Comparison of the immediate postoperative outcome of using the conventional two drains versus a single drain after lobectomy

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
Patients with lung cancer who have undergone thoracotomy and lobectomy were given a single French chest drain (8888-561068; Sherwood Medical) placed in the midposition before closure, to obtain pleural drainage. The drains were connected by tubing (R54502; Rocket Medical Plc) to 1,800 mL single chamber chest drainage bottles (R54502; Rocket Medical Plc). The comparator group of patients were given two similar French drains, one in the apical position and the other in the basal position, with each draining into separate bottles.

All patients had an epidural catheter (100/391/118, 18G Minipack Epidural System 1; SIMS Portex Ltd.) sited at the T5 to T6 level before the operation and 1% lidocaine (Phoenix Pharma Ltd.) instilled locally at the end of the operation. All patients were provided with epidural patient-controlled analgesia (PCA) until drain removal, or for the first 5 days if the drain was left in longer. In patients with prolonged chest drainage, the epidural PCA was substituted with intravenous morphine PCA until the drain was removed, or until oral analgesia controlled the pain.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who underwent thoracotomy and lobectomy for lung cancer. No specific inclusion or exclusion criteria were reported.

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

Dates to which data relate
The effectiveness data were gathered between January 2001 and December 2002. No dates for the resource evidence were given. No price year was given.

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

Link between effectiveness and cost data
The costing was carried out prospectively on the same sample population as that used in the effectiveness analysis.
Study sample
No power calculations were reported and there was no sample selection. All patients who underwent thoracotomy and lobectomy for lung cancer were included in the study. One hundred and twenty consecutive patients were included, of which 60 had two conventional 28 French apical and basal drains (group A) and 60 had a single 28 French chest drain placed in the midposition before closure (group B). The mean age of the patients was 65 (+/- 8.4) years in group A and 66 (+/- 8.6) years in group B. The male-to-female ratio was 4:1 in both groups. The authors did not provide any evidence that the study sample was representative of the study population.

Study design
This was a prospective cohort study that was performed at a single centre. The patients were matched in terms of age and gender in each study group, to ensure comparability. The duration of follow-up was unclear, but it was likely to have been until the end of the hospital stay. The assessment of the outcomes was not blinded. The authors reported no loss to follow-up.

Analysis of effectiveness
The basis of the analysis was intention to treat. The health outcomes used to assess the patients were:
- duration of drainage,
- amount of drainage,
- subcutaneous emphysema,
- post removal haemothorax and pneumothorax,
- drain reinsertion rate,
- duration of PCA,
- analgesic usage,
- maximum pain score, and
- the length of stay in hospital.

Fully qualified senior ward nurses instructed in pain assessment assessed and scored postoperative pain from 0 to 4, according to the hospital numeric verbal pain scale. After surgery, pain was assessed every 15 minutes for the first hour, hourly for the next 12 hours, and every 4 hours thereafter. A pain score of 2 or above was deemed unacceptable and additional analgesia was then administered. Patients with chest drains were assessed for air leak and drainage every hour for the first 24 hours, and then every 6 hours until removal.

Effectiveness results
The duration of drainage was 4 (+/- 3.2) days in the two drain group and 4.3 (+/- 3.3) days in the one drain group.

The amount of drainage was 667 (+/- 369) mL in the two drain group and 804 (+/- 498) mL in the one drain group.

The duration of PCA was 3.7 (+/- 1.5) days in the two drain group and 4.2 (+/- 1.7) days in the one drain group.

The length of hospital stay was 7.7 (+/- 3) days in the two drain group and 7.8 (+/- 3.2) days in the one drain group.

None of these differences were statistically significant.
After drain removal, there was no incidence of clinically significant subcutaneous emphysema, pleural effusion, or
pneumothorax necessitating drain reinsertion in either group.

The maximum pain score was 1.4 (+/- 0.8) in the two drain group and 1.02 (+/- 0.7) in the one drain group, (p=0.02).

Clinical conclusions
There was no clinical advantage to using two drains rather than one for patients who have had lobectomy for lung cancer. However, there was a disadvantage in that patients suffered worse pain as a consequence of having the second drain. The authors pointed out that suffering less pain helps in early lung re-expansion, better cough and expectoration of secretions, reduces the incidence of chest infections and brings earlier mobilisation, although they did not measure these outcomes.

