

## Laparoscopic Management of Recurrent Complete Rectal Prolapse: A Meta-Analysis Study

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### Abstract

**Background:** Complete rectal prolapse is a disabling condition that presents with fecal incontinence, constipation and rectal discharge. Described surgical techniques are varied, and whether the approach is abdominal or perineal, the treatment aims to correct anatomical and functional abnormalities by the fixation of the rectum to the sacrum and/or the resection of the redundant bowel. Recently, an abdominal approach via laparoscopy has emerged as a tool for the treatment of rectal prolapse that is a safe and effective alternative to the conventional open approach. Laparoscopic rectopexy results in lesser postoperative pain, lesser hospital stay, and better patient satisfaction than open rectopexy.

**Aim of Study:** A meta-analysis Study of laparoscopic management of recurrent complete rectal prolapse, through a process of combining the results of individual studies with statistical methods in one review, regarding laparoscopic operations performed most frequently (Resection rectopexy, Suture rectopexy, Mesh rectopexy) and to examine the outcome following recurrence surgery.

**Material and Methods:** We identified 21 studies with a total population of 869 patients comparing different types laparoscopic rectopexy (suture, Resection, and Mesh either posterior or ventral).

**Results:** A significant positive result regarding the postoperative morbidity after laparoscopic suture rectopexy and laparoscopic resection rectopexy were found, meaning that there are some risks of morbidity after LSR and LRR, while there were no risks of morbidity after neither posterior nor ventral LMR. According to the present study there was a significant improvement of constipation after LSR, posterior LMR and LRR, with significant  $p$ -values of  $<0.0001$ . However, there was no significant improvement of continence after LSR. The analysis of the included studies in this meta-analysis showed a significant positive result regarding the improvement of continence postoperatively after laparoscopic resection rectopexy, posterior and ventral laparoscopic mesh rectopexy, meaning that there was a significant improvement of continence after LRR, posterior and ventral LMR.

**Data Sources:** Medline databases (PubMed, Medscape, ScienceDirect, EMF-Portal) and all materials available in the Internet till 2021.

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**Conclusion:** No risk of recurrence was detected in any of the laparoscopic approaches. Although, laparoscopic suture rectopexy (LSR) showed improvement of constipation, it had several adverse events (risk of morbidity, no improvement of continence and new onset of constipation). Laparoscopic resection rectopexy (LRR) showed improvement of the preoperative constipation and continence but it cause significant postoperative morbidity and new onset of constipation. Posterior LMR caused improvement of the preoperative constipation and continence, with no postoperative morbidity. Unfortunately, it caused new onset of constipation. Ventral LMR showed improvement of the preoperative continence with no postoperative morbidity or new onset of constipation.

**Key Words:** *Laparoscopic suture rectopexy – Laparoscopic mesh rectopexy – Laparoscopic resection rectopexy.*

### Introduction

**THE** term rectal prolapse (RP) includes three different entities: Full-thickness RP, mucosal prolapse, and internal prolapse (rectal intussusception).

Complete rectal prolapse (CRP) is defined as the circumferential full-thickness protrusion of the rectal wall through the anus [1]. Straight rectum, a lack of rectal fascial attachments to the sacrum, a redundant sigmoid colon, levatorani diastasis, an abnormally deep Douglas pouch, and a patulous anus may be considered either anatomical predisposing factors for the development of CRP or the result of prolapsing rectum [2,3].

The treatment of CRP in adults is essentially surgical. Surgical management is aimed at restoring physiology by correcting the prolapse and improving continence and constipation with acceptable mortality and recurrence rates [4].

Numerous surgical procedures have been suggested to treat RP; however, the controversy regarding 'which operation is appropriate?' cannot be answered definitely [5]. According to the approach used to repair the RP, surgical treatments

can be divided into two categories: Abdominal procedures, which are generally better for young fit patients, and perineal procedures, which are preferable for patients who are not fit for abdominal procedures, such as elderly frail patients with significant comorbidities. The abdominal procedures have a lower recurrence and a higher morbidity rate than the perineal procedures [4].

Laparoscopic RP surgery including both rectopexy and resection rectopexy can cure prolapse with good results and can be performed safely in older and debilitated patients [6]. Although both techniques offer significant improvements in functional symptoms, laparoscopic resection rectopexy had a higher complication rate than laparoscopic rectopexy did [7].

Because of the acceptable anatomical results, fewer complications, low recurrence rate, good functional results, and low mesh-related morbidity in the short to medium term, laparoscopic ventral mesh rectopexy (LVMR) has been popularized in the past decade. LVMR is performed for patients with CRP and internal prolapse [8].

#### *Aim of the work:*

A meta-analysis Study of laparoscopic management of recurrent complete rectal prolapse, through a process of combining the results of individual studies with statistical methods in one review, regarding laparoscopic operations performed most frequently (Resection rectopexy, Suture rectopexy, Mesh rectopexy) and to examine the outcome following recurrence surgery.

### **Material and Methods**

In our review, we followed the PRISMA statement guideline [9] during this systematic review and meta-analysis preparation and performed all steps according to the Cochrane handbook of systematic reviews of intervention [10].

#### *Search strategy and study selection:*

We searched PubMed, Scopus, Web of Science (WOS), Cochrane, Embase, Medline, and Google Scholar till November 2021 relevant keywords. We used the following search strategy for searching different databases: (“Laparoscopic suture rectopexy” OR “Laparoscopic Mesh rectopexy” OR “Laparoscopic Resection rectopexy” OR Laparoscopies OR Celioscopy OR Celioscopies OR Peritoneoscopy OR Peritoneoscopies OR “Laparoscopic Surgical Procedure” OR “Laparoscopic Surgical Procedures” OR “Laparoscopic Surgery” OR “Laparoscopic Surgeries” OR “Laparoscopic Assisted Surgery”

OR “Laparoscopic Assisted Surgeries”) AND (“complete rectal prolapse” OR “rectal prolapse” OR “Prolapse, Rectal” OR “Prolapses, Rectal” OR “Rectal Prolapses” OR “Anus Prolapse” OR “Anus Prolapses” OR “Prolapse, Anus” OR “Prolapses, Anus”). Reference lists of full-text articles included in the review will be checked to identify any potentially eligible studies. Included studies will be manually screened in order to select other relevant studies.

#### *Eligibility criteria and study selection:*

*We included studies that followed these criteria:* (1) Interventional and observational studies including clinical trials, cohort, and case-control either prospective or retrospective studies design are included. (2) All published studies in patients who underwent Laparoscopic surgery for recurrent complete rectal prolapse. The exclusion criteria were as follow: (1) Published conference abstracts, letters, comments, editorials, practice guidelines, book, or book chapter. (2) Studies with non-laparoscopic surgical techniques. (3) Studies written in a language other than English, and finally, we excluded the duplicated articles by the same author unless those with longer follow-ups studies. All published articles were screened with no restrictions for data of search. Titles and abstracts were done in two parts, followed by full-text screening. Reference lists of the included studies were manually screened to find any other eligible studies that may be omitted from previous steps.

#### *Quality assessment:*

The assessment of quality and risk of bias of the analyzed studies was performed using the Agency for health care research and quality (AHRQ) checklist [11]. This list has 21 evaluation criteria, including a source of information, inclusion and exclusion criteria, time period, consecutive patients, masking, quality assurance, explanation for exclusions, confounder control, incomplete data withdrawal, data collection, and follow-up. One item is scored as 1 if included in the article and 0 if it is not. A score of 8 or higher indicates a high-quality study (Table 1).

#### *Data extraction:*

The necessary information and data were extracted from the selected studies and quantified using a standardized procedure. The characteristics of each study were evaluated, such as year of publication, study design, number of assessed patients.

Following the above inclusion and exclusion criteria, we performed an assessment of studies

for potential inclusion independently. Any differences in opinions will be resolved through discussion until a consensus is reached. A third reviewer may be consulted if necessary.

#### *Statistical analysis:*

We conducted this meta-analysis by using Open Meta Analyst (OMA) (Computer program) (Version 5.4. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014). Regarding the study outcomes, risk ratio (RR) with 95% confidence interval (CI) was used for dichotomous variables. Cochrane's  $I^2$  and  $I^2$  were tested to examine heterogeneity among the studies. High heterogeneity most likely existed due to the clinical and methodological factors, so the random effect model was adopted in this meta-analysis even  $I^2$  was small. Funnel plots and the Egger regression test [12] could not be performed due to the limited number of the included studies.

#### *Data synthesis:*

We presented the results of our review analytically on graphs and narratively. We have provided the results of each study for the primary outcomes, using tables and figures.

## **Results**

#### **Outcomes:**

##### *Risk of recurrence rate:*

##### *LSR (Fig. 2):*

The pooled analysis of the included studies showed no significant positive results regarding the risk of recurrence postoperatively after laparoscopic suture rectopexy (LSR) with a non-significant  $p$ -value of 0.56. Fig. (2).

