Systematic review

doi:10.1111/codi.13574

Abdominal rectopexy for the treatment of internal rectal prolapse: a systematic review and meta-analysis

S. H. Emile*, H. A. Elfeki*, M. Youssef*, M. Farid* and S. D. Wexner†

*General Surgery Department, Colorectal Surgery Unit, Mansoura Faculty of Medicine, Mansoura University, Mansoura City, Egypt and †Department of Colorectal Surgery, Cleveland Clinic Florida, Weston, Florida, USA

Received 20 May 2016; accepted 9 October 2016; Accepted Article online 10 December 2016

Abstract

Aim Internal rectal prolapse (IRP) is a unique functional disorder that presents with a wide spectrum of clinical symptoms, including constipation and/or faecal incontinence (FI). The present review aims to analyse the results of trials evaluating the role of abdominal rectopexy in the treatment of IRP with regard to regarding functional and technical outcomes.

Method A systematic review of the literature for the role of abdominal rectopexy in patients with IRP was conducted. PubMed/Medline, Embase and the Cochrane Central Register of Controlled Trials were searched for published and unpublished studies from January 2000 to December 2015.

Results We reviewed 14 studies including 1301 patients (1180 women) of a median age of 59 years. The weighted mean rates of improvement of obstructed defaecation (OD) and FI across the studies were 73.9% and 60.2%, respectively. Twelve studies reported clinical recurrence in 84 (6.9%) patients. The weighted mean recurrence rate of IRP among the studies was 5.8% (95% CI: 4.2–7.5). Two hundred and thirty complications were reported with a weighted mean complication rate of 15%. Resection rectopexy had lower recurrence rates than did ventral rectopexy, whereas ventral rectopexy achieved better symptomatic improvement, a shorter operative time and a lower complication rate.

Conclusion Abdominal rectopexy for IRP attained satisfactory results with improvement of OD and, to a lesser extent, FI, a low incidence of recurrence and an acceptable morbidity rate. Although ventral rectopexy was associated with higher recurrence rates, lower complication rates and better improvement of bowel symptoms than resection rectopexy, these findings cannot be confirmed owing to the limitations of this review.

Keywords Internal rectal prolapse, rectopexy, resection rectopexy, ventral rectopexy, review, meta-analysis

Introduction

Internal rectal prolapse (IRP), or rectoanal intussusception, is the telescopic infolding of the rectal wall during defecation [1]. IRP is a common cause of obstructed defaecation (OD), but its exact incidence is still unknown. Nevertheless, it has been reported that IRP can be found in up to 40% of patients with OD during evacuation proctography [2].

Although the pathophysiology of IRP is not fully understood, two theories have been proposed. The first theory suggests that IRP is the primary pathology representing an initial stage of repeated trauma by the intussusception, eventually resulting in full-thickness external rectal prolapse [3]. The second hypothesis is that IRP occurs secondary to pelvic floor abnormalities such as anismus and rectocele, which are associated with chronic straining [2].

According to Shorvon and colleagues [4], IRP can be an asymptomatic condition: they observed that up to 50% of normal volunteers had IRP in defaecography. Symptomatic IRP usually presents with a sensation of obstruction of the anal canal and a feeling of incomplete evacuation during attempted defaecation. These complaints are attributed to infolding of the entire circumference of the rectum occupying the space within the anal canal, which explains failure of straining to relieve symptoms.

Alternatively, chronic IRP can present with faecal incontinence (FI) [5]. It has been postulated that FI associated with IRP is caused by occult defects of the external anal sphincter, traction pudendal neuropathy

Correspondence to: Sameh Emile, MD, General Surgery Department, Faculty of Medicine, Mansoura University Hospitals, PO 35516, Elgomhuoria Street, Mansoura City, Egypt.
E-mail: sameh200@hotmail.com
@dr_samehhany81

resulting from repeated excessive straining [6] and distension of the lower rectum by the intussusceptum activating the rectoanal inhibitory reflex and inducing relaxation of the internal anal sphincter causing overflow incontinence [7].

