Robotic-assisted bariatric surgery: a systematic review
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CRD summary
The review concluded that robotic-assisted bariatric surgery was a safe and feasible option for severely obese patients. The authors’ conclusions reflect the evidence presented, but the potential for bias in the evidence mean the conclusions should be viewed with caution.

Authors’ objectives
To assess the efficacy and safety of robotic-assisted bariatric surgery in obese patients.

Searching
MEDLINE, EMBASE, SCOPUS, DARE, BIOSIS Previews, The Cochrane Library, EBM, Clinical Evidence, TRIP and HTA were searched from 2003 to April 2010 with no language or publication status restrictions. Search terms were reported. Reference lists of included articles were scanned for additional articles. Relevant conference abstracts, controlled trial registries and Google were also searched.

Study selection
Primary studies of any design that evaluated robotic-assisted restrictive or malabsorptive bariatric surgery in obese adults (over 18 years) were eligible for inclusion. Adults with a body mass index (BMI) of more than 35 were included. The primary outcomes of interest were complications and mortality rate. Secondary outcomes were intra-operative procedure time, conversion rate, length of hospital stay postoperatively and cost of procedure.

All the included studies used the da Vinci telerobotic surgical system, with two studies also using the Zeus robotic system. Most of the restrictive procedures used laparoscopic-assisted gastric banding; the other procedures used laparoscopic-assisted gastric banding revisions, gastroplasty or implantable gastric stimulator devices. Most of the studies that used bypass procedures used Roux-en-Y gastric bypass; one study also used biliopancreatic diversion/duodenal switch. The mean age of participants was 42 years (range 36 to 44), where reported. The mean preoperative BMI was 46.6kg/m² (range 41 to 52.8), where reported.

One reviewer pre-screened titles and keywords to identify articles which were clearly irrelevant. Two reviewers independently selected studies for inclusion.

Assessment of study quality
Study quality was assessed independently by two reviewers using the Cochrane Risk of Bias tool. Studies were also classified using the Oxford Centre for Evidence-based Medicine levels of evidence.

Data extraction
Data were extracted for relevant outcomes. Complication and mortality rates were calculated based on the total number for total surgical procedures. For operative time and length of hospital stay, means and standard deviations were extracted (where reported).

Two reviewers independently extracted data.

Methods of synthesis
A narrative synthesis was conducted due to differences between studies.

Results of the review
Twenty two studies (1,253 patients, range 2 to 249) were included in the review, including one randomised controlled trial (RCT), three prospective cohort studies and 18 case series. Six studies evaluated restrictive bariatric procedures, 13 involved malabsorptive procedures and three involved both.

Mortality: There were no reported deaths related to robotic-assisted bariatric surgery (12 studies).
Complications: In the studies assessing malabsorptive bariatric procedures, there were: eight anastomotic leaks from a total of 327 patients (2.4%, four studies); seven cases of bleeding from a total of 349 patients (2%, two studies); and 13 out of 430 patients (3%, five studies) had strictures or stenosis. Only one study appeared to report on complications for restrictive bariatric procedures; there were no reports of stenosis or structure.

Intra-operative procedure time: The mean operative duration for restrictive procedures was 133 minutes (range 60 to 167 minutes) and 213 minutes (range 105 to 514 minutes) for malabsorptive procedures.

Conversion rates: The conversion rates for malabsorptive procedures to laparoscopic or open bariatric surgery was 2% (18 out of 921 patients, 10 studies). There were no conversions reported for restrictive procedures (seven studies).

Length of hospital stay: Mean length of stay was 3.7 days (range 1.5 to 9 days, eight studies) for malabsorptive procedures and 2.7 days (range 2 to 4 days, four studies) for restrictive procedures.

Cost information
Three studies reported estimated costs of procedures which ranged from US$ 4,142 to US$ 9,505.

Authors' conclusions
The findings demonstrated that robotic-assisted bariatric surgery was a safe and feasible option for severely obese patients.

CRD commentary
The review question was clear with appropriate inclusion criteria. Several relevant sources were searched with no restriction on publication or language status, which reduced the potential for language and publication bias. Appropriate methods to reduce reviewer error and bias were used to select studies for inclusion, assess quality and extract data.

Study quality was assessed using an appropriate tool, but the results of the assessment were not reported. However most of the included studies used designs that are liable to multiple potential biases. A narrative synthesis was appropriate given the different study designs. No data on length of follow-up was reported, which made it difficult to compare outcomes between studies related to follow-up, such as mortality and complications. Some outcomes were only reported in a small number of studies. Most of the included studies had less than 50 patients.

The authors' conclusions reflect the evidence presented but, given the observational designs and small sample sizes of most studies plus the small numbers reporting the outcomes, the conclusions should be viewed with caution.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that further research was needed to compare the short- and long-term outcomes of patients undergoing laparoscopic and robotic-assisted bariatric surgeries to define clear patient benefits that justify increased costs and operational impact. More research into the cost effectiveness of robotic assisted surgery was needed.

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