##### *Posterior LMR:*

The pooled analysis of the included studies showed no significant positive results regarding the risk of recurrence postoperatively after posterior laparoscopic Mesh rectopexy (LMR) with a non-significant  $p$ -value of 0.464 Fig. (3).

##### *Ventral LMR (Fig. 4):*

The pooled analysis of the included studies showed no significant positive results regarding the risk of recurrence postoperatively after ventral laparoscopic Mesh rectopexy (LMR) with a non-significant  $p$ -value of 0.826. Fig. (4).

##### *LRR (Fig. 5):*

The pooled analysis of the included studies showed no significant positive results regarding the risk of recurrence postoperatively after lapar-

oscopic resection rectopexy (LRR) with a non-significant  $p$ -value of 0.587. Fig. (5).

#### **Morbidity:**

##### *LSR:*

The analysis of the included studies showed a significant positive result regarding the postoperative morbidity after laparoscopic stature rectopexy with a significant  $p$ -value of 0.045 meaning that there are some risk of morbidity after LSR. Fig. (6).

##### *Posterior LMR:*

The analysis of the included studies showed no significant positive results regarding the postoperative morbidity after posterior laparoscopic Mesh rectopexy with a non-significant  $p$ -value of 0.073 meaning that there is no risk of morbidity after post LMR. Fig. (7).

##### *Ventral LMR:*

The analysis of the included studies showed no significant positive results regarding the postoperative morbidity after ventral laparoscopic Mesh rectopexy with a non-significant  $p$ -value of 0.071 meaning that there is no risk of morbidity after ventral LMR. Fig. (8).

##### *LRR:*

The analysis of the included studies showed a significant positive result regarding the postoperative morbidity after laparoscopic Resection rectopexy with a non-significant  $p$ -value of 0.013 meaning that there are some risks of morbidity after LRR. Fig. (9).

#### **Improvement of constipation:**

##### *LSR:*

The analysis of the included studies showed a significant positive result regarding the improvement of constipation postoperatively after laparoscopic suture rectopexy with a significant  $p$ -value of  $<0.0001$  meaning that there was a significant improvement after LSR. Fig. (10).

##### *Posterior LMR (Fig. 11):*

The analysis of the included studies showed a significant positive result regarding the improvement of constipation postoperatively after posterior laparoscopic Mesh rectopexy with a significant  $p$ -value of  $<0.0001$  meaning that there was a significant improvement after LMR. Fig. (11).

##### *Ventral LMR:*

The analysis of the included studies showed no significant positive result regarding the improve-

ment of constipation postoperatively after ventral laparoscopic Mesh rectopexy with a non-significant  $p$ -value of 0.326 with no significant improvement of constipation after ventral LMR. Fig. (12).

#### LRR (Fig. 13):

The analysis of the included studies showed a significant positive result regarding the improvement of constipation postoperatively after laparoscopic Resection rectopexy with a significant  $p$ -value of  $<0.0001$  meaning that there was a significant improvement after LRR. Fig. (13).

Improvement of continence:

#### LSR (Fig. 14):

The analysis of the included studies showed no significant positive results regarding the improvement of continence postoperatively after laparoscopic suture rectopexy with a non-significant  $p$ -value of 0.074 meaning that there was no significant improvement of continence after LSR. Fig. (14).

#### Posterior LMR:

The analysis of the included studies showed a significant positive result regarding the improvement of continence postoperatively after posterior laparoscopic Mesh rectopexy with a significant  $p$ -value of  $<0.001$  meaning that there was a significant improvement of continence after post. LMR. Fig. (15).

#### Ventral LMR (Fig. 16):

The analysis of the included studies showed a significant positive result regarding the improvement of continence postoperatively after ventral laparoscopic Mesh rectopexy with a significant  $p$ -value of = 0.001 meaning that there was a significant improvement of continence after ventral. LMR. Fig. (16).

#### LRR (Fig. 17):

The analysis of the included studies showed a significant positive result regarding the improvement of continence postoperatively after laparoscopic Resection rectopexy with a significant  $p$ -value of  $<0.001$  meaning that there was a significant improvement of continence after LRR. Fig. (17).

New onset of constipation:

#### LSR (Fig. 18):

The analysis of the included studies showed a significant positive result regarding the new onset of constipation postoperatively after laparoscopic suture rectopexy (LSR) with a significant  $p$ -value of 0.018 meaning that there is a significant risk of new onset of constipation after LSR. Fig. (18).

#### Posterior LMR:

The analysis of the included studies showed a significant positive result regarding the new onset of constipation postoperatively after posterior laparoscopic Mesh rectopexy (LMR) with a significant  $p$ -value of  $<0.001$  meaning that there is a significant risk of new onset of constipation after posterior LMR. Fig. (19).

#### Ventral LMR:

The analysis of the included studies showed no significant positive result regarding the new onset of constipation postoperatively after ventral laparoscopic Mesh rectopexy (LMR) with a non-significant  $p$ -value of 0.91 meaning that there is no significant risk of new onset of constipation after ventral LMR. Fig. (20).

#### LRR:

The analysis of the included studies showed a significant positive result regarding the new onset of constipation postoperatively after laparoscopic resection rectopexy (LRR) with a significant  $p$ -value of  $<0.001$  meaning that there is a significant risk of new onset of constipation after LSR. Fig. (21).

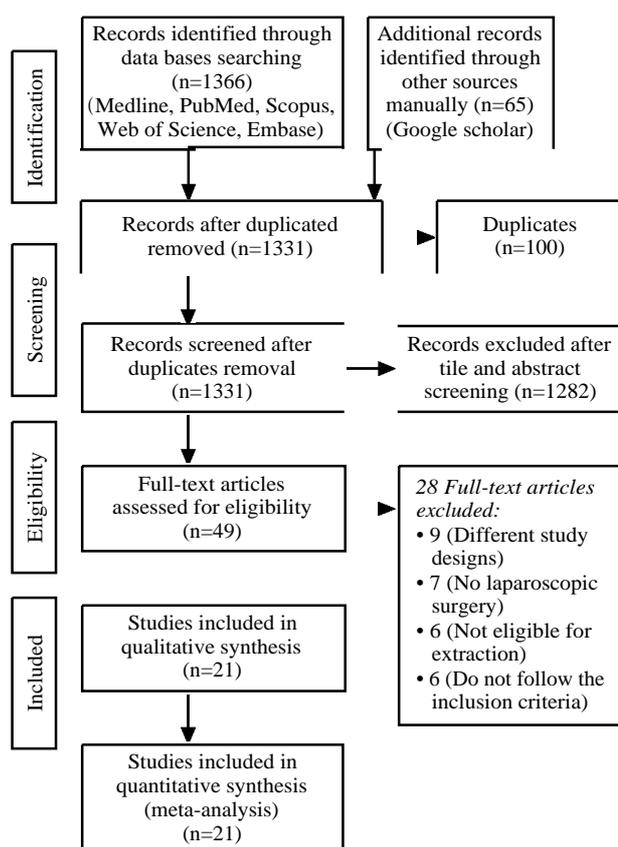


Fig. (1): PRISMA flow diagram of the literature search results.

Table (1A): Quality assessment of the included studies according to the Agency for Health Care Research and Quality (AHRQ) criteria.

Risk of bias domain	Kessler et al. [13]	Bruch et al. [14]	Heah et al. [15]	Kellokumpu et al. [16]	Benpist et al. [17]	Hsu et al. [18]	Wilson et al. [19]	Darzi et al. [20]	Himpens et al. [21]	Benoist et al. [17]
Source of information	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inclusion and exclusion criteria	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Period	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Consecutive patients	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Masking	No	No	Yes	No	Yes	Yes	No	Yes	Yes	No
Quality assurance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Explanation of exclusions	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Control of confounders	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incomplete data withdrawal	No	No	No	No	No	No	No	Yes	No	No
Data integrity	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Follow-up	No	Yes	Yes	No	No	No	Yes	No	Yes	No
Final Score	8	8	10	8	8	7	8	9	10	8
Overall quality	Good	Good	High	Good	Good	Fair	Good	Good	High	Good

Table (1B): Quality assessment of the included studies according to the Agency for Health Care Research and Quality (AHRQ) criteria.

Risk of bias domain	Makineni et al. [22]	Dyrberg et al. [23]	Madbouly et al. [24]	Matsuda et al. [25]	Stevenson et al. [26]	Xynos et al. [27]	Rose et al. [28]	Lechaux et al. [29]	Ashari et al. [30]	Laubert et al. [31]	Formijne Jonkers et al. [7]
Source of information	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inclusion and exclusion criteria	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Period	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Consecutive patients	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes	Yes
Masking	No	No	Yes	Yes	No	No	No	No	No	No	Yes
Quality assurance	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Explanation of exclusions	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Control of confounders	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incomplete data with drawal	No	No	Yes	Yes	Yes	No	No	No	No	No	Yes
Data integrity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Follow-up	Yes	No	Yes	Yes	Yes	6	9	8	9	8	11
Final Score	9	8	11	9	9	Fair	High	Good	Good	Good	High
Overall quality	Good	Good	High	High	High						

Table (2A): Summary of the included studies.

