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Surgery for complete (full-thickness) rectal prolapse in adults (Review)

Tou S, Brown SR, Nelson RL

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[Intervention Review]

Surgery for complete (full-thickness) rectal prolapse in adults

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ABSTRACT

Background

Complete (full-thickness) rectal prolapse is a lifestyle-altering disability that commonly affects older people. The range of surgical methods available to correct the underlying pelvic floor defects in full-thickness rectal prolapse reflects the lack of consensus regarding the best operation.

Objectives

To assess the effects of different surgical repairs for complete (full-thickness) rectal prolapse.

Search methods

We searched the Cochrane Incontinence Group Specialised Register up to 3 February 2015; it contains trials from the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, MEDLINE in process, ClinicalTrials.gov and the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) as well as trials identified through handsearches of journals and conference proceedings. We also searched EMBASE and EMBASE Classic (1947 to February 2015) and PubMed (January 1950 to December 2014), and we specifically handsearched the*British Journal of Surgery* (January 1995 to June 2014), *Diseases of the Colon and Rectum* (January 1995 to June 2014) and *Colorectal Diseases* (January 2000 to June 2014), as well as the proceedings of the Association of Coloproctology meetings (January 2000 to December 2014). Finally, we handsearched reference lists of all relevant articles to identify additional trials.

Selection criteria

All randomised controlled trials (RCTs) of surgery for managing full-thickness rectal prolapse in adults.

Data collection and analysis

Two reviewers independently selected studies from the literature searches, assessed the methodological quality of eligible trials and extracted data. The four primary outcome measures were the number of patients with recurrent rectal prolapse, number of patients with residual mucosal prolapse, number of patients with faecal incontinence and number of patients with constipation.

Main results

We included 15 RCTs involving 1007 participants in this third review update. One trial compared abdominal with perineal approaches to surgery, three trials compared fixation methods, three trials looked at the effects of lateral ligament division, one trial compared techniques of rectosigmoidectomy, two trials compared laparoscopic with open surgery, and two trials compared resection with no resection rectopexy. One new trial compared rectopexy versus rectal mobilisation only (no rectopexy), performed with either open or laparoscopic surgery. One new trial compared different techniques used in perineal surgery, and another included three comparisons: abdominal versus perineal surgery, resection versus no resection rectopexy in abdominal surgery and different techniques used in perineal surgery.

The heterogeneity of the trial objectives, interventions and outcomes made analysis difficult. Many review objectives were covered by only one or two studies with small numbers of participants. Given these caveats, there is insufficient data to say which of the abdominal and perineal approaches are most effective. There were no detectable differences between the methods used for fixation during rectopexy. Division, rather than preservation, of the lateral ligaments was associated with less recurrent prolapse but more postoperative constipation. Laparoscopic rectopexy was associated with fewer postoperative complications and shorter hospital stay than open rectopexy. Bowel resection during rectopexy was associated with lower rates of constipation. Recurrence of full-thickness prolapse was greater for mobilisation of the rectum only compared with rectopexy. There were no differences in quality of life for patients who underwent the different kinds of prolapse surgery.

Authors' conclusions

The lack of high quality evidence on different techniques, together with the small sample size of included trials and their methodological weaknesses, severely limit the usefulness of this review for guiding practice. It is impossible to identify or refute clinically important differences between the alternative surgical operations. Longer follow-up with current studies and larger rigorous trials are needed to improve the evidence base and to define the optimum surgical treatment for full-thickness rectal prolapse.

PLAIN LANGUAGE SUMMARY

Surgery for complete rectal prolapse in adults

Importance of the review

Complete, or full-thickness rectal prolapse is when the lower part of the intestine (the rectum) becomes loose and telescopes out of the anus when straining. It should not be confused with haemorrhoids (or piles), which is when the veins around the anus swell up. Rectal prolapse is most common in older people, especially women, although its cause is unclear. Rectal prolapse can cause complications, such as pain, ulcers, bleeding and faecal incontinence (inability to control bowel movements). Surgery is a common treatment for repairing the prolapse.

The main findings of the review

Whether surgery is performed through a cut in the abdomen or a cut through the anus (known as a perineal approach), it makes no difference with regard to reappearance of the prolapse or appearance of postoperative complications. When surgeons perform the operation through a small hole in the abdomen (laparoscopic or keyhole surgery) recovery may be faster than for open abdominal surgery. When constipation is one of the main symptoms, bowel resection (removing part of the bowel) during prolapse repair may help. There was no difference in the results when different types of repair were used during the perineal (anal) approach.

Adverse effects

There was no particular concern about different types of surgery described in this review.

Limitations of the review

Although 15 studies were included in this review, many of them had different comparisons and some had poor methods, limiting the usefulness of the findings. However, longer follow-up of patients in these studies, together with results from ongoing trials, may provide some information in the future.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON [Explanation]

Perineal compared with abdominal approach for full-thickness rectal prolapse in adults

Patients: Adults with full-thickness rectal prolapse
Setting: Surgical centres in India, Finland, Serbia, Spain, UK
Interventions: perineal versus abdominal surgery

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	No. of participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk (with abdominal approach)	Corresponding risk (with perineal approach)				
Number of patients with recurrent full-thickness prolapse	Moderate risk (study population)		OR 0.7 (0.17 to 2.88)	44 (1 RCT)	⊕⊕⊕ Moderate[a]	A pragmatic trial, participants could be randomised between abdominal or perineal surgery. The abdominal procedure was performed through an open or laparoscopic approach depending on surgeon's preference. For perineal surgery, participants could be randomised to a Delorme's or an Altemeier's procedure. It was the surgeon's choice to participate in either or both of the randomisations
	263 per 1000	200 per 1000 (57 to 507)				
Vaizey incontinence score 3 years post-op	The mean Vaizey incontinence score 3 years post-op in the control group was 4.6	The mean Vaizey incontinence score 3 years post-op in the intervention group was 5 higher (5.44 lower to 6.24 higher)	-	16 (1 RCT)	⊕⊕⊕ Moderate[a]	The Vaizey scores ranged from 0 (perfect continence) to 24 (totally incontinent)

Number of patients with postoperative complications	Moderate risk (study population)		OR 0.65 (0.19 to 2.23)	44 (1 RCT)	⊕⊕⊕ Moderate[a]	-
	421 per 1000	321 per 1000 (121 to 619)				
Bowel function (bowel thermometer) 3 years post-op	The mean bowel function (bowel thermometer) 3 years post-op in the control group was 52	The mean bowel function (bowel thermometer) 3 years post-op in the intervention group was 50 higher (31.69 lower to 27.69 higher)	-	9 (1 RCT)	⊕⊕⊕ Moderate[a]	Bowel function rated by participants, 0 (worst) to 100 (best)
Quality of life score (EQ-5D) at 3 years	The mean quality of life score (EQ-5D) at 3 years in the control group was 0.73	the mean quality of life score (EQ-5D) at 3 years in the intervention group was 0.86 higher (0.14 lower to 0.4 higher)	-	14 (1 RCT)	⊕⊕⊕ Moderate[a]	EQ-5D quality of life scores range from − 0.59 (worst) − 1.0 (perfect health)
Straining at 3 years post-op	Moderate risk (study population)		OR 0.06 (0 to 1.33)	20 (1 RCT)	⊕⊕⊕ Moderate[a]	-
	455 per 1000	48 per 1000 (0 to 526)				

CI: Confidence interval; **OR:** Odds Ratio; **RCT**: randomised controlled trial.

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[a]Downgraded one level for imprecision; single trial with small sample size and wide confidence interval

BACKGROUND

Description of the condition

Complete (full-thickness) rectal prolapse, also known as procidentia, is the circumferential protrusion through the anus of all layers of the rectal wall. It should not be confused with haemorrhoids, which are enlarged cushions of vascular tissue found within the anal canal in the submucosal space. Full-thickness rectal prolapse is a distressing and demoralising condition and can result in serious but rare complications such as gangrene and perforation. Although it can occur in any age group, it is most common in older women. This review assesses some surgical techniques in current clinical practice for rectal prolapse in adults.

The underlying cause of rectal prolapse remains unclear, although there are some known risk factors, including an abnormally deep Pouch of Douglas (the cavity between the rectum and the posterior wall of the uterus); lax muscles in the pelvic floor and anal canal; weak internal and external anal sphincters, often with evidence of pudendal nerve neuropathy; and abnormal fixation of the rectum, with a mobile mesorectum and lax lateral ligaments (Madiba 2005). Other predisposing factors include neurological illnesses, connective tissue disorders, and high parity (Schoetz 1985; Marshman 1987; Karasick 1997).

Rectal prolapse may result in acute complications of the prolapse itself (pain, ulceration, bleeding, incarceration and gangrene) or chronic debilitating symptoms such as difficulty maintaining perianal hygiene (faecal incontinence, mucus discharge).

Description of the intervention

The only potentially curative treatment for full-thickness rectal prolapse is surgery. However, for people who are unfit for surgery, high fibre intake with stool softener may help if constipation is a predominant symptom (Phillips 2005). A range of surgical interventions are available, which are similar in principle although technically different in a number of respects. Differences include the surgical approach to the prolapsed bowel (transabdominal, open versus laparoscopic, perineal), the method of fixation during the rectopexy (suture or mesh), and the performance of a bowel resection (removal of a portion of the intestine). The choice of synthetic material used to perform the rectopexy may also vary and can include nylon, Teflon, Marlex, Ivalon, Gore-Tex, Vicryl or Dexon. There is little information on the best option for failed primary surgical treatment, but repeat surgery can be successful (Fengler 1997; Pikarsky 2000).

The primary surgical interventions are the following.

1. **Anal encirclement operation**. This procedure is generally reserved for debilitated or other individuals at high anaesthetic risk. Under local anaesthesia, and after reduction of the prolapse, a subcutaneous suture is encircled around the anal orifice. This is then tightened to prevent further prolapse. A variety of suture materials may be used, including silicone rubber impregnated with Dacron, knitted Dacron or polypropylene mesh.
2. **Perineal resection**. There are two main methods of perineal resection.
   i) Perineal rectosigmoidectomy aims to resect (remove) the redundant bowel via the perineum and anchor the lower rectum to the sacrum through fibrosis in the hope of preventing future prolapse. It may be combined with a procedure to tighten the pelvic muscles (levatorplasty).
   ii) The Delorme's procedure is a modification of perineal rectosigmoidectomy in which there is no resection of the prolapsed bowel. Instead, the mucosa is stripped and the muscle layer plicated and placed as a buttress above the pelvic floor. It may be combined with levatorplasty.
3. **Transabdominal rectopexy**. The aim of this procedure is to anchor the rectum to the sacrum without resection. There are various modifications to the procedure, including the following.
   i) Use of different fixation materials (mesh made from different materials such as nylon, Teflon, Marlex, Ivalon, Gore-Tex, Vicryl or Dexon, or simple sutures using materials such as prolene).
   ii) Placement of the mesh (anterior or ventral, posterior, completely or partially encircling the rectum).
   iii) Full rectal mobilisation with division or preservation of lateral ligaments prior to fixation.
   iv) Open or laparoscopic access.
4. **Transabdominal resection**. This is similar to perineal resection except that it is performed through the abdomen. However, the extent of the bowel resection (removal) may be more extensive and varied (sigmoid colon, rectosigmoid or subtotal colon). This procedure may be combined with rectopexy (attachment of the rectum to the sacrum), but the redundant colon is resected (removed) first.
5. **Transabdominal mobilisation of rectum**. This is similar to transabdominal rectopexy, except the rectum is not fixed by suture or mesh, relying on the formation of adhesions between the mobilised rectum and the sacrum without artificial fixation.

Why it is important to do this review

Selection of the surgical technique for rectal prolapse is difficult, and results appear to vary depending on the technique used (Eu 1997). However, studies suggest prolapse recurrence might not relate to the technical complexity of the surgery (Nelson 2001; Raftopoulos 2005). The purpose of this review is to investigate the effectiveness of surgical techniques in current clinical practice for the repair of full-thickness rectal prolapse in adults. This condition may co-occur with other pelvic organ prolapse; however, it is beyond the scope of this study to provide a comprehensive review of other conditions. Operative procedures designed to repair specific anal sphincter or pelvic floor defects have been covered

in a separate Cochrane Review (Brown 2013), as has the surgical management of rectocoele (Maher 2013). Likewise, we did not include rectal intussusception (internal or occult rectal prolapse) in our review, as it is often associated with other pelvic floor abnormalities, including rectocoele and enterocoele.

OBJECTIVES

To assess the effects of different surgical repairs for complete (full-thickness) rectal prolapse.

METHODS

Criteria for considering studies for this review

Types of studies

All randomised controlled trials (RCTs) and quasi-RCTs of surgery for managing full-thickness rectal prolapse.

Types of participants

All adults diagnosed with full-thickness rectal prolapse.

Types of interventions

Eligible studies whose interventions include one or more of the following, as described in the Background.

1. Anal encirclement operation.
2. Perineal resection.
3. Transabdominal rectopexy.
4. Tranabdominal resection.
5. Transabdominal mobilisation of rectum.

Types of outcome measures

There are a range of different dimensions to the outcome of surgery for rectal prolapse, as reflected in the list of measures below. Nevertheless, because of the dangers of multiple statistical testing and data dependent reporting, we have selected specific measures of poor outcome as primary measures, presenting them in tabular form regardless of whether or not data were available. We also sought data describing the secondary outcomes, but we only tabulated them if data were available.

Primary outcomes

- Number of people with recurrent full-thickness rectal prolapse
- Number of people with residual mucosal prolapse
- Number of people with faecal incontinence (or incontinence score)
- Number of people with constipation (or delayed gut transit time)

Secondary outcomes

- Participant symptoms: failed treatment as judged by the need for additional therapy (drugs, dietary changes, repeat interventions for either full-thickness or residual mucosal prolapse)

- Clinical end points
    - Operative time
    - Postoperative morbidity (e.g. bleeding, wound infection, pelvic infection, mesh infection, anastomotic complications)
    - Number of people with adverse effects (e.g. chronic wound pain)
    - Length of hospital stay, recovery time
    - Readmission rates
    - Postoperative mortality
    - Bowel function, including defecatory frequency, defecatory problems, straining
- Physiological measures
    - Anal canal pressure profiles (resting and squeeze pressure of anal sphincters)
    - Rectal compliance (change in rectal pressure in relation to change in volume, a measure of rectal wall stiffness)
    - Rectal capacity
    - Rectal sensation (detection of rectal sensation, i.e. perception of need to defecate when distending a rectal balloon with increasing volume). Three common measurements include threshold volume to distension, desire to defecate and maximum volume.
    - Colonic transit time studies
    - Anorectal angle on videoproctography (this angle may affect continence)
- Health status measures
    - Condition-specific health outcomes
    - Psychological measures (e.g. the Hospital Anxiety and Depression Scale; Zigmond 1983)
    - General health measures (e.g. the 36-item Short Form Health Survey (SF-36); Ware 1993)
- Health economic measures: cost utility based on quality of life assessments

We adopted GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach for assessing the quality of

evidence. The primary and secondary outcomes were classified as 'critical', 'important' or 'not important' for decision making from the patients' perspective. The GRADE working group strongly recommends including up to seven outcomes in the summary of findings table (Guyatt 2011; Guyatt 2011a; Guyatt 2013; Guyatt 2013a). We selected the following outcomes:

1. Number of patients with recurrent full-thickness prolapse
2. Vaizey incontinence score 3 years post-op
3. Number of patients with postoperative complications
4. Bowel function (bowel thermometer) 3 years post-op
5. Quality of life score (EQ-5D) at 3 years
6. Straining at 3 years post-op

We used GRADEPro in order to generate Summary of Findings Table (GRADEpro GDT 2015).

Search methods for identification of studies

We did not impose any language or date restrictions on the searches. We did not include studies where rectal prolapse surgery was combined with other pelvic organ prolapse surgery in women.

Electronic searches

For this review, we used the search strategy developed for the Incontinence Review Group to identify relevant trials from the Incontinence Group Specialised Register of Controlled Trials. For more details of the search methods used to build the Specialised Register, please see the Group's module in the Cochrane Library (http://onlinelibrary.wiley.com/o/cochrane/clabout/articles/INCONT/frame.html). The Register contains trials identified from the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, MEDLINE in process, ClinicalTrials.gov, the World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) and handsearches of journals and conference proceedings. Most of the trials in the Cochrane Incontinence Group Specialised Register are also contained in CENTRAL. The date of the most recent search was 3 February 2015. We specify the terms used to search the Incontinence Group Specialised Register in Appendix 1.

We also searched EMBASE and EMBASE Classic (1947 to February 2015) on OvidSP, using the strategy described in Appendix 1. The review authors also performed an additional specific search of PubMed (January 1950 to December 2014); see Appendix 1 for details.

