Reports of Investigation

Comparison of sevoflurane and propofol for ambulatory anaesthesia in gynaecological surgery

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Purpose: To analyse the cost-efficiency ratio of sevoflurane compared with propofol for gynaecological ambulatory anaesthesia.

Methods: In a prospective randomised study 52 ASA I patients scheduled for ambulatory pregnancy termination were premedicated with lorazepam and received alfentanil prior to anaesthesia induction with propofol (group P, n = 26) or with sevoflurane 8% (group S, n = 26) using the single breath vital capacity technique. Anaesthesia was maintained with N_2O in both groups supplemented with sevoflurane (group S) or propofol boluses (group P).

Results: The quality of induction and maintenance of anaesthesia was similar between groups except for the incidence of movement during anaesthesia (14/26 patients in group P and 4/26 in group S, $P < 0,05$). The incidence of post-operative emesis was increased in the sevoflurane group ($P < 0.05$) but the patients felt able to perform normal activity after a similar delay (18.4 ± 2.9 hr *vs* 20.6 ± 2.8 hr, $P > 0,05$). The direct cost of anaesthesia was lower in the sevoflurane group (679 FF, n = 24 *vs* 1153 FF, n = 2-5 in propofol group) but the weight of uterine aspiration products was higher (293 ± 66 g, median = 230 g, Range 110-800 g, n = 13 *vs* 108 ± 8 g, median = 110 g, Range 60-160 g, n = 12, group S *vs* group P respectively, $P = 0.004$). Four patients needed reoperation and ambulatory anaesthesia failed in six patients because of uterine haemorrhage.

Conclusion: Ambulatory anaesthesia with sevoflurane offers a good alternative to propofol but further investigation concerning blood loss with sevoflurane needs to be performed in gynaecological practice.

Objectifs : Cette étude prospective randomisée compare le rapport coût efficacité du sévoflurane et du propofol pour l'anesthésie ambulatoire gynécologique.

Méthodes : Cinquante deux patientes classées ASA I, devant subir une interruption volontaire de grossesse par aspiration ont reçu une prémédication avec du lorazépam et ont reçu de l'alfentanil avant une induction soit intraveineuse, avec du propofol (groupe P, n = 26) soit par technique de capacité vitale avec 8 % de sévoflurane (groupe S, n = 26). L'anesthésie a été maintenue avec du N_2O associé à du sévoflurane (group S) ou à des bolus répétés de propofol (group P).

Résultats : La qualité de l'induction et l'entretien de l'anesthésie ont été similaires entre les 2 groupes sauf que pendant l'anesthésie, 14/26 des patients du groupe P ont bougé et seulement 4/26 dans le groupe S ($P < 0,05$). L'incidence des nausées postopératoires a été supérieure dans le groupe S mais le retour à une activité normale a connu un délai similaire dans les deux groupes (18,4 ± 2,9 h *vs* 20,6 ± 2,8 h, $P > 0,05$). Le coût direct de l'anesthésie avec le sévoflurane a été inférieur (679 FF, n = 24 *vs* 1153 FF, n = 25 dans le groupe propofol) mais le poids des produits d'aspiration utérine a été supérieur (293 ± 66, g, médiane 230 g, limites 110-800 g n = 13 dans le groupe S *vs* 108 ± 8 g, médiane 110 g, limites 60-160 g n = 12 dans le groupe P, $P = 0,004$). Quatre patientes du groupe S ont eu besoin d'une seconde chirurgie et l'anesthésie ambulatoire a échoué chez six d'entre elles à cause d'une hémorragie utérine.

Conclusion : L'emploi de sévoflurane pour l'induction et l'entretien de l'anesthésie ambulatoire gynécologique constitue une alternative valable au propofol mais une recherche plus poussée concernant la perte sanguine lors de son emploi doit être réalisée.

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IN adults, vital capacity inhalation of sevoflurane, a mildly pungent and soluble gas, allows rapid induction with few adverse respiratory and cardiovascular effects.[1-3] Despite the fear of a plastic mask, the acceptability of this technique is remarkably high. The late postoperative adverse effects following hospital discharge after ambulatory anaesthesia and the cost of anaesthesia appear to be the ultimate factors that may limit the use of sevoflurane for induction. Thus, the aim of this study was to evaluate the cost-efficiency ratio of ambulatory anaesthesia induced either with propofol or with sevoflurane 8% associated with opioids and premedication.

Methods

Fifty-two female patients were included in this prospective, randomized study after written informed consent and approval by the institutional ethics committee. All patients were aged > 18 yr, scheduled for ambulatory termination of pregnancy by aspiration and were ASA 1 physical status. Exclusion criteria included obesity, symptomatic regurgitation and inability to understand the vital capacity procedure. Two hours before surgery, patients were premedicated with 1 mg lorazepam and 800 mg cimetidine with sodium citrate *po*. Just before induction, all patients received 0.5-0.75 mg alfentanil. According to randomization obtained in sealed envelopes, anaesthesia (n = 26) was induced in group S with the single-breath vital capacity technique using sevoflurane 8% in 6 $l \cdot min^{-1}$ oxygen and maintained with sevoflurane 2 to 3% with 2 $l \cdot min^{-1}$ fresh gas flow including N_2O. In group P (n = 26), anaesthesia was induced with propofol, maintained with N_2O 60% in O_2 with 20 mg additional boluses of propofol according to signs of awakening. A circle breathing system was used in both groups. At the beginning of anaesthesia, a chronometer was used to measure the duration of administration of fresh gas and each modification was prospectively registered. Adverse events were prospectively assessed during induction, maintenance and at recovery. Patients were asked to answer to an oral questionnaire at discharge from the recovery room and to a mailed questionnaire at 24 hr. Because excessive uterine bleeding was observed during and after surgery in several patients, the product of uterine aspiration was weighed to evaluate blood loss in the last 25 patients. The cost of anaesthesia included the cost of gas, anaesthetics and syringes and assumed that 1 ml sevoflurane provided 183 ml vapour and that vials of propofol would not be used from one patient to another.