Evacuation proctography is the standard method for diagnosis of IRP. The main utility of proctography is to measure the anorectal angle and the length of the puborectalis muscle during defaecation. Proctography can also diagnose coexisting pathologies such as rectocele, enterocele, anismus and descending perineum syndrome. Isolated proctographic findings should not guide management, but should be carefully interpreted and correlated with clinical history before management decisions are made [8].

Patients with symptomatic IRP seldom respond to conservative measures such as laxatives and enemas. Only 34% of patients reported partial improvement of their symptoms after cathartic therapy, while 66% reported no effect or even a worsening of symptoms [9]. Hwang *et al.* [3] evaluated electromyography (EMG)-based biofeedback (BFB) retraining for patients with IRP and reported complete resolution of constipation in 33%, partial improvement in 19% and failure to improve in 48% of their patients.

Surgical treatment of IRP is classified into perineal and abdominal procedures. Perineal procedures include Delorme's operation and stapled transanal rectal resection (STARR).

Abdominal rectopexy is subdivided into resection and nonresection rectopexy, including mesh and suture rectopexy. Poor results have been reported by Graf *et al.* [10] after simple suture rectopexy, and by McCue and Thomson [11] after posterior Ivalon sponge rectopexy. A systematic review [12] of trials evaluating the efficacy of ventral rectopexy for internal and external rectal prolapse reported excellent results, with a mean recurrence rate of 3.4% and a mean percentage decrease in the constipation rate of 24%.

The number of well-powered observational studies evaluating abdominal rectopexy for IRP is limited. In addition, there are no randomized controlled trials comparing the different techniques of rectopexy. Therefore, this review aimed to analyse all eligible studies in which abdominal rectopexy was primarily used for the treatment of IRP.

Method

Search strategy

This systematic review was registered online on the PROSPERO website under the registration number CRD42016032811. A systematic review of the literature to assess the role of abdominal rectopexy in patients with IRP was conducted following the screening guidelines established by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Fig. 1) [13]. Electronic databases including PubMed/Medline, Embase and the Cochrane Central Register of Controlled Trials were searched for published and unpublished studies from January 2000 to December 2015. The PubMed function 'related articles' was used to search for further articles. The reference section of each publication was searched for relevant articles. The full text versions of the selected articles were reviewed independently by two reviewers (S.H.E. and H.A.E.) to check eligibility.

Keywords used in the search process included 'rectopexy', 'abdominal rectopexy', 'laparoscopic rectopexy', 'ventral rectopexy', 'anterior rectopexy', 'posterior rectopexy', 'resection rectopexy', 'suture rectopexy', 'internal rectal prolapse', 'rectoanal intussusception', 'obstructed defaecation' and 'faecal incontinence'. In addition, the following medical subject headings (MeSH) terms were used: (intussusception), (rectal prolapse), (constipation) and (faecal incontinence).

Inclusion criteria

The review included studies that involved patients who underwent abdominal rectopexy for IRP whether open or laparoscopic, which presented clinically with OD, FI or both. Comparative and cohort studies that evaluated any type of abdominal rectopexy were eligible for inclusion. No language restrictions were applied during screening of the articles.

Exclusion criteria

We excluded irrelevant articles, editorials, case reports, reviews and meta-analyses. Studies with a duration of follow-up of less than 12 months were excluded. Duplicate reports were identified and excluded. Articles that comprised patients with IRP in addition to patients with external rectal prolapse in the same context without clear reporting of the results for each entity were considered confounding and were excluded. Articles that did not clearly report the aim, methodology, demographic data of patients, final results and conclusion were also excluded.