Searching other resources

The review authors handsearched the reference lists of all relevant articles as well as several journals: the *British Journal of Surgery* (January 1995 to June 2014), *Diseases of the Colon and Rectum* (January 1995 to June 2014) and *Colorectal Diseases* (January 2000 to June 2014). We also handsearched the conference proceedings of the Association of Coloproctology (January 2000 to December 2014).

Data collection and analysis

Selection of studies

Two review authors (ST, SB) examined all the references and abstracts generated from the electronic searches, retrieving the full-text reports of all potentially relevant trials. The two review authors independently identified trials, resolving any disagreements through discussion with the third reviewer (RLN). Review authors were not blind to the names of authors, institutions or journals. We excluded studies that were not RCTs or if they did not make the prespecified comparisons.

Data extraction and management

Two review authors (ST, SB) independently extracted data from the included trials as described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We resolved any differences of opinion through group discussion. We had to extract some data directly from figures in the publication, and we tried to obtain other information from the trials' authors (Senapati 2013). All other data were published data only.

Assessment of risk of bias in included studies

Two review authors (ST, SB) independently assessed the methodological quality of identified trials according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We assessed bias according to six domains: sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting and 'other' issues. We described the domains for each study as being at 'high', 'low' or 'unclear' risk of bias based on available information.

Measures of treatment effect

We presented dichotomous outcomes as odds ratios (ORs), and continuous outcomes as mean differences (MDs) if scales were comparable or standardised mean differences (SMD) if they were non-comparable. We used 95% confidence intervals (CIs) to measure precision of treatment effect.

Unit of analysis issues

We considered individual participants to be the unit of allocation.

Dealing with missing data

We contacted trial authors for data that may have been collected but not reported. Where trialists reported the results in terms of the mean and standard error (SE), we calculated the standard deviation (SD) using the relationship defined by the equation:
$SD = SE \times \sqrt{s}$
where s represents the sample size.
When only means and ranges were available, we estimated the standard deviation from the range (range x 0.95/4).

Assessment of heterogeneity

We examined the trial methods and descriptions in the Characteristics of included studies tables to identify clinical heterogeneity. We assessed the statistical heterogeneity using the Chi ^{2} test, where a P value of 0.10 was the cutoff value to determine statistical significance, and the I^2 statistic, where 0% to 40% signifies that the statistical heterogeneity might not be important, 30% to 60% may represent moderate heterogeneity, 50% to 90% may represent substantial heterogeneity and 75% to 100% represents considerable heterogeneity (Higgins 2011).

Assessment of reporting biases

We did not use funnel plots to report biases, as the number of trials for each type of intervention was never more than five.

Data synthesis

We analysed data were using Review Manager (RevMan 2012).

Subgroup analysis and investigation of heterogeneity

Subgroup analysis was not possible due to the limited number of identified trials for each type of intervention.

Sensitivity analysis

Sensitivity analysis was not possible due to the limited number of identified trials for each type of intervention.

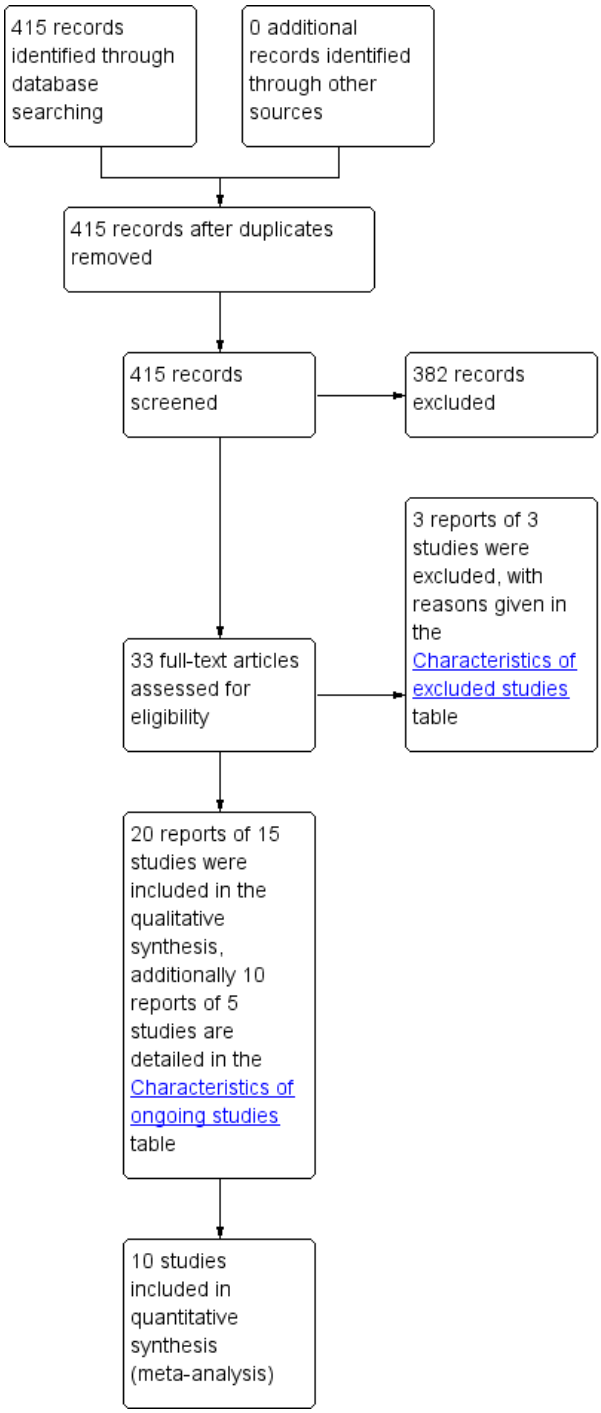
RESULTS

Description of studies

Results of the search

We identified a total of 415 records through the literature search and retrieved 31 potentially relevant full-text articles for further assessment. We finally included 15 eligible studies (20 records) and excluded 3 studies (3 records; Gupta 2006; Nelson 2001; Raftopoulos 2005); see the Characteristics of excluded studies table for details. We also found 10 reports of 5 ongoing studies (Tarquini 2010; DeloRes 2012; Makela-Kaikkonen 2013; ACTRN12605000748617; NCT00946205). Figure 1 shows the assessment process in a PRISMA flowchart.

Figure 1. PRISMA study flow diagram.



Included studies

We have added 3 new trials to this third update of the review (Karas 2011; Senapati 2013; Youssef 2013), bringing the total number of included RCTs to 15. Fourteen trials were published in a full paper format and one trial was published as an abstract. There were a total of 1007 participants included in the 15 trials (Characteristics of included studies table).

- One trial compared abdominal resectional rectopexy and pelvic floor repair with the perineal approach (Deen 1994).
- Five trials compared different methods of rectopexy (Speakman 1991; Selvaggi 1993; Winde 1993; Novell 1994; Galili 1997).
- Three trials examined the difference in abdominal rectopexy with and without division of the lateral ligament (Speakman 1991; Selvaggi 1993; Mollen 2000).
- Three trials compared polyglycolic acid mesh with polypropylene or polyglactin mesh (Winde 1993; Galili 1997; Mollen 2000).
- One trial assessed the results of Ivalon sponge rectopexy with open suture rectopexy (Novell 1994).
- Two trials compared the outcomes of rectopexy with and without bowel resection (Lukkonen 1992; McKee 1992).
- Two trials compared the outcomes of laparoscopic and open abdominal rectopexy (Boccasanta 1998; Solomon 2002).
- One trial compared the outcomes between two different techniques used in perineal rectosigmoidectomy (Boccasanta 2006).
- Two trials examined the cost benefits between laparoscopic and open abdominal rectopexy (Boccasanta 1998; Solomon 2002).
- One trial compared the outcomes of abdominal rectopexy versus mobilisation of rectum and no rectopexy (Karas 2011).
- One trial compared the Delorme's procedure with and without levatorplasty (Youssef 2013).
- One trial made three comparisons: abdominal versus perineal approach, resection versus no resection in abdominal approach and Altemeier's versus Delorme's procedure in perineal approach (Senapati 2013).

All studies apart from Karas 2011 and Senapati 2013 took place in a single surgical centre. Four were conducted at centres in the United Kingdom (Speakman 1991; McKee 1992; Deen 1994; Novell 1994), three in Italy (Selvaggi 1993; Boccasanta 1998; Boccasanta 2006), one in Australia (Solomon 2002) and one each in Finland (Lukkonen 1992), Germany (Winde 1993), Israel (Galili 1997), the Netherlands (Mollen 2000) and Egypt (Youssef 2013). Nineteen countries participated in Karas 2011 (Austria, Brazil, Canada, Czech Republic, Eygpt, Greece, Hungary, India, Iran, Italy, Korea, Lithuania, New Zealand, Poland, Serbia, Spain, Switzerland, Turkey, United States) and five in Senapati 2013 (India, Finland, Serbia, Spain, United Kingdom)

Length of follow-up varied between and within the trials, lasting:

- $\leq$ a year (Speakman 1991; Lukkonen 1992; Youssef 2013);
- > 1 and $\leq$ 3 years (McKee 1992; Selvaggi 1993; Deen 1994; Boccasanta 1998; Solomon 2002; Boccasanta 2006; Senapati 2013);
- > 3 years and $\leq$ 5 years (Winde 1993; Novell 1994; Galili 1997; Mollen 2000; Karas 2011).

We present further details in the Characteristics of included studies table.

Excluded studies

We excluded Gupta 2006 because the participants did not have full-thickness rectal prolapse. The other two studies were not RCTs (Nelson 2001; Raftopoulos 2005; Characteristics of excluded studies).

Risk of bias in included studies

Overall, trials included in this review had major methodological limitations, which may have introduced different forms of bias (Figure 2; Figure 3). Despite a potentially heterogenous group of people, only five trials clearly described the inclusion/exclusion criteria (Solomon 2002; Boccasanta 2006; Karas 2011; Senapati 2013; Youssef 2013). Follow-up periods ranged from 6 months in Lukkonen 1992 to 60 months in Karas 2011.

Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

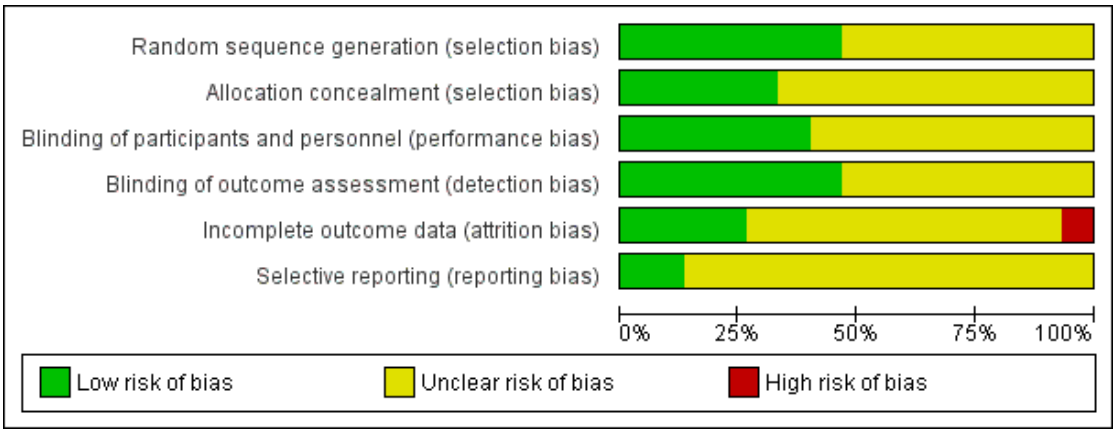
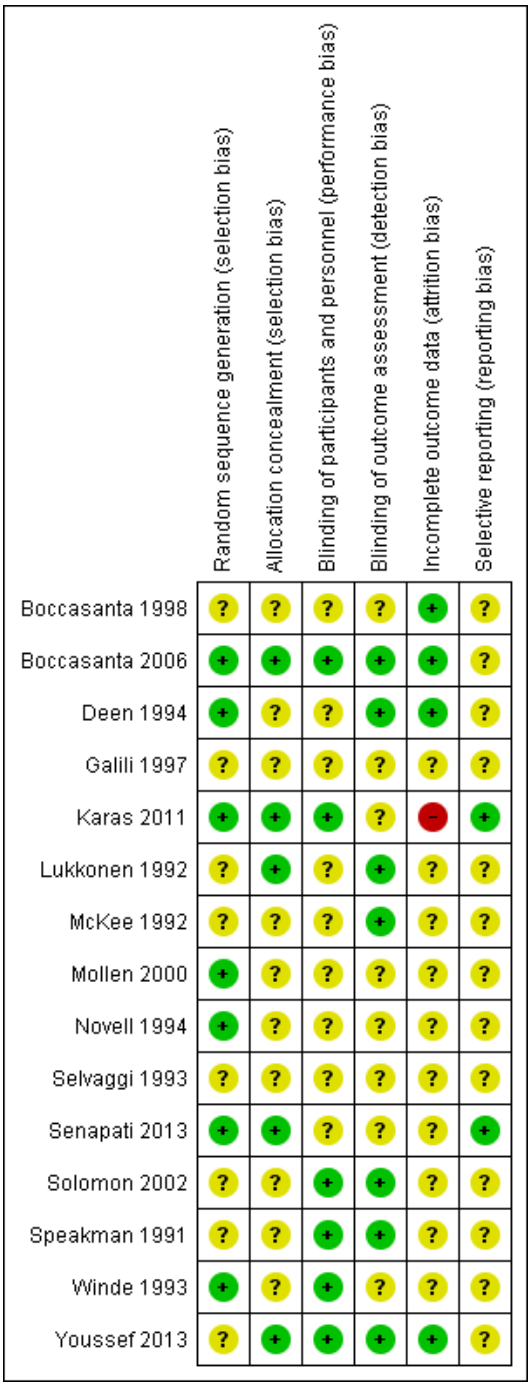


Figure 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Allocation

With regard to sequence generation, eight trials did not mention methods of randomisation (Speakman 1991; Lukkonen 1992; McKee 1992; Selvaggi 1993; Galili 1997; Boccasanta 1998; Solomon 2002; Youssef 2013).

Only five trials mentioned the allocation concealment methods (Lukkonen 1992; Boccasanta 2006; Karas 2011; Senapati 2013; Youssef 2013). Of these studies, three used sealed envelopes (Lukkonen 1992; Boccasanta 2006; Youssef 2013), and two used central allocation (Karas 2011; Senapati 2013). These methods had a low risk of bias.

Blinding

There were only four trials where the assessors were blind to the interventions given (Speakman 1991; Solomon 2002; Boccasanta 2006; Youssef 2013) and were classified as having a low risk of bias. We assessed three further studies as being at low risk of bias, as there was an outcome assessor independent from the surgical team in Deen 1994, and Lukkonen 1992 and McKee 1992 used objective outcome measurements. We assessed eight studies as having an unclear risk of bias as they did not provide any information on blinding of the assessor (Selvaggi 1993; Winde 1993; Novell 1994; Galili 1997; Boccasanta 1998; Mollen 2000; Karas 2011; Senapati 2013).

Incomplete outcome data

Seven trials mentioned patient withdrawals (McKee 1992; Novell 1994; Solomon 2002; Boccasanta 2006; Karas 2011; Senapati 2013; Youssef 2013). The withdrawal/dropout rate ranged from 0% in Boccasanta 2006 to 10% in Karas 2011, with similar rates between the intervention groups apart from in Karas 2011, in which there were 8/136 (6%) lost to follow-up in the rectopexy group and 18/116 (16%) in the no rectopexy group. As a result we assessed this trial being at a high risk of attrition bias. We assessed four trials as being at a low risk of attrition bias, as there was no missing data in three (Deen 1994; Boccasanta 1998; Boccasanta 2006), and the dropout rate between the two intervention arms was similar in the other (Youssef 2013).

Selective reporting

Study protocols were available for three studies (Karas 2011; Senapati 2013; Youssef 2013). Both Karas 2011 and Senapati 2013 were assessed to have low risk of reporting bias as the investigators had reported all the outcomes that were pre-specified the protocols. The protocol for Youssef 2013 was published after the study had finished recruiting participants; although it did not mention a patient satisfaction score, the paper did present one. We considered that this study, together with the rest of the trials, had an unclear reporting bias, as there was insufficient information available to judge whether they were at high or low risk of bias.

Other potential sources of bias

There was considerable variation in the reporting of participant assessment before surgery. Only two trials (Karas 2011; Senapati 2013) carried out a power calculation, and only five reached a sample size greater than 50 participants (Novell 1994; Boccasanta 2006; Karas 2011; Senapati 2013; Youssef 2013). The Characteristics of included studies table contains further details.

