NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

INTERVENTIONAL PROCEDURES PROGRAMME

Interventional procedure overview of laparoscopic gastrectomy for cancer

Cancer of the stomach can be treated by partial or total removal of the stomach (gastrectomy) to take out the tumour and any affected lymph nodes. Gastrectomy was traditionally carried out by open surgery. In this procedure, the gastrectomy is performed using keyhole surgery. The cancer is then removed in exactly the same way as open surgery.

Introduction

This overview has been prepared to assist members of the Interventional Procedures Advisory Committee (IPAC) in making recommendations about the safety and efficacy of an interventional procedure. It is based on a rapid review of the medical literature and specialist opinion. It should not be regarded as a definitive assessment of the procedure.

Date prepared

This overview was prepared in January 2008.

Procedure name

- Laparoscopic gastrectomy for cancer

Specialty societies

- Association of Laparoscopic Surgeons of Great Britain and Ireland
- Association of Upper Gastrointestinal Surgeons
- British Society of Gastroenterology

Description

Indications

Gastric cancer. Over 95% of gastric cancer is adenocarcinoma forming in the glandular cells of the stomach lining. Other types of gastric cancer include leiomyosarcoma, lymphoma, and carcinoid tumours.

Certain conditions, such as pernicious anemia, atrophic gastritis, Helicobacter pylori infection, or Barrett's oesophagus at the gastro-oesophageal junction may predispose to stomach cancer. Symptoms may include heartburn, dysphagia, bloating, loss of appetite, and weight loss. Nausea and vomiting may also occur and stools may contain blood. Further complications may include anemia.

Current treatment and alternatives

If patients present at a disease stage that is amenable to surgical treatment, the surgical treatment options for gastric cancer include laparoscopic gastric resection, or open gastrectomy.

What the procedure involves

The procedure is usually performed with a curative intent. Under general anaesthesia, a laparoscope and trocars are inserted through small incisions in the abdominal wall. A mini-laparotomy may be made for laparoscopically assisted gastrectomy. Surgery may involve total gastrectomy, or partial gastrectomy (either proximal or distal), the choice of total or partial gastrectomy is largely dependent on the site of the tumour. Some lymph nodes are usually dissected and removed, and an anastomosis is created (where the tumour has been removed) using a variety of techniques.

Efficacy

Survival: A multicentre case series (n = 1294 patients treated by laparoscopic surgery) reported 5 year disease free survival to be 99.8% for stage IA disease, 98.7% for stage IB disease, and 85.7% for stage II disease[4]. In a second case series in patients with more advanced disease 5-year overall and disease-free survival was 59% and 57% respectively, with overall survival ranging from 100% in stage 1A to 9% in stage IV[3]. The mortality rate due to cancer recurrence among patients undergoing laparoscopically assisted distal gastrectomy (LADG) was 5% (2/44) in one non randomised controlled trial[1]. In a second non-randomised controlled trial 4% (1/24) of patients undergoing either partial or total laparoscopic gastrectomy died of metastatic cancer at 1 year follow up[2]..

Lymph node dissection: Lymph node dissection is an important conceptual surrogate for curative resection completeness. In a meta analysis a significantly fewer number of lymph nodes were dissected with LADG than

ODG. Weighted mean difference -4.35 nodes (95% CI -5.73 to -2.98 nodes) ($p<0.001$) [5].

Conversion to open surgery: Conversion from laparoscopic to open surgery was reported in between 2% (1/44)[1] of patients among the laparoscopic group in a non randomised controlled trial and in 1% (14/1294)[4] and 3% (3/100)[3] of patients in two case series. The reasons for conversion varied, but included anatomical constraints, bleeding, and mechanical problems.

Length of stay: Patients undergoing LADG were reported to have a hospital length of stay shortened by 5.5 days compared to those undergoing open gastrectomy in a meta analysis ($p<0.001$)[5]. In a case series of 111 patients undergoing a range of laparoscopic gastrectomy surgery the mean length of stay was 14.6 days[6].

Blood loss: A meta analysis reported that there was significantly lower blood loss during LADG than with open gastrectomy, with a weighted mean difference of 146 ml ($p<0.001$)[5].

Operative time: Operative time was reported to be significantly longer with LADG than with open gastrectomy in a meta analysis, with the weighted mean difference in time being 54.3 minutes ($p<0.001$)[5]. Conversely in one non randomised controlled trial the open procedure was 55 minutes shorter than LADG ($p=0.006$)[1].

Safety

A meta analysis of 1161 patients (837 treated by laparoscopic procedures) reported that there were fewer overall complications following LADG 11% (58/535) than following open gastrectomy 18% (97/519), odds ratio 0.54 ($p<0.001$)[5]. However, specifically there was no significant difference between the groups with respect to mortality rate, anastomotic leak, anastomotic stricture, or wound infection.

There were significantly fewer cases of ileus following LADG than following open gastrectomy in a meta analysis, odds ratio 0.27 ($p<0.02$)[5]. In one multi centre case series of 1294 patients, ileus following laparoscopic gastric resection occurred in <1% (3/1294) of patients[4].

One multicentre case series reported perforation (not otherwise described) in <1% (1/1294) of patients[4]. One non-randomised controlled trial of 102 patients (44 undergoing laparoscopic procedures) reported that there were more cases of pulmonary infection following open gastrectomy 10% (6/58) than following LADG 2% (1/44) for stomach cancer, however this difference was not statistically significant ($p=0.110$)[1].

Delayed gastric emptying requiring parenteral nutrition for 16 days occurred in 6% (1/16) of patients undergoing laparoscopic partial gastrectomy in one non-randomised controlled trial[2].

The rate of postoperative bleeding was reported as <1% (1/586)[8], 1% (14/1294)[4], and 2% (1/44)[1] across the included studies.

Literature review

Rapid review of literature

The medical literature was searched to identify studies and reviews relevant to laparoscopic gastrectomy for cancer. Searches were conducted via the following databases, covering the period from their commencement to 8 January 2008: MEDLINE, PREMEDLINE, EMBASE, Cochrane Library and other databases. Trial registries and the Internet were also searched. No language restriction was applied to the searches. (See appendix C for details of search strategy.)