Types of studies included

After reviewing the full text of 42 articles, 14 [14–27] met the eligibility criteria for inclusion. Thirteen studies

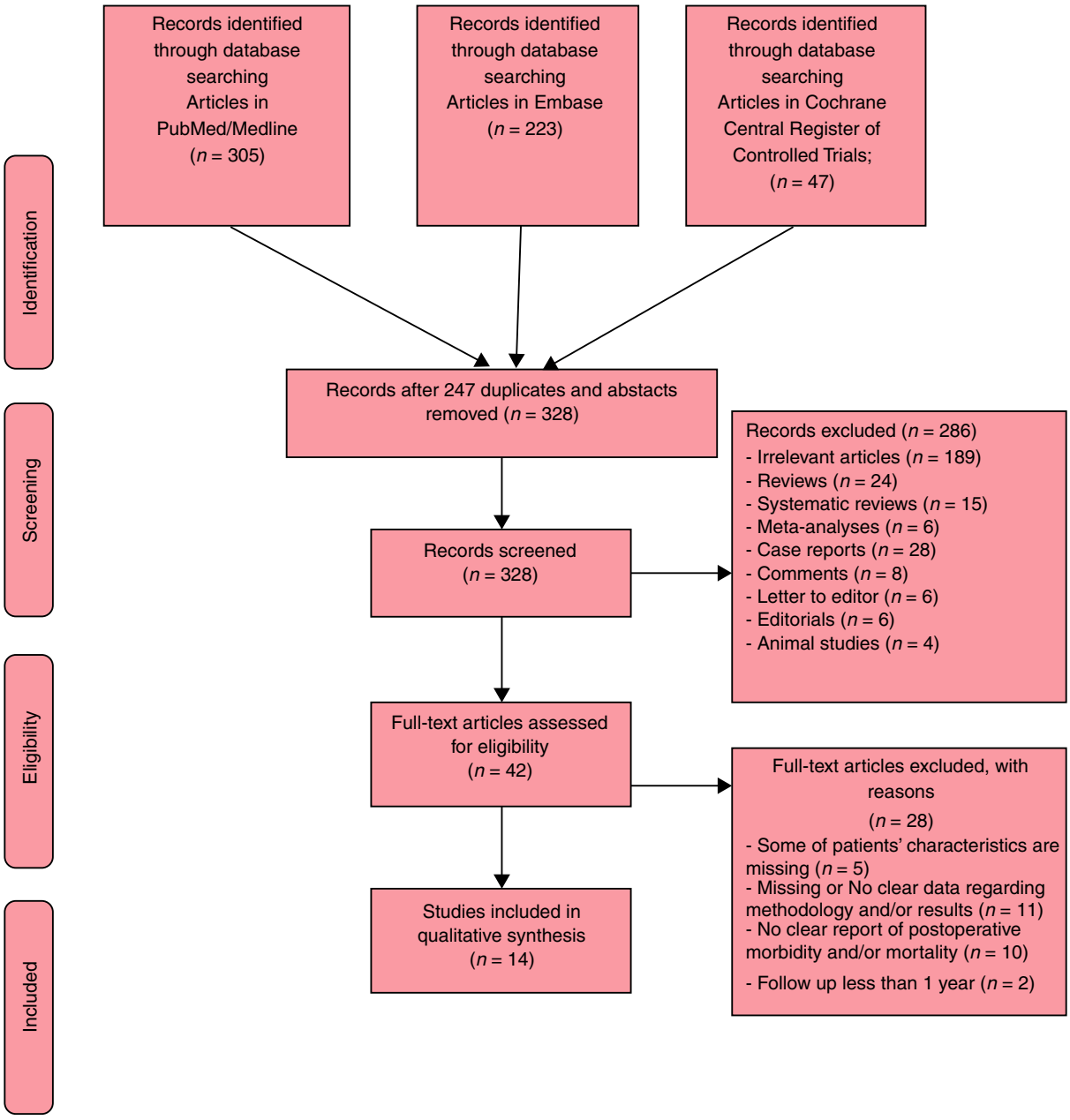

Figure 1 PRISMA flow diagram.

were noncomparative cohort studies, and one was a trial comparing ventral rectopexy with STARR. A summary of the characteristics of each study is shown in Table 1.

