

The Ageing Brain: Age-dependent changes in the electroencephalogram during propofol and sevoflurane general anaesthesia.

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BACKGROUND: Anaesthetic drugs act at sites within the brain that undergo profound changes during typical ageing. We postulated that anaesthesia-induced brain dynamics observed in the EEG change with age.

METHODS: We analysed the EEG in 155 patients aged 18-90 yr who received propofol (n=60) or sevoflurane (n=95) as the primary anaesthetic. The EEG spectrum and coherence were estimated throughout a 2 min period of stable anaesthetic maintenance. Age-related effects were characterized by analysing power and coherence as a function of age using linear regression and by comparing the power spectrum and coherence in young (18- to 38-yr-old) and elderly (70- to 90-yr-old) patients.

RESULTS: Power across all frequency bands decreased significantly with age for both propofol and sevoflurane; elderly patients showed EEG oscillations ~2- to 3-fold smaller in amplitude than younger adults. The qualitative form of the EEG appeared similar regardless of age, showing prominent alpha (8-12 Hz) and slow (0.1-1 Hz) oscillations. However, alpha band dynamics showed specific age-related changes. In elderly compared with young patients, alpha power decreased more than slow power, and alpha coherence and peak frequency were significantly lower. Older patients were more likely to experience burst suppression.

CONCLUSIONS: These profound age-related changes in the EEG are consistent with known neurobiological and neuroanatomical changes that occur during typical ageing. Commercial EEG-based depth-of-anaesthesia indices do not account for age

and are therefore likely to be inaccurate in elderly patients. In contrast, monitoring the unprocessed EEG and its spectrogram can account for age and individual patient characteristics.