A comparative study of general anesthesia, intravenous regional anesthesia, and axillary block for outpatient hand surgery: clinical outcome and cost analysis


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 outpatient hand surgery were examined. These were general anaesthesia (GA), intravenous regional anaesthesia (IVRA) and axillary brachial plexus block (BPB).

Type of intervention
Other: anaesthesia.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients undergoing elective outpatient hand surgery. Procedures such as carpal tunnel release and ganglion excision, those anticipated to exceed 90 minutes and bilateral hand surgery were excluded.

Setting
The setting was secondary care. The economic study was carried out at the Toronto Western Hospital in Toronto, Canada.

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

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness study.

Study sample
Power calculations to determine the sample size were not performed. Eligible patients were identified from those who had undergone elective outpatient hand surgery at the study hospital. A sample of 126 patients was considered in the analysis, of which 39 received GA group, 45 received IVRA and 42 received BPB. The mean age was 39 (+/- 14) years in the GA group, 39 (+/- 15) years in the IVRA group and 41 (+/- 17) years in the BPB group. The groups contained 24 (GA), 26 (IVRA) and 29 (BPB) men, respectively. It was not stated whether some patients were excluded for any reason from the initial study sample.
**Study design**
This was a retrospective cohort study that was carried out in a single centre. The patients were allocated to the study groups, primarily according to their preference for the type of anaesthesia and secondarily on the anaesthesiologist's preferences for those patients undergoing IVRA or BPB. Two unblinded research assistants gathered all the data. The follow-up was limited to the perioperative period (until hospital discharge). No loss to follow-up was observed.

**Analysis of effectiveness**
It was unclear whether all the patients included in the initial study sample were taken into account in the effectiveness study in their original study group. The primary outcome measures were:

- anaesthesia induction and surgery time,
- total anaesthesia time,
- post-anaesthesia care unit (PACU) recovery time,
- day surgery unit (DSU) recovery time,
- total hospital time,
- the proportion of patients experiencing pain requiring opioid analgesics, and
- the incidence of nausea and vomiting requiring antiemetic medication.

The study groups were comparable at baseline in terms of demographics and surgical data.

**Effectiveness results**
Anaesthesia induction time was 10 (+/- 3) minutes in the GA group, 10 (+/- 5) minutes in the IVRA group and 28 (+/- 17) minutes in the BOB group. There were statistically significant differences between IVRA and BPB and between BPB and GA.

Anaesthesia surgery time was 59 (+/- 33) minutes in the GA group, 45 (+/- 26) minutes in the IVRA group and 53 (+/- 21) minutes in the BPB group. The difference was not statistically significant.

Total anaesthesia time was 83 (+/- 29) minutes in the GA group, 72 (+/- 30) minutes in the IVRA group and 106 (+/- 27) minutes in the BPB group. There were statistically significant differences between IVRA and BPB and between BPB and GA, (p<0.005).

PACU recovery time was 70 (+/- 14) minutes with GA, 45 (+/- 21) minutes with IVRA and 63 (+/- 32) minutes with BPB. There were statistically significant differences between IVRA and BPB and between IVRA and GA, (p<0.005).

DSU recovery time was 86 (+/- 55) minutes with GA, 63 (+/- 34) minutes with IVRA and 77 (+/- 50) minutes with BPB. The difference between IVRA and GA was statistically significant, (p<0.005).

Total hospital time was 240 (+/- 75) minutes in the GA group, 180 (+/- 58) minutes in the IVRA group and 244 (+/- 68) minutes in the BPB group. There were statistically significant differences between IVRA and BPB and between IVRA and GA, (p<0.005).

The proportion of patients experiencing pain requiring opioid analgesics was 85% with GA, 51% with IVRA and 43% with BPB. There were statistically significant differences between GA and the other two techniques, (p<0.005).

The incidence of nausea and vomiting requiring antiemetic medication was 62% with GA, 18% with IVRA and 12% with BPB. There were statistically significant differences between GA and the other two techniques, (p<0.005).
However, the authors reported that 2 patients in the IVRA group and 3 in the BPB group required GA due to failure of the anaesthetic block.

**Clinical conclusions**
The effectiveness analysis showed that IVRA was associated with significantly shorter hospital time (mainly due to shorter recovery times) than GA and BPB. However, IVRA failed as a result of tourniquet pain.