The following selection criteria (table 1) were applied to the abstracts identified by the literature search. Where these criteria could not be determined from the abstracts the full paper was retrieved.

Table 1 Inclusion criteria for identification of relevant studies

Characteristic	Criteria
Publication type	Clinical studies were included. Emphasis was placed on identifying good quality studies. Abstracts were excluded where no clinical outcomes were reported, or where the paper was a review, editorial, laboratory or animal study. Conference abstracts were also excluded because of the difficulty of appraising methodology.
Patient	Patients with gastric cancer requiring resection.
Intervention/test	Laparoscopic gastrectomy for cancer.
Outcome	Articles were retrieved if the abstract contained information relevant to the safety and/or efficacy.
Language	Non-English-language articles were excluded unless they were thought to add substantively to the English-language evidence base.

List of studies included in the overview

This overview is based on one meta analysis[5], two non randomised controlled trials[1,2], four case series[3,6,4,8], and one multiple case report[7].

Other studies that were considered to be relevant to the procedure but were not included in the main extraction table (table 2) have been listed in appendix A.

Existing reviews on this procedure

There were no published reviews identified at the time of the literature search.

Related NICE guidance

Below is a list of NICE guidance related to this procedure. Appendix B details the recommendations made in each piece of guidance listed below.

Interventional procedures

- None

Technology appraisals

- Imatinib for gastrointestinal stromal tumours. NICE technology appraisal guidance 86 (2004). Available from www.nice.org.uk/TA086

Clinical guidelines

- Improving outcomes in colorectal cancer. NICE cancer service guideline (2004). Available from www.nice.org.uk/CSGCC

Public health guidance

- None

Table 2 Summary of key efficacy and safety findings on laparoscopic gastrectomy for cancer

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Hosono S (2006)[5] **Meta analysis** International, studies from Korea, Italy, and Japan **n=1611 (837 Laparascopic) 4 RCTs 12 NRCT's** Study aim: to elucidate the current status of LADG with regard to short term outcomes compared to ODG Study period: Various Population: Various Indication: Early gastric cancer (definitions varied). Technique: **Laparoscopically assisted** distal gastrectomy. Versus open distal gastrectomy. Degree of lymph node excision varied between studies **Follow up: not stated (to discharge)** Conflicts of interest: not stated	**Clinical outcomes** Time to passage of first flatus was achieved significantly earlier with LADG than ODG Weighted mean difference -0.68 days (95% CI -0.85 to -0.50) (p<0.001) There was a great deal of variability between studies in the length of stay. Overall length of stay was significantly shorted with LADG than ODG. Weighted mean difference -5.5 days (955 CI -7.61 to -3.42) (p<0.001) **Operative characteristics** A significantly longer operative time was required with LADG than ODG. Weighted mean difference 54.3 minutes (95% CI 38.8 to 69.8 minutes) (p<0.001) Significantly less blood loss occurred with LADG than ODG. Weighted mean difference -145.6 ml (95% CI -181.4 to -109.9 ml) (p<0.001) A significantly fewer number of Lymph nodes were dissected with LADG than ODG. Weighted mean difference -4.35 nodes (95% CI -5.73 to -2.98 nodes) (p<0.001)	**Postoperative complications** Overall there were significantly fewer complications with LADG (58/535) than ODG (97/519), OR 0.54 (95% CI 0.37 to 0.77) (p<0.001). No significant difference in the rate of mortality between LADG 2% (2/101) and ODG 3% (3/105) (p=0.67) (Follow up period not stated. No significant difference in the number of anastomotic leaks between LADG <1% (2/385) and ODG 3% (10/365) (p=0.10). There was no significant difference in the incidence of anastomotic stenosis between LADG 3% (6/172) and ODG 3% (5/163) (p=0.86). There were significantly fewer cases of ileus following LADG 1% (2/267) than ODG 5% (13/264), OR 0.27 (95% CI 0.09 to 0.84) (p<0.02) There was no significant difference in the incidence of wound infection between LADG 2% (9/448) and ODG 3% (13/421) (p=0.37).	No details provided of quality assessment of included studies, or whether this was taken into account in the analysis. Meta analysis presented both combined and separately for RCT and NRCT data. Searches limited to Embase Medline and Cochrane register, for publication between Jan 1991 and Aug 2006. Independent clinical appraisal and data extraction by two reviewers. Random effects model used for meta analysis. Test for heterogeneity undertaken. No details provided of assessment of potential publication bias.

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Ziqiang W (2006)[1] **Non-randomised controlled trial** China **n = 102 (44 laparoscopic)** Study period: March 2004–May 2005 Study aim: To investigate feasibility, safety and cancer clearance of LADG with D2 lymphadenectomy. Population: Age = 53 years (mean) Male = 58%. Indication: Malignant tumours on biopsy, in lower or middle part of the stomach. Patients with invasion of gastric serosa >10 cm^2 were excluded. Technique: **Laparoscopically assisted** distal gastrectomy with D2 lymph node dissection under general anesthetic with 5-port access, and 4 to 7 cm superior abdominal incision versus open distal gastrectomy. **Follow up: mean 14 months** Conflict of interest: Not stated	**Clinical outcomes** 5% (2/44) of patients in the LADG group died during the 14-month follow-up period. One patient (with stage IV cancer) had port site recurrence, and abdominal metastases at 3 months; another patient had peritoneal metastases and ileus at 1 year. In comparison, 5% (3/58) of the open surgery group died during follow-up, 2 of multiple systemic metastases and 1 of abdominal metastases of gastric cancer. Times to death not stated. Outcome / LADG / Open / p = Time to first flatus (days) / 4.1 ± (0.8) / 5.3 ± (1.0) / 0.024 Time to ground activities (days) / 3.2 ± (0.8) / 5.2 ± (1.3) / 0.006 **Operative characteristics** Conversion to open surgery was required in 2% (1/44) of patients because the left gastric artery was encircled by enlarged lymph nodes. Outcome / LADG / Open / p = Operative time (min) / 282.8 ± (32.8) / 227.1 ± (21.9) / 0.006 Intraoperative blood loss (ml) / 139.3 ± (82.7) / 331.4 ± (206.4) / 0.011 Proximal tumour margin (cm) / 6.1 ± (1.3) / 6.1 ± (1.0) / 0.166 Distal tumour margin (cm) / 6.4 ± (1.1) / 6.0 ± (1.0) / 0.178 Number of lymph nodes retrieved / 30.1 ± (17.0) / 33.2 ± (19.2) / 0.798	**Complications** Outcome / LADG / Open / p = Operative death / 0% / 4% (2/58) / NR Wound infection / 2% (1/44) / 4% (2/58) / NR Anastomotic leak / 0% / 0% / NR Epididymitis / 2% (1/44) / 0% / NR Pulmonary infection / 2% (1/44) / 10% (6/58) / 0.110 Gastrasthenia / 2% (1/44) / 4% (2/58) / NR Cerebral infarction / 2% (1/44) / 2% (1/58) / NR Anastomotic site bleeding / 2% (1/44) / 2% (1/58) / NR	Concurrent but not deliberately paired group of patients undergoing open surgery. No details of independent outcome assessment No significant difference in baseline demographic characteristics or TNM staging between the groups. A mixed cohort of patients in terms of cancer stage at baseline with patients from TNM IA to IV.

