A randomized comparison of propofol and methohexital as general anesthetics for vacuum abortion

Lichtenberg E S, Hill L J, Howe M, Heber W, Peipert J F

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
A comparison of propofol and methohexital as general anaesthetics for vacuum abortion.

Type of intervention
Other: Anaesthesia.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women electing to undergo vacuum abortion between 4 and 14 weeks’ gestation, as dated by pelvic examination or ultrasonography. To be included in the study, women had to have pregnancy proven on-site by latex agglutination or monoclonal antibody test on the day of surgery, plus bimanual or ultrasonographic validation of a pregnant uterus. They also had to have chosen to undergo a general anaesthetic. Women were excluded if they were unable to give consent, or if they preferred a local anaesthetic. They were also excluded if they had severe cardio-respiratory or other medical illness, a known allergy to methohexital or propofol, or had violated prohibitions against oral intake after midnight. Women aged 18 years or younger or those with an extreme body mass index were not excluded.

Setting
The study setting was secondary care. The economic study was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data were gathered between February and April 2000. Correspondence with the authors has indicated that the price year equated to the period of recruitment, namely 2000.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
The authors reported that no power calculations were performed. A total of 400 consecutive patients were selected on days when the same two authors were in attendance to perform surgery and anaesthesia. These 400 women were
enrolled and individually randomised to the propofol group (n=200) or methohexital group (n=200). The mean age in the propofol group was 25.8 (+/- 6.3) years, compared with 26.7 (+/- 6.8) years in the methohexital group.

**Study design**

This was a randomised controlled trial (RCT) that was carried out at the Albany Medical-Surgical Centre in Chicago, USA. The patients were randomised using a random number table. Random assignment of the anaesthetic agent was coded on all chart work and any health personnel who were responsible for postoperative care did not know this code. Consequently, only the programme analyst and operating staff were aware of which anaesthetic was used. Although the exact duration of follow-up was not reported, it would appear that the patients were only followed up for a short time. No loss to follow-up was reported.

Note: in correspondence with the authors, they have informed us that "The follow-up period was the day of surgery to the point of patient discharge, a matter of 1-2 hours after the surgery. There were no anesthesia-related adverse events remotely in time." and "The criterion of loss to follow-up did not apply, since all anesthetic problems resolved prior to same-day discharge and none recurred remotely".

**Analysis of effectiveness**

As it would appear there was no loss to follow-up, it is irrelevant whether the analysis of the clinical study was conducted on treatment completers only or on an intention to treat basis. The outcomes used were as follows.

1) An assessment of the patient's ease in awakening, mood and incidence of nausea, vomiting or other adverse effects, as measured by the charge nurse using a 100-mm linear visual analogue scale (VAS). Incidents of apnoea, laryngospasm, nausea and vomiting were recorded, as were other events that could be related to the operation (e.g. electrocardiographic abnormalities, seizure activity and skin manifestations).

2) After the patient was able to ambulate comfortably, the patient was asked to subjectively rate the quality of her anaesthetic experience using VAS cards. A staff member who was not present in the first-stage recovery area administered this rating.

3) Blood pressure (BP), whereby a sub-sample of patients had BP recorded at the time of the induction dose and again at the mid- and end points of the uterine evacuation, so as to measure possible differences in BP effects between the two induction agents. This sub-set was chosen at random from patients 101 - 200 in each study arm.

The patient characteristics of the two study groups showed no statistically significant differences in maternal age, body mass index, gestational length, gravidity, parity, and spontaneous or induced abortion. The patients' preoperative anxiety scores hovered closely around the midpoint of 5.0 for both groups.

**Effectiveness results**

Statistically significantly higher mean BP rises were observed during methohexital anaesthesia. Before anaesthesia, the mean systolic (diastolic) BP was 116.2 +/- 16.5 (76.7 +/- 18.1) mmHg versus 127.9 +/- 17.4 (83.2 +/- 15.5) mmHg after anaesthesia, (systolic BP, p< 0.001; diastolic BP, p=0.004). The 95% confidence interval (CI) for the mean difference ranged from -17.6 to -5.8 (-12.4 to -0.6). The authors also reported that the inclusion of 95% CIs of the mean differences shows that, even at the statistical extremes of BP ranges, these readings were not clinically significant in magnitude.

Fewer methohexital patients were wakeful within the first 3 minutes (52.5% versus 67.5%, p=0.002; 95% CI of mean difference: 5.5% - 24.5%).

