Correspondence

Monitoring for central apnoea in infancy—limitations of single channel recordings

Sir,

We were interested to read the article by MacFadyen et al on how the detection of ‘central’ apnoea (pauses in breathing movements) can be improved by using two respiratory channels. The statement that ‘breathing movements with amplitudes less than 25% of those at rest were considered not to be associated with appreciable ventilation’ is not substantiated. To have done so would require concurrent measurement of one or more of the following: airflow into and out of the lungs, oxygenation, and carbon dioxide concentrations. In our opinion, non-invasive monitoring of the arterial oxygen saturation (SaO₂) with pulse oximetry provides more relevant data than a second channel of respiratory movements.

Experience with long term recordings of SaO₂, breathing movements, electrocardiography, and respiratory airflow indicates that ‘central apnoea’ may be less important than falls in oxygen saturation which occur with continued breathing movements (see figure). Moreover, a recent evaluation of the volume expansion capsule transducer applied to the abdomen has found it to be an excellent indicator of breathing movements in infants under 6 months of age.

Many readers may misinterpret the fact that in fig 1–4 the graph papers upon which each signal is printed are maligned. We also have used their analysis system and therefore know that this may occur despite time synchrony of the signals. We would, however, question the abdominal breathing movement signals in fig 4 before the purported episode of ‘abdominal apnoea’. It is clearly asynchronous with both the electroencephalogram and thoracic impedance signals, therefore casting doubt upon the adequacy of attachment of the volume expansion transducer.

Figure  Cardiorespiratory monitoring of a 3 month old infant showing arterial oxygen saturation in beat-to-beat mode (I), the arterial pulse waveform from which the oxygen signal is derived (II), the abdominal expansion capsule (III) and electrocardiography (IV). Recording breathing movements and electrocardiotherapy alone would fail to identify gross hypoxaemic episodes which were not evident clinically.
capsule and its consequent detection of breathing movements.

References
3 Southall DP. The role of apnoea in the sudden infant death syndrome (SIDS)—a personal view. Pediatrics 1988;80:73-84.

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Dr MacFadyen comments:
Our paper was written to draw attention to the possible inaccuracy of conclusions drawn from data which rely on a single channel recording as an indicator of respiration. We suggest that use of two separate channels reduces false interpretation of occurrence or duration of periods of absent movement on only one of the channels. We state clearly that we do not attempt to extrapolate from our observations to the possible significance of such pauses and caution against conclusions drawn from such extrapolations by others.1 The use of indicators of oxygenation is an entirely separate issue. We recognise the continuing advances in non-invasive monitoring but reiterate the need for critical interpretation of data from any type of recording.

Malalignment of electrocardiographic graph paper on reproduction does not alter the finding that duration of apparent apnoea was misleading if based on the single abdominal channel. The pressure capsule was properly applied and yielding consistent signals during quiet breathing as described in the paper. On critical review of literature on interpretation of respiratory movements in most cases, including Dr Southall’s work, an arbitrary threshold for significant movement or absence of movement is applied. As we describe in the methods section, applying an arbitrary threshold to interpretation of our recordings yielded an even higher rate of false positives for apnoea. Our stated conclusion holds true—the use of two channels of respiratory movement is less prone to qualitative and quantitative error than one, not that we have found an ideal foolproof indicator of apnoea and its significance.

Reference
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