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Dulucq J-L (2005)[2] For "European data" it would be better to include, Huscher and also probably Azagra 2006 and Ibanez 2006 **Non-randomised controlled trial** France **n = 52 (24 laparoscopic)** Study period: April 1995–March 2004 Study aim: To compare clinical outcomes and margin size between laparascopic and open gastrectomies Population: Mean age = 71 years. Male = 42%. Indication: Malignant disease diagnosed by endoscopy, unltrasonography, and dynamic CT scanning. Technique: **Laparoscopic** partial or total gastrectomy with 5-port access, and CO_2 insufflation to 12 mmHG versus partial or total open gastrectomy. **Follow up: mean 29 months (lap), 34 months (open)** Conflict of interest: Not stated	**Clinical outcomes** In the laparoscopic groups 4% (1/24) of patients had died of metastatic cancer at 1 year, the remaining patients were disease-free with no port site metastases. In the open gastrectomy groups 29% (8/28) of patients (with advanced disease) died of metastatic cancer; the remaining patients were disease-free with no recurrences at laparotomy incision site. Outcome / Lap total / Open total / Lap. partial / Open partial Ambulation (days): 3.1 ± (0.3) / 6.2 ± (0.7)^ / 2.5 ± (1.2) / 5.8 ± (1.0)^ Time to first flatus (days): 3.6 ± (1.2) / 4.7 ± (1.2)^ / 2.9 ± (1.5) / 5.8 ± (1.0)^ Length of stay (days): 16.9 ± (3.0) / 24.0 ± (9.0) / 16.0 ± (5.4) / 25.0 ± (10.0) ^ p<0.05 vs equivalent laparoscopic procedure **Operative characteristics** Conversion to open surgery was required in 0% of patients after the decision to operate laparoscopically. Outcome / Lap total / Open total / Lap partial / Open partial (n=8) / (n=11) / (n=16) / (n=17) ASA* physical status score: 1.7 ± (0.5) / 1.6 ± (0.4) / 1.7 ± (0.8) / 1.5 ± (0.5) Operative time (min): 183 ± (48) / 165 ± (60) / 130 ± (31) / 124 ± (22) Intraoperative blood loss (ml): 81 ± (107) / 125 ± (95)^ / 60 ± (90) / 55 ± (50) +ve margins: 0 / 0 / 0 / 1 Number of lymph nodes retrieved: 24 ± (12) / 20 ± (8) / 17 ± (7) / 15 ± (4) *American Society of Anesthesiologists ^ p<0.05 Vs equivalent laparoscopic procedure	**Complications** There was 1 incident of splenectomy during laparascopic surgery (4%; 1/24), compared with 5 incidences (18%; 5/28) during open surgery. High fever, right abdominal pain and leukocytosis at 10-day follow-up occurred in 6% (1/16) of patients undergoing laparoscopic partial gastrectomy. Laparoscopic evaluation revealed an abscess and small duodenal fistula. Peritoneal lavage and drain placement resolved this. Delayed gastric emptying occurred in 6% (1/16) of patients undergoing laparoscopic partial gastrectomy, requiring parenteral nutrition for 16 days. There were complications in 18% (5/28) of patients in the open surgery group, including 2 abscesses, 2 cases of delayed gastric emptying, and 1 death at 10 days from a cardiac event.	Prospective study Patients with serosal invasion by the tumour on explorative laparoscopy were treated by open surgery. Unclear whether laparoscopic procedures were totally laparoscopic, or laparoscopically assisted. There were no significant differences in patient demographic characteristics at baseline. No details of cancer stage at baseline reported. All patients with advanced gastric cancer (T3 and/or N1 or higher) received adjuvant chemo-radiotherapy. Different follow-up periods for the two groups makes comparison of disease-free survival difficult. Within the 24 patients treated by laparoscopic surgery, 19 had an adenocarcinoma, 2 had malignant stromal tumours, and 1 had a neuroendocrine tumour Authors state that further randomised studies are required to enforce their results