Parametric results were compared by Student's t test and ANOVA for repeated measures.

Non parametric results were compared by exact Fisher's tests or χ^2 when appropriate.

Results

The demographic data, the date of conception, and the duration of surgery were not different between groups. During induction of anaesthesia, no adverse ventilatory events were noted. During maintenance of anaesthesia, 14 patients in group P and four in group S moved but the incidence of other adverse effects was similar between groups. The results of the two questionnaires are presented in Table I.

The total cost of drugs and medical gases used for anaesthesia in the operating room was lower in the sevoflurane group (679 FF, n = 24) than in the propofol group (1153 FF, n = 25). Medical gases and anaesthetics used during anaesthesia are presented in Table II to allow cost comparisons between hospitals.

TABLE I Results of questionnaires obtained in the recovery room and at the 24 hr after surgery.

	Group S	*Group P*
Recovery room oral questionnaire		
Unpleasant induction	5/26	4/26
Unpleasant smell	2/26	1/26
Difficult breathing	1/26	1/26
Anxiety	3/26	4/26
Pain in the arm	0/26	2/26
Same induction again	2/26	2/26
24 hr mailed questionnaire		
Nausea	13/22	4/23
Vomiting	5/22	2/23
Pain	6/22	8/23
Unpleasant subjective feeling	18/22	19/23
- lightheadedness	7/22	8/23
- heavy head	2/22	3/23
- somnolence	11/22	11/23
- lassitude	9/22	6/23
- migraine	3/22	3/23
- inattention	3/22	7/23
- clumsiness	2/22	4/23
Post-op treatment	6/22	7/23
Total adverse events at 24 hr	67/242	63/253

TABLE II Anaesthetics and gases used during anaesthesia. Mean ± SEM or total waste.

	Group P *n = 25*	*Group S* *n = 24*
Propofol (mg)	153 ± 8	
total vials	25	
Sevoflurane (ml)		6.56 ± 0.49
total volume (ml)		151
alfentanil (mg)	0.610 ± 0.038	0.558 ± 0.025
total dose (mg)	15.25	14.5
Oxygen (l)	55 ± 4	43 ± 2*
total volume	1316	1074
N_2O (l)	6 ± 0.5	11 ± 1*
total volume (l)	149	286

* $P < 0.05$

However, four patients of group S had to undergo uterine curettage because of incomplete uterine voiding due to prolonged bleeding whereas only one patient of group P did because termination of pregnancy was incomplete ($P > 0.05$, Fisher's test). The weight of uterine aspiration was higher in group S (293 ± 66 g, median = 230 g, Range 110-800 g, n = 13) than in group P patients (108 ± 8 g, median = 110 g, Range 60-160 g, n = 12, $P = 0.004$ Mann Whitney test) despite a similar gestational age (9.0 ± 0.3 wk *vs* 9.2 ± 0.4 wk). As a result, six group S patients and one group P patient had failed ambulatory anaesthesia. No patient received homologous blood but, owing to large and unpredictable variations in peroperative uterine bleeding, the protocol was immediately interrupted.

Discussion

A favourable assessment of anaesthesia was made by anaesthetists and by the patients in the recovery room and during the 24 hr after surgery whatever the anaesthetic technique. Thus, sevoflurane 8% with the vital capacity technique allowed an induction which was as safe and as well tolerated as was propofol.[1-3] The depth of anaesthesia during maintenance was better with sevoflurane than with propofol boluses as previously demonstrated.[4] Excluding uterine surgery, the lower direct cost, deeper anaesthesia and similar late psychometric recovery obtained with sevoflurane compared with propofol favoured the use of sevoflurane for short ambulatory procedures. The bleeding risk and the indirect cost linked to failed ambulatory surgery did not favour the use of sevoflurane for uterine aspiration.

The unacceptable increase in bleeding observed in the sevoflurane group could not be explained by different gestation times or volatile agent concentration and the study was immediately stopped. The effects of sevoflurane on uterine smooth muscle has not been reported but is likely similar to that of other halogenated anaesthetic agents. When anaesthesia for uterine curettage was maintained with isoflurane, blood loss increased 2-fold compared with propofol.[5] The high concentration of sevoflurane with this particular technique and its low solubility might induce excessive uterine partial pressure and thus relaxation of smooth muscle. Inhibition of platelet aggregation induced by sevoflurane might also participate to excessive bleeding.[6]

Induction of anaesthesia with sevoflurane 8% allows a safe induction but a deeper level of anaesthesia than with repeated boluses of propofol. The late post-operative period differed by the higher occurrence of emesis which was of short duration and did not induce failed ambulatory surgery or delay normal activity. Nevertheless, the high blood loss with sevoflurane is unpredictable and precludes its use as the sole anaesthetic for uterine aspiration. For other ambulatory procedures, the favourable direct cost-efficiency suggests that sevoflurane is a good alternative to propofol.

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