

CHAPTER VII

DISCUSSION, CONCLUSION AND RECOMMENDATION

Discussion

It is desirable to have a rapid recovery from anesthesia, especially after day case surgery. Isoflurane appears to offer advantages in this context. The pharmacological profile of isoflurane (low blood/gas partition coefficient, low biodegradation) suggests that it provide a more rapid recovery compared to halothane. The purpose of this study was to compare the recovery characteristics of halothane and isoflurane anesthesia. Other than strict randomization, a standardized anesthetic technique was employed. Propofol was given for induction of anesthesia in both groups, also succinyl choline, vecuronium bromide, nitrous oxide and oxygen. Propofol was chosen as the induction agent because immediate recovery is rapid and, in absence of inhalation agents, its effect on postoperative psychomotor testing disappears quickly.⁽²¹⁾ This study was confined to the patients whose anesthesia had lasted for a minimum of 20 minutes, to ensure that the effect of propofol had been decreased or disappeared. None of the patients received any premedications or adjuvants likely to affect recovery from anesthesia. The results of this study probably reflect real differences between the effects of halothane and isoflurane anesthesia because of the sufficient duration of anesthesia and due to the restricted use of adjuvants. In addition, similar prolongation, if it occurred, would be expected in each group, and thus the significance of our results was unlikely to be affected by our use of

these agents.

Concerning the concentration of inhalation agents, halothane and isoflurane, we used the properly measured equipotent dose of these agents which was different from previous studies. In those studies the concentrations of inhalation agents were adjusted as clinically indicated to maintain anesthesia and there was no attempt to measure anesthetic concentrations or administer equipotent doses. Though, in some studies the concentration of the inhalation agent was administered at an equipotent dose, they did not measure the end tidal concentration. It should be noted, however, that equipotent inspired concentrations do not necessarily result in equipotent alveolar concentrations, since a variety of factors (e.g. respiratory minute volume, cardiac output, blood solubility) affect the difference between inspired and alveolar concentrations. For these reasons, in this study we used end tidal concentration monitoring to measure the concentrations of inhalation agents continuously in order to ensure that these two agents were administered at equipotent doses.

The variable time from the discontinuation of the anesthetic gases to the end of surgery might be a confounding factor in the analysis of recovery time; in this study all anesthetics were therefore continued until the end of surgery which was different from normal clinical practice. In normal practice we will gradually reduce the anesthetic concentration towards the end of surgery. This will obviously result in a decreased recovery time. However, it may not be possible to reduce isoflurane concentration in quite the same way as with halothane because of the probability of the patient's becoming light toward the end of the anesthetic. Thus, we waited until all surgical stimulation had ceased before discontinuation of the anesthetics, in order to prevent surgical stimulation from causing an earlier awakening than

might be expected in the absence of stimulation.

Concerning muscle relaxants and recovery, in the past succinylcholine was the only muscle relaxant applicable for outpatient anesthesia. Pancuronium or other long acting nondepolarizing muscle relaxants should be avoided in ambulatory practice because it is not clear to what extent and for how long possible residual relaxation may impair psychomotor skill in some patients.⁽²²⁾ Today it appears that vecuronium is suitable for ambulatory surgery⁽²³⁾ and is unlikely to cause residual relaxation which might impair psychomotor skills.⁽²⁴⁾ This study used vecuronium for muscle relaxation in order to ensure that the real differences between the effects of halothane and isoflurane were not influenced by muscle relaxant effect. In addition the psychomotor and cognitive impairment was not the result of muscle relaxant. However, it would have been better if we could monitor the muscle relaxant effect.

The rationale behind the use of 0.5 % bupivacaine for local infiltration intraoperatively in this study was to give not only the adequate intraoperative analgesia but also the postoperative analgesia so that the patients did not need the analgesic adjuvant likely to affect recovery time. Additionally, similar postoperative analgesia would occur in each group and therefore the significant differences of our result was not likely to be affected by the analgesic adjuvant. However, as far as ethical concerned, diclofenac which has been previously shown to have no effect on recovery⁽²⁵⁾, was given to the patient with severe postoperative pain.

