Complementary roles of laparoscopic abdominal exploration and diagnostic peritoneal lavage for evaluating abdominal stab wounds: a prospective study
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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
Laparoscopic abdominal exploration (LE) and diagnostic peritoneal lavage (DPL) to evaluate anterior abdominal stab wounds penetrating the fascia.

Type of intervention
Diagnosis and treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients admitted to the trauma emergency room with anterior abdominal stab wounds.

Setting
Secondary care. The economic study was carried out in the USA.

Dates to which data relate
The dates for the effectiveness evidence and the resources used were November 1991 to September 1993. The price year was not given.

Source of effectiveness data
The evidence for the final outcomes was derived from a single study.

Link between effectiveness and cost data
No information was given as to whether resource calculation was carried out prospectively or retrospectively. The same patients were used for the effectiveness data and the resource calculation.

Study sample
Power calculations were not used to determine the appropriate sample size. All 76 patients with abdominal stab wounds during the time under study were included. 22 of these underwent emergency celiotomy, and, of the remaining 54, 23 had mandatory celiotomy and 31 underwent laparoscopic exploration. 14 of the latter then went on to have celiotomy. One of the 14 was excluded from the study because the severity of his injuries resulted in a length of stay of more than 2 SD of the mean values of the total study group. The decision about which patients would undergo which type of treatment was not based on random selection, but on the expertise of the attending surgeon who was on duty at that particular time. All patients gave their informed consent to the treatment plan.
Study design
This was a non-randomised study with concurrent controls, carried out in a single centre. All patients were studied until they did not require further treatment. No information regarding the duration of follow-up was provided.

Analysis of effectiveness
The effectiveness results were based on treatment completers as one patient, who had an unusually long hospital stay, was not included in the analysis. The primary health outcomes used in the analysis were the number of non-therapeutic celiotomies, and the length of hospital stay. There was no analysis of the groups receiving the two kinds of treatment to see whether they were comparable.

Effectiveness results
19% of patients who had an initial laparoscopy ended up with a nontherapeutic celiotomy, whereas 57% of the patients undergoing mandatory celiotomy ended up with the celiotomy being nontherapeutic, (p<0.05). The average length of stay in hospital was 5.9 days (standard error 0.4) for mandatory celiotomy group, and 4.1 days (standard error 0.6) for the initial laparoscopy group, (p<0.05). DPL was performed on 36 of the patients in the two groups and its performance as a diagnostic tool was compared with laparoscopy. Laparoscopy turned out to be slightly more accurate than DPL: DPL gave one false negative and 9 false positives, whereas laparoscopic exploration gave 0 false negatives and 6 false positives.

Clinical conclusions
Laparoscopy was found to reduce the number of nontherapeutic celiotomies and to reduce the length of hospital stay among stable patients with abdominal stab wounds. Laparoscopy was found to be only slightly more accurate than diagnostic peritoneal lavage in assessing the need for celiotomy.

Measure of benefits used in the economic analysis
This was a cost-consequences analysis, as only individual health outcomes were reported and no attempt was made to combine these into a single benefit measure.

Direct costs
Discounting was not carried out, as costs were not spread out over an extended period of time. The following quantities were measured: length of hospital stay, length of stay in intensive care, total number of celiotomies, total number of nontherapeutic celiotomies. The following costs were given: the total hospital cost and the operating room cost for the average patient receiving each type of treatment, total hospital stay, total stay in intensive care. In the comparison of DPL with laparoscopy, from a retrospective study of a different sample of patients, the average total hospital costs for the two groups of patients were given. The quantities and costs were taken from the hospital in which the study was carried out. The quantities and costs were measured between November 1991 and September 1993, but adjustment to a common price year was not reported. In the comparison of DPL with laparoscopy, the date of the cost data for DPL was not given; it was described as being before the date of the main study.

Statistical analysis of costs
Unpaired Student's t-test was used to compare total costs.