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Sakuramoto S (2006)[6] Doesn't really help – mainly technique oriented **Case series** Japan **n = 111** Study period: Septembert 1998 --January 2005 Study aim: To examine surgical outcomes using different laparoscopic procedures Population: Mean age = 59 years. Male = 76%. Indication: Early gastric cancer Technique: **Laparoscopic gastrectomy and lymph node dissection** with 6-port access, and CO_2 insufflation to 8 mmHG. 55 patients had 7 cm minilaparotomy, 56 had lymph nodes dissected laparoscopically, including 31 who had celiac branches of the vagus nerve preserved. **Follow up: Mean 36 months** Conflict of interest: Not stated	**Clinical outcomes** 2 patients 2% (2/111) died during follow-up, 1 from peritoneal recurrence at 3 years and 11 months, and one from other causes. The remaining patients were alive without recurrence or port site metastasis at a mean follow-up of 36 months. First flatus occurred after a mean period of 2.9 days ± 1.0days, and first oral intake was achieved after 3.9days ± 1.0 days. The mean length of hospital stay among all the patients undergoing laparascopic gastrectomy was 14.6 days ± 8.7days. **Operative characteristics** The mean operative time was 255 minutes ± 46 minutes. Mean blood loss was 147g ± 109g Additional lyphadenectomy was not performed in any patients.	**Complications** Outcome — Rate Total postoperative complications — 12% (13/111) Major outcomes requiring length of stay of > 1 month Anastomotic leak — 1% (1/111) Abdominal abscess — 1% (1/111) Pancreatic leakage — 1% (1/111) Cholecystitis — 1% (1/111) (all managed conservatively) Minor complications Cholecystitis — 1% (1/111) Wound infection — 3% (3/111) Atelectasis — 3% (3/111) Anastomotic stenosis (endoscopic bougienage) — 2% (2/111) The postoperative course did not differ between the groups by laparoscopy typ.	Comparisons are made between different laparascopic procedures rather than with open surgery. Consecutive patients at one centre During the series, the inclusion criterion of tumours < 4 cm in diameter was relaxed to include all tumours not indicated for endoscopic mucosal resection. Various comparisons between LADG and hand-assisted laparoscopic surgery, and between vagus nerve sparing and non vagus nerve sparing surgery are reported but not described here.

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Kitano S (2007)[4] **Case series** Japan **n = 1294** Study period: April 1994–December 2003 Study aim: To examine the short- and long-term outcomes of laparoscopic gastrectomy for early gastric cancer. Population: Mean age = 63 years. Male = 67%. Indication: Early gastric cancer with adenocarcinomas shown by endoscopy and barium meal to be in the mucosal or submucosal layer of the stomach and not candidates for endoscopic resection. Technique: **Laparoscopic gastrectomy, either distal (proximal or distal) or total, and lymph node dissection** with CO_2 insufflation, and 5 to 7cm minilaparotomy. **Follow up: Median 36 months** Conflict of interest: Part supported by government grant	**Clinical outcomes** The 5-year disease-free survival (Kaplan-Meier) was 99.8% for stage IA disease, 98.7% for stage IB disease, and 85.7% for stage II disease. Overall recurrence occurred in <1% (6/1294) of patients. There was 1 local recurrence, 1 lymph node recurrence, 2 peritoneal disseminations, 1 liver metastases, and 1 skin metastasis. There were no port site metastases in any patient during a median follow up of 36 months. **Operative characteristics** Outcome: LADG (n=1185) | LAPG (n=54) | LATG (n=55) | p = Operative time (min): 253.1 ± (19.0) | 229.4 ± (31.0) | 271.4 ± (26.0) | <0.05 p = LATG vs LADG or LAPG Conversion to open surgery was required in 1% (14/1294) of patients because of bleeding, mechanical problems, or other reason.	**Complications** Outcome: Rate Intraoperative complications Bleeding: <1% (12/1294) Perforation: <1% (1/1294) Organ injury: <1% (5/1294) Mechanical problem: <1% (4/1294) Others: <1% (3/1294) Postoperative complications Bleeding: 1% (14/1294) Anastomotic stenosis: 3% (38/1294) Anastomotic leakage: 2% (28/1294) Abscess: 1% (17/1294) Pancreas injury: 1% (14/1294) Ileus: <1% (3/1294) Respiratory complication: <1% (9/1294) Wound infection: 2% (20/1294) Overall there were significantly more intraoperative complications during LADG than LAPG or LATG (p<0.05)	Potential crossover of patients with Hosono (2006) and Sakuramoto S (2006) but likely to include additional patients from other centres. Retrospective case review 16 participating centres Conversion to open surgery was not associated with worse short- or long-term outcome. Authors state that large prospective randomised studies are required to confirm results

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Tanimura S (2008)[8] **Case series** Japan **n = 586** Study period: March 1998–June 2006 Study aim: To examine the outcomes of laparoscopic gastrectomy with 'triangulating stapling technique' for early gastric cancer. Population: Not reported. Indication: Gastric cancer, not otherwise defined. Technique: Laparoscopic gastrectomy, either distal (proximal or distal) or total, and intercorporeal anastomosis in 303 patients, with CO_2 insufflation, and 4 to 7cm minilaparotomy. **Follow up: not reported** Conflict of interest: Not stated	**Operative characteristics** Outcome: Operative time (min) LAG Circular stapler: 239 ± (50) Hand assisted Triangular stapler: 212 ± (22) Total lap: 249 ± (38) p = <0.01 p = Hand assisted vs other groups	**Complications** Outcome: Rate Intraoperative complications Anastomotic leakage: <1% (3/586) Bleeding: <1% (1/586) Anastomotic stenosis: <1% (1/586)	No clinical efficacy outcomes reported. Laparoscopic technique evolved across the series.

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Huscher CGS (2007)[3] **Case series** Italy **n = 100** Study period: Nov 2002 – Sep 2005 Study aim: To report the short- and long-term outcomes of laparoscopic gastrectomy for advanced gastric cancer. Population: Mean age = 66 years. Male = 61%. Indication: advanced gastric cancer with biopsy proven adenocarcinoma. Computed tomography negative for distant metastases.30% of patients had undergone previous abdominal surgery Technique: **Totally Laparoscopic gastrectomy, either partial or total, and lymph node dissection** with CO_2 insufflation. Specimen bag used for removal. **Follow up: Mean 58 months** Conflict of interest: Not stated	**Clinical outcomes** Recurrence occurred in 31% (31/100) patients to a mean follow up of 38 months, and 29% (29/100) patients died of recurrence at a mean follow up of 24 months. No port site metastases were reported. The 5-year overall and disease-free survival (Kaplan-Meier) was 59% and 57% respectively, with overall survival ranging from 100% in stage 1A to 9% in stage IV. The mean period until first flatus was 3.4 days (range 1 to 7). **Operative characteristics** Conversion to open surgery was required in 3% (3/100) of patients because of bleeding, intestinal adhesions, or tumour invasion of the posterior duodenal wall. Lymph node dissection D_1 in 30% of patients and D_2 in 70%. The mean surgical time was 217 minutes (range 120 to 480), and length of stay was 11.4 days (range 6 to 32). The mean clearance margin from the tumour was 6.4 cm (± 0.3 cm), and the mean number of lymph nodes dissected was 35 (± 18).	**Complications** Postoperative mortality and morbidity were 6% (6/100) and 23% (23/100) respectively. Two patients died from respiratory failure at 4to 6 days follow up. One patient died from congestive heart failure at 57 days, one patient died of multiple organ failure at 78 days, one patient died of sepsis at 24 days following anastomotic leakage, and one at 17 days following a gastrojejumostomy leak. Outcome — Rate Bleeding (surgically treated) — 6% (6/100) Duodenal dehiscence (surgical or conservative treatment) — 5% (5/100) Pneumothorax — 1% (1/100) Pancreatitis. — 1% (1/100) Urinary infection — 3% (3/100) Pleural effusion — 3% (3/100) Wound infection — 4% (4/100)	Method of case selection or case accrual not reported. No independent assessment of outcome. 7 patients were lost to follow up suspected to be disease free.

