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# Balanced anaesthesia today

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An 'ideal' anaesthetic can be approached by using a combination of different compounds. A variety of anaesthetic techniques has been described to ensure safe administration and an early recovery with high patient satisfaction. In particular, the inhalational anaesthetics desflurane and sevoflurane, with their rapid pharmacokinetics, re-established the notion of balanced anaesthesia as an equivalent, well-controllable technique. With the choice of anaesthetics and anaesthetic adjuvants clinically available today, especially the combination of a volatile anaesthetic with a short-acting opioid, balanced anaesthesia represents a big step towards an ideal anaesthetic.

**Key words:** general anaesthesia; balanced anaesthesia; total intravenous anaesthesia; propofol; desflurane; sevoflurane; remifentanil.

In current anaesthetic practice there is no single ideal anaesthetic agent. Although some substances have advantages in certain areas, they lack other important properties. An ideal anaesthetic can be approached by the use of a combination of different compounds. Although new developments such as target-controlled infusion (TCI) renewed the interest in intravenous anaesthesia, the introduction of the inhalational anaesthetics desflurane and sevoflurane, with their rapid pharmacokinetics, re-established the notion of balanced anaesthesia as an equivalent, well-controllable technique. With the choice of anaesthetics and anaesthetic adjuvants clinically available today, especially the combination of a volatile anaesthetic with a short-acting opioid, balanced anaesthesia represents a big step towards an ideal anaesthetic.

## DEFINITION OF BALANCED ANAESTHESIA

The concept of combining several compounds with different actions—such as amnesia, analgesia, or diminution of autonomic reflexes—was first conceived by

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George W. Crile in 1910 with a theory called anociassociation.[1] Crile suggested the use of a light general anaesthesia together with local anaesthesia for blocking painful stimuli. The term balanced anaesthesia was introduced by John S. Lundy in 1926.[2] Lundy's idea was to utilize a balance of agents and techniques (e.g. premedication, regional anaesthesia, general anaesthesia) to achieve the different objectives desired during anaesthesia (i.e. analgesia, amnesia, muscle relaxation, and reduction or elimination of autonomic reflexes while maintaining homeostasis).[3] The concept of balanced anaesthesia today is that a combination of anaesthetics will act synergistically with respect to desired effects such as hypnosis or analgesia, but not with respect to side-effects. Synergism of effects has been demonstrated for a variety of anaesthetic compounds as well as adjuvants; however, it is not found for all compounds. Currently, the term balanced anaesthesia is mostly used for a combination of several anaesthetics and anaesthetic adjuvants, including the use of an inhalational anaesthetic, although a clear-cut definition is lacking. The term balanced anaesthesia is often used for an inhalational anaesthetic-based technique as opposed to techniques that exclude all inhalational anaesthetics, including nitrous oxide, which have been termed total intravenous anaesthesia (TIVA). Although the concept of balanced anaesthesia today is still as viable as ever, it is at times regarded as old-fashioned and is often not even easily found in current textbooks of anaesthesia (e.g. see index in Miller's Anesthesia, sixth edition, Elsevier Churchill Livingstone, Philadelphia, USA, 2005). In the 1990s introduction of the volatile anaesthetics desflurane and sevoflurane into the commercial market renewed the interest in balanced anaesthesia. The improved pharmacokinetics compared to those of halothane, enflurane, and isoflurane promised faster induction times as well as a more rapid recovery from anaesthesia (Figure 1).

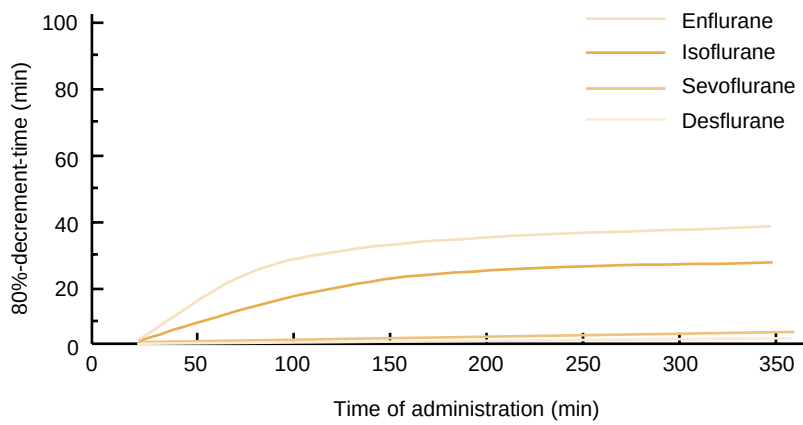


**Figure 1.** The 80% decrement times of volatile anaesthetics. By analogy with the context-sensitive half-time, the decrement time describes the decay of the alveolar concentration with the time of administration. The 80% decrement times of both sevoflurane and desflurane are less than 8 minutes and do not increase with the duration of anaesthesia. However, the 80% decrement times of isoflurane and enflurane increase significantly after approximately 60 minutes of anaesthesia, reaching plateaus of approximately 30–35 minutes. The 80% decrement time correlates closely with the clinically observed recovery of consciousness. Modified from Bailey (1997, Anesthesia and Analgesia 85: 881–886) with permission.

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