Effects of interventions

See: **Summary of findings for the main comparison** Perineal versus abdominal approach for full-thickness rectal prolapse in adults

Altogether, the 15 included trials made the following comparisons:

1. Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique.
2. Comparisons of different perineal approaches.
3. Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy.
4. Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy.
5. Preservation versus division of the lateral ligaments during open mesh rectopexy.
6. Laparoscopic versus open procedure.
7. Abdominal versus perineal approach.
8. Resection versus no resection rectopexy.
9. Rectopexy versus no rectopexy.

There were no trials on anal encirclement operation.

Comparison 1: Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Boccasanta 2006 evaluated whether emerging surgical techniques improved patient outcomes, comparing traditional monopolar electrocautery and handsewn anastomosis with harmonic scalpel (Ultracision) and circular stapler during rectosigmoidectomy and pelvic floor repair.

Primary outcomes

The only primary outcome measured was recurrent rectal prolapse, which occurred in 3/20 (15%) people in the handsewn group compared to 2/20 (10%) in the stapled group (Analysis 1.1). There was no significant difference in the incontinence score at 12 months after surgery between both groups (Analysis 1.2).

Secondary outcomes

Investigators reported on five secondary outcomes: postoperative morbidity, length of hospital stay (Analysis 1.3), recovery time (Analysis 1.4), defecating problems (Analysis 1.5) and physiological parameters (Analysis 1.6; Analysis 1.7; Analysis 1.8). Two of 10 people in the handsewn group developed stenosis, which was treated by transanal dilatation. Although defecatory problems (dyschezia, tenesmus, rectal bleeding) and incontinence scores improved from baseline in both groups, the trial was too small to detect statistically significant differences between the groups in any of the physiological outcomes.

Comparison 2: Comparisons of different perineal approaches

Delorme's procedure with levatorplasty versus Delorme's procedure without levatorplasty

One trial examined this comparison (Youssef 2013).

Primary outcomes

There was less prolapse recurrence using the Delorme's with levatorplasty (1/41) compared to Delorme's without levatorplasty (6/41), but the difference was not significant (Analysis 2.1). The number of people with residual faecal incontinence was significantly lower in Delorme's with levatorplasty compared to Delorme's without levatorplasty (OR 0.07, 95% CI 0.01 to 0.56; Analysis 2.2).. There was also no difference in the incidence of constipation between a Delorme's with levatorplasty and a Delorme's without levatorplasty (Analysis 2.3).

Secondary outcomes

Operating time was significantly longer in the Delorme's with levatorplasty group compared to the regular Delorme's group (OR 29.40, 95% CI 22.72 to 36.08; Analysis 2.4). However, there was no difference in postoperative complications or length of hospital stay between these two approaches (Analysis 2.5; Analysis 2.6). Resting and squeeze pressures were significantly higher in the Delorme's with levatorplasty group compared to the Delorme's without levatorplasty group (Analysis 2.7; Analysis 2.8). The rectal sensation improved in both groups after surgery, but the Delorme's with levatorplasty group required less volume at which rectal sensation was first perceived, suggesting a better functional outcome (Analysis 2.9). The satisfaction score was significantly higher in people who had Delorme's with levatorplasty (Analysis 2.10).

Altemeier's versus Delorme's procedure

One trial examined this comparison (Senapati 2013).

Primary outcomes

There was no significant difference between recurrent rectal prolapse after an Altemeier's procedure (24/102) versus a Delorme's procedure (31/99; Analysis 2.11), and no difference in incontinence score between the Altemeier's and Delorme's procedure groups (Analysis 2.12).

Secondary outcomes

There was no difference in overall bowel function or quality of life score at three years postsurgery (Analysis 2.13; Analysis 2.14).

Comparison 3. Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy

A single trial of 63 participants compared open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy; 31 underwent Ivalon sponge rectopexy and 32 underwent suture rectopexy (Novell 1994).

Primary outcomes

The study reported three of the four primary outcomes contemplated: recurrent full-thickness prolapse, residual faecal incontinence and constipation. There was one recurrent rectal prolapse from each group (Analysis 3.1). At median follow-up (47 months), 9/31 people (29%) who had had Ivalon sponge rectopexy and 5/32 (16%) of people who had received suture rectopexy complained of faecal incontinence, but the difference was not significant (OR 2.21, 95% CI 0.65 to 7.56; Analysis 3.2). Postoperative constipation occurred in 15/31 (48%) people in the Ivalon sponge rectopexy group, compared with 10/32 (31%) people in the sutured rectopexy group (Analysis 3.3, not significant).

Secondary outcomes

The trial reported three secondary outcomes: postoperative mortality, postoperative morbidity and length of hospital stay. There was no 30-day mortality in either group. In the Ivalon sponge group, 6/31 (19%) of participants had postoperative complications compared with 3/32 (9%) in the sutured rectopexy group (Analysis 3.4), but this was not significant. Median hospital stay was 14 days in both groups.

Comparison 4. Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Two small trials compared different mesh materials for open abdominal rectopexy: Winde 1993 compared polyglycolic acid mesh versus polyglactin mesh, and Galili 1997 compared polyglycolic acid mesh versus polypropylene mesh.

Primary outcomes

There were no recurrent rectal prolapses in either group in Winde 1993, but there was one in Galili 1997 from the group treated with polyglycolic acid mesh (Analysis 4.1). There were no statistically significant differences for residual mucosal prolapse between the trial groups, but the confidence intervals were wide (Analysis 4.2). Three of 15 participants (20%) in Winde 1993 complained of residual faecal incontinence after polyglycolic acid mesh rectopexy, compared with 7/20 (35%) in Galili 1997 after polyglactin mesh rectopexy (Analysis 4.3, not significant). In Galili 1997, there was no statistically significant difference in the faecal incontinence scores (Analysis 4.4) and only two reports of postoperative constipation (Analysis 4.5).

Secondary outcomes

There were few data for participants with postoperative complications (Analysis 4.6). One trial also reported length of stay (Galili 1997), which averaged eight days for both groups. However, the trials were too small to detect differences in of these outcomes.

Comparison 5. Preservation versus division of the lateral ligaments during open mesh rectopexy

Three small trials compared the effects of preservation versus division of lateral ligaments during open mesh rectopexy (Speakman 1991; Selvaggi 1993; Mollen 2000). The Selvaggi trial was only available in abstract format, though, and we could not perform any statistical analyses due to insufficient reporting of data.

Primary outcomes

Rectal prolapse recurred in 4/21 (19%) participants following preservation of the lateral ligaments and in 0/23 participants following division of the ligaments (OR (fixed) 15.35, 95% CI 0.73 to 321.58, Analysis 5.1). In Speakman 1991, 2/12 (17%) participants developed mucosal prolapse following rectopexy with preservation of lateral ligaments compared with 0/14 in the group that had division of lateral ligaments (Analysis 5.2). Mollen 2000 reported the colonic transit times rather than the number of people with constipation due to the operation. If we assume that those with delayed colonic transit were constipated, then 4/21 (19%) people developed constipation after rectopexy with preservation of the lateral ligaments compared with 10/23 (43%) with division (OR (fixed) 0.32 CI 0.08 to 1.23, Analysis 5.3). The numbers were too low to assess differences in the constipation score (Analysis 5.4).

Secondary outcomes

Speakman 1991 reported no major complications in 26 participants (Analysis 5.5), while Mollen 2000 reported several physiological parameters (Analysis 5.6; Analysis 5.7; Analysis 5.8; Analysis 5.9). There was no difference in the parameters between intervention groups except in defecation frequency, which was higher in the group with division of lateral ligaments (MD − 1 episode per day, 95% CI − 1.39 to − 0.61; Analysis 5.6). The authors suggested that the elasticity and capacity of the rectum reduced with division of the lateral ligaments, resulting in more frequent defecation.

Comparison 6. Laparoscopic versus open procedure

Boccasanta 1998 and Solomon 2002 compared laparoscopic mesh rectopexy versus open mesh rectopexy. There was a subsequent cost analysis for participants that were involved in Solomon 2002.

Primary outcomes

Both trials reported on recurrent prolapse: in Solomon 2002, 0/20 participants in the laparoscopic group had a full thickness prolapse recurrence, compared with 1/19 after open surgery (Analysis 6.1). In Boccasanta 1998, 0/8 had a residual mucosal prolapse after laparoscopic repair versus 1/13 in the open group (Analysis 6.2).
Two other primary outcomes measured were incontinence and constipation. Solomon 2002 reported faecal incontinence scores (correlated with severity of faecal incontinence): although both groups improved from baseline, the trials were too small to detect a significant difference (Analysis 6.3). In the other trial, the faecal incontinence scores (the score is correlated with severity of faecal incontinence) were 9 (laparoscopic) versus 10 (open) respectively, without measures of dispersion (Boccasanta 1998).
Because of different assessment criteria for constipation, we could not combine results for this outcome. However, there was no statistically significant difference from baseline or between groups in a Visual Analogue Scale for constipation in Solomon 2002, and in Boccasanta 1998, the numbers were too low to to analyse a difference in constipation (Analysis 6.4).

Secondary outcomes

The two trials reported on three of the same secondary outcomes: operating time, length of hospital stay and cost analysis. In addition, Solomon 2002 reported postoperative morbidity, and Boccasanta 1998 examined some physiological parameters. Operating time was significantly longer in the laparoscopic group (MD

67 min, 95% CI 52 to 83, Analysis 6.5); Solomon 2002's results suggested that postoperative complications were significantly less common in the laparoscopic group (OR 0.15, 95% CI 0.04 to 0.62, Analysis 6.6). Hospital stay was also significantly shorter (MD 2.35 days fewer, 95% CI 1.37 to 3.33, Analysis 6.7). There was no statistically significant difference in measured physiological parameters between the two groups in Boccasanta 1998 (Analysis 6.8; Analysis 6.9; Analysis 6.10; Analysis 6.11). Regarding costs, both studies found that the laparoscopic approach was cheaper (Analysis 6.12), but the trials were carried out in different healthcare systems (USA and Australia; the Australian costs were converted to USD for this analysis).

Comparison 7: Abdominal versus perineal approach

Deen 1994 compared perineal rectosigmoidectomy and pelvic floor repair in 10 people versus abdominal resection rectopexy and pelvic floor repair in another 10. Senapati 2013 compared a perineal procedure in 25 people versus an abdominal procedure in 19. In that study, after initial randomisation, participants could undergo an abdominal or perineal procedure according to surgeon's preference or could be randomised again (Characteristics of included studies table). After full randomisation (2 x 2), 11 participants had resection rectopexy and 12 underwent Altemeier's procedure.

Primary outcomes

Deen 1994 reported data for three primary outcome measures, and Senapati 2013 reported data for two. Both trials reported on recurrence after perineal rectosigmoidectomy (Altemeier's procedure) and resection rectopexy. Overall there was no significant difference between the two approaches (odds ratio (OR) 0.64, 95% confidence interval (CI) 0.12 to 3.55; Analysis 7.1). Assessing outcomes purely from an abdominal versus a perineal approach, Senapati 2013 observed recurrence in 5 of 25 (20%) patients after perineal surgery compared with 5/19 (26%) after abdominal surgery (Analysis 7.2), again showing no significant difference. Two participants from each group in Deen 1994 complained of residual mucosal prolapse after surgery (Analysis 7.3).

There was no significant difference in Vaizey incontinence scores at three years postsurgery between an abdominal or a perineal approach (Analysis 7.4). After perineal surgery, 6/10 people continued to suffer from faecal incontinence, compared with 1/10 after abdominal surgery (Deen 1994). On the other hand, there was no significant difference in residual incontinence between Altemeier's procedure (2/12 people) and resection rectopexy (3/11 people) (OR 2.26, 95% CI 0.61 to 8.40; Analysis 7.5; Senapati 2013)).

Secondary outcomes

Deen 1994 reported four clinical end points: postoperative mortality, postoperative morbidity, need for intervention due to failed therapy and length of hospital stay. There was no mortality in this study. One patient developed anastomotic stricture after rectosigmoidectomy, which was treated with dilatation (Analysis 7.6). Two people had prolonged ileus, and one patient had wound infection after abdominal resection rectopexy (Analysis 7.7). In Senapati 2013, 8/19 people in the abdominal group experienced complications compared with 8/25 in the perineal group (Analysis 7.7). There was no difference in bowel function (from 0 = worst to 100 = best) between perineal and abdominal approaches at three years after surgery (Analysis 7.8). There were more people straining at three years after abdominal surgery than after perineal surgery, although the difference was not significant (Analysis 7.9). Deen 1994 reported three physiological outcomes, finding no significant difference in maximum resting or squeeze pressure between perineal rectosigmoidectomy and resection rectopexy (Analysis 7.10; Analysis 7.11); however, rectal compliance was significantly higher (less stiff) after abdominal surgery (MD − 1.70, 95% CI − 2.37 to − 1.03; Analysis 7.12). There was no difference in EQ-5D (the EuroQol survey that measures quality of life in five dimensions) score converted to a health utility score between perineal and abdominal approaches at three years after surgery (Analysis 7.13).

Comparison 8: Resection versus no resection rectopexy

Three trials compared resection of redundant bowel in one group versus no resection in the other. In Lukkonen 1992, resection was combined with suture rectopexy and compared with mesh rectopexy alone. In McKee 1992 and Senapati 2013, suture rectopexy was performed in both groups but resection in only one group.

Primary outcomes

Neither Lukkonen 1992 nor McKee 1992 reported any recurrent rectal prolapse. In Senapati 2013, recurrence occurred in 4/32 of the resection group and 9/35 of the no resection group, but the difference was not significant (OR 0.41, CI 0.11 to 1.50; Analysis 8.1). Lukkonen 1992 and McKee 1992 reported residual faecal incontinence, and we were able to obtain data from the authors of Senapati 2013, who confirmed that there was no statistically significant difference between groups (18/56 (32%) incontinent in the resection group versus 20/59 (34%) in the rectopexy group; OR 0.93, 95% CI 0.43 to 2.03; Analysis 8.2). There was again no difference in the Vaizey incontinence score three years after surgery (Senapati 2013; Analysis 8.3). There was significantly less postoperative constipation in the resection group (5/42, 12% versus 20/42, 48%, OR 0.14, 95% CI 0.04 to 0.44; Analysis 8.4).

Secondary outcomes

Data on complications were available in the published report of Lukkonen 1992, and we obtained them from authors for Senapati 2013. In the meta-analysis, there were complications in 16/47

(34%) in the resection group compared to 11/50 (22%) in the non-resection group (Analysis 8.5).

There were virtually no differences between groups in bowel function (Analysis 8.6) and in physiological parameters including anal resting pressure (Analysis 8.7), maximum rectal volumes (Analysis 8.8), volume to first sensation (Analysis 8.9) and anorectal angle (Analysis 8.10). There was a difference between groups in rectal compliance, which was significantly higher (more compliant) in the non-resection group (McKee 1992; Analysis 8.11), possibly because of the kinking of the redundant sigmoid colon onto the rectum, resulting in more constipation in this group of participants. Additionally, gut transit time was faster in the resection group (McKee 1992; Analysis 8.12). There was no difference in the quality of life score between the resection and no resection groups (Senapati 2013; Analysis 8.13).

Comparison 9: Rectopexy versus no rectopexy

One multicentre trial examined this comparison (Karas 2011).

Primary outcome

The only primary outcome measured was recurrence of rectal prolapse. There were 2 cases of this in the rectopexy group and 10 in the no rectopexy group, and the difference was significant (OR (fixed) 6.32, 95% CI 1.36 to 29.47, Analysis 9.1).

Secondary outcomes

There were two deaths in the rectopexy group (both died of pulmonary embolism) and none from the no rectopexy group (Analysis 9.2). There was a non-significant difference in other complications, which occurred in 23/136 people in the rectopexy group and 11/116 in the no rectopexy group (Analysis 9.3). The median blood loss was 150 ml in the rectopexy group and 100 ml in the no rectopexy group. The median operating time was shorter in the rectopexy group (118 min) than in the no rectopexy group (145 min). There was no difference between groups in median length of hospital stay (six days).

DISCUSSION

Summary of main results

We have identified three new eligible studies since the last review, including two multicentre trials (Karas 2011; Senapati 2013; Youssef 2013). This update included 15 randomised controlled trials with 1007 participants.

There is a tendency to carry out an abdominal procedure in young, fit people because of the perceived reduced recurrence rate compared with perineal procedures, which are reserved for more frail or unfit people. The logic is that these interventions are less invasive and therefore carry less risk of morbidity than abdominal approaches. There were only two trials that compared an abdominal with a perineal approach, but there were insufficient data to confidently comment on the difference in complications (Deen 1994; Senapati 2013). We did not see any obvious difference in recurrence between abdominal or perineal approaches. The participants are still being followed up in Senapati 2013, and it will be interesting to see the long-term results.

Rectopexy has stood the test of time, and in experienced hands it provides good long-term results (Byrne 2008; Foppa 2014). Five trials examined different materials used to fix the mobilised rectum, but it appears that essentially there were no differences in primary outcomes (Speakman 1991; Selvaggi 1993; Winde 1993; Novell 1994; Galili 1997).

