary thromboembolism requires further validation in children and Dollery *et al* will find this clearly stated in our paper. We did use age appropriate paediatric reference values for the analysis of ECGs and echocardiograms and again, this is stated in the methods. Use of adult normal values would have been inappropriate. Until prospective data are available, we believe that clinicians may well find information from these readily available, non-invasive investigations helpful.

We had hoped to stimulate interest in the prevention of pulmonary embolism in parenteral nutrition dependent children with small bowel failure, which is a goal we share with Clare Dollery and her colleagues.⁹

1 Pollard AJ, Sreeram N, Wright JG, Beath SV, Booth IW, Kelly DA. ECG and echocardiographic diagnosis of pulmonary thromboembolism associated with central venous lines. *Arch Dis Child* 1995; 73: 147-50.

2 The PIOPED Investigators. Value of the ventilation/perfusion scan in acute pulmonary embolism: results of the prospective investiga-

- tion of pulmonary embolism diagnosis (PIOPED). *JAMA* 1990; 263: 2753-9.
- 3 Sreeram N, Cheriex E, Smeets JLRM, Gorgels AP, Wellens HJJ. Value of the 12-lead ECG at hospital admission in the diagnosis of pulmonary embolism. *Am J Cardiol* 1994; 73: 298-303.
- 4 Garson A. Electrocardiography. In: Anderson R, Macartney FJ, Shinebourne EA, Tynan M, eds. *Paediatric cardiology*. London: Churchill Livingstone, 1987: 235-317.
- 5 Gordon I, Helms P, Fazio P. Clinical applications of radionuclide lung scanning in infants and children. *Br J Radiol* 1981; 54: 576-85.
- 6 Chitwood RW, Lyster HK, Sabiston DC. Surgical management of chronic pulmonary embolism. *Ann Surg* 1985; 201: 11-26.
- 7 Cheriex E, Sreeram N, Eussen Y, Pieters PA, Wellens HJJ. Cross-sectional Doppler echocardiography as the initial technique for the diagnosis of acute pulmonary embolism. *Br Heart J* 1994; 72: 52-7.
- 8 Dollery CM, Sullivan ID, Bauraind O, Bull K, Milla P. Pulmonary embolism and long term central venous access for parenteral nutrition. *Lancet* 1994; 344: 1043-5.
- 9 Dollery CM. Pulmonary embolism in parenteral nutrition. *Arch Dis Child* 1996; 74: 95-8.

Persistent nocturnal cough in childhood: a population based study

EDITOR,—The study by Ninan *et al* accepts that 'it is now well established that in some cases isolated persistent cough may be the sole presenting manifestation of asthma'.¹ This is a fact proved in two studies that the article refers to.^{2,3} However, at the same time Ninan *et al* try to discount isolated persistent nocturnal cough as a marker of asthma.

Asthma is a chronic health condition and this has been defined as a condition that has been present for at least three months.⁴ Consequently those children with persistent nocturnal cough should have been defined as those who have had symptoms for at least three months and not four weeks.

The second problem is relying on the parents' history of persistent nocturnal cough. This is simply unreliable in our experience and has been proved in the small study by Falconer *et al*.⁵ This means that the reported persistent nocturnal cough is underestimated and inevitably has biased the results.

As it has been suggested the diagnosis of asthma is easier when cough is associated with wheeze, shortness of breath and tightness in the chest, although, in fact, none of these symptoms individually or collectively is specific for asthma. For example, cystic fibrosis, bronchiectasis, tuberculosis, and other rare conditions may present in a similar way. Detailed history including type of cough may help in the differential diagnosis. For example, dry cough is more suggestive of asthma. Other studies have relied on diagnostic tests to confirm or refute the diagnosis of asthma rather than relying on history alone.^{2,3,6}

Unfortunately in this study no diagnostic tests were applied to the group who reported persistent nocturnal cough. We also would have liked to know if the symptoms of the 12% of the 27 children with it had been controlled by the antiasthma treatment. We therefore think it is rather misleading to discount persistent nocturnal cough as a marker of childhood asthma.

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Drs Ninan and Russell comment:

We thank Drs Madlome and Inglis for their comments. We would like to point out that the publication here is only a small part of a