Abbreviations used: CI, confidence interval; CT, computed tomography; LADG, laparoscopically assisted distal gastrectomy; LAPG, laparoscopically assisted proximal gastrectomy; LATG, laparoscopically assisted total gastrectomy; NR, not reported; NS, not significant; ODG, open distal gastrectomy; OR, odds ratio; NRCT, non randomised controlled trial; RCT, randomised controlled trial

Study details	Key efficacy findings	Key safety findings	Comments
Kitano S (2007)[7] Kitano is from Oita in Japan – what is he doing writing up a silly case report on botches from Korean surgeons!! - exclude **Case report** Korea **n = 2** Study period: Not stated Study aim: To describe two cases with uncommon outcomes Population: Mean age = 65 years. Male = 50%. Indication: Early gastric cancer Technique: **Laparoscopically assisted** distal gastrectomy, with Bilroth I reconstruction. No further details provided. **Follow up: to 1 month** Conflict of interest: Not stated	No efficacy outcomes reported	**Complications** Case 1 After LADG the colouration of the stomach appeared normal. On the 2nd postoperative day abdominal pain was aggravated and fever developed.. Open surgical exploration revealed a blueish gastric remnant, and the pancreatic tail was necrotic with surrounding inflammation. Total gastrectomy, distal pancreatectomy, and splenectomy were performed. Examination showed infarction of the gastric remnant, and severe pancreatitis. Anastomotic leakage and intra-abdominal abscess followed the second procedure. The patient was discharged after 29 days. Case 2 On the 7th postoperative day abdominal pain increased and fluid drain turned dark. CT showed absence of contrast enhancement at the gastric wall, and the distal pancreas was swollen. Open surgical exploration identified severe pancreatitis, and the distal half of the gastric remnant was blueish, although flow in the splenic vessels and short gastric vessels were preserved. Total gastrectomy was performed, and the patient recovered on the 13th day following the second operation.	No details provided of the operator experience or the dominator number of procedures performed at the institution. Few details provided of the exact laparoscopic procedure performed. Authors postulate that pancreatitis may have led to development or progression of thrombosis of the remnant gastric vessels leading to infarction.

Validity and generalisability of the studies

- Some studies included patients treated by laparoscopically assisted surgery, and some by total laparoscopic surgery.
- Insufflation was used in some but not all studies. (irrelevant)
- The degree of resection varied between studies (some patients had total gastrectomy) as did the resection of lymph nodes. This makes comparison between studies difficult.
- Some partial resections involved distal gastrectomy, and others proximal gastrectomy. Expected – depends on site of tumour – exclude this comment)
- Some studies included only patients with early-stage cancer while others were more inclusive, making comparison of outcomes between studies difficult.
- Some studies limited patient inclusion according to lesion size.
- Some studies specified the use of an endoscopy retrieval bag.- is universally used for cancer

Specialist advisers' opinions

Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College.

Mr H Ali, Mr M Vipond (Association of Laparoscopic Surgeons of Great Britain and Ireland)

Mr D Menzies, Mr P Sedman (Association of Upper Gastrointestinal Surgeons)

Mr T Dehn, Mr G Fullarton (British Society of Gastroenterology)

- Three including Tom Dehn Specialist Advisers considered this procedure to be a minor variation on an established procedure, and three Advisers said that it was novel and of uncertain safety and efficacy.
- Known adverse events following this procedure include port insertion injury to intra-abdominal organs/vessels, complications of prolonged pneumoperitoneum, anastomotic/duodenal stump leak, chyle leaks, incomplete resection, bleeding and anastomotic stricture.

- Theoretical adverse events may include inadequate lymphadenectomy, cancer seeding, Roux limb ischaemia, deep vein thrombosis, infection and cardiac complications.

- One Adviser thought that the procedure was being taken up in an uncontrolled fashion.

- There is a steep learning curve with this procedure; however, this is the same with any open procedure undertaken for the first time.

- Mentoring should be offered by surgeons experienced in this technique, as the procedure requires advanced laparoscopic skills, and safety is operator-dependent.

- The BSG/AUGIS dataset should be collected for each case. ALS, Dendrite database – check with als

- The main controversy in this field is the level of lymph node dissection rather than laparoscopic technique.

- Key efficacy outcomes by which to consider this procedure include mortality (early and late), return to theatre, lymph node clearance and adequate surgical margins.

- Key safety outcomes by which to consider this procedure include anastomotic leak, respiratory complications and hemorrhage.

Issues for consideration by IPAC

- Non-English language studies were excluded.
- Studies including patients with benign gastric tumours were excluded.
- 16 studies (4 RCTs and 12 other comparative studies) are included in the meta-analysis by Hosono (2006)[5] and have not been included in this overview to avoid ‘double-counting’ patients.

- Significant number of comparative studies and case series totaling 2223 patients undergoing the laparoscopic procedure are include in appendix A

References

1. Ziqiang W, Feng Q, Zhimin C et al. (2006) Comparison of laparoscopically assisted and open radical distal gastrectomy with extended lymphadenectomy for gastric cancer management. Surgical Endoscopy 20: 1738-1743.