Assessment of methodological quality and bias within the included studies

Two reviewers (S.E and H.E) independently assessed the methodological quality and risk of bias in each study, and any discrepancies in interpretation were resolved by discussion and mutual agreement. The revised grading system of the Scottish Intercollegiate Guidelines Network (SIGN) [28] was used to assess comparative studies. The checklist for the quality of case series of the National Institute for Health and Care Excellence (NICE) [29] was used for assessment of cohort studies. Assessment revealed five studies of high quality and nine of fair quality. (Table 1)

Table 1 Characteristics of the 14 studies included in this review.

Study	Type of study	Duration of the study	Country	Type of rectopexy	No. of patients	Mean age (years)	Follow-up (months)	Quality of the study
Johnson *et al.* (2003) [14]	Retrospective	Sept 1998–Oct 2001	Norway	Resection	23	48	18	5/8 (fair)
Tsiaoussis *et al.* (2005) [15]	Retrospective	1993–2002	Greece	Resection	27	59	45	5/8 (fair)
von Papen *et al.* (2006) [16]	Retrospective	July 1998–Nov 2004	Australia	Resection	56	60	44	7/8 (good)
Collinson *et al.* (2010) [17]	Retrospective	Aug 2005–Dec 2007	UK	Ventral	75	58	12	6/8 (fair)
Portier *et al.* (2011) [18]	Retrospective	2002–2008	France	Ventral	40	60.6	38	7/8 (good)
Johnson *et al.* (2012) [19]	Retrospective	Feb 1999–June 2006	Norway	Resection	48	53	76	5/8 (fair)
Sileri *et al.* (2012) [20]	Retrospective	Apr 2009–Feb 2011	Italy	Ventral	34	59	12	6/8 (fair)
Gosselink *et al.* (2013) [21]	Prospective	Aug 2009–July 2011	UK	Ventral	72	59	12	7/8 (good)
Borie *et al.* (2014) [22]	Retrospective	2002–2011	France	Ventral	25	60	18	11/21 (fair)
Owais *et al.* (2014) [23]	Retrospective	2002–2013	UK	Ventral	50	34.5	41	5/8 (fair)
Gosselink *et al.* (2015) [24]	Retrospective	June 2010–Oct 2012	UK	Ventral	50	59	12	5/8 (fair)
Franceschilli *et al.* (2015) [25]	Retrospective	Apr 2009–Apr 2013	Italy	Ventral	98	63	20	7/8 (good)
Tsunoda *et al.* (2015) [26]	Retrospective	Feb 2012–Nov 2013	Japan	Ventral	26	75	16	5/8 (fair)
Consten *et al.* (2015) [27]	Retrospective	Jan 1999–April 2013	Netherlands and Belgium	Ventral	677	50.1	33.9	7/8 (good)

Variables of interest

Data collection objectives focused on the technical outcome and function of abdominal rectopexy for IRP. The primary objective was clinical and radiological recurrence of IRP, and the secondary objectives included postoperative improvement of symptoms (OD and FI), functional bowel scores, complication and mortality rates, operative time and length of hospital stay (LOS).

Assessment of publication bias among the included studies

A funnel plot of the standard error of the recurrence rates against the recurrence rates of the included studies was used to assess the publication bias across the studies of this review. A straight vertical line in the plot indicates the zone in which 95% of studies should be if there were no publication bias. (Fig. 2). The Begg and Mazumdar rank correlation test was used to investigate publication bias and the Kendall's tau-b (corrected for ties, if any) was −0.257, with a one-tailed *P*-value of 0.121 and a two-tailed *P*-value of 0.243.

