How to make Sevoflurane work for you - VIMA
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VIMA is Volatile Induction and Maintenance Anesthesia.
VIMA and Sevoflurane are an ideal combination.
VIMA is an acceptable equivalent alternative to IV plus Volatile combinations.
VIMA preparation requires 2 minutes for circuit anesthetic prime, lung oxygen prime, and brain psychological prime.
VIMA Sevoflurane induction is faster than IV Propofol (51 ± 4 sec vs. 81 ± 12 sec).
VIMA wake up is as fast and uncomplicated as Propofol induction and VM anesthesia.
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VIMA is an acronym for Volatile Induction and Maintenance Anesthesia. Volatile Maintenance (VM) of anesthesia is almost universal for general anesthesia, but Volatile Induction (VI) is uncommon.

VIMA works. When actually used in an ambulatory surgery program, VI with sevoflurane is faster (51 ± 4 seconds vs. 81 ± 12 seconds) and has similar side effects, recovery times and patient satisfaction compared with intravenous (IV) anesthesia induction with propofol.\(^1\) In addition, VI costs less than IV induction, especially when the savings from eliminated or reduced muscle relaxant is considered.

Volatile Induction is performed by encouraging the patient to take one or several deep breaths of a high concentration of sevoflurane with or without nitrous oxide. Volatile Induction with nitrous oxide - sevoflurane combination from a circuit primed with 8% Sevoflurane in 75% nitrous oxide provides loss of consciousness (LOC) after 1 - 4 breaths in 51 ± 4 seconds. If induction is complete after just one breath, LOC occurs in 39 ± 3 seconds.\(^1\)

Preparation for VI takes just two minutes. During this time, we provide a volatile prime for the anesthesia circuit, an oxygen prime for the patient’s lungs, and a psychological prime for the patients brain.

Two minute volatile prime fills the carbon dioxide absorber and reservoir bag with the maximum sevoflurane and nitrous oxide concentrations available, to make induction faster and safer\(^2\). Two minute oxygen prime provides close to 2 liters of oxygen reserve; this allows safe apnea for 8 - 10 minutes. Concomitant psychological prime reassures the patient that sleep will come quickly after one or several breaths.

Volatile Induction is performed by encouraging the patient to take a deep breath from the primed breathing circuit which contains an average of 6.2% sevoflurane and 64% nitrous oxide. This induction provides LOC in less than one minute, as quantified above. During the first few minutes, blood pressure and/or heart rate may rise. Excitement-like motion is rare and minor.

Following VI, anesthesia should be deepened. After three to five minutes, blood pressure usually falls and the patient is ready for tracheal intubation if it is required for the intended surgery. No other medications are required for this intubation under deep anesthesia. During the time between loss of consciousness and tracheal intubation, surgical preparation can usually proceed. Alternatively, laryngeal mask airway (LMA) can usually be inserted in two (2) minutes or continued mask anesthesia can continue if it is practical.

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Volatile Maintenance of anesthesia with sevoflurane is easy because sevoflurane’s low blood/gas solubility allows expired sevoflurane tension to follow inspired closely. To achieve great and rapid changes in anesthetic depth, the sevoflurane vaporizer is switched full on (8%) or full off (0%) with high fresh gas flow to achieve inspired and expired overpressure when great and fast changes in anesthesia depth are desired. Small adjustments at low fresh gas flows provide slow changes in anesthesia depth.

Wake up from sevoflurane is faster than from isoflurane and slower than from desflurane and/or nitrous oxide. This is because sevoflurane’s blood/gas solubility is 0.67 compared with 1.3 for isoflurane and 0.42 for desflurane and 0.48 for nitrous oxide. Sevoflurane’s low blood/gas solubility makes expired sevoflurane tension follow inspired tension closely after the vaporizer is switched off and the fresh gas flow is increased. If MAC\textsubscript{Awake} is 0.33 MAC then this is a reasonable measure to use in understanding wake up. With sevoflurane’s low solubility, alveolar tension crosses MAC\textsubscript{Awake} within 5 minutes, even after an infinite duration 1 MAC anesthetic. If MAC\textsubscript{Awake} is 0.2 MAC alveolar tension crosses MAC\textsubscript{Awake} in 12 minutes. Clinical wake up (response to verbal command) usually occurs when brain anesthetic tension crosses MAC\textsubscript{Awake}, about 3 minutes after alveolar tension crosses this value.

The entire course of VIMA can be shown in graph and pictures with the computer simulation Gas Man\textsuperscript{®}. The Gas Man graph shows overpressure in vaporizer setting, inspired tension, and expired tension, to achieve rapid and large changes in brain tension and anesthetic depth.

Volatile Induction and Maintenance Anesthesia is an acceptable equivalent alternative to IV plus Volatile combinations. With VIMA, a potent inhalation anesthetic - Sevoflurane - alone provides all the components of general anesthesia. VIMA provides deep anesthesia from the beginning to the end of surgery. If post operative analgesia is required, it can be added at any time. Preparation for induction takes only two minutes. No additional drugs are required for intra-operative analgesia or muscle relaxation so side effects, complications, and other drug costs are averted. VIMA provides faster induction and has similar side effects, recovery times and patient satisfaction compared with propofol intravenous induction in adults undergoing ambulatory surgery\textsuperscript{1}. No other volatile anesthetics have the necessary attributes of low solubility, high tolerability, and high vaporizer capability, to make VIMA work.

![Figure. Gas Man\textsuperscript{®} Simulation of anesthetic tension in gas which is delivered (Del), inspired (I), expired (E), in vessel-rich group including brain (R), in muscle (M), and in fat (F). Nitrous oxide was simulated but its concentration is not shown here.](image-url)
References