2. Dulucq JL, Wintringer P, Stabilini C et al. (2005) Laparoscopic and open gastric resections for malignant lesions: a prospective comparative study. Surgical Endoscopy 19: 933-938.

3. Huscher CGS, Mingoli A, Sgarzini G et al. (2007) Totally laparoscopic total and subtotal gastrectomy with extended lymph nope dissection for early and advanced gastric cancer; early an long term results of a 100 patient series. The American Journal of Surgery 194: 839-844.

4. Kitano S, Shiraishi N, Uyama I et al. (2007) A multicenter study on oncologic outcome of laparoscopic gastrectomy for early cancer in Japan. Annals of Surgery 245: 68-72.

5. Hosono S, Arimoto Y, Ohtani H et al. (2006) Meta-analysis of short-term outcomes after laparoscopy-assisted distal gastrectomy. World Journal of Gastroenterology 2: 7676-7683.

6. Sakuramoto S, Kikuchi S, Kuroyama S et al. (2006) Laparoscopy-assisted distal gastrectomy for early gastric cancer: experience with 111 consecutive patients. Surgical Endoscopy 20: 55-60.

7. Kim HJ, Lee KH, Young KH, et al (2007) Gastric remnant infarction following laparoscopically-assisted distal gastrectomy. CT diagnosis in two cases. Abdominal Imaging 32: 290-292.

8. Tanimura S, Higashino M, Fukunaga Y, et al (2008) Intracorporeal Billroth 1 Reconstruction by Triangulating stapling technique after laparoscopic distal gastrectomy for gastric cancer. Surgical Laparoscopic Endoscopy and Percutaneous Techniques 18: 54-58.

Appendix A: Additional papers on laparoscopic gastrectomy for cancer not included in summary table 2

The following table outlines the studies that are considered potentially relevant to the overview but were not included in the main data extraction table (table 2). It is by no means an exhaustive list of potentially relevant studies. Studies (of any design) with 20 or less patients undergoing the laparoscopic gastrectomy procedure are not listed here.

Article	Number of patients/follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
Adachi Y, Shiraishi N, Shiromizu A, Bandoh T, Laparoscopy-assisted Billroth I gastrectomy compared with conventional open gastrectomy. Archives of Surgery 2000; 135(7):806-810.	NRCT n=102 (49 lap.) FU=36 months	There was no significant difference in complication rate between laparoscopic surgery (8%) and open surgery (21%).	Larger studies are presented in table 2.
Asao T, Hosouchi Y, Nakabayashi T, Haga N, Mochiki E, Kuwano H. Laparoscopically assisted total or distal gastrectomy with lymph node dissection for early gastric cancer. British Journal of Surgery 2001; 88(1):128-132.	Case series n=49 FU= to 6 months	There were no conversions to open surgery, and in 5 cases the macroscopic diagnosis of depth on invasion was found to have been underestimated	Larger studies are presented in table 2.
Azagra JS, Ibanez-Aguirre JF, Goergen M, Ceuterick M, Bordas-Rivas JM, Almendral-Lopez ML et al. Long-term results of laparoscopic extended surgery in advanced gastric cancer: a series of 101 patients. Hepato-Gastroenterology 2006; 53(68):304-308.	Case series n=101 FU=41 months	Actuarial 5 year survival of curative surgery was 34%	A cohort of patients with advanced gastric cancer, some undergoing palliative surgery.
Ballesta LC, Ruggiero R, Poves I, Bettonica C, Procaccini E. The contribution of laparoscopy to the treatment of gastric cancer. Surgical Endoscopy 2002; 16(4):616-619.	Case series n=25 FU=38 months	5 procedures were converted to open surgery. A mean of 30.5 lymph nodes were removed	Larger studies are presented in table 2.
Besozzi A, Besozzi S, Lanza V, Mitolo CI, Novelli D, Sisto T. Laparoscopic treatment gastric cancer with advanced techniques: technical notes and follow-up. Chirurgia Italiana 2007; 59(1):63-67.	Case series n=24 FU=N/S	Complications noted included pleural effusion, subphrenic collection, and partial dehiscence of the duodenal stump.	Larger studies are presented in table 2.
Chiu, P. W. Y. Endoscopic submucosal dissection used for treating early neoplasia of the foregut using a combination of knives. Surgical Endoscopy 22 (3) 777-	Case series n=30 FU= 6months	Successful procedure in 29/30 patients	Larger studies are included in table 2

Article	Number of patients/follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
783.2008			
Dulucq JL, Wintringer P, Perissat J, Mahajna A. Completely laparoscopic total and partial gastrectomy for benign and malignant diseases: a single institute's prospective analysis. Journal of the American College of Surgeons 2005; 200(2):191-197.	Case series n=33 FU=39 months	All resected margins were tumour free. There was one splenectomy, and postoperatively one abscess and one case of delayed gastric emptying.	Larger studies are presented in table 2.
Etoh T, Shiraishi N, Tajima M, Shiromizu A, Yasuda K, Inomata M et al. Transient liver dysfunction after laparoscopic gastrectomy for gastric cancer patients. World Journal of Surgery 2007; 31(5):1115-1120.	NRCT n=205 (147 lap.) FU= 22 to 75 months	The postoperative complication rate was similar between the groups	Largely biochemical rather than clinical outcomes. Studies with longer follow up period are presented in table 2.
Fujiwara M. Longterm Outcomes of Early-Stage Gastric Carcinoma Patients Treated with Laparoscopy-Assisted Surgery. Journal of the American College of Surgeons 2008; 206(1):138-143.	Case series n=94 FU=Up to 5 years	Overall 5 years survival rate was 90%. 3 patients had recurrence including 1 case of port site recurrence.	Larger studies are presented in table 2.
Hiki N, Shimoyama S, Yamaguchi H, Kubota K, Kaminishi M. Laparoscopy-assisted pylorus-preserving gastrectomy with quality controlled lymph node dissection in gastric cancer operation. Journal of the American College of Surgeons 2006; 203(2):162-169	NRCT n=109 (72 lap.) FU= 22 to 75 months	There was no significant difference in the number of lymph nodes retrieved for any of the nodal stations between the groups	Larger studies are presented in table 2.
Huscher CG, Mingoli A, Sgarzini G, Brachini G, Binda B, Di Paola M et al. Totally laparoscopic total and subtotal gastrectomy with extended lymph node dissection for early and advanced gastric cancer: early and long-term results of a 100-patient series. American Journal of Surgery 2007; 194(6):839-844.	Case series n=100 FU= 57 months	3% of operations were converted to open procedures. 5 year disease free survival was 57%	Some cross over / duplication of patients with Huscher (2005) Larger studies are presented in table 2.
Hyodo M. Gasless laparoscopy-assisted distal gastrectomy is feasible and useful for non-obese patients with early gastric cancer. Hepato-Gastroenterology 2007; 54(78):1854-1857.	NRCT n=92 (40 lap.) FU= N/S	3 procedures were converted to open surgery. Blood loss, operative and recovery time were shorter with the laparoscopic approach. No cardiopulmonary complcations	Studies with longer follow up period are presented in table 2.

