Sequential intravenous/oral antibiotic vs. continuous intravenous antibiotic in the treatment of pyogenic liver abscess


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
The use of sequential intravenous-oral antibiotic therapy versus continuous intravenous antibiotic therapy for the treatment of pyogenic liver abscess.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with pyogenic liver abscess. Patients with amoebic liver abscess, patients who failed to stabilise after initial intravenous antibiotic therapy, and patients receiving oral antibiotic therapy alone, were excluded from the analysis.

Setting
The setting of the study was tertiary care (teaching hospitals). The study was conducted in Hong Kong.

Dates to which data relate
The effectiveness and resources use data referred to a period between 1 January 1991 and 31 May 2000. The price year was 2000.

Source of effectiveness data
The effectiveness data were 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 (retrospective) effectiveness study.

Study sample
The study sample was selected by reviewing the case records of patients with pyogenic liver abscess who were treated in two teaching hospitals in Hong Kong. The case records examined referred to a period from 1 January 1991 to 31 May 2000 in one hospital, and from 1 January 1995 to 31 May 2000 in the other. Pyogenic liver abscess was diagnosed on the basis of a combination of clinical findings, imaging studies, and/or aspiration of pus from the lesions. During the study period, 120 episodes of pyogenic liver abscess were identified. Three patients had recurrent episodes. However,
only the first episode of liver abscess during the study period was analysed. Four patients could not be stabilised with intravenous antibiotic treatment and finally succumbed. One patient was successfully treated with oral antibiotic alone and was excluded from the analysis. In total, 112 patients were analysed. Continuous intravenous antibiotic therapy was administered to 55 patients (group I) and sequential intravenous-oral antibiotic therapy to 57 patients (group II). No power calculations were performed. There was no evidence that the initial study sample was appropriate for the clinical study question.

**Study design**
The basis of the analysis was a retrospective cohort study. All the patients were followed-up at the outpatient clinic of the same institution after discharge. The median period of follow-up was 27.5 months for group I (continuous therapy) and 21.0 months for group II (sequential therapy).

**Analysis of effectiveness**
All the patients included in the study were accounted for in the analysis. The health outcomes examined were in-hospital mortality, length of hospital stay and relapse rates. The two groups were comparable in terms of baseline characteristics (age, gender, race), incidence of non-malignant co-morbidities, clinical presentations, microbiological and imaging findings, time to stabilisation after hospital admission, and frequency of the drainage procedures. All patients received intravenous broad-spectrum antibiotics initially. Potential confounding factors were adjusted for using logistic regression analysis.

**Effectiveness results**
There were 3 in-hospital deaths in group I (continuous therapy) and none in group II (sequential therapy), (p=0.11).

The median length of hospital stay was 42 days (interquartile range, IQR=5.0) in group I and 28 days (IQR=12.0) in group II, (p<0.01).

During follow-up there was no recurrence of liver abscess within 6 weeks after the cessation of antibiotic treatment.

On longer follow-up, one patient in group I with cryptogenic liver abscess had a liver abscess recur in a different lobe 16 months after the initial presentation.

In group II, two patients had a recurrence in the 5th and 33rd months.

**Clinical conclusions**
A sequential intravenous-oral antibiotic regime was a safe and effective treatment for pyogenic liver abscess.

**Measure of benefits used in the economic analysis**
No summary measure of health benefit was used in the economic analysis and the clinical outcomes were left disaggregated. The economic analysis was, in effect, a cost-consequences analysis.

**Direct costs**
The perspective of the study was not stated, but it seems to have been that of a third-party payer. The costs were for medication and a hospital bed. It was not reported whether these cost elements included costs arising from treating potential adverse events, or additional tests and practices potentially needed in relation to the strategies under evaluation. The costs and the quantities were not analysed separately. The costs were estimated using actual data derived from patient records. The quantity of the resources used referred to the period from 1 January 1991 to 31 May 2000. The costs were calculated according to the charges for the year 2000 in Hong Kong. Discounting was, appropriately, not carried out since the costs were incurred during less than one year.
Statistical analysis of costs
The costs were treated stochastically, with median costs and interquartile ranges being provided. A statistical analysis was performed to investigate any significant differences in the costs between the two groups.

