equivalent to drinking two and a half times as many cups of coffee or tea each day as usual. If there is a dose response relation between coffee consumption and coronary heart disease or low birthweight babies, as seems to be the case, and that risk is mediated by caffeine then smokers who abstain would be at continuing high risk because of their caffeine consumption. Doctors offering antismoking treatment should advise patients that continued consumption of coffee at the same level may exacerbate the tobacco withdrawal syndrome and contribute to increased health risks; these patients should reduce their consumption.

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Identifying hypoxaemia in children admitted for adenotonsillectomy

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Most children with obstructive sleep apnoea have adenotonsillar hypertrophy,^{1,3} but what proportion of the children with large tonsils and adenoids have obstructive sleep apnoea is unknown.^{4,5} We studied this and whether affected children might be identified without recourse to studies during sleep.

Subjects, methods, and results

Forty four children (aged 2 to 7) were studied on the night before adenotonsillectomy. Twenty controls with no active symptoms of upper or lower respiratory tract disease were studied on the night before another elective procedure. Both groups underwent a pre-operative clinical assessment by an otorhinolaryngologist, who noted symptoms, signs, and the indication for adenotonsillectomy.

Oxygen saturation was measured continuously overnight with a pulse oximeter (Novamatrix). Chest impedance was also measured and electrocardiography performed. The baseline oxygen saturation during sleep was obtained by sampling the saturation three times an hour outside dips. Dips in the saturation of 10% or more below the baseline value were studied. A stepped fall in saturation with steady pulse waveform and continued breathing movements suggested obstruction of the airways. These episodes were counted as incidents per hour and their length noted as

time of hypoxia per hour. Oxygen saturation when the child was awake was noted at the beginning or end of the night.

The figure shows the full results of measuring oxygen saturation. For all measures of hypoxaemia a substantial minority of the patients admitted for adenotonsillectomy fell completely outside the normal range. Fifteen children who suffered night time hypoxaemia were identified, with baseline oxygen saturation below 90% (nine patients) or at least one hypoxic episode an hour (13), or both (seven). Twelve children had episodes of hypoxia (totalling ≥ 1 minute per hour). The 15 children who suffered night time hypoxia were then compared with the remaining 29 from the group admitted for adenotonsillectomy.

There were no notable differences between the groups regarding sex, history of snoring or apnoea, body weight, or any features found on examination of ears, palate, mandible, tonsils, or neck glands. The clinical features that did distinguish the hypoxic group were younger age (median 3.5 v 5.6 years; $p < 0.01$), non-white ethnic origin (80% (12/15) v 24% (7/29); $p = 0.001$), and physical signs of nasal obstruction—namely, open mouth and audible respiration at rest (93% (14/15) v 38% (11/29); $p = 0.001$). In addition, oxygen saturation when the patient was awake was lower (median 95% v 97%; $p < 0.001$).

Hypoxic patients could not be identified by clinical features alone, but by combining the presence or absence of breathing through the mouth with the oxygen saturation when awake we identified affected patients with 93% sensitivity (95% confidence interval 70 to 100%) and 86% specificity (73 to 99%).

Comment

We showed that significant night time hypoxaemia is common, occurring in 34% of children admitted for adenotonsillectomy. We have clearly defined the importance of breathing through the mouth as a clinical sign of obstruction and the usefulness of measuring oxygen saturation when awake. Children who clearly breath through the mouth will suffer night time hypoxaemia unless their oxygen saturation when awake is at least 97%. We hope that this will help paediatricians and otorhinolaryngologists to assess children correctly and avoid unnecessary operations.

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Results of monitoring oxygen saturation. Dashed lines show median values. Data are not normally distributed; for each measure the difference between patients and controls was highly significant (Mann-Whitney U test; $p \leq 0.005$)