Article	Number of patients/follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
Hyung WJ, Song C, Cheong JH, Choi SH, Noh SH. Factors influencing operation time of laparoscopy-assisted distal subtotal gastrectomy: analysis of consecutive 100 initial cases. European Journal of Surgical Oncology 2007; 33(3):314-319	Case series n=100 FU= to discharge	Multivariate analysis demonstrated that operative time was influenced by BMI score and surgical experience	Studies with longer follow up period are presented in table 2.
Ibanez Aguirre FJ, Azagra JS, Erro Azcarate ML, Goergen M, Rico SP, Moreno Elola-Olaso A et al. Laparoscopic gastrectomy for gastric adenocarcinoma. Long-term results.[see comment]. Revista Espanola de Enfermedades Digestivas 2006; 98(7):491-500.	Case series n=130 FU= 49 months	6 patients died within 60 days of the operation	A mixed cohort of patients some had staging only without resection.
Ishigami, S., Natsugoe, S., Uenosono, Y., Usefulness of sentinel node biopsy in laparoscopic partial gastrectomy for early gastric cancer. Hepato-Gastroenterology 54 (79) 2164-2166.2007	Case series n=5 FU=?	Average of 2.6 sentinel nodes were detected	Larger studies are included in table 2. Few clinical results of gastrectomy are reported.
Jin SH, Kim DY, Kim H, Jeong IH, Kim MW, Cho YK et al. Multidimensional learning curve in laparoscopy-assisted gastrectomy for early gastric cancer. Surgical Endoscopy 2007; 21(1):28-33.	Case series n=109 FU= to discharge	There were 14 performance and 5 oncologic failures. The learning curve was achieved after 40 patients but was broken when advanced techniques were introduced, or patients were unselected.	Studies with longer follow up period are presented in table 2.
Kim, J.-J. Totally laparoscopic gastrectomy with various types of intracorporeal anastomosis using laparoscopic linear staplers: Preliminary experience. Surgical Endoscopy 22 (2) 436-442.2008.	Case series n=45 FU=?	There was no conversion to an open procedure. First flatus was observed at 2.9 days, liquid diet was started at 3.7 days.	Larger studies are included in table 2

Article	Number of patients/follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
Kim MC, Choi HJ, Jung GJ, Kim HH. Techniques and complications of laparoscopy-assisted distal gastrectomy (LADG) for gastric cancer. European Journal of Surgical Oncology 2007; 33(6):700-705.	Case series n=128 FU= 17 months	Postoperative morbidity and mortality rates were 15.6 % and 0.7% respectively.	Studies with longer follow up period are presented in table 2.
Kiyama T, Mizutani T, Okuda T, Fujita I, Yamashita N, Ikeda K et al. Laparoscopic surgery for gastric cancer: 5 years' experience. Journal of Nippon Medical School = Nihon Ika Daigahu Zasshi 2006; 73(4):214-220.	Case series n=101 FU= to discharge	Anastomotic bleeding occurred in 3 patients, pneumohypodermia in 1, remote infection in 6 , and stroke in 1 patient.	Studies with longer follow up period are presented in table 2.
Lee JH. A phase-II clinical trial of laparoscopy-assisted distal gastrectomy with D2 lymph node dissection for gastric cancer patients. Annals of Surgical Oncology 2007; 14(11):3148-3153.	Case series n=64 FU= to discharge	The mean number of lymph nodes retrieved was 50.1. There were two conversions to open surgery and complication rate was 3% (2/66).	Larger studies are presented in table 2.
Lee SI, Choi YS, Park DJ, Kim HH, Yang HK, Kim MC. Comparative study of laparoscopy-assisted distal gastrectomy and open distal gastrectomy.[see comment]. Journal of the American College of Surgeons 2006; 202(6):874-880.	NRCT n=256 (136 lap.) FU=to discharge	Mean operative time was similar and >30 lymph nodes retrieved in each group.	Studies with longer follow up period are presented in table 2.
Miura S, Kodera Y, Fujiwara M, Ito S, Mochizuki Y, Yamamura Y et al. Laparoscopy-assisted distal gastrectomy with systemic lymph node dissection: a critical reappraisal from the viewpoint of lymph node retrieval.[see comment]. Journal of the American College of Surgeons 2004; 198(6):933-938.	NRCT n=431 (89 lap.) FU=N/S	A significantly greater number of lymph nodes were retrieved using the open technique	Few clinical outcomes were reported Studies with longer follow up period are presented in table 2.
Nunobe S. H. Laparoscopy-assisted pylorus-preserving gastrectomy: Preservation of vagus nerve and infrapyloric blood flow induces less stasis. World Journal of Surgery 2007; 31(12):2335-2340.	NRCT n=90 (39 lap.) FU=7 to 21 months	Gastric stasis was observed in 8% of patients in the laparoscopic group and 6% of patients in the open surgery group	Larger studies are presented in table 2.
Ohgami M, Otani Y, Kumai K, Kubota T, Kim YI, Kitajima M. Curative laparoscopic surgery for early gastric cancer: five years experience. World Journal of Surgery 1999; 23(2):187-192.	Case series n=61 FU=23 months	There were 2 recurrences at the site of staple line at 2 years follow up.	Larger studies are presented in table 2.
Orsenigo E., Tomajer. Sentinel node mapping during	Case series	These early gastric cancer patients with nodal	Larger studies are included in table 2.