During rectal mobilisation in rectopexy, the lateral ligaments may be preserved or divided, and evidence from non-randomised studies suggests division may result in denervation of the rectum due to damage to the parasympathetic component of the inferior hypogastric plexus (Varma 1992; El Muhtaseb 2014). On the other hand, preservation may result in increased recurrence, presumably due to incomplete mobilisation of the rectum. The evidence is limited due to small numbers, but there appears to be more constipation among those with division of the lateral ligaments.

If constipation is one of the main symptoms, sigmoid resection during abdominal rectopexy in conjunction with prolapse repair may be advisable (Madoff 1992). Three trials in this review examined abdominal rectopexy with and without sigmoid resection, and their combined results suggest that resection does avoid constipation (Lukkonen 1992; McKee 1992; Senapati 2013). There were more complications in the resection group, but the difference was not significant.

Two non-randomised studies suggest fixation is not necessary, and rectal mobilisation alone results in recurrence rates similar to fixation (Nelson 2001; Raftopoulos 2005). If this were true, then the potential complications associated with fixation, such as presacral bleeding or infection associated with foreign bodies used, may be obviated. However, these observations did not come from Level 1 evidence, and a subsequent multicentre trial involving 252 patients compared rectopexy versus no rectopexy (Karas 2011). Although comparatively large, this trial has some limitations, such as the use of non-standardised surgical techniques (whether open or laparoscopic approach, extent of rectal mobilisation, methods of rectopexy, the addition of sigmoid resection) and the unusually high proportion of males. With these caveats in mind, the results do suggest that recurrence is more likely if the rectum is simply mobilised but not fixed.

Minimally invasive surgery has been gaining popularity. Two trials examined the role of laparoscopy in an abdominal approach. The

trial data suggest equivalent low recurrence rates with less morbidity and a more rapid recovery for the laparoscopic group. Although equipment costs are higher, the authors of both studies suggest more rapid hospital discharge results in a cost saving compared with open surgery (Boccasanta 1998; Solomon 2002).

There are two commonly performed perineal approaches: the Delorme's procedure is widely practised in the UK, while the Altemeier's procedure is popular in North America. Either procedure can be combined with levatorplasty. The data is limited to two studies, and the evidence favouring one procedure or the other is either conflicting or not statistically significant. This suggests that the evidence is too limited to determine whether one perineal approach is better than another.

Will more information be available in the future to guide our practice in management of full-thickness rectal prolapse? Results from five ongoing trials will hopefully add to our current understanding and help us to improve the management of rectal prolapse. A multicentre study currently recruiting participants in Germany and Switzerland will compare the Delorme's procedure versus laparoscopic resection rectopexy (DeloRes 2012). A single centre study in Denmark is assessing the difference between laparoscopic posterior rectopexy without mesh and laparoscopic anterior mesh rectopexy (NCT00946205). Another trial is examining robotic-assisted versus laparoscopic ventral rectopexy in full-thickness rectal prolapse and intussusception (Makela-Kaikkonen 2013); this trial has finished recruiting and is awaiting results. One Australian trial compared laparoscopic resection rectopexy with fixation rectopexy (ACTRN12605000748617), and another single centre study compared standard mesh rectopexy with ventral rectopexy (Tarquini 2010). Furthermore, outcomes from longer follow-up of the trials included in the present review may also provide more information on prolapse recurrence and bowel function.

Overall completeness and applicability of evidence

There are several major weaknesses of this review. The first relates to the plethora of interventions that have been analysed. There is very little consensus about the best treatment for rectal prolapse, apart from the agreement that surgery is the only potential mechanism for cure. Thus, when it comes to surgical intervention, the options are numerous. Should the approach be perineal or abdominal, open or laparoscopic? Should the rectum be mobilised anteriorly/posteriorly/laterally? Should redundant colon be routinely resected in combination with rectal fixation, and how should the rectum be fixed?

For each of these interventions, there are, in turn, numerous outcomes. Although many would agree that the most important universal outcome is recurrence of rectal or mucosal prolapse, some interventions are utilised because they have distinct advantages over other techniques. For instance, constipation can be considered the primary outcome when comparing resection rectopexy with mesh rectopexy, and adverse effects and cost may become primary outcomes when comparing laparoscopic abdominal surgery with open surgery, assuming efficacy is comparable. The different interventions, with the variable reporting of outcomes (including different follow-up periods for each trial) weaken the power of the meta-analyses, as often results from only two trials can be combined because of the specificity and heterogeneity of the individual comparisons.

During data synthesis and analysis, we calculated the standard deviation from the range, but this only provides estimated values.

Quality of the evidence

Another significant drawback of this review is the methodological weakness of many of the included trials, which compromises the value of their results. For instance, eight trials did not mention methods of randomisation and only five trials documented the allocation concealment methods. Other potential sources of bias are likely due to lack of blinding in most trials, poor withdrawal and exclusion criteria data, and inadequate follow-up, which has to be long-term in order to exclude recurrence. Only five trials had follow-up more than three years and none more than five years. Having said that, the most recent trials (Karas 2011; Senapati 2013) have larger numbers of participants and improved design.

AUTHORS' CONCLUSIONS

Implications for practice

Little has changed from the conclusion of the original review, despite three more trials meeting the criteria for inclusion. There is still inadequate evidence from this review due to small sample sizes of available trials and their methodological weakness for guiding practice. However, our results suggest that:

- there is no obvious difference in recurrence between abdominal or perineal approaches;
- if an abdominal procedure is carried out, a laparoscopic procedure may result in less morbidity and more rapid discharge;
- the rectum should be fixed rather than simply mobilised;
- resection rectopexy results in reduced constipation (as compared to preoperation and non-resectional rectopexy).

Implications for research

There is a need for trials with adequate power and long-term follow-up to evaluate the reliability of each existing prolapse repair technique. The most important question that needs to be answered

is whether to carry out an abdominal or perineal approach. If perineal, should physicians opt for a perineal rectosigmoidectomy or a Delorme's procedure? If abdominal, should the intervention be laparoscopic or open? With lateral ligament division or preservation? How should the rectum be fixed and should a redundant bowel be resected?

In Europe, there is a current trend for recommending a laparoscopic ventral rectopexy for the treatment of external rectal prolapse, and two ongoing trials are examining this procedure (Tarquini 2010; Makela-Kaikkonen 2013). The technique is becoming very popular because of a perceived low recurrence rate in the short to medium term (Samaranayake 2010). Advocates therefore claim the procedure does not induce constipation. There is a need for well-designed and adequately powered trials comparing this new technique with other prolapse repair techniques. However, Senapati 2013 offers lessons for future studies; it took years to recruit and never achieved the target number of participants. NCT00946205 aims to compare laparoscopic ventral mesh rectopexy with laparoscopic posterior rectopexy without mesh. Another potential comparator is the Delorme's procedure.

Participants in the included studies had full-thickness prolapse recurrence rates ranging from 0% to 33%. However, the follow-up periods from these studies ranged from six months to five years. Future trials should aim to have adequate follow-up and publish short- and long-term results to ensure proper comparisons between studies.

Quality of life assessments attracted little attention in the included trials, with one notable exception (Senapati 2013). Any future trials must also incorporate formal assessment of quality of life issues, using validated tools that allow some assessment of cost, particularly if making comparisons with newer technologies such as laparoscopic surgery.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Boccasanta 1998

Methods	**Allocation**: no details **Blinding**: none **Follow-up period**: mean 29.5 months (range 8-45 months) **Setting**: single centre, Italy **Withdrawals**: no details **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 21 (13 open, 8 laparoscopic) **Mean age**: 57.3 years (range 20-76 years) **Sex**: 20 females, 1 male
Interventions	Laparoscopic stapled mesh (Marlex) rectopexy versus open suture mesh (Mersilene in 6 cases and Marlex in 7) rectopexy. Mesh fixed to anterolateral surfaces of rectum. Lateral ligaments preserved in both groups
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Number undergoing further surgery • Physiological measures • Length of hospital stay • Operating time • Cost analysis
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information

Boccasanta 1998 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing outcome data
Selective reporting (reporting bias)	Unclear risk	No information

Boccasanta 2006

Methods	**Allocation**: computer generated randomisation **Blinding**: assignment, assessment **Follow-up period**: mean 28.4 months (range 18-37 months) **Setting**: single centre, Italy **Withdrawals**: 0 **Intention-to-treat**: yes **Inclusion criteria**: rectal prolapse > 5 cm, faecal incontinence score > 10, no absolute contraindications to surgery **Exclusion criteria**: rectal prolapse < 5 cm, faecal incontinence score < 10, absolute contraindications to surgery, mental disorders, colonoscopy showed inflammatory disease, polyp or cancer (18 patients excluded)
Participants	**Sample size**: 40 (20 in each group) **Mean age**: 72.2 (range 60-83 years) **Sex**: 37 females, 3 males
Interventions	Perineal rectosigmoidectomy with Ultracision and stapled anastomosis versus diathermy and handsewn anastomosis
Outcomes	**Primary outcome measures** • Recurrent rectal prolapse • Continence score **Secondary outcome measures** • Postoperative morbidity • Adverse effects (defecating problems) • Length of hospital stay • Recovery time • Physiological parameters
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer generated randomisation

Boccasanta 2006 (*Continued*)

Allocation concealment (selection bias)	Low risk	Sealed envelopes
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Surgeons were not blinded. Lack of blinding unlikely to affect outcomes. The assignment of the treatment was made by a nurse on the ward before the operation. Another nurse in the operating room measured the duration of the operation, the length of fresh resected tissue and the blood loss
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Independent nurse measured intraoperative parameters and some objective measurements post-op
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing outcome data
Selective reporting (reporting bias)	Unclear risk	Insufficient information

Deen 1994

Methods	**Allocation**: random number tables **Blinding**: no mention of blinding **Follow-up period**: median 17 months, range 8-22 months **Setting**: single centre, UK **Withdrawals**: no details **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 20 (10 per group) **Median age**: 68 years (range 50-80 years) **Sex**: all female
Interventions	Perineal rectosigmoidectomy and pelvic floor repair versus abdominal resection rectopexy with pelvic floor repair
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Postoperative complications • Length of hospital stay • Anorectal physiology
Notes	-

Deen 1994 (*Continued*)

Risk of bias		
Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers table
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Independent assessor not from surgical team
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data
Selective reporting (reporting bias)	Unclear risk	Insufficient data

Galili 1997

Methods	**Allocation**: no details **Blinding**: no details **Follow-up period**: mean 3.7 years **Setting**: single centre, Israel **Withdrawals**: no details **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 37 (17 polypropylene mesh, 20 polyglycolic mesh) **Mean age**: 70 years (range not given) **Sex**: 33 females, 4 males
Interventions	Open polyglycolic acid mesh suture rectopexy versus open polypropylene mesh suture rectopexy. Mesh fixed to anterolateral surfaces of rectum. Lateral ligaments preserved in both groups
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation (measured as an index) **Secondary outcome measures** • Number of patients with postoperative complications

Galili 1997 (*Continued*)

	• Continence score • Length of hospital stay
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information
Selective reporting (reporting bias)	Unclear risk	No information

Karas 2011

Methods	**Allocation**: central allocation **Blinding**: participants were blind to intervention **Follow-up period**: 5 years **Setting**: multicentre, Austria, Brazil, Canada, Czech Republic, Eygpt, Greece, Hungary, India, Iran, Italy, Korea, Lithuania, New Zealand, Poland, Serbia, Spain, Switzerland, Turkey, USA **Withdrawals**: one (allocated to rectopexy group), lost to follow-up (8 in rectopexy group and 18 in no rectopexy group) **Intention-to-treat**: yes **Inclusion criteria**: > 18 years medically fit with full-thickness rectal prolapse **Exclusion criteria**: failure to sign informed consent, unfit for general anaesthesia, prior surgery for rectal prolapse, concomitant pelvic floor descent
Participants	**Sample size**: 252 (136 in rectopexy group, 116 in no rectopexy group) **Median age**: 56.5 years (range 17-93 years) **Sex**: 185 females, 67 males
Interventions	Rectopexy versus rectal mobilisation only (no rectopexy). Operation was performed either with open or laparoscopic approach, and sigmoid resection (not randomised) was performed in participants with constipation

Karas 2011 (*Continued*)

Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse **Secondary outcome measures** • Operating time • Blood loss • Conversion (laparoscopic to open) • Postoperative complications • Resumption of solid diet (days) • Length of hospital stay
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Central allocation
Allocation concealment (selection bias)	Low risk	Central allocation
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants were blinded to intervention
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	High risk	26/252 lost to follow-up in the trial, 8/136 (6%) lost to follow-up in rectopexy group, 18/116 (16%) lost to follow-up in non rectopexy group, imbalance of lost to follow-up between two groups
Selective reporting (reporting bias)	Low risk	Protocol was available with pre-specified outcome

Lukkonen 1992

Methods	**Allocation**: sealed envelopes **Blinding**: good attempt at allocation concealment and blinding from patients but no mention of blinding of outcome assessors **Follow-up period**: 6 months **Setting**: single centre, Finland **Withdrawals**: no details **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 30 (15 per group) **Mean age**: 66 years (range 38-88 years) **Sex**: 28 females, 2 males
Interventions	Open resection (sigmoid) and suture rectopexy versus open (polyglycolic acid) mesh rectopexy
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Postoperative complications • Length of hospital stay
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Low risk	Sealed envelopes
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Many were objective measurements
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information
Selective reporting (reporting bias)	Unclear risk	No information

McKee 1992

Methods	**Allocation**: no details **Blinding**: no details **Follow-up period**: mean 20 months **Setting**: single centre, UK **Withdrawals**: one patient in rectopexy group had thrombosis of retinal vein and was excluded (before operation) **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 18 **Mean age**: 69.5 years (range not given) **Sex**: unclear
Interventions	Open sigmoid resection and suture rectopexy versus open abdominal suture rectopexy
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Postoperative complications • Length of hospital stay • Patients requiring further intervention • Physiological measures
Notes	-

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Many were objective measurements
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information

McKee 1992 (*Continued*)

Selective reporting (reporting bias)	Unclear risk	No information

Mollen 2000

Methods	**Allocation**: drawing lots **Blinding**: none **Follow-up period**: mean 42 months (range 36-48 months) **Setting**: single centre, Netherlands **Withdrawals**: 4 patients withdrew consent for barostat studies (3 from ligament division group and 1 from preserved group) **Intention-to-treat**: no **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 18 (10 ligaments divided, 8 ligaments preserved) **Mean age**: 56.3 years (range 33-85 years) **Sex**: 16 females, 2 males
Interventions	Posterior mesh rectopexy (Well's procedure) with division versus preservation of the lateral ligaments
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with constipation (or constipation score) **Secondary outcome measures** • Anorectal physiology
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Drawing lots
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information

Mollen 2000 (*Continued*)

Selective reporting (reporting bias)	Unclear risk	No information

Novell 1994

Methods	**Allocation**: random number tables **Blinding**: no details **Follow-up period**: median 47 months, range 44-50 months **Setting**: single centre, UK **Withdrawals**: none; some patients died within 12 months after surgery, but no details were given **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 63 **Mean age**: 76.5 years (range 43-93 years) **Sex**: 62 females, 1 male
Interventions	Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy. Mesh fixed to anterolateral surfaces of rectum. Lateral ligaments divided
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Number with postoperative complications • Number requiring further surgery • Performance index • Length of hospital stay
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers table
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information

Novell 1994 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	12/63 died unrelated to surgery during follow-up period
Selective reporting (reporting bias)	Unclear risk	No information

Selvaggi 1993

Methods	**Allocation**: no details **Blinding**: no details **Follow-up period**: mean 14 months, range 6-24 months **Setting**: single centre, Italy **Withdrawals**: no details **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 20 **Mean age**: 62 years (range 52-71 years) **Sex**: all female
Interventions	Anteroposterior Marlex rectopexy with either division or preservation of the lateral ligaments
Outcomes	**Primary outcome measures** • Number of patients with residual faecal incontinence **Secondary outcome measures** • Frequency of defecation • Postoperative symptoms • Anorectal physiology
Notes	Abstract. Limited information available. Numerical raw data were not reported Postoperative symptoms (e.g. constipation) were reported to be significantly better in the group without division of the lateral ligaments. Continence improved significantly in both groups

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Unclear risk	No information

Selvaggi 1993 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information
Selective reporting (reporting bias)	Unclear risk	No information