Study ID	Year	Design	Sample Size	Follow-Up duration
Kessler et al. [13]	1999	Retrospective	28	33 months
Bruch et al. [14]	1999	Prospective	32	30 months
Heah et al. [15]	2000	Prospective	25	26 months
Kellokumpu et al. [16]	2000	Prospective	17	24 months
Benpist et al. [17]	2001	Retrospective	16	24 months
Hsu et al. [18]	2007	Prospective	12	38 months
Wilson et al. [19]	2011	Retrospective	72	48 months
Darzi et al. [20]	1995	Prospective	29	8 months
Himpens et al. [21]	1999	Prospective	37	N/A
Benoist et al. [17]	2001	Retrospective	14	47 months
Makineni et al. [22]	2014	Prospective	17	14 months
Dyrberg et al. [23]	2015	Prospective	81	24 months
Madbouly et al. [24]	2018	Retrospective	33	46 months
Matsuda et al. [25]	2019	Retrospective	10	25 months
Stevenson et al. [26]	1998	Prospective	30	18 months
Xynos et al. [27]	1999	Prospective	10	12 months
Rose et al. [28]	2002	Prospective	94	N/A
Lechoux et al. [29]	2005	Prospective	13	36 months
Ashari et al. [30]	2005	Prospective	117	62 months
Laubert et al. [31]	2012	Prospective	154	56 months
FormijneJonkers et al. [7]	2014	Retrospective	28	57 months

Table (2B): Findings of the included studies.

Study ID	Findings
Kessler et al. 1999	- Our experience indicates that laparoscopic suture rectopexy, with and without sigmoid colectomy, is safe, feasible, and effective for the treatment of rectal prolapse.
Bruch et al. 1999	- Laparoscopic procedures in the treatment of pelvic floor disorders, e.g., rectal prolapse or outlet obstruction, lead to acceptable functional results. However, follow-up has to be extended and long-term results of recurrence, continence, and constipation have to be evaluated.
Heah et al. 2000	- Laparoscopic suture rectopexy without resection is both safe and effective in this frequently frail population and offers a minimally invasive approach that may have potential advantages for selected groups of patients with full-thickness rectal prolapse.
Kellokumpu et al. 2000	- Laparoscopic-sutured rectopexy and laparoscopic-assisted resection rectopexy are feasible and carry an acceptable morbidity rate. They eliminate prolapse and cure incontinence in the great majority of patients
Benpist et al. 2001	- Our results show that the addition of sigmoid resection to laparoscopic rectopexy is safe and could contribute to reduce the risk of severe constipation after operation.
Hsu et al. 2007	- Laparoscopic rectopexy is safe and is associated with a low recurrence rate. If performed on patients who do not have a history of constipation, it is unlikely that suture rectopexy alone will cause motility problems provided the lateral stalks are not divided and extreme sigmoid redundancy is not created
Wilson et al. 2011	- Laparoscopic abdominal suture rectopexy without resection is safe and effective for the treatment of full-thickness rectal prolapse
Darzi et al. 1995	- The benefit of such a minimally invasive approach to rectal prolapse between especially obvious in the elderly or physiologically disabled patient with prolapse.
Himpens et al. 1999	- Our variation of the Wells technique performed laparoscopically is feasible and safe; it cures rectal prolapse and incontinence but also produces an unacceptable incidence of postoperative constipation
Benoist et al.	- Laparoscopic Wells procedure for rectal prolapse has good functional results, low recurrence rate and proved to be a feasible and safe procedure as supported by the literature.
Makineni et al. 2014	- The treatment of rectal prolapse should be individualized to achieve best results. Abdominal rectopexy can be safely applied in most of patients with minimal post operative increase in constipation and recurrence by using posterior mesh rectopexy technique.

Table (2C): Findings of the included studies.

Study ID	Findings
Dyrberg et al. 2015	- Laparoscopic posterior rectopexy is a safe and well-tolerated procedure in older patients and can be done with acceptable complications and recurrence rates and short hospital stays.
Madbouly et al. 2018	- Both LVR and LWR successfully and safely corrected the prolapse and prevented recurrence in patients after long-term follow-up.
Matsuda et al. 2019	- Laparoscopic posterior mesh rectopexy (LPMR) technique appears safe and acceptable with few complications and low recurrence rates.
Stevenson et al. 1998	- Laparoscopic-assisted resection rectopexy is feasible and safe, with acceptable recurrence rates and functional results compared with the open procedure in the surgical literature.
Xynos et al. 1999	- Resection rectopexy for rectal prolapse can be performed safely via the laparoscopic route. Recovery is uneventful and of shorter duration after the laparoscopic than after the open approach.
Rose et al. 2002	- The techniques of conventional prolapse surgery can readily be translated to the laparoscopic modality, since oncological criteria do not have to be considered. The usually elderly patients in this group benefit to a particular degree from the known advantages associated with reduced surgical trauma. Perioperative morbidity is determined largely by the surgeon's experience.
Lechaux et al. 2005	- Laparoscopic rectopexy with or without resection is both safe and effective. Advantages include low-morbidity, improved cosmesis, the rapid return of intestinal function, early discharge from hospital, and a low recurrence rate
Ashari et al. 2005	- Laparoscopically-assisted resection rectopexy for rectal prolapse provides a favorable functional outcome and low recurrence rate
Laubert et al. 2012	- This study supports the benefits of LRR for rectal prolapse in elderly patients. Age per se is not a contraindication for LRR. Elderly patients encounter complications slightly more frequently (although not statistically significant) than younger patients.
FormijneJonkers et al. 2014	- Both Laparoscopic resection rectopexy (LRR) and laparoscopic ventral rectopexy (LVR) are effective for the treatment for RP. Although both techniques offer significant improvements in functional symptoms, continence may be better after LRR.

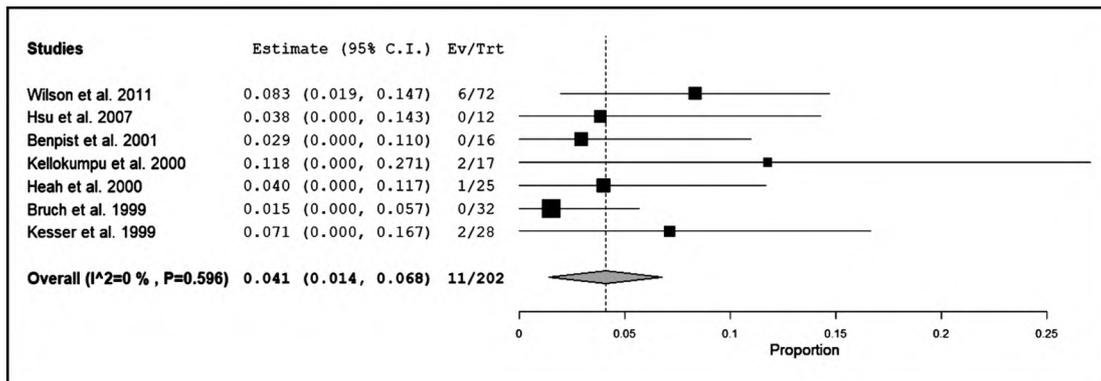


Fig. (2): Forest plot of risk ratio (RR) in recurrent rate in LSR.

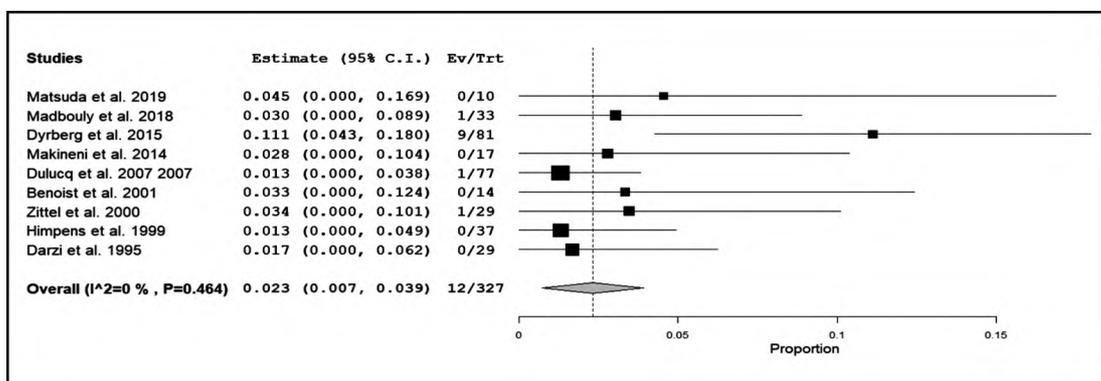


Fig. (3): Forest plot of risk ratio (RR) in recurrent rate posterior LMR.

