A comparison of an open and laparoscopic appendectomy for patients with liver cirrhosis
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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
The health intervention examined in the study was laparoscopic appendectomy (LA) in patients with liver cirrhosis.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients diagnosed with liver cirrhosis. Inclusion criteria were patients with no evidence of intra-abdominal adhesion, those with a low risk of comorbidities of the lungs, heart, and kidney, and those with a disease classified as Child's class A or B.

Setting
The setting was hospital. The study was carried out at the Department of General Surgery, Iikuza Hospital (Iikuza) and at the Department of Surgery II, Kyushu University Hospital (Fukuoka), Japan.

Dates to which data relate
Data on effectiveness and resource use were gathered from January 1988 through December 1999. The price year was not reported.

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

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

Study sample
No power calculations were performed. Patients were selected from those who underwent appendectomy at the study centres from January 1988 to December 1999. Forty eligible patients were identified: 25 subjects (mean age: 59.5 +/- 11.5 years; 17 men) were included in the OA group and 15 subjects (mean age: 61.5 +/- 8.5 years; 10 men) in the LA group. No patient was excluded from the initial sample.

Study design
This was a retrospective case-control study, carried out in two centres (Iikuza Hospital and Kyushu University Hospital in Japan). Length of follow-up was not reported, but no loss of follow-up occurred.

**Analysis of effectiveness**

The analysis of the clinical study was based on intention to treat (including patients switched to an open procedure), and all patients included in the study were accounted for in the analysis. The primary health outcomes were operative time (between first incision and application of dressing to the wound), postoperative pain (scored by each patient every 6 hours on a visual analogue scale), use of analgesics, reintroduction of a liquid diet, hospital stay, changes in the serum glutamic oxaloacetic transaminase/glutamic pyruvic transaminase (GOT/GPT) and C-reactive protein (CRP), and postoperative complications (wound infections, ascites, ileus, intra-abdominal abscess, and urinary tract infections). Groups were shown to be comparable in terms of mean age, gender, duration of symptoms, and hepatic function.

**Effectiveness results**

The effectiveness results were as follows:

Operative time was 43 +/- 19 minutes in the OA group and 59 +/- 19 minutes in the LA group, (p< 0.05).

Postoperative pain was significantly less in the LA group than in the OA group during both the first (59.2 +/- 25.5 versus 34.5 +/- 24.5) and second (35.5 +/- 21.5 versus 18.5 +/- 14.5) postoperative days.

Similarly, use of analgesics was significantly less in the LA group than in the OA group during both the first (2.2 +/- 0.9 versus 1.3 +/- 0.5) and second (1.8 +/- 0.9 versus 1.0 +/- 0.5) postoperative days.

No statistically significant difference was found in terms of reintroduction of a liquid diet (1.5 +/- 0.3 days versus 1.3 +/- 0.3 days).

Hospital stay was 14.5 +/- 4.3 days in the OA group and 8.2 +/- 2.6 days in the LA group, (p<0.05).

Changes in the enzyme activities were similar in the groups for GOT and GPT, but mean values of CRP on postoperative days 1, 3, and 7 were significantly higher in the OA group than in the LA group (7.9 +/- 2.5, 5.2 +/- 1.9, and 2.8 +/- 0.2 versus 5.1 +/-2.7, 2.7 +/- 2.7, and 0.8 +/- 0.3).

Postoperative complications were statistically different only as regards wound infections (5 cases in the OA group versus no cases in the LA group) and wound bleeding (5 cases in the OA group versus no cases in the LA group).

**Clinical conclusions**

The analysis of effectiveness data showed that LA was as safe as OA, but more effective in terms of numerous clinical outcomes. Only average operative time was longer for LA, but it remained less than one hour.

**Measure of benefits used in the economic analysis**

Health outcomes were left disaggregated and no summary benefit measure was used, therefore a cost-consequences analysis was conducted.