Egger's regression test was also performed and the intercept (B0) was −0.6347 (95% CI: −1.696 to 0.426), with $t = 1.332$ and 10 degrees of freedom (d.f.). The one-tailed *P*-value was 0.106 and the two-tailed *P*-value was 0.212.

Statistical analysis

Data were extracted from the original articles into fields of Excel (Microsoft Windows). Variables were expressed using median, normal range and percentage of patients reported in each variable. A meta-analysis was conducted using open-source, cross-platform software for advanced meta-analysis, openMeta[Analyst]™ version 12.11.14. Data concerning postoperative recurrence, complications and improvement of symptoms were pooled and the weighted mean rates with 95% CI were calculated. A fixed-effect model was used to pool data when statistical heterogeneity was not present. In cases of significant ($P < 0.1$) statistical heterogeneity, the binary random-effect model was utilized for pooling of data.

Results

The included studies

Fourteen studies fulfilled the eligibility criteria, 13 being retrospective studies and one prospective [21]. All were

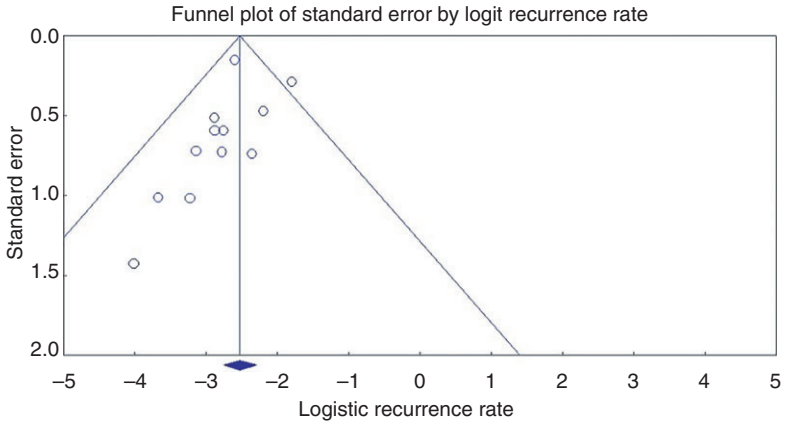

Figure 2 Funnel plot demonstrating publication bias regarding recurrence of IRP among the 14 studies fulfilling the criteria for entry in the review.

published between 2003 and 2015 and 12 (85.7%) studies were conducted in European countries. All but one of the studies [22] were of cohort observational design. The exception was a nonrandomized comparison between ventral rectopexy and STARR. Ventral mesh rectopexy, as described by D'Hoore *et al.* [30], was reported in ten studies and resection rectopexy in four [14–16,19]. Abdominal rectopexy was performed laparoscopically in all the studies and in four [14,15,18,19] open rectopexy was also used (Table 1).

Patient demographics

The 14 studies included 1301 patients (1180 (90.7%) women; 121 (9.3%) men) of median age 59 (34.5–75) years. The commonest symptom was mixed OD and FI in twelve studies and FI without OD in two [21,24]. The median duration of symptoms was 84 (30–156) months. All patients had internal rectal prolapse (IRP) diagnosed clinically, by defaecography and/or by examination under anaesthesia. Eight studies [14,19,21–24,26,27], including 971 patients, reported the presence of a concomitant anterior rectocele in 671 (69.1%) patients. Ten studies, which included 1158 patients, classified rectoanal intussusception according to the Oxford grading system as Grade I–II in 50 (4.4%) patients and Grade III–V in 1108 (95.6%).

Surgery

Abdominal rectopexy was performed laparoscopically in 1238 (95.1%) of the 1302 patients and was undertaken by an open approach in 63 (4.9%). Twenty-four (1.9%) laparoscopic procedures were converted to open surgery, with conversion rates ranging from 0% to 12%. The median operation time was 110 (60–198) min in five studies. [16,20,23,25,26] and the median length of hospital stay was 2 (1–7) days in nine studies. The median duration of follow-up was 19 (12–76) months.