Senapati 2013

Methods	**Allocation**: central allocation **Blinding**: no details **Follow-up period**: 3 years **Setting**: multicentre, India, Finland, Serbia, Spain, UK **Withdrawals**: 15 patients did not have surgery, including 1 who died and 1 who withdrew from the trial. No details on 8 patients with regards to surgery or follow-up **Intention-to-treat**: yes **Inclusion criteria**: adult participants with first presentation of full-thickness prolapse **Exclusion criteria**: no details
Participants	**Sample size**: 293 **Mean age**: 73 years in perineal randomised group; 58 years in abdominal randomised group **Sex**: 251 females, 42 males
Interventions	Abdominal compared with perineal surgery; Delorme's operation compared with Altemeier's operation; suture rectopexy compared with resection rectopexy
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Mortality • Morbidity • Quality of life (EQ-5D) • Overall bowel function (thermometer scale from 0 (worst) to 100 (best)) • Frequency of bowel actions, straining, incomplete emptying • Use of oral laxatives/enemas/suppositories/resource (visit by social worker, hospital or GP visit)

Notes	A pragmatic, factorial (2 x 2) design trial; participants could be randomised to abdominal or perineal surgery. For abdominal surgery, participants could be randomised between suture rectopexy and resection rectopexy. The abdominal procedure was performed through an open or laparoscopic approach, depending on surgeon's preference. For perineal surgery, participants could be randomised to a Delorme's or an Altemeier's procedure. It was the surgeon's choice to participate in either one or both of the randomisations. A video was provided to assist training in all the operations. The original protocol was powered to recruit 950 participants to detect a 5% difference in recurrence between abdominal and perineal approaches. Due to slow uptake of participants, the target was revised to detect a difference in quality of life or level of incontinence (Vaizey score) by recruiting 300 participants

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer generated randomisation
Allocation concealment (selection bias)	Low risk	Central allocation
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	No information
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	8/293 lost to follow-up
Selective reporting (reporting bias)	Low risk	Protocol was available with pre-specified outcomes

Solomon 2002

Methods	**Allocation**: no details **Blinding**: assessors were blind to the operative procedure and patients were instructed not to inform the assessors **Follow-up period**: mean 24.15 months (range 2-52 months) **Setting**: single centre, Australia **Withdrawals**: 1 **Intention-to-treat**: yes **Inclusion criteria**: Patients with full-thickness rectal prolapse **Exclusion criteria**: people for whom concomitant gynaecological procedures were planned, people who had undergone previous rectopexy, people with a large irreducible prolapse
Participants	**Sample size**: 39 (20 laparoscopic, 19 open). Initially 40 patients were randomised and one patient randomised to the open group refused any surgery and was excluded from the analysis. Subsequently the trial committee met and this patient underwent laparoscopic rectopexy and included the data in the open group (intention-to-treat analysis) Characteristics of participants not described (no details on age or sex)
Interventions	Laparoscopic versus open abdominal rectopexy. Mesh secured to the sacral promontory with a single spiked chromium staple and to the lateral rectum using hernia staples
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with constipation (constipation score) **Secondary outcome measures** • Postoperative complications • Continence/constipation score • Length of hospital stay • Operating time, cost assessment of laparoscopic versus open abdominal rectopexy
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Lack of blinding unlikely to influence outcomes. Surgeons and patients were not blinded but assessors were
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Blinded assessors

Solomon 2002 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No information
Selective reporting (reporting bias)	Unclear risk	Insufficient information

Speakman 1991

Methods	**Allocation**: no details **Blinding**: blinding of outcome assessors **Follow-up period**: median 12 months **Setting**: single centre, UK **Withdrawals**: no details **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 26 (14 divided ligaments, 12 preserved ligaments) **Mean age**: 54 years (range 17-78 years) **Sex**: 23 females, 3 males
Interventions	Open mesh rectopexy with division of lateral ligaments versus open polypropylene mesh rectopexy with preservation of lateral ligaments
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Anorectal physiology • Number requiring repeat surgery for rectal prolapse
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Outcomes unlikely to be influenced by lack of blinding of the surgeons, as assessors were blinded

Speakman 1991 (*Continued*)

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Outcomes assessors were blinded
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	2/26 declined further tests post-op
Selective reporting (reporting bias)	Unclear risk	No information

Winde 1993

Methods	**Allocation**: random number tables **Blinding**: none **Follow-up period**: mean 50.5 months **Setting**: single centre, Germany **Withdrawals**: 12 patients lost to follow-up; no details **Intention-to-treat**: no details **Inclusion criteria**: no details **Exclusion criteria**: no details
Participants	**Sample size**: 47 (30 polyglycolic acid mesh, 17 polyglactin) **Mean age**: 59 years (range not given) Sex: 45 female, 2 male
Interventions	Open abdominal mesh (polyglycolic acid) rectopexy versus open abdominal mesh rectopexy (polyglactin). Lateral ligaments preserved in both groups. Mesh fashioned as an anterior sling
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual mucosal prolapse • Number of patients with residual faecal incontinence • Number of patients with constipation **Secondary outcome measures** • Postoperative complications
Notes	-

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random numbers table
Allocation concealment (selection bias)	Unclear risk	No information

Winde 1993 (*Continued*)

Blinding of participants and personnel (performance bias) All outcomes	Low risk	Outcomes unlikely influenced by lack of blinding
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	12/47 lost to follow-up
Selective reporting (reporting bias)	Unclear risk	No information

Youssef 2013

Methods	**Allocation**: closed envelope **Blinding**: outcome assessment was blinded **Follow-up period**: one year **Setting**: single centre, Egypt **Withdrawals**: all patients randomised received treatments, two lost to follow-up in Delorme's group and one lost to follow-up in Delorme's with postanal repair/levatorplasty **Intention-to-treat**: yes **Inclusioncriteria**: full-thickness rectal prolapse **Exclusion criteria**: pregnant, previous anal surgery, pudendal nerve neuropathy, anal fistula, sepsis, age > 80 years, vascular disease, scleroderma, malnutrition and coagulopathy
Participants	**Sample size**: 82 **Mean age**: 40 years (range 16-64 years) **Sex**: 51 females, 31 males
Interventions	Delorme's procedure versus Delorme's with postanal repair/levatorplasty
Outcomes	**Primary outcome measures** • Number of patients with recurrent full-thickness prolapse • Number of patients with residual incontinence • Number of patients with constipation **Secondary outcome measures** • Postoperative complications • Operating time • Length of hospital stay • Patient satisfaction • Postoperative anal manometry
Notes	Constipation was assessed using Wexner score, and incontinence was graded using Pescatori classification
Risk of bias	

Youssef 2013 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No details
Allocation concealment (selection bias)	Low risk	Closed envelopes
Blinding of participants and personnel (performance bias) All outcomes	Low risk	No details about blinding of participants in article but mentioned in the study protocol
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Outcome assessment was blinded
Incomplete outcome data (attrition bias) All outcomes	Low risk	Lost to follow-up: 3/82 (n = 1 Delorme's/ levatorplasty, n = 2 Delorme's)
Selective reporting (reporting bias)	Unclear risk	Study protocol first published in July 2012, after the study completed recruiting participants. There was no patient's satisfaction score mentioned in the study protocol

EQ-5D: EuroQol survey that measures quality of life in five dimensions.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Gupta 2006	Treatment for rectal mucosal prolapse (not full-thickness)
Nelson 2001	Not an RCT
Raftopoulos 2005	Not an RCT

RCT: randomised controlled trial.

Characteristics of ongoing studies *[ordered by study ID]*

ACTRN12605000748617

Trial name or title	Randomised controlled trial of laparoscopic resection rectopexy compared with fixation rectopexy for rectal prolapse
Methods	No information available
Participants	People with full-thickness rectal prolapse Target sample size: 132
Interventions	Laparoscopic resection rectopexy versus fixation rectopexy
Outcomes	Constipation, incontinence, quality of life, postoperative pain, time to return of bowel function, postoperative morbidity, length of hospital stay, recurrence
Starting date	January 2006
Contact information	Professor Michael Solomon, Surgical Outcomes Research Centre, P.O. Box M157 Missenden Road, Camperdown, NSW 2050, Australia
Notes	-

DeloRes 2012

Trial name or title	DeloRes
Methods	No information available
Participants	People with full-thickness rectal prolapse. 130 participants will be recruited
Interventions	Delorme's procedure versus laparoscopic resection rectopexy
Outcomes	Recurrence, operating time, mortality and morbidity, hospital stay, quality of life, constipation, incontinence
Starting date	13 October 2010
Contact information	Mr Florian Herrie, University Medical Centre Mannheim, Theodor-Kutzer-Ufer 1-3, 68167 Mannheim, Germany
Notes	-

Makela-Kaikkonen 2013

Trial name or title	Robotic-assisted versus laparoscopic ventral rectopexy in the treatment of rectal prolapse or intussusception
Methods	No information available
Participants	People with full-thickness rectal prolapse or enterocoele with intussusception 30 participants were recruited
Interventions	Robotic-assisted ventral rectopexy versus laparoscopic ventral rectopexy
Outcomes	Perioperative parameters, complications, short-term results, functional outcomes, quality of life, anatomic changes (measured by MR defecography)
Starting date	February 2012
Contact information	Professor Jyrki Makela, University Hospital of Oulu, Department of Surgery, Division of Gastroenterology, P.O. Box 5000, Oulu, 90140, Finland
Notes	Trial finished in August 2014 and awaiting for results

NCT00946205

Trial name or title	Laparoscopic posterior rectopexy without mesh versus laparoscopic anterior mesh rectopexy for rectal prolapse
Methods	No information available
Participants	People with full-thickness rectal prolapse. 64 participants will be recruited.
Interventions	Laparoscopic anterior mesh rectopexy versus laparoscopic posterior rectopexy
Outcomes	Severity of obstructive defecation, constipation score, obstructed defecation syndrome score, physiology testing of anorectum
Starting date	June 2006
Contact information	Professor Soren Laurberg, Aarhus University Hospital, Department of Surgery, Denmark
Notes	-

Tarquini 2010

Trial name or title	Anterior mesh rectopexy in the treatment of rectal prolapse
Methods	No information available
Participants	People with full-thickness rectal prolapse 30 female participants were recruited

Tarquini 2010 (*Continued*)

Interventions	Standard mesh rectopexy versus ventral mesh rectopexy
Outcomes	Constipation, incontinence, recurrence, postoperative complications
Starting date	June 2005
Contact information	Dr Valerio Celentano, address (no information available)
Notes	-

MR: magnetic resonance

DATA AND ANALYSES

Comparison 1. Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Incontinence score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
3 Hospital stay	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Recovery time	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Number of patients with defecatory problems	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
6 Resting anal pressure (mmHg)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7 Squeeze pressure (mmHg)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8 Threshold volume (ml)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 2. Comparisons of different perineal approaches

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Number of patients with residual faecal incontinence	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Number of patients with constipation after surgery	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
4 Operating time (min)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Number of patients with postoperative complications	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
6 Length of hospital stay (days)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7 Postoperative maximum resting pressure	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8 Postoperative maximum squeeze pressure	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9 Postoperative rectal sensation	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10 Patient's postoperative satisfaction score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11 Number of patients with recurrent full-thickness prolapse	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected

12 Vaizey incontinence score 3 years post-op	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
13 Bowel function (bowel thermometer) 3 years post-op	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
14 Quality of life score (EQ-5D) at 3 years	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 3. Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Number of patients with postoperative faecal incontinence	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Number of patients with constipation after surgery	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
4 Number of patients with postoperative complications	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected

Comparison 4. Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	2		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
1.1 Polyglycolic versus polypropylene	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
1.2 Polyglycolic versus polyglactin	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Number of patients with residual mucosal prolapse	2		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2.1 Polyglycolic versus polypropylene	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
2.2 Polyglycolic versus polyglactin	1		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
3 Number of patients with residual faecal incontinence	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3.1 Polyglycolic versus polypropylene	0		Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

3.2 Polyglycolic versus polyglactin	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
4 Incontinence score	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4.1 Polyglycolic versus polypropylene	1	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
4.2 Polyglycolic versus polyglactin	0	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
5 Number of patients with constipation after surgery	2	Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
5.1 Polyglycolic versus polypropylene	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
5.2 Polyglycolic versus polyglactin	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6 Number of patients with postoperative complications	2	Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
6.1 Polyglycolic versus polypropylene	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
6.2 Polyglycolic versus polyglactin	1	Odds Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Comparison 5. Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness rectal prolapse	2		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Number of patients with residual mucosal prolapse only	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Number of patients with constipation	2	44	Odds Ratio (M-H, Fixed, 95% CI)	0.32 [0.08, 1.23]
4 Constipation score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Number of patients with postoperative complications	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
6 Defecation frequency (per day)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7 Resting anal pressure (mmHg)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8 Anal squeeze pressures (mmHg)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9 Compliance (ml/mmHg)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 6. Laparoscopic versus open procedure

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Number of patients with residual mucosal prolapse only	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Incontinence score	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Number of patients with constipation after surgery	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
5 Operating time (min)	2	60	Mean Difference (IV, Fixed, 95% CI)	67.25 [51.61, 82.88]
6 Number of patients with postoperative complications	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
7 Length of hospital stay (days)	2	60	Mean Difference (IV, Fixed, 95% CI)	-2.35 [-3.33, -1.37]
8 Maximum resting anal pressure (cmH_2O)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9 Maximum squeeze pressure	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10 Maximum rectal volume (ml)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11 Rectal capacity (ml)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
12 Total cost (USD)	2	60	Std. Mean Difference (IV, Fixed, 95% CI)	-0.84 [-1.41, -0.28]

Comparison 7. Abdominal versus perineal approach

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	2	43	Odds Ratio (M-H, Fixed, 95% CI)	0.64 [0.12, 3.55]
2 Number of patients with recurrent full-thickness prolapse	1		Odds Ratio (M-H, Random, 95% CI)	Totals not selected
3 Number of patients with residual mucosal prolapse only	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
4 Vaizey incontinence score 3 years post-op	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Number of patients with residual faecal incontinence	2	43	Odds Ratio (M-H, Fixed, 95% CI)	2.26 [0.61, 8.40]
6 Complications requiring surgical interventions	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
7 Number of patients with postoperative complications	2	64	Odds Ratio (M-H, Fixed, 95% CI)	0.46 [0.15, 1.37]
8 Bowel function (bowel thermometer) 3 years post-op	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9 Straining at 3 years post-op	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected

10 Maximum resting pressure (cmH_2O)	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11 Maximum squeeze pressure (cmH_2O)	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
12 Rectal compliance (ml/cmH_2O)	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected
13 Quality of life score (EQ-5D) at 3 years	1	Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 8. Resection versus no resection rectopexy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	3	115	Odds Ratio (M-H, Fixed, 95% CI)	0.41 [0.11, 1.50]
2 Number of patients with residual faecal incontinence	3	115	Odds Ratio (M-H, Fixed, 95% CI)	0.93 [0.43, 2.03]
3 Vaizey incontinence score 3 years post-op	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
4 Number of patients with constipation due to surgery	3	84	Odds Ratio (M-H, Fixed, 95% CI)	0.14 [0.04, 0.44]
5 Number of patients with postoperative complications	2	97	Odds Ratio (M-H, Fixed, 95% CI)	1.89 [0.76, 4.73]
6 Bowel function (bowel thermometer) 3 years post-op	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
7 Maximum resting anal pressure (mmHg)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
8 Maximum rectal volumes (ml)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
9 Volume to first sensation (ml)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
10 Anorectal angle (postoperative)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
11 Rectal compliance (mmHg/ml)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
12 Postoperative transit time (days)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
13 Quality of life score (EQ-5D) at 3 years	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected

Comparison 9. Rectopexy versus no rectopexy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Number of patients with recurrent full-thickness prolapse	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
2 Mortality	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected
3 Number of patients with complications	1		Odds Ratio (M-H, Fixed, 95% CI)	Totals not selected

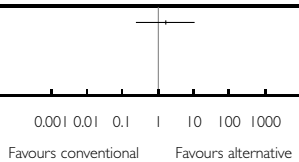
Analysis 1.1. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 1 Number of patients with recurrent full-thickness prolapse

Study or subgroup	Conventional n/N	Alternative n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Boccasanta 2006	3/20	2/20		1.59 [0.24, 10.70]



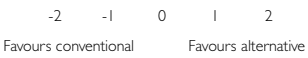
Analysis 1.2. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 2 Incontinence score.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 2 Incontinence score

Study or subgroup	Conventional		Alternative		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 2006	20	8.1 (1.8)	20	7.9 (1.9)		0.20 [-0.95, 1.35]



Analysis 1.3. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 3 Hospital stay.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 3 Hospital stay

Study or subgroup	Conventional		Alternative		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 2006	20	3.9 (0.8)	20	3 (0.5)		0.90 [0.49, 1.31]

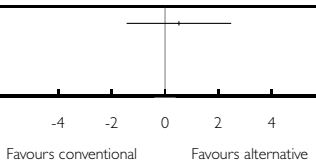
Analysis 1.4. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 4 Recovery time.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 4 Recovery time

Study or subgroup	Conventional		Alternative		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 2006	20	12.2 (3.5)	20	11.7 (2.8)		0.50 [-1.46, 2.46]



