Title: ONSET OF HYPNOSIS WITH HALOTHANE INDUCTION USING SINGLE BREATH, TRIPLE BREATH AND CONVENTIONAL TECHNIQUES.

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Introduction. Inhalation induction of anesthesia in adults is often avoided by patients and anesthetists because of the patient's fear of the mask and the possibility of a dangerous excitement phase. Previous work has demonstrated that rapid inhalation induction of anesthesia with a single vital capacity breath of 4% halothane in oxygen is safe and well accepted in adult volunteers (1). Computer simulations have suggested that 2 or 3 vital capacity breaths during the first sixty seconds of induction would raise the brain concentration of halothane even more rapidly to a hypnotic level (2). But do these "single breath" methods actually induce hypnosis in less time than the conventional induction technique of gradually increasing the inspired halothane concentration? To answer this question we compared the time to onset of hypnosis using "single breath", "triple breath", and the conventional technique of induction with halothane.

Methods. After approval by our Clinical Investigation Committee and following informed consent we selected eight healthy volunteers of both sexes ranging in age from 25-45 years. General anesthesia was induced in each volunteer three times in a single day. The three trials were as follows: a 60 second vital capacity breath hold of 4% halothane in oxygen followed by an additional three minutes of spontaneously breathing 4% halothane in oxygen; a vital capacity breath hold of 4% halothane in oxygen followed by a second vital capacity breath at 21 seconds and a third vital capacity breath at 33 seconds which was held until 60 seconds unless unconsciousness occurred first; a mask induction with halothane in oxygen starting with 5% halothane and increasing the inspired concentration by 5% every 15 seconds until 4% halothane was reached. In all trials volunteers breathed halothane for a total of four minutes. A latin square design was used to randomize the order of trials in each volunteer. We monitored blood pressure with a Dinamap, ECG on a standard operating room monitor, heart and breath sounds with a pre-cordial stethoscope, oxygenation with an ear oximeter, and inspired and expired gas tensions with a Perkin-Elmer mass spectrometer (Model MCA 1100). Data was stored and processed on a DEC MINC 11/23 laboratory computer. Unconsciousness was defined as the point at which the volunteers failed to open their eyes on command. The command was repeated at 10 second intervals. We compared the time to unconsciousness among trials by the P-test using the analysis of variance for repeated measures and Duncan's multiple range test.

Results. Each volunteer reached unconsciousness on all trials. Onset of unconsciousness was most rapid with three vital capacity breaths of 4% halothane (average 69 seconds), intermediate with a single vital capacity breath held for 60 seconds (average 112 seconds), and slowest with gradually increasing concentrations of halothane (average 166 seconds). These times were significantly different at the p < .01 level. The increase in end tidal halothane concentration was most rapid with the three breath induction, intermediate with the single breath (Line A)(Fig 1) and slowest with the conventional technique (Line B)(Fig 1). Excitement on induction was seen only with the conventional induction technique in three of the eight volunteers. Airway obstruction was uncommon and was always manageable with jaw elevation. Vital signs and oxygen saturation remained at safe levels for all trials. Oxygen saturation never dropped below 98%. Blood pressure never went below 90/53. Volunteers unanimously preferred the more rapid inductions.

Discussion. Although previous work has shown that rapid inhalation induction is safe and well accepted, this is the first time that it has been directly compared to a more conventional technique. The results show that the rapid technique is safe in that an excitement phase is avoided. It is also more pleasant. Our "conventional" induction protocol was arbitrary because the concentration of halothane could have been increased more slowly or more rapidly. We attempted to duplicate our usual clinical practice. Our definition of anesthesia is also arbitrary in being lack of response to a verbal stimulus rather than a surgical incision. We have induced hypnosis rather than a surgical plane of anesthesia. In current studies, we are investigating how rapidly the surgical plane can be reached in patients.

FIGURE I
Rate of rise of ET(\text{HAL})

\begin{table}
\centering
\begin{tabular}{|c|c|c|}
\hline
ET & HAL & \\
\hline
A & Single breath & \\
B & Conventional & \\
\hline
\end{tabular}
\end{table}

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{figure1.png}
\caption{Rate of rise of ET(\text{HAL})}
\end{figure}

References:

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