Assessment of recovery should include a number of tests. This study used the clinical, psychomotor and cognitive tests. The Ball Bearing Test and the Digit Symbol Substitution Test are the tests which may influence the normal recovery period, because they can awaken the

patients artificially. However, the similar effect should occur in both groups and thus the significant difference of our results is unlikely to be affected by the tests.

Recovery times

The result of this study showed that both halothane and isoflurane anesthesia resulted in similar recovery assessed by the times taken to extubation, response to verbal command to open eyes, orientation, sit up unaided, the Ball Bearing and Digit Symbol Substitution Test. However, the recovery assessed by the times taken to stand up and walk unaided were more rapid in isoflurane group compared to halothane group. Theoretically, isoflurane should take advantage over halothane in term of rapid recovery. The differences favoring isoflurane may be explained on two basis. Isoflurane is less soluble than halothane, and its elimination is therefore more rapid. In addition, metabolism of isoflurane is far less than metabolism of halothane. Our result suggests, on the contrary, that both anesthetics resulted in equal recovery even the duration of anesthesia in the halothane group seemed to be longer than isoflurane group. The finding of a quicker clinical recovery in the isoflurane group is unlikely to be significant in the clinical situation because only 15 minutes are not long enough to produce benefit to both patient and health care provider in terms of increasing work productivities and decreasing work load. Moreover, it was evident that even the clinical recovery of isoflurane anesthesia (stand up and walk unaided) was more rapid than halothane but the patients in isoflurane group were still under the influence of an anesthetic drug. It is, therefore, not safe for the patients to be discharged from the hospital unaccompanied.

However, the results of this study could not be applied to the longer anesthesia, because the duration of administration will affect rapidity of recovery after inhalational anesthesia. The pharmacokinetics of inhaled anesthetics depend on the length of time they are administered. ⁽²⁸⁾

Side effects

Nausea and vomiting following the ambulatory surgery is a significant problem, as it is distressing to the patients and prolongs the time to ambulation and subsequent discharge from the hospital. It has also been shown to be a significant cause of unexpected hospital admission from the PACU. The incidence of postoperative nausea and vomiting is affected by a number of different factors. The anesthetic agent is one of the important factors that influence the incidence of nausea and vomiting. The result of this study showed that the incidence of nausea and vomiting in both groups was similar.

Also, the incidences of the minor postoperative side effects and the intraoperative side effects were similar in both groups.

Excessive postoperative pain is the most common surgical-related cause of unexpected hospital admissions after ambulatory surgery. Pain control is one of the most important factors in determining when a patient can be discharged from the hospital. Pain must be treated rapidly and effectively in order to minimize postoperative symptoms which can delay ambulation. Pain management for outpatient surgery includes three essential components : use of potent, rapid - acting intravenous opioid analgesics to decrease the intraoperative anesthetic requirement and provide effective analgesia in the early recovery period, use of regional and local anesthetic techniques for analgesia during the perioperative period and use of oral analgesics

for controlling pain after discharge. In this study we used 0.5 % bupivacaine 10 cc. for local infiltration at the incisional site in order to decrease the intraoperative anesthetic requirement and provide the postoperative analgesic effect. The result of this study showed that there was no difference between these 2 groups in the visual analogue pain score and the number of the patients needed postoperative analgesic drugs. That is to say the combined local anesthetic with general anesthesia either by halothane or isoflurane had similar postoperative analgesic effects.

Patient's satisfaction and acceptance of anesthesia

Every study that concerns recovery should include the patient's opinion about anesthesia. The patient can offer a lot of informations about his experience. In this study we asked the patients to answer the questionnaire concerning the recovery. The result showed that there was no difference in patient's satisfaction and acceptance of anesthesia between these 2 groups.

Conclusion

It can be concluded that both halothane and isoflurane anesthesia resulted in similar rapid recovery. The side effects and patient acceptance of these two anesthetics were not different. However, isoflurane is much more expensive than halothane. By cost minimization, halothane is the drug of choice for general anesthesia in gynecologic diagnostic laparoscopy.

Recommendation

For further study, the following recommendations should be taken into consideration

1. To be more generalizable, the similar study should be done in a wider range of surgical and anesthetic setting.
2. To get more informations concerning the recovery, the questionnaire should be given to the patient after discharge.
3. To get more accurate result, muscle relaxant's effect should be monitored using nerve stimulator for criteria of extubation.