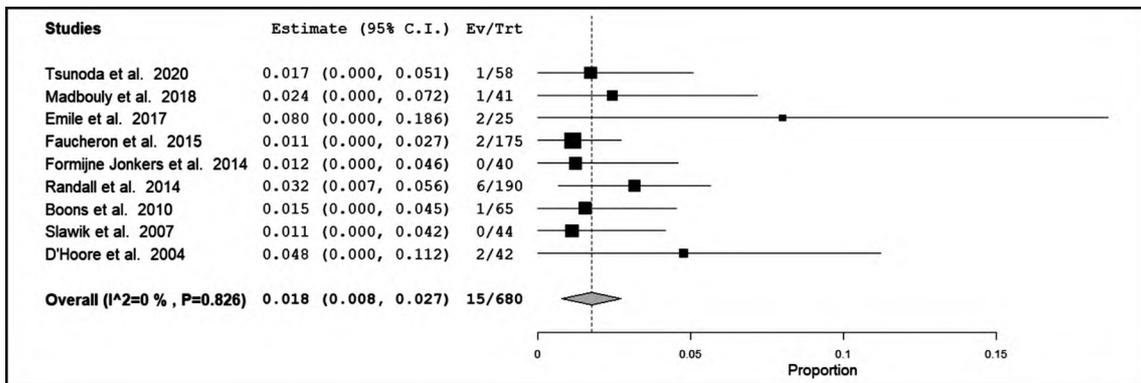


Fig. (4): Forest plot of risk ratio (RR) in recurrent rate ventral LMR.

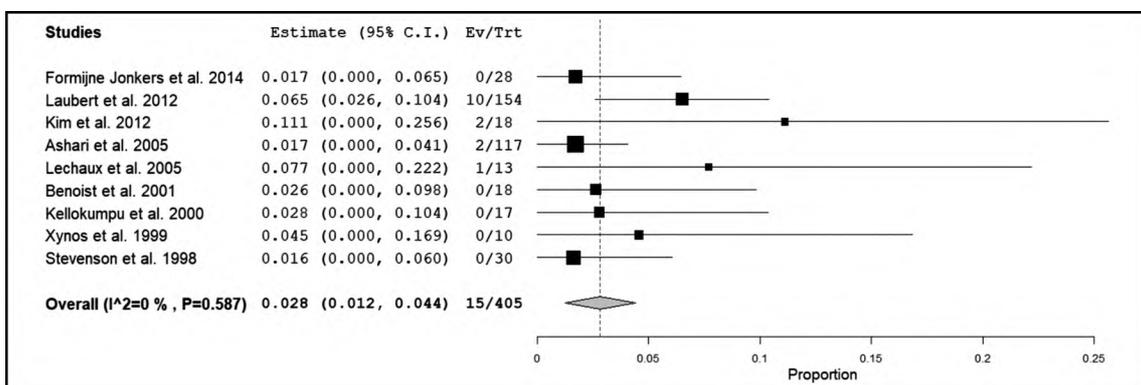


Fig. (5): Forest plot of risk ratio (RR) in recurrent rate LRR.

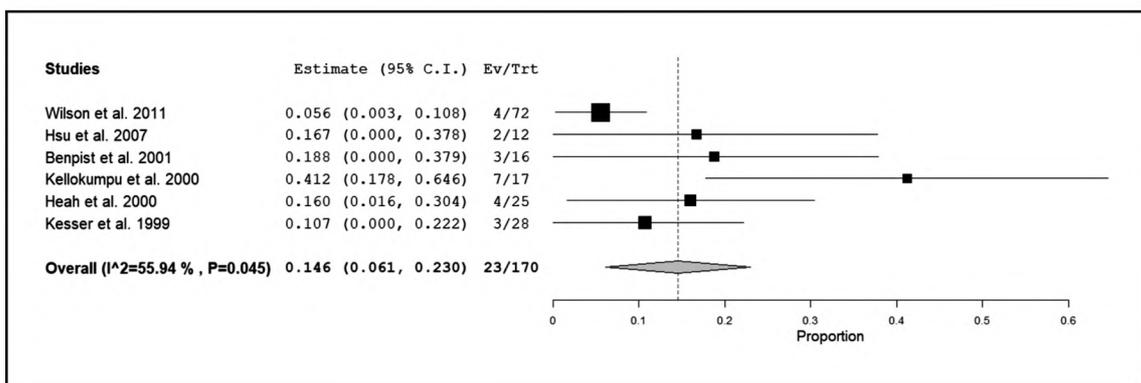


Fig. (6): Forest plot of risk ratio (RR) in the risk of morbidity in LSR.

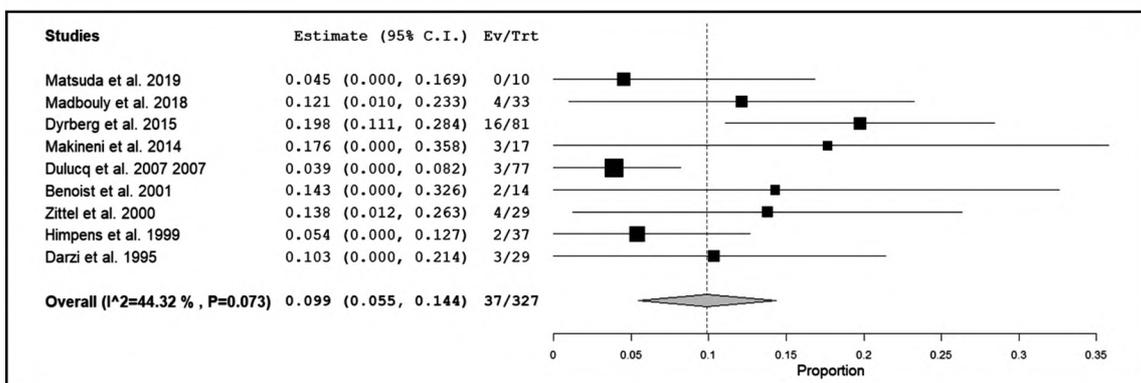


Fig. (7): Forest plot of risk ratio (RR) in the risk of morbidity in post. LMR.

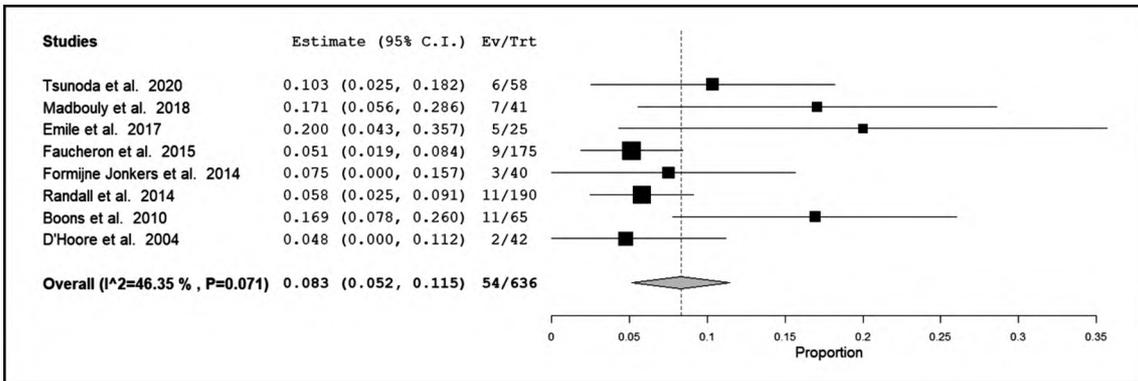


Fig. (8): Forest plot of risk ratio (RR) in the risk of morbidity in ventral LMR.

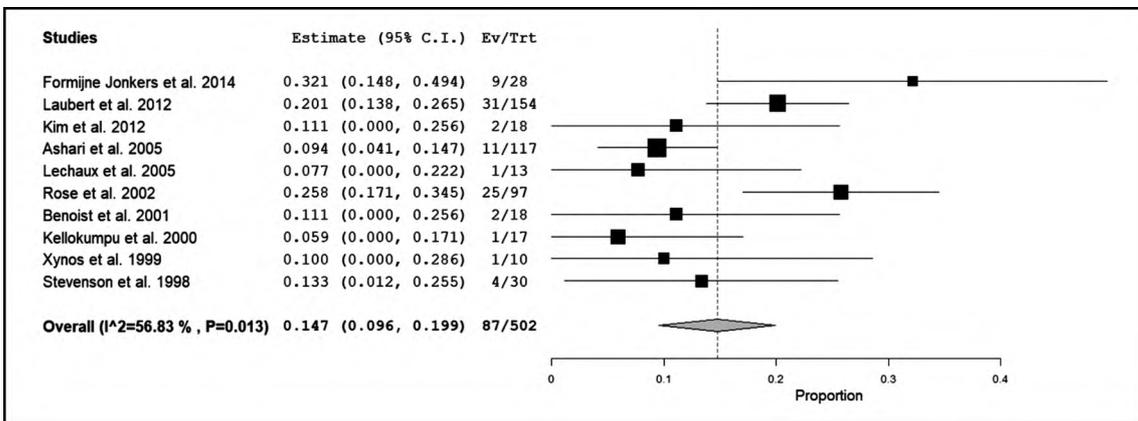


Fig. (9): Forest plot of risk ratio (RR) in the risk of morbidity in LRR.