**Direct costs**

Discounting was not carried out, and it was not clear whether it would have been relevant. Unit costs and quantities of resources were not reported. The cost/quantity boundary adopted was that of the hospital. The cost items included in the analysis were examination (electrocardiogram, blood test, etc.), X-ray, injection, operation, and hospital stay. The estimation of quantities and costs was based on actual data derived from the hospitals’ internal accounts. Charges rather than true costs were used. Quantities of resources were collected from January 1988 and December 1999.
Statistical analysis of costs
Statistical analyses of total costs were conducted to test for statistical significance of the results. The tests utilised were the Wilcoxon rank sum test and Fisher's exact test for proportions. Statistical significance was set at p<0.05.

Indirect Costs
Indirect costs were not included.

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses were not conducted.

Estimated benefits used in the economic analysis
See effectiveness results above.

Cost results
Costs for examination, X-ray, and injections were as follows:

OA Group: examination, $672.0 +/- $135.8, X-ray, $445.0 +/- $255.5, and injections, $659.5 +/- $602.3.

LA Group: examination, $632.1 +/- $155.1, X-ray, $496.6 +/- $311.2, and injections, $701.3 +/- $226.2.

Costs for operation were statistically lower in the OA group ($1,600 +/- $135.2) than in the LA group ($2,852.9 +/- $202.8), (p<0.05).

Hospitalisation was more costly in the OA group ($2,901.9 +/- $846.6) than in the LA group ($1,620 +/- $289.8), (p<0.05).

Other costs were similar in the two groups ($95.1 +/- $45.4 versus $64.4 +/- $39.2).

Total costs were not statistically different: $6,239.1 +/- $1,335.8 in the OA group and $6,695.0 +/- $1,695.8 in the LA group.

Synthesis of costs and benefits
Not relevant.

Authors' conclusions
The authors concluded that laparoscopic appendectomy should be aggressively used for cirrhotic patients as it proved to be a safe technique, which improved clinical outcomes in comparison with conventional open appendectomy. The two techniques were similar in terms of costs, since cost-savings due to reduced hospital stay in the LA group were completely offset by greater operation costs. However, the laparoscopic approach should be limited to the study population identified in the study.

CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. Conventional open appendectomy was selected as it represented the routine procedure before the introduction of laparoscopic techniques for the treatment of cirrhotic
patients. You, as a user of this database, should assess whether it represents a widely used health intervention in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis of effectiveness was based on a retrospective case-control study, which appeared appropriate to the study question. However, some factors could have limited the internal validity of the analysis. The sample size was relatively small and no power calculations were performed in the planning phase to ensure that an adequate number of subjects were included in the study. The lack of randomisation could have led to incorrect conclusions due to possible selection bias and confounding factors, although the study groups were similar at baseline. Finally, the time horizon of the analysis was too short to assess long-term effects of the interventions.

**Validity of estimate of measure of benefit**
No summary benefit measure was used and hence a cost-consequences analysis was carried out. It would have been interesting had the authors assessed the impact of the interventions on patients' health through a composite benefit measure, reflecting the perceived quality of life associated with the two appendectomy techniques.

**Validity of estimate of costs**
Few details of the analysis of costs were reported. Unit costs and quantities of resources were not reported. It would have been interesting to have included indirect costs related to the treatment. Charges rather than true costs were used, which limits the external validity of the cost results. The price year was not reported. Cost estimates appeared somewhat specific to the study setting.

**Other issues**
The issue of the generalisability of the study to other settings was not addressed. The overall external validity of the study was limited by the lack of sensitivity analyses and the fact that unit costs and quantities of resources were not reported separately.

**Implications of the study**
In terms of clinical practice the results suggest that LA may be superior to OA for treatment of post-operative pain and post-operative complications in patients with liver cirrhosis. The authors suggest, however, that further studies should assess long-term effects of the laparoscopic approach, specifically to determine whether LA could result in a possible decrease in late bowel obstruction.

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