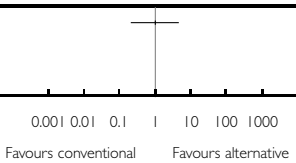
Analysis 1.5. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 5 Number of patients with defecatory problems.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 5 Number of patients with defecatory problems

Study or subgroup	Conventional	Alternative	Odds Ratio	Odds Ratio
	n/N	n/N	M-H,Fixed,95% CI	M-H,Fixed,95% CI
Boccasanta 2006	4/20	4/20		1.00 [0.21, 4.71]



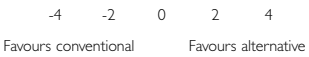
Analysis 1.6. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 6 Resting anal pressure (mmHg).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 6 Resting anal pressure (mmHg)

Study or subgroup	Conventional		Alternative		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 2006	20	34.2 (5.4)	20	34.4 (5.5)		-0.20 [-3.58, 3.18]



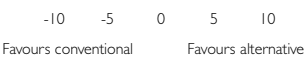
Analysis 1.7. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 7 Squeeze pressure (mmHg).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 7 Squeeze pressure (mmHg)

Study or subgroup	Conventional		Alternative		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 2006	20	65.4 (12.3)	20	64.8 (12.9)		0.60 [-7.21, 8.41]



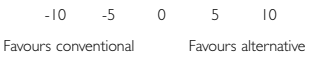
Analysis 1.8. Comparison 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique, Outcome 8 Threshold volume (ml).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 1 Conventional diathermy and handsewn rectosigmoidectomy versus harmonic scalpel and stapled technique

Outcome: 8 Threshold volume (ml)

Study or subgroup	Conventional		Alternative		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 2006	20	41.5 (7)	20	41.9 (7.6)		-0.40 [-4.93, 4.13]



Analysis 2.1. Comparison 2 Comparisons of different perineal approaches, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 1 Number of patients with recurrent full-thickness prolapse

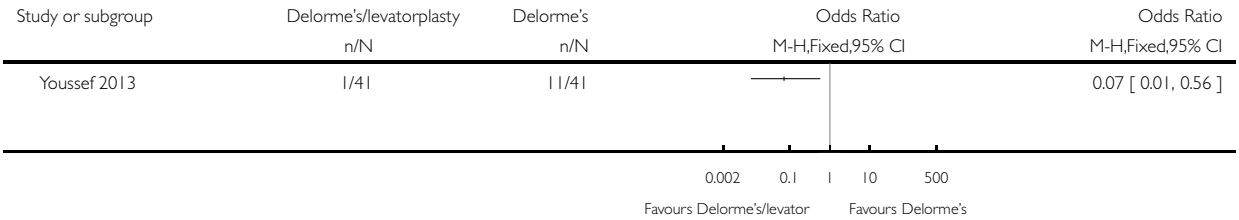
Study or subgroup	Delorme's/levatorplasty	Delorme's	Odds Ratio	Odds Ratio
	n/N	n/N	M-H,Fixed,95% CI	M-H,Fixed,95% CI
Youssef 2013	1/41	6/41		0.15 [0.02, 1.27]

Analysis 2.2. Comparison 2 Comparisons of different perineal approaches, Outcome 2 Number of patients with residual faecal incontinence.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 2 Number of patients with residual faecal incontinence

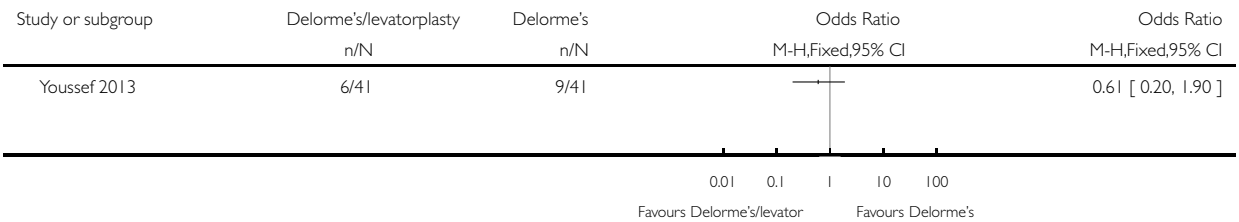


Analysis 2.3. Comparison 2 Comparisons of different perineal approaches, Outcome 3 Number of patients with constipation after surgery.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 3 Number of patients with constipation after surgery



Analysis 2.4. Comparison 2 Comparisons of different perineal approaches, Outcome 4 Operating time (min).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 4 Operating time (min)

Study or subgroup	Delorme's/levatorplasty		Delorme's		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Youssef 2013	41	153.5 (17)	41	124.1 (13.7)		29.40 [22.72, 36.08]

Analysis 2.5. Comparison 2 Comparisons of different perineal approaches, Outcome 5 Number of patients with postoperative complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 5 Number of patients with postoperative complications

Study or subgroup	Delorme's/levatorplasty	Delorme's	Odds Ratio	Odds Ratio
	n/N	n/N	M-H,Fixed,95% CI	M-H,Fixed,95% CI
Youssef 2013	3/41	2/41		1.54 [0.24, 9.73]

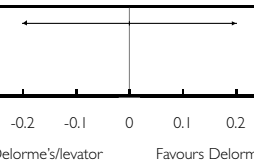
Analysis 2.6. Comparison 2 Comparisons of different perineal approaches, Outcome 6 Length of hospital stay (days).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 6 Length of hospital stay (days)

Study or subgroup	Delorme's/levatorplasty		Delorme's		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Youssef 2013	41	1.4 (0.5)	41	1.4 (0.5)		0.0 [-0.22, 0.22]



Analysis 2.7. Comparison 2 Comparisons of different perineal approaches, Outcome 7 Postoperative maximum resting pressure.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 7 Postoperative maximum resting pressure

Study or subgroup	Delorme's/levatorplasty		Delorme's		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Youssef 2013	41	63.8 (3.9)	41	55.2 (6)		8.60 [6.41, 10.79]

Analysis 2.8. Comparison 2 Comparisons of different perineal approaches, Outcome 8 Postoperative maximum squeeze pressure.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 8 Postoperative maximum squeeze pressure

Study or subgroup	Delorme's/levatorplasty		Delorme's		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Youssef 2013	41	95.7 (5.5)	41	89.4 (5.3)		6.30 [3.96, 8.64]

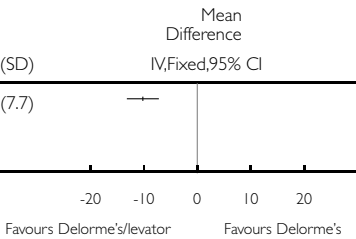
Analysis 2.9. Comparison 2 Comparisons of different perineal approaches, Outcome 9 Postoperative rectal sensation.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 9 Postoperative rectal sensation

Study or subgroup	Delorme's/levatorplasty		Delorme's		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Youssef 2013	41	30.4 (6.4)	41	40.6 (7.7)		-10.20 [-13.26, -7.14]



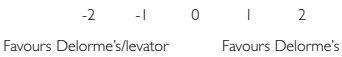
Analysis 2.10. Comparison 2 Comparisons of different perineal approaches, Outcome 10 Patient's postoperative satisfaction score.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 10 Patient's postoperative satisfaction score

Study or subgroup	Delorme's/levatorplasty		Delorme's		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Youssef 2013	41	8 (0.9)	41	6.5 (1.3)		1.50 [1.02, 1.98]



Analysis 2.11. Comparison 2 Comparisons of different perineal approaches, Outcome 11 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 11 Number of patients with recurrent full-thickness prolapse

Study or subgroup	Altemeier's	Delorme's	Odds Ratio	Odds Ratio
	n/N	n/N	M-H,Fixed,95% CI	M-H,Fixed,95% CI
Senapati 2013	24/102	31/99		0.67 [0.36, 1.26]

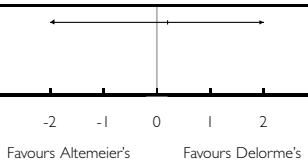
Analysis 2.12. Comparison 2 Comparisons of different perineal approaches, Outcome 12 Vaizey incontinence score 3 years post-op.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 12 Vaizey incontinence score 3 years post-op

Study or subgroup	Altemeier's N	Mean(SD)	Delorme's N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	37	7.6 (6.7)	37	7.4 (6.8)		0.20 [-2.88, 3.28]



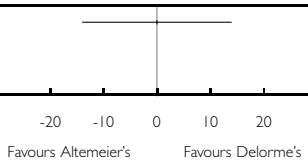
Analysis 2.13. Comparison 2 Comparisons of different perineal approaches, Outcome 13 Bowel function (bowel thermometer) 3 years post-op.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 13 Bowel function (bowel thermometer) 3 years post-op

Study or subgroup	Altemeier's N	Mean(SD)	Delorme's N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	24	68 (27)	26	68 (23)		0.0 [-13.96, 13.96]



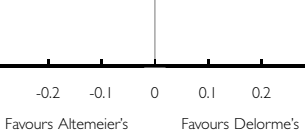
Analysis 2.14. Comparison 2 Comparisons of different perineal approaches, Outcome 14 Quality of life score (EQ-5D) at 3 years.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 2 Comparisons of different perineal approaches

Outcome: 14 Quality of life score (EQ-5D) at 3 years

Study or subgroup	Altemeier's N	Mean(SD)	Delorme's N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	38	0.72 (0.31)	32	0.68 (0.31)		0.04 [-0.11, 0.19]



Analysis 3.1. Comparison 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy

Outcome: 1 Number of patients with recurrent full-thickness prolapse

Study or subgroup	Ivalon n/N	Suture n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Novell 1994	1/31	1/32		1.03 [0.06, 17.28]

Analysis 3.2. Comparison 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy, Outcome 2 Number of patients with postoperative faecal incontinence.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy

Outcome: 2 Number of patients with postoperative faecal incontinence

Study or subgroup	Ivalon n/N	Suture n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Novell 1994	9/31	5/32		2.21 [0.65, 7.56]

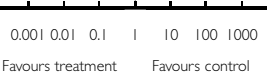
Analysis 3.3. Comparison 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy, Outcome 3 Number of patients with constipation after surgery.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy

Outcome: 3 Number of patients with constipation after surgery

Study or subgroup	Ivalon n/N	Suture n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Novell 1994	15/31	10/32		2.06 [0.74, 5.76]



Analysis 3.4. Comparison 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy, Outcome 4 Number of patients with postoperative complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 3 Open abdominal Ivalon sponge rectopexy versus open abdominal suture rectopexy

Outcome: 4 Number of patients with postoperative complications

Study or subgroup	Ivalon n/N	Suture n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Novell 1994	6/31	3/32		2.32 [0.53, 10.25]

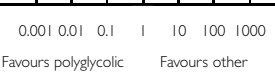
Analysis 4.1. Comparison 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Outcome: 1 Number of patients with recurrent full-thickness prolapse

Study or subgroup	Polyglycolic n/N	Other n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Polyglycolic versus polypropylene				
Galili 1997	1/20	0/17		2.69 [0.10, 70.49]
2 Polyglycolic versus polyglactin				
Winde 1993	0/15	0/20		Not estimable



Analysis 4.2. Comparison 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy, Outcome 2 Number of patients with residual mucosal prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Outcome: 2 Number of patients with residual mucosal prolapse

Study or subgroup	Polyglycolic n/N	Other n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Polyglycolic versus polypropylene				
Galili 1997	1/20	2/17		0.39 [0.03, 4.78]
2 Polyglycolic versus polyglactin				
Winde 1993	2/15	3/20		0.87 [0.13, 6.00]

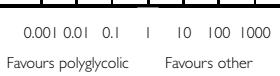
Analysis 4.3. Comparison 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy, Outcome 3 Number of patients with residual faecal incontinence.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Outcome: 3 Number of patients with residual faecal incontinence

Study or subgroup	Polyglycolic n/N	Other n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Polyglycolic versus polypropylene				
2 Polyglycolic versus polyglactin				
Winde 1993	3/15	7/20		0.46 [0.10, 2.22]



Analysis 4.4. Comparison 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy, Outcome 4 Incontinence score.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Outcome: 4 Incontinence score

Study or subgroup	Polyglycolic N	Mean(SD)	Other N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
1 Polyglycolic versus polypropylene						
Galili 1997	20	-0.66 (0.25)	17	-0.77 (0.42)		0.11 [-0.12, 0.34]
2 Polyglycolic versus polyglactin						

Analysis 4.5. Comparison 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy, Outcome 5 Number of patients with constipation after surgery.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Outcome: 5 Number of patients with constipation after surgery

Study or subgroup	Polyglycolic n/N	Other n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Polyglycolic versus polypropylene				
Galili 1997	1/20	0/17		2.69 [0.10, 70.49]
2 Polyglycolic versus polyglactin				
Winde 1993	1/17	0/30		5.55 [0.21, 143.90]

Analysis 4.6. Comparison 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy, Outcome 6 Number of patients with postoperative complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 4 Open abdominal polyglycolic acid mesh versus open polyglactin or polypropylene mesh rectopexy

Outcome: 6 Number of patients with postoperative complications

Study or subgroup	Polyglycolic n/N	Other n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
1 Polyglycolic versus polypropylene				
Galili 1997	4/20	4/17		0.81 [0.17, 3.89]
2 Polyglycolic versus polyglactin				
Winde 1993	4/17	9/30		0.72 [0.18, 2.81]

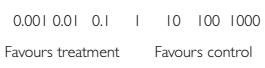
Analysis 5.1. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 1 Number of patients with recurrent full-thickness rectal prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 1 Number of patients with recurrent full-thickness rectal prolapse

Study or subgroup	Preservation of ligaments n/N	Division of ligaments n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Mollen 2000	0/9	0/9		Not estimable
Speakman 1991	4/12	0/14		15.35 [0.73, 321.58]

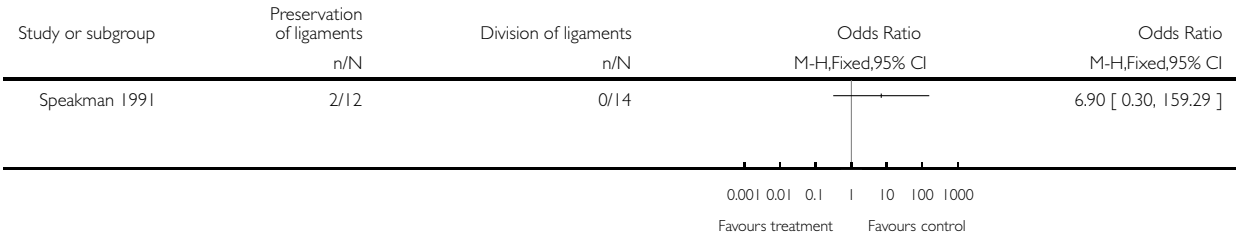


Analysis 5.2. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 2 Number of patients with residual mucosal prolapse only.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 2 Number of patients with residual mucosal prolapse only

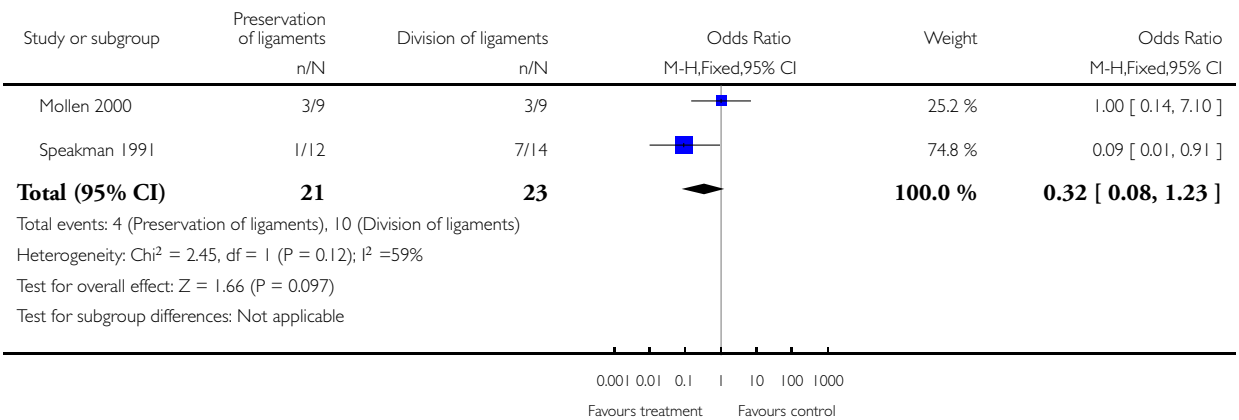


Analysis 5.3. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 3 Number of patients with constipation.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 3 Number of patients with constipation



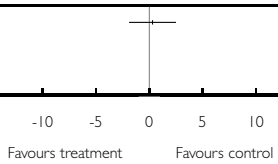
Analysis 5.4. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 4 Constipation score.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 4 Constipation score