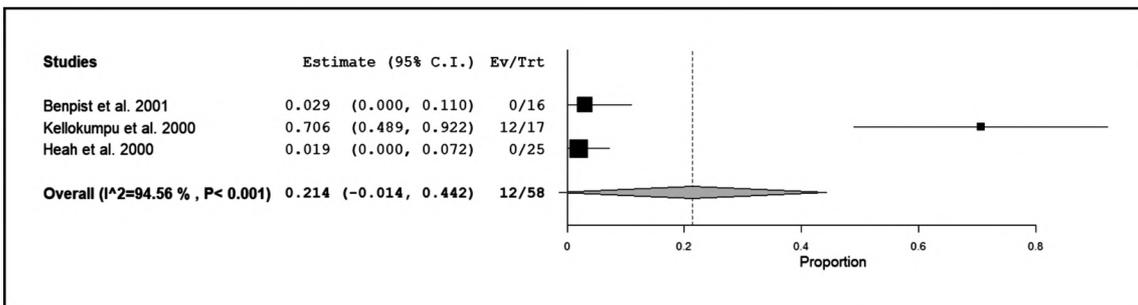


Fig. (10): Forest plot of risk ratio (RR) in the improvement of constipation in LSR.

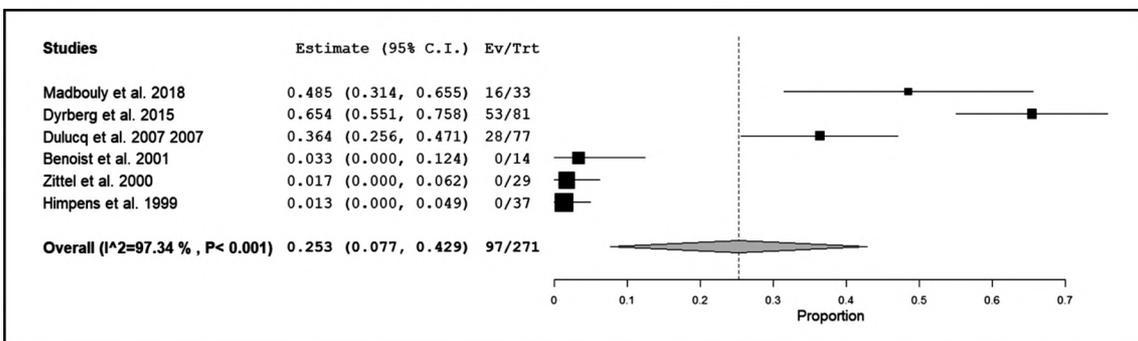


Fig. (11): Forest plot of risk ratio (RR) in the improvement of constipation in posterior LMR.

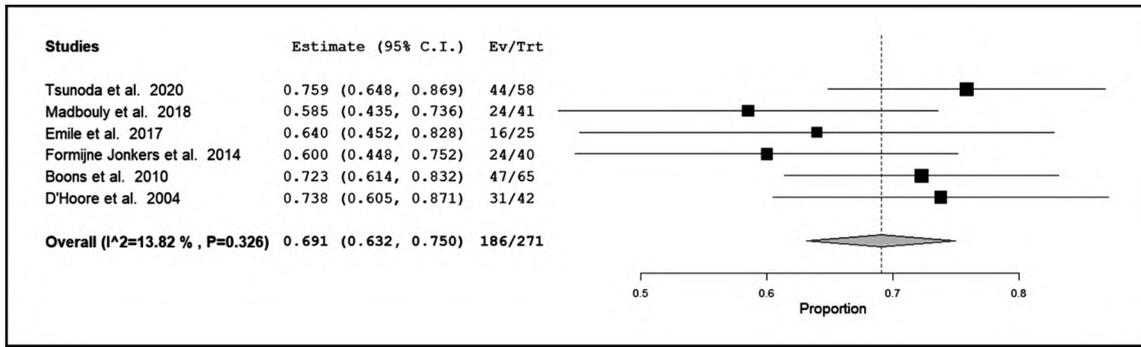


Fig. (12): Forest plot of risk ratio (RR) in the improvement of constipation in ventral LSR.

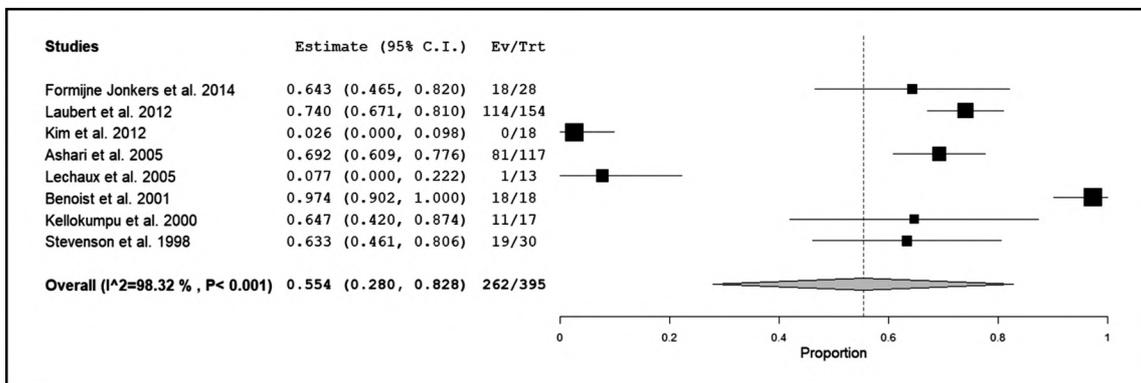


Fig. (13): Forest plot of risk ratio (RR) in the outcome of improvement of constipation LRR.

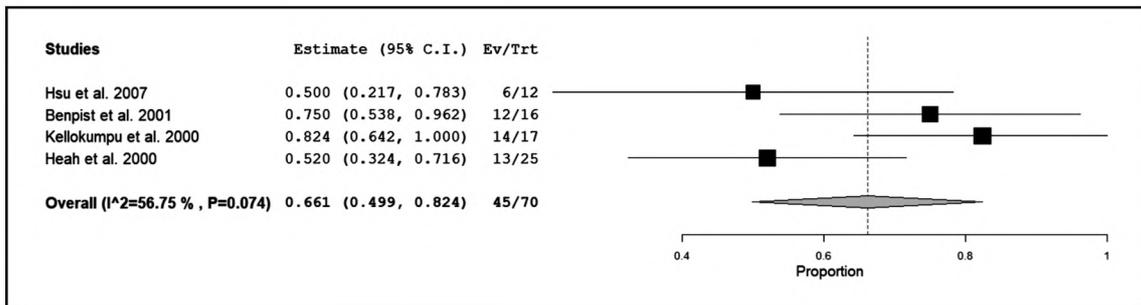


Fig. (14): Forest plot of risk ratio (RR) in the outcome of improvement of continence in LSR.

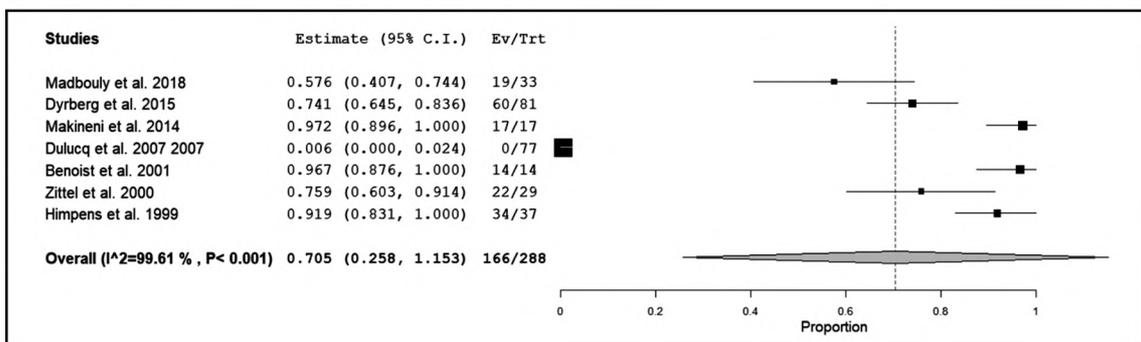


Fig. (15): Forest plot of risk ratio (RR) in the outcome of improvement of continence in post LMR.

