Comparison of the costs and recovery profiles of three anesthetic techniques for ambulatory anorectal surgery

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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
Three anaesthetic techniques for patients undergoing anorectal surgery were examined. The three techniques were local anaesthesia, spinal anaesthesia and general anaesthesia.

In the local anaesthesia group, patients received local infiltration with a 30-mL mixture of lidocaine 2% (15 mL), bupivacaine 0.5% (15 mL) and epinephrine (1:200,000), in combination with intravenous (iv) sedation using a propofol infusion (25 - 100 microg/kg per minute.

In the spinal anaesthesia group, the patients received a spinal subarachnoid block with a combination of 30 mg lidocaine and 20 microg fentanyl with midazolam (1 - 2 mg iv bolus).

In the general anaesthesia group, the patients received 2.5 mg/kg iv propofol and 0.5 - 2% sevoflurane in combination with 65% nitrous oxide.

In the spinal and general anaesthesia groups, the surgeon also administered 10 mL of the local anaesthetic mixture at the surgical site before the skin incision.

Type of intervention
Anaesthesia.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with American Society of Anesthesiologists physical status I-III, who were aged 24 to 65 years and who were scheduled for outpatient anorectal surgery. Patients with clinically significant cardiovascular, respiratory, renal-hepatic or metabolic disease, mental dysfunction or morbid obesity were excluded.

Setting
The setting was secondary care. The economic study was carried out at the Texas Southwestern Medical Center in Dallas (TX), USA.

Dates to which data relate
The dates when the effectiveness and resource use data were collected were not reported. The price year was not given.

Source of effectiveness data
The effectiveness evidence was derived from a single study.
Link between effectiveness and cost data
The costing was carried out prospectively on the same sample of patients as that used in the effectiveness analysis.

Study sample
An a priori power analysis was carried out in the preliminary phase of the study. This analysis determined that a minimum of 29 patients per group would be required to detect a 30% reduction in total institutional costs, with a power of 90% at a level of significance of alpha equal to 0.05. It was also calculated that this sample size was adequate to detect a 25% difference in time to home-readiness among groups, with a power of 80% and a 5% level of significance. An overall group of 93 consenting eligible patients was enrolled in the study, 31 patients in each group. There were 22 men in the local anaesthesia group, 21 in the spinal anaesthesia group and 24 in the general anaesthesia group. The mean ages were 40 (+/- 9) years (local), 43 (+/- 10) years (spinal) and 41 (+/- 9) years (general), respectively.

Study design
This was a prospective, randomised controlled trial that was carried out in a single centre. Randomisation was performed through a computer-generated random-number table. The patients were followed until discharge. No loss to follow-up was observed. The patients were interviewed by telephone 24 hours after discharge. The investigator assessing side effects and patient satisfaction was blinded to patient allocation.

Analysis of effectiveness
The analysis of the clinical study was conducted on an intention to treat basis. The health outcomes used were:

the mean arterial pressure, heart rate and haemoglobin oxygen saturation values;

the duration of anaesthesia and surgery;

the post anaesthesia recovery score on arrival in Phase 1 and Phase 2 stay;

the time to oral intake;

the Aldrete score on arrival in the recovery unit, and the time to an Aldrete score of 10;

the time to home-readiness and time to discharge, and the duration of hospital stay;

side effects;

supplemental oxygen in recovery;

overnight hospitalisation;

patients with acceptable surgical conditions; and

the percentages of patients highly satisfied or satisfied.

The study groups were comparable in baseline characteristics such as demographics and type of surgery performed.

Effectiveness results
The duration of anaesthesia was significantly shorter in the local anaesthesia group (40 +/- 15 minutes) than in the spinal anaesthesia group (72 +/- 17 minutes) or the general anaesthesia group (75 +/- 19 minutes), (p<0.05).

The duration of surgery did not differ among the three groups (about 26 +/- 14 minutes in each group).

Phase 1 and Phase 2 stays were shorter in the local anaesthesia group than in the spinal and general anaesthesia groups,
(p<0.05). In the three groups, Phase 1 stays were 0 minutes (local), 52 (+/- 18) minutes (spinal) and 44 (+/- 27) minutes (general), while Phase 2 stays were 71 (+/- 17) minutes (local), 135 (+/- 113) minutes (spinal) and 120 (+/- 52) minutes (general).

The time to oral intake was shorter in the local anaesthesia group (12 +/- 5 minutes) than in the spinal group (59 +/- 18 minutes), (p<0.05) and general group (60 +/- 29 minutes), (p<0.05).

The Aldrete score on arrival in the recovery unit reached 10 for all patients in the local anaesthesia group (mean score: 10), compared with 13% in the spinal group (mean score: 9) and 3% in the general group (mean score: 8), (p<0.05).

The time to an Aldrete score of 10 was shorter in the local anaesthesia group (0) than in the spinal group (19 +/- 7 minutes) and general group (30 +/- 19 minutes), (p<0.05).

The time to home-readiness was shorter in the local anaesthesia group (76 +/- 17 minutes) than in the spinal group (193 +/- 112 minutes) and general group (171 +/- 58 minutes), (p<0.05).

The duration of hospital stay was shorter in the local anaesthesia group (116 +/- 21 minutes) than in the spinal group (266 +/- 112 minutes), (p<0.05), or in the general group (247 +/- 65 minutes), (p<0.05).

Side effects were comparable across the groups, although a significantly higher number of patients in the general anaesthesia group required medication for pain and nausea. In the general group, 45% of the patients required medication for pain versus 19% of the local group and 19% of the spinal group, (p<0.05). For nausea, 26% of the general group patients required medication versus 0% (local) and 3% (spinal), respectively, (p<0.05).

