Laparoscopic entry: a literature review and analysis of techniques and complications of primary port entry
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Authors' objectives
To determine the optimal form of laparoscopic entry to the peritoneal cavity.

Searching
MEDLINE was searched from 1966 to 2000 using the search terms 'laparoscopy', 'complications' and 'pneumoperitoneum'. The references from identified studies were also screened. Only studies published in the English language were included.

Study selection
Study designs of evaluations included in the review
Only studies that reported numerators and denominators were included; otherwise, eligible studies were not restricted by study design. The included studies were randomised controlled trials (RCTs), prospective and retrospective studies.

Specific interventions included in the review
Studies of Veress needle, open or direct entry methods of laparoscopic entry to the peritoneal cavity were eligible for inclusion. Studies that did not specify the mode of entry were included in a non-specific group if they met the other inclusion criteria.

Participants included in the review
Studies of patients undergoing laparoscopy were eligible. The included studies were of patients undergoing gynaecological and general surgery.

Outcomes assessed in the review
Studies that reported complications in relation to the mode of entry were eligible. The review assessed bowel and vascular injuries. Sites of injury were also reported.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
Validity was not formally assessed. The authors commented upon potential bias existing in retrospective studies.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction. The data extracted were: specific mode of entry, study type, population size, number of complications (bowel or vascular), injury type, time to diagnosis and subsequent management. Attempts were made to exclude duplicate data.

Methods of synthesis
How were the studies combined?
The rate of bowel and vascular complications was estimated for all patients combined and according to the mode of entry (Veress needle, open or direct access, or non-specified), study design (prospective or retrospective) and the type...
of surgery (gynaecological or general surgery). The odds ratios (ORs) and 95% confidence intervals (CIs) were estimated for complications associated with different modes of entry and different study designs.

How were differences between studies investigated?
The rates of injury using Veress needle in prospective and retrospective studies were compared, and potential reasons for differences were discussed.

Results of the review
For Veress needle entry (134,917 patients), 9 retrospective studies, 4 prospective studies and 5 randomised studies were included. For open laparoscopic entry (21,547 patients), 10 retrospective studies, 6 prospective studies and 2 randomised studies were included. For direct laparoscopic entry (16,739 patients), 5 retrospective studies, 5 prospective studies and 3 randomised studies were included. For no-specified entry (679,847 patients), 10 retrospective studies, 1 retrospective study and 1 prospective study were included.

Major injuries at the time of injury occurred in 1.1 per 1,000 cases. Major injuries were significantly less common with direct entry (0.5/1,000) than with open entry (1.1/1,000) or Veress entry (0.9/1,000), (P=0.005). Overall, bowel injuries occurred in 0.7 per 1,000 cases and major vascular injuries in 0.4 per 1,000. The bowel injury rates were 0.4 per 1,000 cases for Veress needle, 1.1 per 1,000 cases for open entry, 0.5 per 1,000 cases for direct entry and 0.8 per 1,000 cases for non-specified entry mode. Compared with Veress needle or direct entry, bowel injuries were significantly more common with open entry (P=0.0001). The OR for open entry compared with Veress was 2.9 (95% CI: 1.8, 4.8).

The vascular injury rates were 0.4 per 1,000 cases for Veress needle, 0 per 1,000 cases for open entry, 0 per 1,000 cases for direct entry and 0.4 per 1,000 cases for non-specified entry mode. The OR for open entry compared with Veress was 0.1 (95% CI: 0.01, 0.8). Vascular injuries were significantly higher with Veress needle than with open entry.

In the Veress studies, 7 of the 55 bowel injuries (12%) were caused by the Veress needle, while the remaining 48 (88%) were caused by the primary trochar.

Prospective studies found significantly higher rates of injuries than retrospective studies (P=0.001).

Only 17 of the 75 cases of bowel injuries and 16 of the 125 cases of vascular injuries had sufficient information on the timing of injury diagnosis.

The mortality rate was at least 1:100,000. Five deaths were reported in studies that specified the mode of entry, all with Veress needle: two due to delayed diagnosis of bowel perforation, and three due to gas embolus at time of insufflation. Another five deaths were reported in the non-specified entry studies.

Bowel injury was more common in general surgery (1.5/1,000) than in gynaecology operations (0.4/1,000), (P=0.0001). The vascular injury rates were the same for general and gynaecological surgery (both 0.4/1,000).

Authors’ conclusions
The injury rates of 0.7 per 1,000 for bowel injuries and 0.4 per 1,000 for vascular injuries, as found in the review, are likely to underestimate the true injury incidence. The optimal route of entry remains unclear. The authors also concluded that direct entry may be a safe alternative to the Veress needle and open entry.

CRD commentary
The review question was clear only in terms of the intervention and outcome. Only one database was searched and the studies were restricted to English language publications; this may have resulted in the omission of other relevant studies and the possibility of publication bias. The methods used to select the studies, assess validity and extract the data were not described. Therefore, the adequacy of the methods used to conduct the review cannot be assessed. Although validity was not formally assessed and studies of any design were eligible, the potential for bias inherent in retrospective studies was discussed. Relevant data were extracted and tabulated. No details were given of the methods used to estimate the injury rates; it was not reported whether the overall estimated rates were weighted by sample size or not. The studies
were appropriately grouped by intervention, and the influence of study design and type of surgery on the results was assessed. Comparisons of injury rates between entry modes were based on indirect comparisons and no results from RCTs comparing different entry modes were reported. Hence, differences between entry modes were not conclusive.

In view of the dependence of the results upon retrospective studies, the authors are correct to conclude that the results from the review are likely to be underestimated and that the optimal mode of entry is uncertain.

**Implications of the review for practice and research**
Practice: The authors state that in low-risk patients, surgeons should use whichever method they are most experienced and at ease with. They further state that adequate close supervision and training of junior laparoscopists, well-maintained equipment, increased awareness of the risks of laparoscopy, and prompt recognition and management of entry-related juries will help to minimise the impact of potentially serious complications.

Research: The authors state that new developments in laparoscopy require adequate assessment in large trials.

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