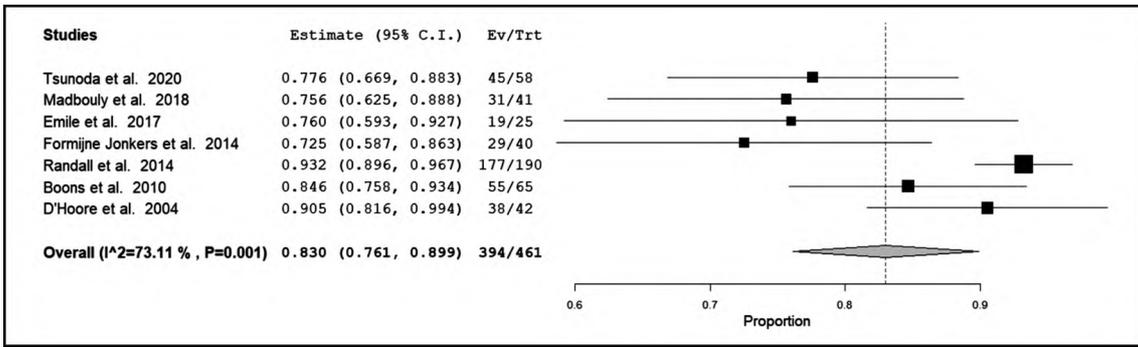


Fig. (16): Forest plot of risk ratio (RR) in the outcome of improvement of continence in ventral LMR.

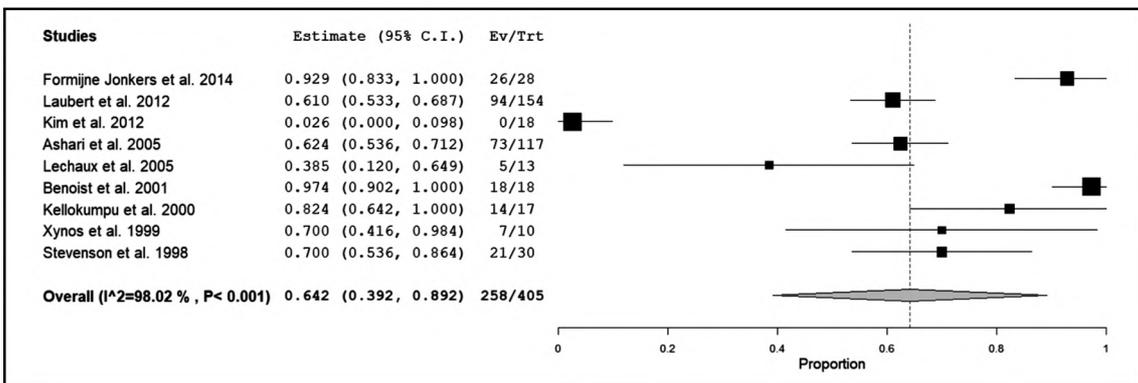


Fig. (17): Forest plot of risk ratio (RR) in the outcome of improvement of continence in LRR.

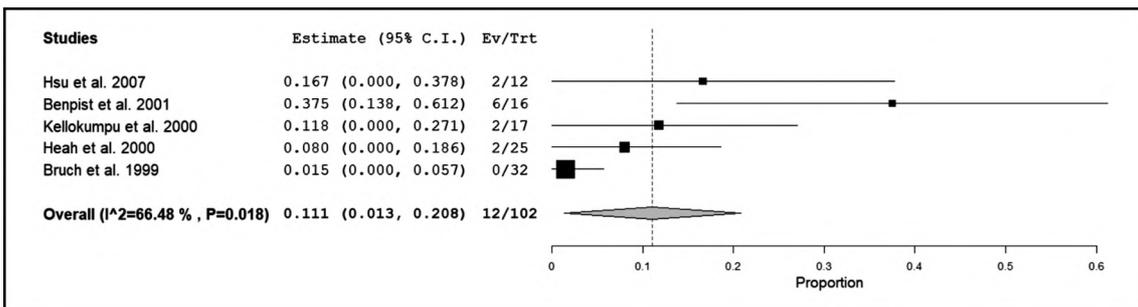


Fig. (18): Forest plot of risk ratio (RR) in the outcome of new onset of constipation in LSR.

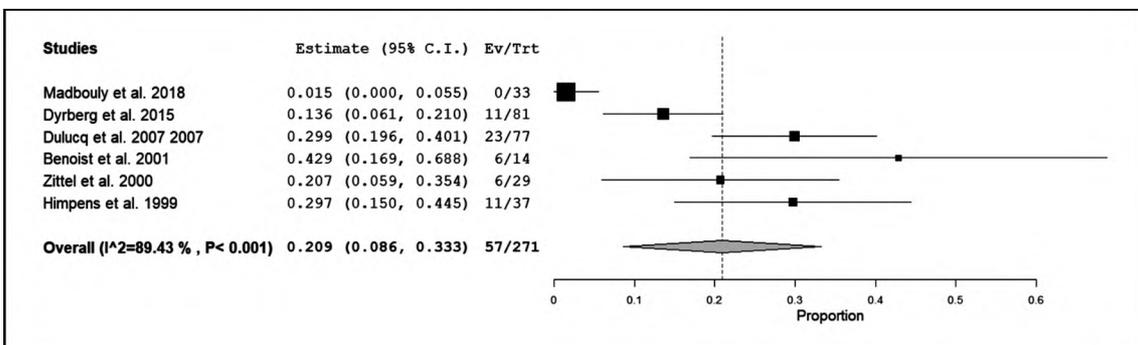


Fig. (19): Forest plot of risk ratio (RR) in the outcome of new onset of constipation in posterior LMR.

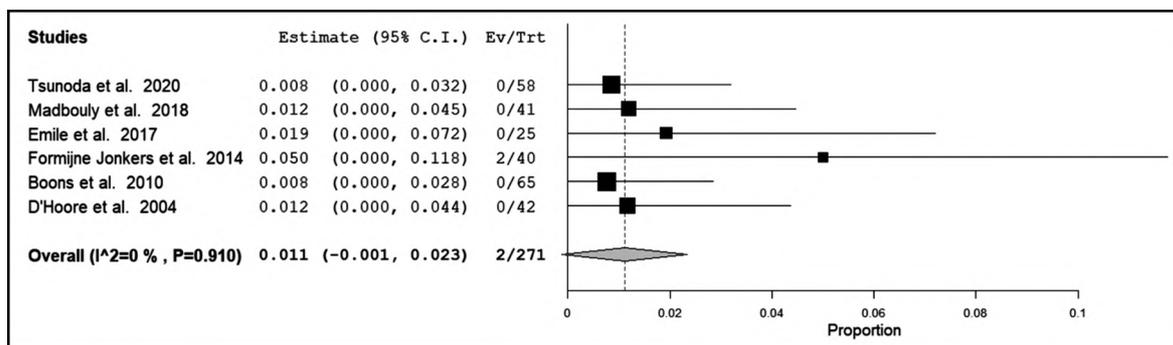


Fig. (20): Forest plot of risk ratio (RR) in the outcome of new onset of constipation in ventral LMR.

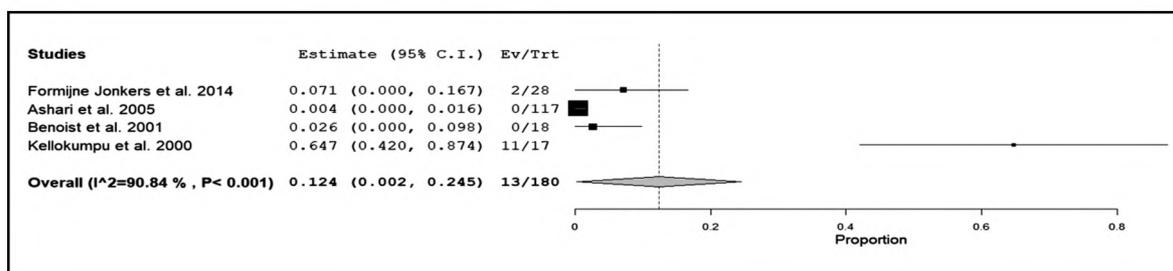


Fig. (21): Forest plot of risk ratio (RR) in the outcome of new onset of constipation in LRR.

## Discussion

Rectal prolapse refers specifically to prolapse of some or all of the rectal mucosa through the external anal sphincter. The highest incidence of rectal prolapse has been noted in the first year of life [32].

Complete rectal prolapse is a disabling condition that presents with fecal incontinence, constipation and rectal discharge. Incontinence may be explained by the presence of the prolapse, which leads to the chronic stretch of the sphincter, and continuous stimulation of the rectoanal inhibitory reflex by the prolapse tissue [33].