Study or subgroup	Preservation of ligaments		Division of ligaments		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Mollen 2000	9	7.9 (2.38)	9	7.6 (2.38)		0.30 [-1.90, 2.50]



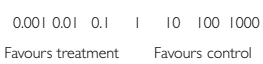
Analysis 5.5. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 5 Number of patients with postoperative complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 5 Number of patients with postoperative complications

Study or subgroup	Preservation of ligaments	Division of ligaments	Odds Ratio	Odds Ratio
	n/N	n/N	M-H,Fixed,95% CI	M-H,Fixed,95% CI
Speakman 1991	0/12	0/14		Not estimable



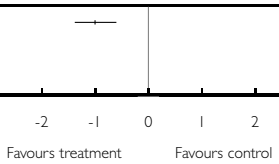
Analysis 5.6. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 6 Defecation frequency (per day).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 6 Defecation frequency (per day)

Study or subgroup	Preservation of ligaments		Division of ligaments		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Mollen 2000	9	1 (0.27)	9	2 (0.54)		-1.00 [-1.39, -0.61]



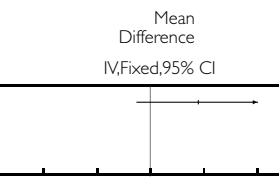
Analysis 5.7. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 7 Resting anal pressure (mmHg).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 7 Resting anal pressure (mmHg)

Study or subgroup	Preservation of ligaments		Division of ligaments		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Mollen 2000	9	26 (14.96)	9	17 (9.5)		9.00 [-2.58, 20.58]



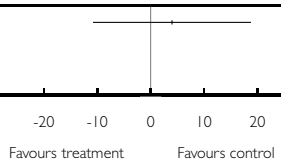
Analysis 5.8. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 8 Anal squeeze pressures (mmHg).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 8 Anal squeeze pressures (mmHg)

Study or subgroup	Preservation of ligaments		Division of ligaments		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Mollen 2000	9	50 (18.05)	9	46 (13.78)		4.00 [-10.84, 18.84]



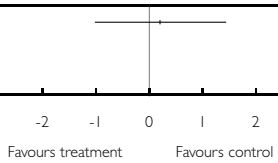
Analysis 5.9. Comparison 5 Preservation versus division of the lateral ligaments during open mesh rectopexy, Outcome 9 Compliance (ml/mmHg).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 5 Preservation versus division of the lateral ligaments during open mesh rectopexy

Outcome: 9 Compliance (ml/mmHg)

Study or subgroup	Preservation of ligaments		Division of ligaments		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Mollen 2000	7	6.9 (1.02)	7	6.7 (1.31)		0.20 [-1.03, 1.43]



Analysis 6.1. Comparison 6 Laparoscopic versus open procedure, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 1 Number of patients with recurrent full-thickness prolapse

Study or subgroup	Laparoscopic n/N	Open n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Solomon 2002	0/20	1/19		0.30 [0.01, 7.85]

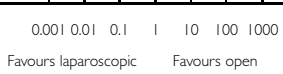
Analysis 6.2. Comparison 6 Laparoscopic versus open procedure, Outcome 2 Number of patients with residual mucosal prolapse only.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 2 Number of patients with residual mucosal prolapse only

Study or subgroup	Laparoscopic n/N	Open n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Boccasanta 1998	0/8	1/13		0.49 [0.02, 13.52]



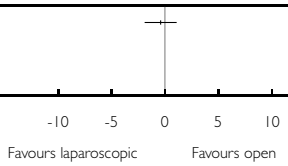
Analysis 6.3. Comparison 6 Laparoscopic versus open procedure, Outcome 3 Incontinence score.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 3 Incontinence score

Study or subgroup	Laparoscopic N	Mean(SD)	Open N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Solomon 2002	20	1.6 (2.61)	19	2 (2.14)		-0.40 [-1.89, 1.09]



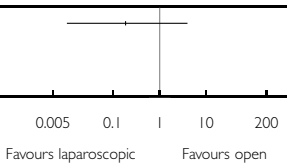
Analysis 6.4. Comparison 6 Laparoscopic versus open procedure, Outcome 4 Number of patients with constipation after surgery.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 4 Number of patients with constipation after surgery

Study or subgroup	Laparoscopic n/N	Open n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Boccasanta 1998	0/8	3/13		0.18 [0.01, 3.91]



Analysis 6.5. Comparison 6 Laparoscopic versus open procedure, Outcome 5 Operating time (min).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 5 Operating time (min)

Study or subgroup	Laparoscopic N	Mean(SD)	Open N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Boccasanta 1998	8	273 (27.5)	13	190 (20)		50.8 %	83.00 [61.06, 104.94]
Solomon 2002	20	199 (30)	19	148 (40)		49.2 %	51.00 [28.72, 73.28]
Total (95% CI)	**28**		**32**			**100.0 %**	**67.25 [51.61, 82.88]**

Heterogeneity: Chi^2 = 4.02, df = 1 (P = 0.04); I^2 =75%

Test for overall effect: Z = 8.43 (P < 0.00001)

Test for subgroup differences: Not applicable

Analysis 6.6. Comparison 6 Laparoscopic versus open procedure, Outcome 6 Number of patients with postoperative complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 6 Number of patients with postoperative complications

Study or subgroup	Laparoscopic n/N	Open n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Solomon 2002	6/20	14/19		0.15 [0.04, 0.62]

Analysis 6.7. Comparison 6 Laparoscopic versus open procedure, Outcome 7 Length of hospital stay (days).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

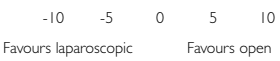
Outcome: 7 Length of hospital stay (days)

Study or subgroup	Laparoscopic N	Mean(SD)	Open N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Boccasanta 1998	8	7 (1.75)	13	9 (1.25)		49.9 %	-2.00 [-3.39, -0.61]
Solomon 2002	20	3.9 (0.75)	19	6.6 (3)		50.1 %	-2.70 [-4.09, -1.31]
Total (95% CI)	**28**		**32**			**100.0 %**	**-2.35 [-3.33, -1.37]**

Heterogeneity: Chi^2 = 0.49, df = 1 (P = 0.48); I^2 =0.0%

Test for overall effect: Z = 4.69 (P < 0.00001)

Test for subgroup differences: Not applicable



Analysis 6.8. Comparison 6 Laparoscopic versus open procedure, Outcome 8 Maximum resting anal pressure (cmH2O).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 8 Maximum resting anal pressure (cmH_2O)

Study or subgroup	Laparoscopic N	Mean(SD)	Open N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Boccasanta 1998	8	47.2 (45.64)	13	47.2 (22.3)		0.0 [-33.87, 33.87]

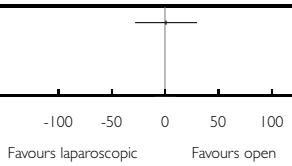
Analysis 6.9. Comparison 6 Laparoscopic versus open procedure, Outcome 9 Maximum squeeze pressure.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 9 Maximum squeeze pressure

Study or subgroup	Laparoscopic		Open		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 1998	8	98.4 (41.72)	13	97.4 (9.72)		1.00 [-28.39, 30.39]



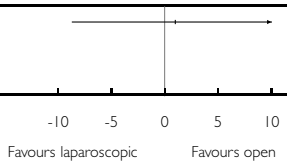
Analysis 6.10. Comparison 6 Laparoscopic versus open procedure, Outcome 10 Maximum rectal volume (ml).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 10 Maximum rectal volume (ml)

Study or subgroup	Laparoscopic		Open		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
Boccasanta 1998	8	31.9 (13.72)	13	30.9 (3.6)		1.00 [-8.71, 10.71]

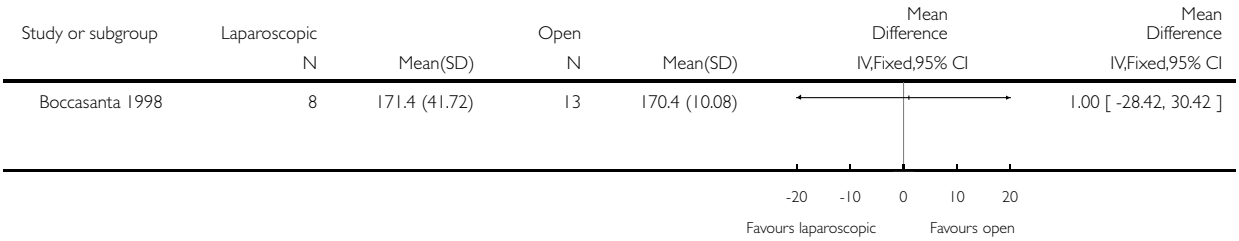


Analysis 6.11. Comparison 6 Laparoscopic versus open procedure, Outcome 11 Rectal capacity (ml).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 11 Rectal capacity (ml)

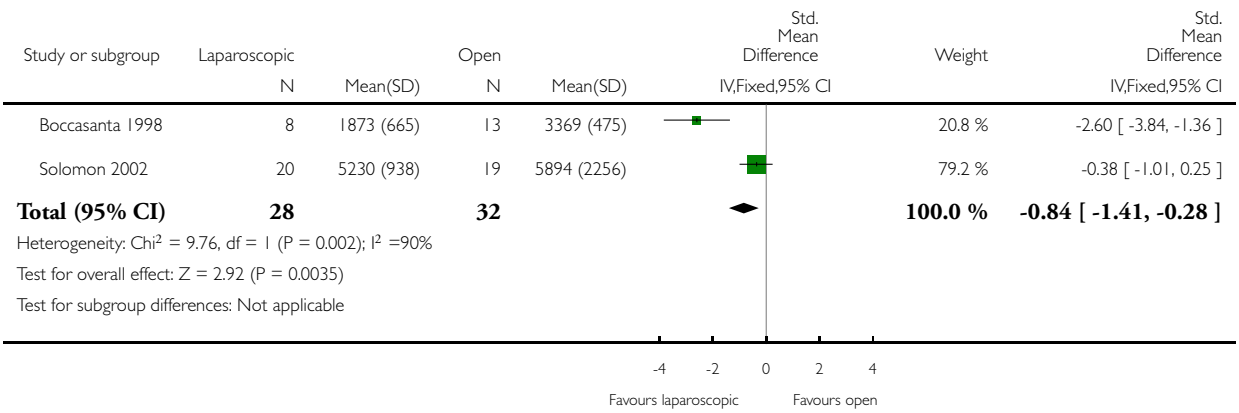


Analysis 6.12. Comparison 6 Laparoscopic versus open procedure, Outcome 12 Total cost (USD).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 6 Laparoscopic versus open procedure

Outcome: 12 Total cost (USD)

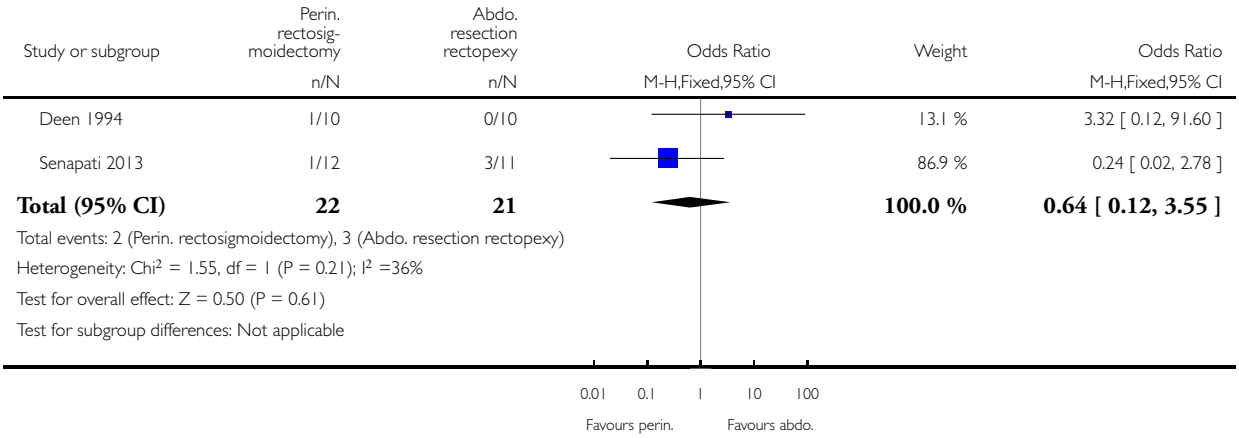


Analysis 7.1. Comparison 7 Abdominal versus perineal approach, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 1 Number of patients with recurrent full-thickness prolapse

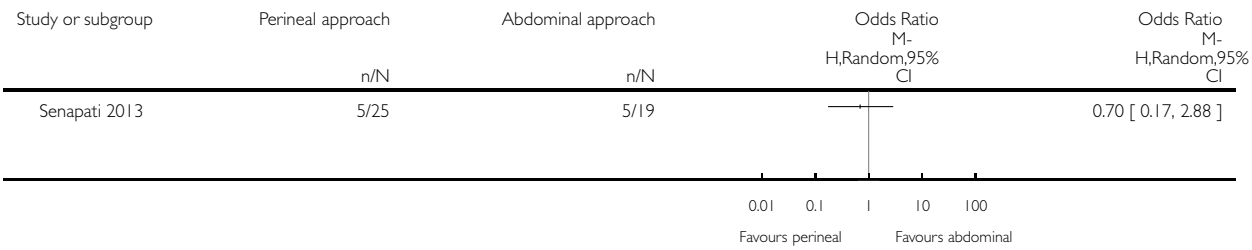


Analysis 7.2. Comparison 7 Abdominal versus perineal approach, Outcome 2 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 2 Number of patients with recurrent full-thickness prolapse



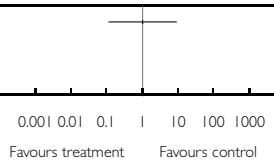
Analysis 7.3. Comparison 7 Abdominal versus perineal approach, Outcome 3 Number of patients with residual mucosal prolapse only.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 3 Number of patients with residual mucosal prolapse only

Study or subgroup	Perin. rectosig-moidectomy n/N	Abdo. resection rectopexy n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Deen 1994	2/10	2/10		1.00 [0.11, 8.95]



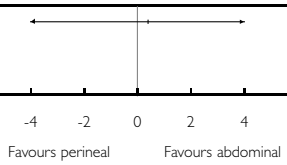
Analysis 7.4. Comparison 7 Abdominal versus perineal approach, Outcome 4 Vaizey incontinence score 3 years post-op.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 4 Vaizey incontinence score 3 years post-op

Study or subgroup	Perineal N	Mean(SD)	Abdominal N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	7	5 (7)	9	4.6 (4.1)		0.40 [-5.44, 6.24]

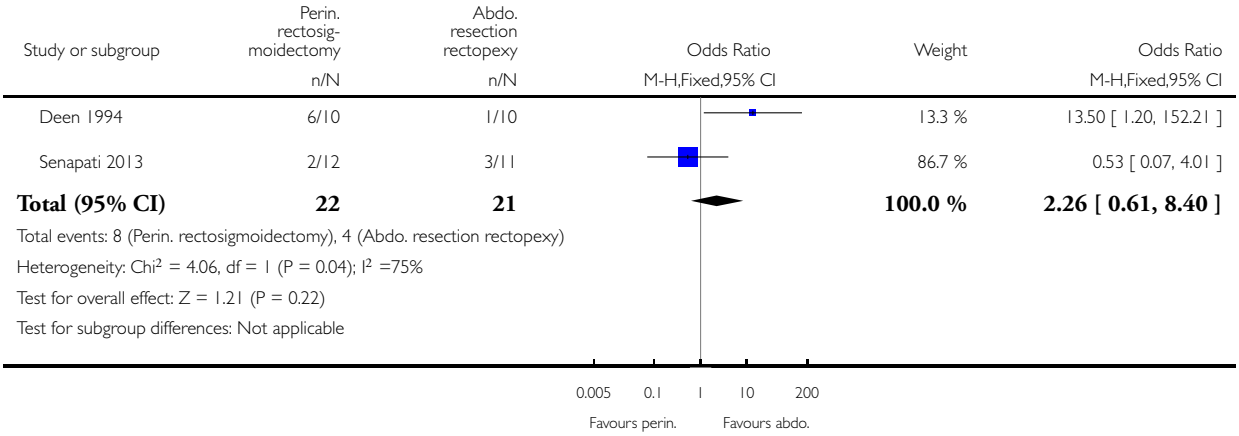


Analysis 7.5. Comparison 7 Abdominal versus perineal approach, Outcome 5 Number of patients with residual faecal incontinence.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 5 Number of patients with residual faecal incontinence