No patients in the local anaesthesia group required supplemental oxygen in recovery compared with 13% in the spinal group and 87% in the general group, (p<0.05).

Overnight hospitalisation was not required in any of the groups.

All patients reported acceptable surgical conditions in the groups.

More patients in the local anaesthesia group (68%) were highly satisfied with the care they received than in the spinal group (58%; p>0.05) and in the general group (39%; p<0.05).

**Clinical conclusions**
Compared with patients in the spinal and general anaesthesia groups, patients in the local anaesthesia group had better outcomes in terms of faster recovery times, higher satisfaction, shorter hospital stay and duration of anaesthesia. The differences were more apparent in comparison with general anaesthesia patients.

**Measure of benefits used in the economic analysis**
The health outcomes were left disaggregated and no summary benefit measure was used in the economic evaluation. The study was therefore classified as a cost-consequences analysis.

**Direct costs**
Discounting was not carried out because the costs were incurred during less than one year. The unit costs were not presented separately from the quantities of resources used, but a breakdown of the cost items was provided. The health services included in the economic evaluation were anaesthetic equipment, anaesthetic drugs, recovery unit drugs, recovery unit resources (emesis management and oxygen delivery equipment) and nursing labour. Anaeesthetic equipment covered infusion pump tubing and disposables, spinal tray, gloves, needle, lidocaine, endotracheal tube, circuit, suction, and salter nasal cannulae. The anaesthetic drugs were midazolam, propofol, succinylcholine, fentanyl, sevoflurane, lidocaine, and bupivacaine with epinephrine. The recovery unit drugs were ondansetron, hydrocodone-acetaminophen, and meperidine. The costs common to the three groups, such as electrocardiogram leads, pulse oximeter probes, iv catheters and administration tests, were not considered in the analysis. The cost/resource boundary
of the study was that of the chief financial officer of the ambulatory surgery centre. The resource use data were estimated using actual data gathered alongside the clinical trial, and the same sample of patients was used. The unit costs came from the actual acquisition costs (not charges) derived from the study centre. The price year was not reported.

**Statistical analysis of costs**
Standard statistical tests were carried out to test for the statistical significance of the differences in cost estimates across the three groups. A one-way analysis of variance was used for continuous data, the Newman-Keuls test for inter-group comparisons, and chi-squared or Fisher's exact tests for categorical data. The costs were presented as mean values with standard deviations.

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

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analyses were performed.

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

**Cost results**
The total intraoperative drugs and supplies costs were statistically significantly lower in the group receiving spinal anaesthesia ($17.21 +/- 1.55) than in the groups receiving local anaesthesia ($27.39 +/- 9.39) or general anaesthesia ($57.32 +/- 7.89), (p<0.05). The costs were statistically significantly higher in the group receiving general anaesthesia, (p<0.05).

However, the total intraoperative costs (including labour costs) were lower in the local anaesthesia group ($63.73 +/- 20.69) than in the spinal ($83.50 +/- 15.17) or general ($125.78 +/- 20.69) groups, (p<0.05).

The recovery costs were statistically significantly lower in the local anaesthesia group than in the spinal or general groups, (p<0.05).

The total perioperative costs were lower in the local anaesthesia group ($69.02 +/- 20.39) than in the spinal ($103.68 +/- 18.13) and general ($145.02 +/- 25.31), groups, (p<0.05). The differences between the groups reached statistical significance.

**Synthesis of costs and benefits**
Not relevant.

**Authors' conclusions**
Local anaesthesia with sedation was effective in terms of shorter recovery times, fewer adverse events, shorter hospital stay and lower costs than both general and spinal anaesthesia, in patients undergoing outpatient anorectal surgeries.
CRD COMMENTARY - Selection of comparators

The rationale for the choice of the comparator was clear. The three anaesthetic procedures were selected because they represented current approaches for patients undergoing outpatient anorectal surgery. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness

The internal validity of the analysis was high because the effectiveness data came from a randomised single-blind trial, which was appropriate for the study question. Power calculations were carried out to ensure that the sample size was adequate to detect statistically significant differences in one of the outcome measures. However, the study is likely to have been underpowered for other measures. The study sample was selected from a single centre and the method of sample selection was unclear (e.g. patients who refused to participate or were excluded from the initial study sample). Therefore, it was unclear whether the study sample was representative of the study population. The study groups were comparable at baseline.

Validity of estimate of measure of benefit

No summary benefit measure was used in the analysis because a cost-consequences analysis was conducted.

Validity of estimate of costs

The authors reported the perspective of the analysis. It appears that all the relevant categories of costs have been included. A breakdown of the cost items was provided. However, details of resource use and the unit costs were not presented. The price year was not reported. Statistical tests to compare the estimated costs in the study groups were performed, as were power calculations to ensure that the sample size was sufficient to detect statistically significant differences across the groups. However, sensitivity analyses were not performed. The authors stressed that costs rather than charges were used in the economic analysis.

Other issues

The authors compared their findings with the results of other studies that evaluated alternative anaesthetic approaches. Consistent results were observed among patients undergoing inguinal hernia repair. However, the authors did not address the issue of the transferability of the study results to other settings and contexts. Sensitivity analyses were not performed. The study enrolled patients undergoing anorectal surgery and this was reflected in the authors' conclusions. The authors did not present their results selectively. The authors discussed some limitations of their analysis, mainly the use of branded drugs rather than generics.

Implications of the study

The main implication of the study was that, compared with both general and spinal anaesthesia, there are clinical and economic advantages in using local anaesthesia for anorectal surgery.

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