Indirect Costs
The indirect costs were not included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

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

Cost results
The median medication cost was $791 (IQR=453) in group I (continuous therapy) and $552 (IQR=443) in group II (sequential therapy). The difference in medication costs was $239 (30%; p=0.01).

The median hospitalisation cost was $16,153 (IQR=1,923) in group I and $10,769 (IQR=4,615) in group II. The difference in hospitalisation costs was $5,384 (33%; p<0.001).

The median total cost was $16,944 in group I and $11,321 in group II. The overall difference between the median costs was $5,623 (33%), favouring the sequential intravenous-oral antibiotic treatment.

These costs referred to the whole period of hospital stay until discharge.

Synthesis of costs and benefits
Not applicable because the study was, in effect, a cost-consequences analysis.

Authors’ conclusions
Sequential intravenous-oral antibiotic therapy was a safe and effective treatment for pyogenic liver abscess. Moreover, compared with continuous intravenous antibiotic therapy, it reduced the cost of therapy and the length of hospital stay.

CRD COMMENTARY - Selection of comparators
The choice of the comparator (continuous intravenous antibiotic therapy) was implicitly justified since it reflected routine practice in the authors’ setting. You should decide whether this practice represents a widely used health technology in your own setting.

Validity of estimate of measure of effectiveness
The study was based on a retrospective cohort analysis of case records. This type of analysis is subject to selection and information bias. Moreover, there was no unified protocol for the antibiotic agents used, or the clinical management of non-compliant patients. The study sample seems to have been representative of the patient population, although no further evidence to justify its selection was provided. The patient groups were comparable at analysis. Appropriate statistical tests were performed to account for potential confounding factors.
Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit. The analysis was, in effect, a cost-consequences analysis.

Validity of estimate of costs
The perspective of the study was not stated, but it was consistent with that of a third-party payer. All the categories of cost relevant to the perspective adopted were included in the analysis. However, the cost categories were not analysed in terms of their cost components. Therefore, it is not known whether some relevant costs, such as those associated with treating complications of therapy, were included in the analysis. Moreover, the costs and the quantities were not reported separately, thereby limiting the generalisability of the results. A statistical analysis of the costs was performed. The median costs were reported, which is not as useful as providing the average costs per patient. The estimated costs were based on charges. Discounting was not carried out, which was appropriate since all the costs were incurred during less than one year. The date to which the prices referred was reported and this increases the reproducibility of the results.

Other issues
The authors made comparisons of their findings with those of similar studies. However, they stated that no study had specifically compared the safety and efficacy of sequential intravenous-oral antibiotic therapy with that of continuous intravenous antibiotic therapy for pyogenic liver abscess. The issue of generalisability to other settings was not addressed. In addition, the fact that the study was conducted in teaching hospitals limits the generalisability of the results, as routine practice in secondary care may differ significantly from that in tertiary care. The authors reported a number of limitations of their study. First, the undetermined power of the statistical tests performed. Second, the differences in the kind or generation of antibiotic agents used by the two groups, owing to the lack of a protocol. Third, the potential selection bias associated with non-compliant patients. Moreover, because no patient with pre-existing malignancy was included in group II, it was stated that the extrapolation of the results to patients with pre-existing malignancy should be conducted with caution. The authors appear to have presented their results adequately. Their conclusions reflected the scope of the analysis.

Implications of the study
The authors recommended that a pyogenic liver abscess be treated initially with a broad-spectrum intravenous antibiotic. After stabilisation, the intravenous antibiotic should be followed by oral antibiotic treatment. They suggested that further prospective studies determining the exact duration of treatment are needed, as well as a prospective randomised controlled trial to resolve the limitations of their study.

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