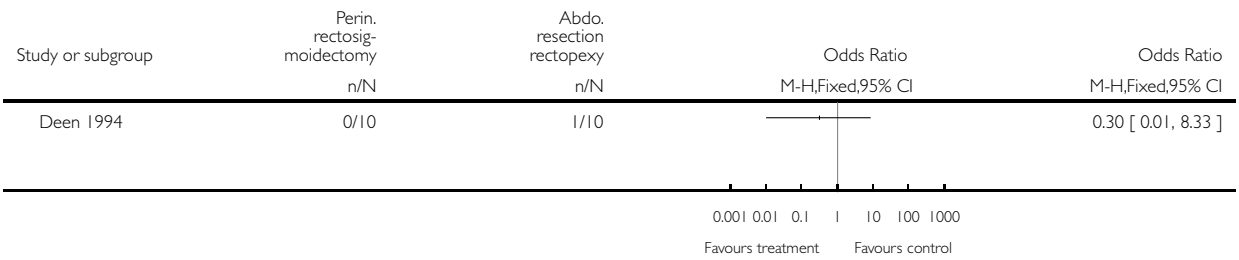


Analysis 7.6. Comparison 7 Abdominal versus perineal approach, Outcome 6 Complications requiring surgical interventions.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 6 Complications requiring surgical interventions



Analysis 7.7. Comparison 7 Abdominal versus perineal approach, Outcome 7 Number of patients with postoperative complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 7 Number of patients with postoperative complications

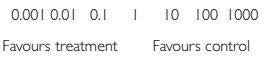
Study or subgroup	Perin. rectosig-moidectomy n/N	Abdo. resection rectopexy n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Deen 1994	0/10	3/10		35.1 %	0.10 [0.00, 2.28]
Senapati 2013	8/25	8/19		64.9 %	0.65 [0.19, 2.23]
Total (95% CI)	**35**	**29**		**100.0 %**	**0.46 [0.15, 1.37]**

Total events: 8 (Perin. rectosigmoidectomy), 11 (Abdo. resection rectopexy)

Heterogeneity: Chi^2 = 1.20, df = 1 (P = 0.27); I^2 =17%

Test for overall effect: Z = 1.40 (P = 0.16)

Test for subgroup differences: Not applicable



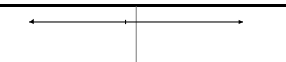
Analysis 7.8. Comparison 7 Abdominal versus perineal approach, Outcome 8 Bowel function (bowel thermometer) 3 years post-op.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 8 Bowel function (bowel thermometer) 3 years post-op

Study or subgroup	Perineal N	Mean(SD)	Abdominal N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	3	50 (18)	6	52 (27)		-2.00 [-31.69, 27.69]



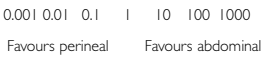
Analysis 7.9. Comparison 7 Abdominal versus perineal approach, Outcome 9 Straining at 3 years post-op.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 9 Straining at 3 years post-op

Study or subgroup	Perineal n/N	Abdominal n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Senapati 2013	0/9	5/11		0.06 [0.00, 1.33]



Analysis 7.10. Comparison 7 Abdominal versus perineal approach, Outcome 10 Maximum resting pressure (cmH2O).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 10 Maximum resting pressure (cmH_2O)

Study or subgroup	Perin. rectosig-moidectomy N	Mean(SD)	Abdo. resection rectopexy N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Deen 1994	10	51.2 (29.62)	10	63.3 (28.67)		-12.10 [-37.65, 13.45]

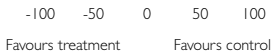
Analysis 7.11. Comparison 7 Abdominal versus perineal approach, Outcome 11 Maximum squeeze pressure (cmH2O).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 11 Maximum squeeze pressure (cmH_2O)

Study or subgroup	Perin. rectosig-moidectomy N	Mean(SD)	Abdo. resection rectopexy N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Deen 1994	10	103 (49.23)	10	97.6 (29.12)		5.40 [-30.05, 40.85]



Analysis 7.12. Comparison 7 Abdominal versus perineal approach, Outcome 12 Rectal compliance (ml/cmH2O).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 12 Rectal compliance (ml/cmH_2O)

Study or subgroup	Perin. rectosig-moidectomy N	Mean(SD)	Abdo. resection rectopexy N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Deen 1994	10	2.2 (0.78)	10	3.9 (0.75)		-1.70 [-2.37, -1.03]

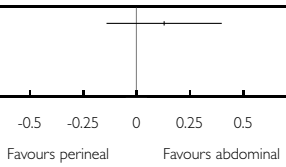
Analysis 7.13. Comparison 7 Abdominal versus perineal approach, Outcome 13 Quality of life score (EQ-5D) at 3 years.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 7 Abdominal versus perineal approach

Outcome: 13 Quality of life score (EQ-5D) at 3 years

Study or subgroup	Perineal N	Mean(SD)	Abdominal N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	5	0.86 (0.22)	9	0.73 (0.29)		0.13 [-0.14, 0.40]



Analysis 8.1. Comparison 8 Resection versus no resection rectopexy, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 1 Number of patients with recurrent full-thickness prolapse

Study or subgroup	Resection n/N	No resection n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Lukkonen 1992	0/15	0/15			Not estimable
McKee 1992	0/9	0/9			Not estimable
Senapati 2013	4/32	9/35		100.0 %	0.41 [0.11, 1.50]
Total (95% CI)	**56**	**59**		**100.0 %**	**0.41 [0.11, 1.50]**
Total events: 4 (Resection), 9 (No resection)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.34 (P = 0.18)					
Test for subgroup differences: Not applicable					

Analysis 8.2. Comparison 8 Resection versus no resection rectopexy, Outcome 2 Number of patients with residual faecal incontinence.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 2 Number of patients with residual faecal incontinence

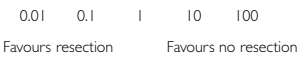
Study or subgroup	Resection n/N	No resection n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Lukkonen 1992	5/15	4/15		20.2 %	1.38 [0.29, 6.60]
McKee 1992	3/9	1/9		5.1 %	4.00 [0.33, 48.66]
Senapati 2013	10/32	15/35		74.7 %	0.61 [0.22, 1.65]
Total (95% CI)	**56**	**59**		**100.0 %**	**0.93 [0.43, 2.03]**

Total events: 18 (Resection), 20 (No resection)

Heterogeneity: $Chi^2 = 2.25$, df = 2 (P = 0.32); $I^2 = 11\%$

Test for overall effect: Z = 0.17 (P = 0.86)

Test for subgroup differences: Not applicable



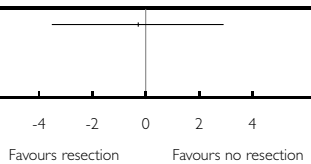
Analysis 8.3. Comparison 8 Resection versus no resection rectopexy, Outcome 3 Vaizey incontinence score 3 years post-op.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 3 Vaizey incontinence score 3 years post-op

Study or subgroup	Resection N	Mean(SD)	No resection N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	13	4.5 (4.7)	18	4.8 (4.2)		-0.30 [-3.51, 2.91]



Analysis 8.4. Comparison 8 Resection versus no resection rectopexy, Outcome 4 Number of patients with constipation due to surgery.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 4 Number of patients with constipation due to surgery

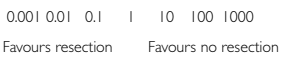
Study or subgroup	Resection n/N	No resection n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Lukkonen 1992	0/15	5/15		30.6 %	0.06 [0.00, 1.24]
McKee 1992	2/9	7/9		31.2 %	0.08 [0.01, 0.75]
Senapati 2013	3/18	8/18		38.2 %	0.25 [0.05, 1.18]
Total (95% CI)	**42**	**42**		**100.0 %**	**0.14 [0.04, 0.44]**

Total events: 5 (Resection), 20 (No resection)

Heterogeneity: $Chi^2 = 1.05$, df = 2 (P = 0.59); $I^2 = 0.0\%$

Test for overall effect: Z = 3.36 (P = 0.00078)

Test for subgroup differences: Not applicable



Analysis 8.5. Comparison 8 Resection versus no resection rectopexy, Outcome 5 Number of patients with postoperative complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 5 Number of patients with postoperative complications

Study or subgroup	Resection n/N	No resection n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Lukkonen 1992	3/15	2/15		23.9 %	1.63 [0.23, 11.46]
Senapati 2013	13/32	9/35		76.1 %	1.98 [0.70, 5.57]
Total (95% CI)	**47**	**50**		**100.0 %**	**1.89 [0.76, 4.73]**

Total events: 16 (Resection), 11 (No resection)

Heterogeneity: $Chi^2 = 0.03$, df = 1 (P = 0.86); $I^2 = 0.0\%$

Test for overall effect: Z = 1.37 (P = 0.17)

Test for subgroup differences: Not applicable

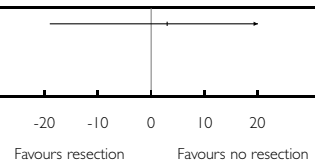
Analysis 8.6. Comparison 8 Resection versus no resection rectopexy, Outcome 6 Bowel function (bowel thermometer) 3 years post-op.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 6 Bowel function (bowel thermometer) 3 years post-op

Study or subgroup	Resection N	Mean(SD)	No resection N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	8	66 (25)	13	63 (25)		3.00 [-19.02, 25.02]



Analysis 8.7. Comparison 8 Resection versus no resection rectopexy, Outcome 7 Maximum resting anal pressure (mmHg).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 7 Maximum resting anal pressure (mmHg)

Study or subgroup	Resection		No resection		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
McKee 1992	9	40 (18)	6	56 (39)		-16.00 [-49.35, 17.35]

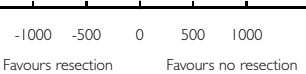
Analysis 8.8. Comparison 8 Resection versus no resection rectopexy, Outcome 8 Maximum rectal volumes (ml).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 8 Maximum rectal volumes (ml)

Study or subgroup	Resection		No resection		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
McKee 1992	9	383 (555)	8	467 (561)		-84.00 [-615.60, 447.60]



Analysis 8.9. Comparison 8 Resection versus no resection rectopexy, Outcome 9 Volume to first sensation (ml).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 9 Volume to first sensation (ml)

Study or subgroup	Resection		No resection		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
McKee 1992	9	143 (96)	8	115 (96)		28.00 [-63.43, 119.43]

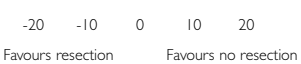
Analysis 8.10. Comparison 8 Resection versus no resection rectopexy, Outcome 10 Anorectal angle (postoperative).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 10 Anorectal angle (postoperative)

Study or subgroup	Resection		No resection		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
McKee 1992	9	101 (12)	8	99 (15)		2.00 [-11.02, 15.02]



Analysis 8.11. Comparison 8 Resection versus no resection rectopexy, Outcome 11 Rectal compliance (mmHg/ml).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 11 Rectal compliance (mmHg/ml)

Study or subgroup	Resection		No resection		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
McKee 1992	9	0.1 (0.06)	8	0.24 (0.06)		-0.14 [-0.20, -0.08]

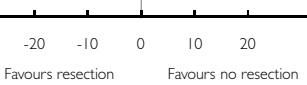
Analysis 8.12. Comparison 8 Resection versus no resection rectopexy, Outcome 12 Postoperative transit time (days).

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 12 Postoperative transit time (days)

Study or subgroup	Resection		No resection		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI	IV,Fixed,95% CI
McKee 1992	9	6.8 (6.9)	8	14.6 (6.6)		-7.80 [-14.22, -1.38]



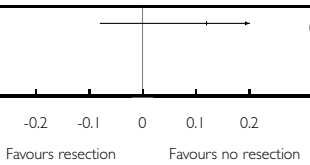
Analysis 8.13. Comparison 8 Resection versus no resection rectopexy, Outcome 13 Quality of life score (EQ-5D) at 3 years.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 8 Resection versus no resection rectopexy

Outcome: 13 Quality of life score (EQ-5D) at 3 years

Study or subgroup	Resection N	Mean(SD)	No resection N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Mean Difference IV,Fixed,95% CI
Senapati 2013	14	0.82 (0.23)	17	0.7 (0.34)		0.12 [-0.08, 0.32]



Analysis 9.1. Comparison 9 Rectopexy versus no rectopexy, Outcome 1 Number of patients with recurrent full-thickness prolapse.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 9 Rectopexy versus no rectopexy

Outcome: 1 Number of patients with recurrent full-thickness prolapse

Study or subgroup	No rectopexy n/N	Rectopexy n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Karas 2011	10/116	2/136		6.32 [1.36, 29.47]

Analysis 9.2. Comparison 9 Rectopexy versus no rectopexy, Outcome 2 Mortality.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 9 Rectopexy versus no rectopexy

Outcome: 2 Mortality

Study or subgroup	No rectopexy n/N	Rectopexy n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Karas 2011	0/116	2/136		0.23 [0.01, 4.86]

Analysis 9.3. Comparison 9 Rectopexy versus no rectopexy, Outcome 3 Number of patients with complications.

Review: Surgery for complete (full-thickness) rectal prolapse in adults

Comparison: 9 Rectopexy versus no rectopexy

Outcome: 3 Number of patients with complications

Study or subgroup	No rectopexy n/N	Rectopexy n/N	Odds Ratio M-H,Fixed,95% CI	Odds Ratio M-H,Fixed,95% CI
Karas 2011	11/116	23/136		0.51 [0.24, 1.11]

APPENDICES

Appendix 1. Search strategies

Cochrane Specialised Register searches

- Cochrane Incontinence Group Specialised Register

The terms used to search the Incontinence Group Specialised Register are given below. The date of the most recent search was: 3 February 2015.
({TOPIC.FAECAL*} OR {TOPIC.PROLAPSE*} OR {TOPIC.RECTALPROLAPSE.})
AND
({DESIGN.CCT*} OR {DESIGN.RCT*})
AND
(INTVENT.SURG*)
(All searches were of the keywords field of Reference Manager 2012).

- The Cochrane Colorectal Cancer Group Specialised Register was searched indirectly via CENTRAL (on CRSO) as part of the search for the Incontinence Group Specialised Register (November 2014).

EMBASE (on OvidSP)
We searched EMBASE Classic and EMBASE 1947 to 2015 Week 05 on 2 February 2015 using the following search strategy:
1. Randomized Controlled Trial/
2. crossover procedure/ or double blind procedure/ or parallel design/ or single blind procedure/
3. Placebo/
4. placebo$.tw,ot.
5. random$.tw,ot.
6. ((singl$ or doubl$ or trebl$ or tripl$) adj25 (blind$ or mask$)).tw,ot.
7. crossover.tw,ot.
8. cross over$.tw,ot.
9. allocat$.tw,ot.
10. trial.ti.
11. parallel design/
12. triple blind procedure/
13. or/1-12
14. exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/
15. exp human/ or exp “human tissue, cells or cell components”/
16. 14 and 15
17. 14 not 16
18. 13 not 17
19. ((rect* or anorect*) adj3 (prolaps* or intuss* or procident*)).tw.
20. rectum prolapse/
21. 19 or 20
22. 18 and 21

Searches by review authors
For this review the review authors also performed additional specific searches. These included systematic searches of the following electronic databases:

- PubMed. Search period: January 1950 to December 2014. We used the following search terms: rectal prolapse (limited to randomised controlled trial).

For a previous version of the review the review authors had performed the following search:
EMBASE (on OVID online) was searched in June 2013. Search period: January 1998 to June 2013. The following search terms were used: (Fecal incontinence/) OR (faecal or fecal incontinen$).tw. These terms were combined using the Boolean operator ’OR’.

WHAT'S NEW

Last assessed as up-to-date: 3 February 2015.

Date	Event	Description
23 November 2015	New search has been performed	Three new trials were added in this third update (Karas 2011; Senapati 2013; Youssef 2013)
23 November 2015	New citation required but conclusions have not changed	Three new trials were added in this third update (Karas 2011; Senapati 2013; Youssef 2013)

HISTORY

Protocol first published: Issue 2, 1999

Review first published: Issue 1, 2000

Date	Event	Description
22 June 2012	Amended	Converted to new review format.
27 February 2008	New search has been performed	minor update
27 February 2008	New citation required but conclusions have not changed	Minor amendment Issue 3 2008
1 February 2003	Amended	Review updated February 2003: Issue 2 2003. One study added.

CONTRIBUTIONS OF AUTHORS

Samson Tou was involved in the search and grading of the literature as well as rewriting the review.

Steven Brown was involved in the search of the literature as well as editing the updated review.

Rick Nelson was involved in initiating and overseeing the project.

DECLARATIONS OF INTEREST

Samson Tou: none known.

Steven Brown: none known.

Rick Nelson: none known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- The National Institute for Health Research (NIHR), UK.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The review has been significantly updated twice, but the original protocol remains unchanged. We have adopted GRADE for assessing the quality of evidence and have included the summary of findings table.

INDEX TERMS

Medical Subject Headings (MeSH)

Randomized Controlled Trials as Topic; Rectal Prolapse [*surgery]; Rectum [*surgery]; Treatment Outcome

MeSH check words

Adult; Humans