Constipation may result from intussusception of the rectum, which leads to narrowing bowel lumen and creating a blockage, which is deteriorated with excessive straining and colonic dysmotility. Hemorrhage occurs frequently when the prolapsed rectum is left unrestored. Pelvic organ prolapse, including bladder prolapse, uterine prolapse, or rectocele, may also be combined [34].

Described surgical techniques are varied, and whether the approach is abdominal or perineal, the treatment aims to correct anatomical and functional abnormalities by the fixation of the rectum to the sacrum and/or the resection of the redundant bowel.,

[35]. Comprehensive diagnostic tests provide clinicians with valuable information by detecting any underlying pathology and suggesting which patient will benefit from which procedure [36].

Recently, an abdominal approach via laparoscopy has emerged as a tool for the treatment of rectal prolapse that is a safe and effective alternative to the conventional open approach. Laparoscopic rectopexy results in lesser postoperative pain, lesser hospital stay, and better patient satisfaction than open rectopexy [37].

In view of the ongoing debates regarding the best approach for laparoscopic rectopexy in the management of complete rectal prolapse, it would be valuable to conduct a comprehensive systematic review and meta-analysis aimed to assess laparoscopic management of recurrent complete rectal prolapse, through a process of combining the results of individual studies with statistical methods in one review, regarding laparoscopic operations performed most frequently (Resection rectopexy, Suture rectopexy, Mesh rectopexy) and to examine the outcome following recurrence surgery.

We identified 21 studies with a total population of 869 patients comparing different types of laparoscopic rectopexy (suture, Resection, and Mesh either posterior or ventral).

*Risk of recurrence rate:*

The pooled analysis of the included studies in the current meta-analysis showed no significant positive results regarding the risk of recurrence postoperatively after laparoscopic suture rectopexy (LSR), posterior laparoscopic Mesh rectopexy (LMR), ventral laparoscopic Mesh rectopexy (LMR) and laparoscopic resection rectopexy (LRR), with non-significant  $p$ -values of 0.56, 0.464, 0.0826 and 0.587, respectively.

A meta-analysis study was conducted by Hajibandeh et al., to compare outcomes of laparoscopic mesh rectopexy (LMR) and laparoscopic posterior sutured rectopexy (LPSR) in patients with rectal prolapse. The results showed that the recurrence rate in the mesh group was 3.7% and it was 12.2% in the sutured group. LMR was associated with significantly lower recurrence rate compared to LPSR (OR: 0.28, 95% CI 0.11-0.73,  $p=0.009$ ) [38].

The meta-analysis conducted by Emile et al., aimed to determine the predictive factors of recurrence of full-thickness external rectal prolapse after Laparoscopic ventral mesh rectopexy (LVMR). It was concluded that LVMR is an effective and safe option in treatment of full-thickness external rectal prolapse with low recurrence rates. Male patients and length of the mesh may potentially have a significant impact on recurrence of rectal prolapse after LVMR [39].

Yehya et al., conducted a study to compare laparoscopic mesh rectopexy with laparoscopic suture rectopexy. A significant difference was found regarding the recurrence rate between patients underwent laparoscopic suture rectopexy (14.2%) and patients underwent laparoscopic mesh rectopexy (0%),  $p=0.038$  [40].

After long-term follow-up of double-blinded RCT that compared functional outcomes after laparoscopic ventral mesh rectopexy (LVMR) versus laparoscopic posterior suture rectopexy (LPSR) in patients with full-thickness rectal prolapse, Hidaka et al., detected that functional outcome after LVMR was significantly better than for LPSR, with a trend toward a lower recurrence rate. That may be due to the less likely autonomic nerve damage in LVMR because there is no posterior pelvic dissection, unlike LPSR [41].

Lundby et al., conducted a study comparing the changes in functional outcome 12 months after laparoscopic ventral mesh rectopexy versus laparoscopic posterior sutured rectopexy in patients

with rectal prolapse. Two (5%) patients in the posterior sutured rectopexy group developed recurrence within 12 months compared with none in the ventral mesh rectopexy group, which is insignificant difference ( $p=0.305$ ) [42].

Sahoo et al., conducted a study to compare the results of laparoscopic mesh vs. suture rectopexy. There were no risk of recurrence detected in any of the two procedures [43].

Yasser et al., conducted a study aiming to evaluate the outcome of laparoscopic ventral mesh rectopexy as a procedure for repair of complete rectal prolapse. Recurrence rate in this study was 15% of patients [44].

A systematic review by Gouvas et al., reviewed the short-term and functional results of laparoscopic ventral rectopexy, reported prolapse recurrence of 0% to 15% and mainly reflect differences in technique and length of follow-up, [45] whereas a large series of 919 consecutive laparoscopic ventral rectopexy patients by Consten et al., reported their long-term recurrence rate of 8.2% [46].

Randall et al., studied 190 patients with rectal prolapse who underwent LVMR, and reported a recurrence rate of 3% which is lower than recurrences rate in our study. The reason of higher recurrence rate of LVMR in these studies than the present study findings can be attributed to either technical factors or patient-related factors [47].

De Bruijn et al., reported recurrence rate of complete rectal prolapse in 23% of patients at median follow-up of 5 years and explained this high recurrence rate as their study population had median age of 66 years, which is slightly higher than in most studies [48].

The study by Fu et al., showed similar high recurrence of prolapse of 22.1% as they have taken more liberal definition of recurrence to include other forms of posterior compartment prolapse, also (29.6%) of patients who experienced recurrence had undergone prolapse repair operations, and lastly due to relatively longer median follow-up time in this study of about 4 years [49].

Long-term studies have shown that recurrence rates after complete rectal prolapse repair increase over the years [48].

Consten et al., showed Thirteen patients with complete rectal prolapse developed a clinical full thickness external prolapse recurrence generating a recurrence percentage (Kaplan-Meier estimates) of 4.2%, 7.2%, and 8.2% after 3, 5, and 10 years

respectively. Patients with recurrence may have an inherent tissue weakness, chronic pelvic floor laxity and poor anal sphincter function which contribute to recurrence [46].

#### *Morbidity:*

The analysis of the included studies showed a significant positive result regarding the postoperative morbidity after laparoscopic suture rectopexy and laparoscopic Resection rectopexy with a significant *p*-value of 0.045 and 0.013, respectively, meaning that there are some risks of morbidity after LSR and LRR. No significant positive results regarding the postoperative morbidity after posterior and ventral laparoscopic Mesh rectopexy were found with non-significant *p*-values of 0.073 and 0.071, respectively, meaning that there are no risks of morbidity after neither posterior nor ventral LMR.

In a multicenter study, including more than 2000 patients who underwent LVMR, by Evans et al 2.0% (45 patients) mesh erosion rate was reported with a median follow-up of 36 months (range, 0-162 months) [50]. In Hidaka et al., study, none of the patients underwent laparoscopic ventral mesh rectopexy (LVMR) or laparoscopic posterior suture rectopexy (LPSR) for full-thickness rectal prolapse developed mesh-related complication or underwent re-operation [51].

According to Lundby et al study findings Postoperative surgical complications of Clavien-Dindo grade II or worse were reported in one (3%) of 38 patients in the ventral mesh rectopexy group (ureteral injury resulting in urine leakage, and a psoas abscess) and one (3%) of 37 patients in the posterior sutured rectopexy group (hematoma and pelvic abscess) [42].

On comparing the results of laparoscopic mesh vs. suture rectopexy in Sahoo et al., study. There were no significant postoperative complications except for one (2.6%) port site infection in mesh rectopexy group [43].

Weinberg et al., conducted a study to was to retrospectively compare the results of LRR and LVR for the treatment for external RP. They detected that significantly, more complications occurred after LRR (n=9: 1 major, 8 minor) then after LVR (n=3: 2 major, 1 minor) ( $p < 0.05$ ). LRR had a higher complication rate then did LVR [52].

The number of minor and major complications after LRR in literature were between 13 and 30% for minor complications and around 5% for major complications [30,53].

In general, the complication rate after LVR is slightly lower in the literature: Several series of patients after LVR, all showing minor complication rates below 17% [54,55].

Major complications, for example mesh infection and mesh erosions after LVR, seem to be rare, although some cases of lumbar discitis at the proximal fixation point of the mesh have been described [56].

#### *Improvement of constipation and continence:*

The analysis of the included studies showed a significant positive result regarding the improvement of constipation postoperatively after laparoscopic suture rectopexy, posterior laparoscopic Mesh rectopexy and laparoscopic resection rectopexy, with significant *p*-values of  $<0.0001$  meaning that there was a significant improvement after LSR, posterior LMR and LRR.

No significant positive result regarding the improvement of constipation postoperatively after ventral laparoscopic Mesh rectopexy was found with a non-significant *p*-value of 0.326. No significant improvement of constipation after ventral LMR occurred.

In the present study no significant positive results regarding the improvement of continence postoperatively after laparoscopic suture rectopexy was detected, showing that there was no significant improvement of continence after LSR.