Measure of benefits used in the economic analysis
No measure of benefits was produced. As such, the authors carried out a cost-consequences analysis.

Direct costs
No discounting was carried out as the costs were incurred during less than one year. The costs measured were the cost of a complete chest drain set, the radiology service cost for a digital roentgenogram, and the costs of additional sutures, disposable stitch cutters, dressing pads, dressings and drain removal packs. The unit costs of these three items were given and were taken from the authors' setting. The quantities and the costs were analysed separately. The resource quantities were estimated from actual data. The actual cost for each patient was not recorded. The authors calculated the marginal cost of an additional drain, using the prices of all the necessary inputs. No price year was given.

Statistical analysis of costs
No statistical analysis of the costs was carried out.

Indirect Costs
The indirect costs were not calculated.

Currency
UK pounds sterling (£)

Sensitivity analysis
No sensitivity analysis was carried out.

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

Cost results
The marginal cost of having an extra drain was greater than or equal to 55 per patient.

The total cost-saving in group B (one drain) was greater than or equal to 3,300 compared with group A (two drains).

The duration of the costs appear to have been the hospital stay.

As no subcutaneous emphysema, pleural effusion, or pneumothorax occurred in either group, the costs of these were not included.
Synthesis of costs and benefits
The costs and benefits were not combined as the study was, in effect, a cost-consequences analysis.

Authors' conclusions
A single chest drain in the midposition is just as effective, significantly less painful, and much more cost-effective than the conventional use of two drains after lobectomy.

CRD COMMENTARY - Selection of comparators
The choice of the comparator, two drains, was justified because it represents current practice in many settings. You should decide if the comparator represents current practice in your own setting.

Validity of estimate of measure of effectiveness
The source of the effectiveness data was a single study. The study design (a cohort study with a stratified allocation of patients to the two groups) was appropriate for the study question. The fact that there were no statistically significant differences in outcomes between the two groups might have been due to the small sample size and consequent lack of power. Only age and gender characteristics were reported, therefore it is not possible to assess whether there were any differences between the two groups that might have impacted on the study results. Moreover, the authors did not provide any evidence that the study sample was representative of the study population, which may limit the external validity of the study. The study represents a single anaesthetist's and surgeon's experience, which also limits the possible extrapolation of results to other settings. There were no other sources of effectiveness data.

The patient groups were comparable in terms of age and gender, and there was no statistically significant difference between the patient groups concerning the sites of their lobectomies. The effectiveness analysis was handled credibly, although it would have been interesting to have had data on the variables which the authors argue are influenced by pain level, such as early mobilisation.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit. The analysis was one of cost-consequences, so the health benefits are therefore those associated with the effectiveness outcomes.

Validity of estimate of costs
The perspective adopted was not stated clearly, but it appears to have been that of the hospital. Most of the relevant categories of cost related to this perspective were included in the study, although their estimate was only valid for patients who followed the predicted path. Patient histories that veered from the standard path were not taken into consideration. For example, the two drain patients spent slightly longer in hospital and the cost of this longer hospital stay was not included. Given the large cost-difference found by the authors, these omissions are unlikely to have changed their conclusions.

The unit costs were reported separately from the resource quantities and this will enable decision-makers to assess the generalisability of the cost results to other settings. The resource use quantities were taken from a single study, while the prices were taken from the authors’ setting, and no other sources were used. No statistical, sensitivity or any other kinds of analyses were performed on the quantities or prices. These facts limit the generalisability of the results. In addition, the price year was not given, which will prevent any inflation exercises in other settings.

Other issues
The authors did not compare their results with the findings from other studies. The issue of the generalisability to other settings was not addressed. The authors did not present their results selectively. Their conclusions reflected the scope of the analysis in terms of effectiveness, but not in terms of costs, where the analysis was not complete. The authors
reported a number of limitations to their study. First, there were relatively small numbers of patients in each group. Second, there was a lack of comparison between groups on chest infections, antibiotic usage and time to mobilisation.

**Implications of the study**
The authors did not make any direct recommendations for changes to practice. However, they pointed out that they have continued to use a single chest drain after lobectomy for lung cancer and have maintained similar results to those in the present study.

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