**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. In effect, the evaluation was a cost-consequences analysis.

**Direct costs**
Discounting was not relevant due to the short timeframe of the analysis. The unit costs were reported separately from the quantities of resources used and a breakdown of the costs was provided. The health services included in the economic analysis were anaesthetic drugs and equipment, recovery unit drugs, and nursing services. The cost/resource boundary adopted in the study was that of the hospital. Resource use was estimated using actual data that were estimated from the same samples of patients as those included in the effectiveness study. The unit costs came from the Finance Department of the study hospital. The price year was not reported.

**Statistical analysis of costs**
The costs were treated stochastically and were presented as mean values with standard deviations. Statistical tests were carried out to test the statistical significance of the difference in the estimated costs.

**Indirect Costs**
The indirect costs were not considered in the economic evaluation.

**Currency**
Canadian dollars (Can$).

**Sensitivity analysis**
No sensitivity analyses were carried out.

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

**Cost results**
The total labour costs were Can$257 (+/- 71) in the GA group, Can$204 (+/- 68) in the IVRA group and Can$293 (+/- 22) in the BPB group.

The total drug/supply costs were Can$44 (+/- 9) in the GA group, Can$10 (+/- 9) in the IVRA group and Can$22 (+/- 10) in the BPB group.

The total perioperative costs were Can$300 (+/- 77) in the GA group, Can$214 (+/- 74) in the IVRA group and Can$317 (+/- 65) in the BPB group.

The difference in total perioperative costs was statistically significant when comparing IVRA to both GA and BPB.
The difference between BPB and GA did not reach statistical significance.

**Synthesis of costs and benefits**
The costs and benefits were not synthesised.

**Authors' conclusions**
Intravenous regional anaesthesia (IVRA) led to significantly shorter hospital stay and lower hospital costs for patients undergoing elective outpatient hand surgery than did standard general anaesthesia (GA) and axillary brachial plexus block (BPB). IVRA patients also experienced fewer side effects of the anaesthetic.

**CRD COMMENTARY - Selection of comparators**
The three anaesthetic techniques were used to reflect all possible approaches for patients undergoing elective outpatient hand surgery. The authors stated that newer volatile anaesthetics were not considered within each approach. You should decide whether they are valid comparators in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis used a retrospective cohort study. However, the use of a randomised study would have been more appropriate for the study question, not only for the prospective design but also for the random allocation of patients to the study groups. The authors acknowledged that the non-random selection of the anaesthetic technique represented the main limitation of the study, although the study groups were apparently comparable at baseline. The study sample was not selected on the basis of very strict inclusion criteria, thus it is likely to have been representative of the study population. A further threat to the internal validity of the analysis was the lack of power calculations, owing to the small samples of patients included in each group. The study identified patients from a single academic centre and the authors admitted that variations across hospitals might occur.

Although a fast-track protocol was not adopted at the study institution, the authors stated that this would be of equal advantage to all techniques. IVRA would, therefore, remain the most effective in terms of reduced hospital times. Five patients switched from their initial study group, but it was unclear how they were then accounted for in the analysis of the effectiveness. The internal validity is likely to be low given the nature of the study design.

**Validity of estimate of measure of benefit**
No summary benefit measure was used in the analysis.

**Validity of estimate of costs**
The perspective of the study was implicitly stated and it appears that all the relevant categories of costs have been considered. Details on the unit costs and the quantities of resource use were provided separately. However, the price year was not given, thus making reflation exercises in other settings difficult. The dates during which the resource use data were collected were not reported. Discounting was not relevant and, appropriately, was not carried out. The costs were treated stochastically and statistical tests were carried out when the expected costs estimated in each group were compared. However, the cost estimates were specific to the study setting and no sensitivity analyses were carried out.

**Other issues**
The authors made some comparisons of their findings with those from other studies. They did not, however, address the issue of the generalisability of the study results to other settings. Sensitivity analyses were not carried out and the estimates were specific to the study institution. Therefore, the external validity of the analysis was low and caution is required when extrapolating the study results. The authors referred to a sample of patients undergoing elective outpatient hand surgery and this was reflected in the conclusions of the study. Some limitations of the analysis were discussed.
Implications of the study
The study results suggested that IVRA offered the greatest advantages in terms of both economic and health measures for patients undergoing elective outpatient hand surgery.

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