Indirect Costs
No indirect costs were included.

Currency
NHS Economic Evaluation Database (NHS EED)
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US dollars ($).

Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
Not applicable.

Cost results
The average hospital costs of a patient receiving a mandatory celiotomy were $8,312 (+/- 627), and those of a patient initially receiving a laparoscopic examination were $6,119 (+/- 756), (p<0.05). In the diagnostic peritoneal lavage cost study, the hospital costs of patients receiving laparoscopic examination and no celiotomy were $4,246 (+/- 468), whereas the hospital costs of patients with a negative DPL who then stayed in hospital under observation were $1,374 (+/- 135), (p<0.05).

Synthesis of costs and benefits
The initial laparoscopic examination was taken to be superior to mandatory celiotomy with respect to both costs and effects. When DPL was compared with laparoscopy, apart from one patient with thoraco-abdominal penetration, the results were considered almost as accurate as laparoscopy, and as it was less expensive it was recommended as the first diagnostic tool (except in cases of thoraco-abdominal penetration).

Authors’ conclusions
Patients with anterior abdominal stab wounds who do not need emergency celiotomy benefit from an initial laparoscopic examination rather than automatically undergoing a celiotomy, as the laparoscopic examination can exclude certain patients from the need to have a celiotomy. This reduction in non-therapeutic celiotomies will reduce the average length of hospital stay and reduce hospital costs. There were no adverse effects for patients from initial screening with laparoscopy. When laparoscopy was compared with diagnostic peritoneal lavage as an initial screening procedure, it was found that, if the criteria for a positive test, were set low (>= 5,000 RBC/mm3) and if patients with thoraco-abdominal wounds were excluded, there was a slight clinical advantage to laparoscopy but there was a huge cost advantage to DPL. The authors recommend that, if DPL yields a positive result, the patient should then receive a laparoscopic examination, which would determine whether a celiotomy is necessary. If DPL yields a negative result the patient should be kept in hospital for observation.

CRD COMMENTARY - Selection of comparators
The authors justified the use of mandatory celiotomy as the comparator, as it is widely used.

Validity of estimate of measure of effectiveness
This was a non-randomised study that might have suffered from the inherent biases of this particular study design. The patient groups were not shown to be comparable in terms of baseline characteristics at analysis, nor were any sample size calculations used. The authors also excluded one patient’s results on the grounds that they represented an extreme outlier: it would have been more helpful had the authors given the full results without this exclusion so that the effects of the outlier could be assessed.

Validity of estimate of measure of benefit
This was a cost-consequences study, as only individual health outcomes were reported without using a summary benefit measure in the economic analysis.
Validity of estimate of costs
Insufficient details were provided about the methods of cost estimation. The estimate of costs was valid for the patients in the hospital under study but has limited external validity given the limited reporting of the cost methodology.

Other issues
The authors compared their findings to those of other studies and discussed the generalisability of their results. One issue they raised was the variation in costs between hospitals as regards different procedures, particularly laparoscopy. They hypothesised that the costs of laparoscopy would decrease over time relative to other hospital procedures. Another factor determining generalisability will be the skills of the surgeons in laparoscopic techniques. A more conclusive study would be a randomised controlled trial, which could only take place where surgeons were equally skilled at celiotomy and laparoscopy. The study comparing DPL with laparoscopy was very interesting and suggested that hospitals could cut costs dramatically by initially using DPL unless the injury was abdomino-thoracic. However, it would be more conclusive to carry out an RCT in which one group was first given DPL and the other LE.

Implications of the study
The study provides evidence in favour of LE as compared to mandatory celiotomy in patients suffering from abdominal stab wounds. It also suggests that DPL (with a low cut off for a positive test, 5,000 RBC/mm3) should be carried out initially when the wound has not penetrated the thoracic region, before the decision to carry out a laparoscopic examination is made. The authors' findings, however, should be interpreted carefully given the study's limitations.

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