Article	Number of patients/follow-up	Direction of conclusions	Reasons for non-inclusion in table 2
laparoscopic distal gastrectomy for gastric cancer. Surgical Endoscopy 22 (1) 118-121.2008.	n=34 FU=?	metastases had at least one metastatic lymph node among the SNs identified (sensitivity 100%)	Few clinical results of gastrectomy are reported.
Song, K. Y. Laparoscopy-assisted distal gastrectomy with D2 lymph node dissection for gastric cancer: Technical and oncologic aspects. Surgical Endoscopy 22 (3) 655-659.2008.	NRCT n=75 (n=44 Lap) FU=?	operative time was significantly longer for the LADG group. The postoperative LOS was significantly shorter for the LADG group (7.7 vs 9.4 days, respectively; p = 0.003). No significant differences were found in the total number of retrieved lymph nodes	Larger studies are included in table 2
Tanimura S, Higashino M, Fukunaga Y, Osugi H. Laparoscopic gastrectomy with regional lymph node dissection for upper gastric cancer. Gastric Cancer 2003; 6(1):64-68.	Case series n=110 FU=to discharge	1% postoperative recurrence.	Studies with longer follow up period are presented in table 2.
Uyama I, Sugioka A, Sakurai Y, Komori Y, Hanai T, Matsui H et al. Hand-assisted laparoscopic function- preserving and radical gastrectomies for advanced-stage proximal gastric cancer.[see comment]. Journal of the American College of Surgeons 2004; 199(3):508-515.	Case series n=48 FU=24 months	Mean blood loss was 87 ml, and a mean 49.2 lymph nodes were retrieved. There were no instances of recurrence relating to gastric cancer	Larger studies are presented in table 2.
Uyama I, Sakurai Y, Komori Y, Nakamura Y, Syoji M, Tonomura S et al. Laparoscopy-assisted uncut Roux-en-Y operation after distal gastrectomy for gastric cancer. Gastric Cancer 2005; 8(4):253-257.	Case series n=42 FU=6 moths	There were no conversions to open surgery, and no instances of anastomotic leakage or stricture.	Larger studies are presented in table 2.
Yasuda K. Learning curve for laparoscopy-assisted distal gastrectomy. Digestive Endoscopy 2003; 15(4):280-283.	Case series n=75 FU=50 moths	The incidence of postoperative complications did not differ between the groups. No conversions to open surgery were required	Larger studies are presented in table 2.

Appendix B: Related NICE guidance for laparoscopic gastrectomy for cancer

Guidance	Recommendation
Interventional procedures	None
Technology appraisals	• **Imatinib for gastrointestinal stromal tumours. NICE technology appraisal guidance 86 (2004)** 1.1 Imatinib treatment at 400 mg/day is recommended as first-line management of people with KIT (CD117)-positive unresectable and/or KIT (CD117)-positive metastatic gastro-intestinal stromal tumours (GISTs). 1.2 Continuation with imatinib therapy is recommended only if a response to initial treatment (as defined in Section 1.5) is achieved within 12 weeks. 1.3 Responders should be assessed at intervals of approximately 12 weeks thereafter. Continuation of treatment is recommended at 400 mg/day until the tumour ceases to respond, as defined in Section 1.5. 1.4 An increase in the dose of imatinib is not recommended for people receiving imatinib who develop progressive disease after initially responding (see Section 1.5). 1.5 For the purpose of this guidance, response to imatinib treatment should be assessed on the basis of the results of diagnostic imaging to assess size and density of the tumour(s), patients' symptoms and other factors, in accordance with the Southwest Oncology Group (SWOG) criteria detailed in Appendix D. For the purpose of this guidance, response to therapy is defined as the SWOG classifications of complete response, partial response or stable disease. 1.6 The use of imatinib should be supervised by cancer specialists with experience in the management of people with unresectable and/or metastatic GISTs.

Guidance	Recommendation
Cancer service guidelines	• **Improving outcomes in colorectal cancer. NICE cancer service guideline CC (2004)** High quality surgery can be crucial to patients' survival. Surgery should be undertaken by specialist colorectal cancer surgeons who are members of colorectal cancer multi-disciplinary teams (MDTs) and who can demonstrate low tumour involvement at the margins of the excised specimens, low rates of surgical complications, and high survival rates among their patients.
Clinical guidelines	• **Diagnosis and management of colorectal and anal cancer. NICE clinical guideline (in development)**
Public health guidance	None

Appendix C: Literature search for laparoscopic gastrectomy for cancer

IP: 677 Laparascopic gastrectomy for cancer		
Database	**Date searched**	**Version searched**
Cochrane Library	08/01/2008	Issue 4, 2007
CRD databases (DARE & HTA)	08/01/2008	November/December 2007
Embase	08/01/2008	1980 to 2008 Week 1
Medline	08/01/2008	1950 to December Week 4 2007
Premedline	08/01/2008	January 07, 2008
CINAHL	08/01/2008	1982 to December Week 1 2007
British Library Inside Conferences	08/01/2008	-
NRR	03/01/2008	-
Controlled Trials Registry	08/01/2008	-

The following search strategy was used to identify papers in Medline. A similar strategy was used to identify papers in other databases.

1. exp Laparoscopy/

2. exp Laparoscopes/

3. laparoscop$.tw.

4. or/1-3

5. Gastrectomy/

6. gastrect$.tw.

7. (gastric$ adj3 resection$).tw.

8. or/5-7

9. ((gastric or stomach or gastronintestinal or duodenum or duodenal or digestive tract$) adj3 (neoplasm$ or cancer$ or carcinoma$ or adenocarcinom$ or tumour$ or tumor$ or malignan$)).tw.

10. exp Gastrointestinal Neoplasms/

11. 9 or 10

12. 4 and 8 and 11

13. Animals/

14. Humans/

15. 13 not (13 and 14)

16. 12 not 15