The analysis of the included studies in this meta-analysis showed a significant positive result regarding the improvement of continence postoperatively after laparoscopic Resection rectopexy, posterior and ventral laparoscopic Mesh rectopexy, meaning that there was a significant improvement of continence after LRR, posterior and ventral LMR.

Sahoo et al., in their study reported that constipation improved postoperatively in 61.1% of patients received laparoscopic suture rectopexy and in 47.3% of patients received laparoscopic mesh rectopexy. Improvement of continence was detected in 90.4% and 80% of patients received laparoscopic suture rectopexy and laparoscopic mesh rectopexy [43].

In agreement with the current meta-analysis findings, Yehya et al., reported that fecal incontinence improved in 92.8% in laparoscopic suture rectopexy while in mesh rectopexy it was improved in 100% of cases. The difference was insignificant that can be attributed to the small sample size (64

patients) or the different study population (pediatrics) [40].

In another study the Cleveland Clinic constipation faecal incontinence score was also reduced in both groups, by 3.55 (95% CI 2.07 to 5.02) in the posterior sutured rectopexy group and by 4.10 (2.11 to 6.09) in the ventral mesh rectopexy group, but did not differ significantly between groups [42].

Laubert et al., designed a study to evaluate both the perioperative results and the long-term functional outcome in patients who received laparoscopic resection rectopexy for rectal prolapse. Of those patients who had been recorded to have previous constipation, 81.3% stated a complete elimination or definite improvement of constipation after surgery. Of those patients who had been recorded with previous incontinence, 67.3% stated an elimination of incontinence or a definite improvement after surgery. Within a 5-year-period of follow-up, rates for improvement of constipation and incontinence were 89.1 and 76%, respectively [57].

Yasser et al., conducted a study aiming to evaluate the outcome of laparoscopic ventral mesh rectopexy as a procedure for repair of complete rectal prolapse. They reported that in those patients who had constipation at the time of presentation, there was a significant improvement in postoperative Wexner score as compared to preoperative scores. In patients presenting with faecal incontinence (FI), significant improvement in postoperative wexner (Cleveland clinic incontinence score) was found in (78.6%) of rectal prolapse patients treated with laparoscopic ventral rectopexy.

It can be explained by anatomical correction of the rectum as before surgery the rectum constantly presents to the anal canal which, by reflex, causes the internal sphincter muscle to relax. This type of incontinence often improves after surgery

[44].

In the systematic review by Gouvas et al., six studies assessed the value of Ventral rectopexy for complete rectal prolapse reported pre- and postoperative incontinence in 191 patients which ranged from 23.3 to 92.9% and 0 to 28.6%, respectively. Pooled analysis of the available data from all six studies demonstrated a statistically significant difference favoring the postoperative continence

[45].

Slawik et al., showed improvement of incontinence in (91%) of patients after laparoscopic ventral rectopexy for treatment of patients with full thick-

ness rectal prolapse [58]. Collinson et al., also focused on improvement of incontinence and found significant reduction of incontinence in 85% of patients after a mean follow-up of 12 months [59].

It should be noted that some of these results are relatively short-term and the functional result may not be borne out over the longer term. Nevertheless, many of these patients are elderly with relatively end-stage pelvic floors, and cannot be expected to be immune from deteriorating function in the longer term. In a series of 65 patients by Boons et al., constipation was cured or improved in (72%) of constipated cohort with fall in the overall median preoperative Wexner score from 9 to 4 [60].

Improved continence and constipation in patients after LVR seems to be caused by restored anatomy, probably resulting in a better function of the rectum, better sensitivity for faeces in the rectum and less bulging of the rectal wall, causing obstructed defecation syndrome (ODS) [61].

The cause of incontinence and constipation is regularly multifactorial and the patients who did not improve after surgery may have had other underlying factors causing symptoms of incontinence and constipation, such as anal sphincter failure or colonic transit disorders.

D'Hoore et al., have postulated that postoperative constipation was prevented by the avoidance of posterolateral rectal mobilization, which interrupts the autonomic sympathetic innervation of the rectum, causing a hindgut 'denervation inertia' and distal slow transit. They reported that relief of symptoms of ODS in 16 of 19 (84%) patients may be attributed to the ventral position of the mesh. The authors believe that resection rectopexy should be limited to selected patients with rectal prolapse and documented slow-transit constipation who have no major functional anal sphincter deficit [62].

#### *New onset of constipation:*

The analysis of the included studies showed a significant positive result regarding the new onset of constipation postoperatively after laparoscopic suture rectopexy (LSR), posterior laparoscopic Mesh rectopexy (LMR) and laparoscopic resection rectopexy (LRR) with a significant *p*-value of 0.018, <0.001 and <0.001, respectively, meaning that there is a significant risk of new onset of constipation after LSR, posterior LMR and LRR. However, no significant positive result regarding the new onset of constipation postoperatively after

ventral laparoscopic Mesh rectopexy (LMR) was detected. There is no significant risk of new onset of constipation after ventral LMR.

Avoidance of posterior mobilisation, preservation of the lateral stalks, and anterior distal mobilisation of rectum from the rectovaginal septum (in females) to the pelvic floor muscles with mesh fixation to the sacral promontory in ventral mesh rectopexy can potentially reduce postoperative new onset of constipation. The lateral ligaments containing the parasympathetic inflow to the left colon may be cut during mobilisation which can lead to constipation. At least two studies have demonstrated a higher incidence of constipation with significant changes in rectal sensation when lateral ligaments are divided as compared with when they are not [63].

In concordance of the present study findings Yasser et al., reported that there were no risk of onset of new constipation among patients underwent ventral LMR as a procedure for repair of complete rectal prolapse [44].

Posterior mesh rectopexy is argued to be associated with high rates of de novo constipation as well as worsening of pre-existing constipation as shown in Brown & Ellis study; [44] nevertheless, Hajibandeh et al., meta-analysis found comparable outcomes of posterior mesh rectopexy and sutured rectopexy [38].

#### Conclusion:

No risk of recurrence was detected in any of the laparoscopic approaches. Although, laparoscopic suture rectopexy (LSR) showed improvement of constipation, it had several adverse events (risk of morbidity, no improvement of continence and new onset of constipation). Laparoscopic resection rectopexy (LRR) showed improvement of the preoperative constipation and continence but it cause significant postoperative morbidity and new onset of constipation. Posterior LMR caused improvement of the preoperative constipation and continence, with no postoperative morbidity. Unfortunately, it caused new onset of constipation. Ventral LMR showed improvement of the preoperative continence with no postoperative morbidity or new onset of constipation. However, it didn't improve the preoperative continence.

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## مناجزة تدلى المستقيم المرتجع بالمناظر الجراحي تحليل تلوى

تدلى المستقيم الكامل هو حالة تؤدي إلى إعاقة تتمثل في عدم التحكم في البراز، والإمساك، وإفرازات المستقيم. تتنوع التقنيات الجراحية الموصوفة، وسواء كان النهج بطنياً أم عجاناً، يهدف العلاج إلى تصحيح التشوهات التشريحية والوظيفية عن طريق تثبيت المستقيم في العجز و/أو استئصال الأمعاء الزائدة عن الحاجة. في الآونة الأخيرة، ظهر نهج البطن عن طريق المناظر الجراحي كأداة لعلاج تدلى المستقيم، وهو بديل آمن وفعال للنهج المفتوح التقليدي.

تم اكتشاف نتيجة إيجابية مهمة فيما يتعلق باعتلال ما بعد العملية الجراحية بعد خياطة وتثبيت المستقيم بالمناظر واستئصال وتثبيت المستقيم بالمناظر، مما يعني أن هناك بعض مخاطر الاعتلال بعد خياطة وتثبيت المستقيم بالمناظر، واستئصال وتثبيت المستقيم بالمناظر، في حين لم تكن هناك مخاطر الاعتلال بعد تثبيت المستقيم الخلفي والأمامي بالشبكة بالمناظر.

في ضوء المناقشات الجارية بشأن أفضل نهج لاستئصال المستقيم بالمناظر في إدارة تدلى المستقيم الكامل، لم يتم الكشف عن خطر الارتجاع في أي من نهج المناظر الجراحي. وأظهر استئصال وتثبيت المستقيم بالمناظر تحسناً في إمساك ما قبل الجراحة والتحكم في البراز، ولكنه يسبب اعتلال كبير بعد الجراحة وظهور جديد للإمساك.

تسبب تثبيت المستقيم الخلفي بالشبكة بالمناظر في تحسن الإمساك والتحكم في البراز عن ما قبل الجراحة، مع عدم وجود اعتلال ما بعد الجراحة. ولكن لسوء الحظ تسبب في بداية جديدة للإمساك. أظهر تثبيت المستقيم الأمامي بالشبكة بالمناظر تحسناً في التحكم عن ما قبل الجراحة مع عدم وجود اعتلال بعد الجراحة أو بداية جديدة للإمساك.