Propofol use was associated with markedly less nausea (11.5% versus 17.5%) or vomiting (3.5% versus 7.0%), (combined value, p=0.02; 95% CI of mean difference: 1.8% - 17.2%.

The mean nurses' scoring of the quality of the anaesthetic experience favoured the use of propofol over methohexital (8.4 +/- 1.4 versus 7.7 +/- 1.5, p<0.001).
There were no statistically significant differences in the quality of the anaesthetic experience as rated by the patients (8.9 +/- 1.7 versus 8.7 +/- 1.9, p=0.1).

**Clinical conclusions**
The authors concluded that propofol had modest advantages over methohexitol when they were used as single agents, as judged by the first recovery charge nurses, but the patients found them equally acceptable.

**Measure of benefits used in the economic analysis**
The authors did not derive a measure of health benefit. The analysis was therefore categorised as a cost-consequences analysis.

**Direct costs**
The direct costs included only the cost of the two agents in the authors' setting. The cost of the two agents was based on the ability to purchase methohexitol in flats containing 25 vials (each with 2.5 g of 1% concentrate) and premixed 1% propofol in 10-g boxes containing 20 vials. As these costs were incurred immediately, discounting was appropriately not performed. The study reported the average costs. The price year was not reported.

**Statistical analysis of costs**
The costs were treated as point estimates (i.e. the data were deterministic).

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
The authors investigated the effects of adding fentanyl or alfentanil to the anaesthetic used.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The cost per patient was $9.51 for propofol versus $4.42 for methohexitol.

**Synthesis of costs and benefits**
The costs and benefits were not combined. The authors reported that the addition of fentanyl would have increased the average cost by only $0.29 to $0.58, whereas alfentanil would have increased the cost by $2.00 to $7.90.

**Authors' conclusions**
The authors did not provide a synthetic conclusion combining both the effectiveness and costs. They did not draw any conclusions as to whether the modest clinical benefits achieved with propofol over methohexitol were worth the increased cost of propofol.
CRD COMMENTARY - Selection of comparators
A justification was given for choosing methohexital as the comparator. It is currently the most frequently used induction agent for first-trimester vacuum abortion in the USA and Canada. You should decide if this is a widely used health intervention in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on an RCT. This was appropriate for the study question, as well-conducted RCTs are considered the 'gold' standard when comparing different health interventions. The authors reported the method of randomisation appropriately. The study sample was representative of the study population. The patient groups were shown to be comparable in terms of maternal age, body mass index, gestational age, gravidity, parity, and spontaneous or induced abortion. Appropriate statistical tests were performed to determine statistically significant differences between the groups.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit. The analysis was therefore categorised as a cost-consequences analysis.

Validity of estimate of costs
Only the costs of the anaesthetic drugs were included in the study. Other relevant costs, such as nursing and doctor time and length of time in the operating theatre, were therefore omitted from the analysis. However, it is unclear how the inclusion of these costs would have affected the authors' results. No statistical analysis of the costs was undertaken, although the authors did examine the impact on the costs of including other drugs in the anaesthetic regimen. Since all the costs were incurred during a very short time, discounting was unnecessary and was therefore not performed. The price year was not reported, which will hamper any possible inflation exercises.

Other issues
The authors made appropriate comparisons of their findings with those from other studies that found similar results. The issue of generalisability to other settings was addressed. The authors do not appear to have presented their results selectively and their conclusions reflected the scope of the analysis. The authors reported a number of further limitations to their study. First, the study recruited highly experienced personnel from a single centre dedicated to providing induced abortion. Hence, the circumstances at other sites could render their methods unfeasible or impractical. Second, the authors did not design this trial as a true cost-effectiveness analysis. Thus, the observed clinical differences favouring propofol would have different consequences in other settings that diminished or amplified the dollar cost differential. Third, nurses' preferences for propofol might have resulted from subtle cues transmitted by surgical site personnel, although the authors were unaware of any signals or behaviours of this kind.

Implications of the study
The authors did not recommend one anaesthetic over the other. They also did not comment on whether the modest clinical benefits achieved with propofol over methohexital were worth the increased cost of propofol.

Source of funding
None stated.

Bibliographic details
Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Abortion, Induced; Adult; Anesthesia, General; Anesthetics, Intravenous; Anxiety; Drug Costs; Female; Gestational Age; Humans; Infusions, Intravenous; Methohexital /administration & dosage /adverse effects; Nausea; Patient Satisfaction; Pregnancy; Propofol /administration & dosage /adverse effects; Vacuum Curettage; Vomiting

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