Clinical outcome including function

Twelve studies (Table 2) reported improvement of OD in 577 (75.1%) of 768 patients; and improvement of FI in 392 (63.8%) of 614 patients. The weighted mean rate of improvement of OD in all the studies was 73.9% (95% CI: 65.9–81.9). The weighted mean rate of improvement of FI in the studies was 60.2% (95% CI: 45.6–74.9) (Table 3). The median rate of postoperative improvement of OD was 77.1 (41–92)% and the median rate of improvement of FI was 63.3 (0–91.5)%.

Seven studies [14,16,18,19,21,26,27] reported new-onset or worsening of OD in a median of 4.5 (2.4–11.5)% of patients. Five studies [16,19,21,24,27] reported new-onset or worsening of FI in a median of 7.5 (3.1–14.5)% of patients. Symptoms as assessed by functional bowel scoring systems improved in six studies [17,20,21,24–26]. The median Wexner constipation score [31] decreased from 12.5 (10.3–18.4) to 6.5 (5–8) and the median Fecal Incontinence Severity Index (FISI) score [32] had fallen from 29 (8.4–42) to 11.5 (3–25) at 1 year.

Recurrence

Postoperative recurrence of IRP was defined by clinical and radiological evidence of IRP associated with residual or persisting clinical symptoms. In 12 studies recurrence was reported to occur in 84/1204 (6.9%) patients (Table 2). It included external or mucosal prolapse (n = 10), rectoanal intussusception (n = 72) and worsening of symptoms (n = 2). The weighted mean recurrence rate of IRP in all the studies combined was 5.8% (95% CI: 4.2–7.5) (Table 4, Fig. 3) and the median rate of recurrence was 5.5 (0–14)%.

Table 2 Clinical outcome and function after abdominal rectopexy in the 14 included studies.

Study	No. of patients	Preoperative constipation	Postoperative constipation	Preoperative FI	Postoperative FI	Recurrence, *n* (%)	Complications, *n* (%)
Johnson *et al.* (2003) [14]	23	20	8	2	2	2 (8.6)	6 (26)
Tsiaoussis *et al.* (2005) [15]	27	27	6	7	2	0	6 (22)
von Papen *et al.* (2006) [16]	56	28	13	24	8	3 (5.3)	7 (12.5)
Collinson *et al.* (2010) [17]	75	65	9	59	5	4 (5)	3 (4)
Portier *et al.* (2011) [18]	40	20	7	27	8	1 (2.5)	3 (7.5)
Johnson *et al.* (2012) [19]	48	35	8	48	22	2 (4.1)	11 (23)
Sileri *et al.* (2012) [20]	34	28	5	15	6	2 (5.8)	9 (23.5)
Gosselink *et al.* (2013) [21]	72	Not reported	Not reported	72	51	Not reported	10 (14.4)
Borie *et al.* (2014) [22]	25	20	4	Not reported	Not reported	Not reported	6 (24)
Owais *et al.* (2014) [23]	50	Not clear	Not clear	Not reported	Not reported	5 (10)	11 (22)
Gosselink *et al.* (2015) [24]	50	Not reported	Not reported	50	39	3 (6)	2 (4)
Franceschilli *et al.* (2015) [25]	98	89	7	43	6	14 (14)	16 (16)
Tsunoda *et al.* (2015) [26]	26	22	13	21	7	1 (3.8)	2 (7.6)
Consten *et al.* (2015) [27]	677	414	111	246	66	47 (7)	138 (20.3)
Total	1301	768	191	614	222	84/1194	230/1301

Six studies [15,17,19,23,24,26], which included 276 patients, reported radiological evidence of IRP in the postoperative defaecogram in 21 (7.6%) patients, but eight patients were completely without clinical symptoms and were thus not considered to have recurrence. The median rate of radiographic improvement or resolution of signs of IRP was 94.5 (69.2–100)%.

Management of recurrent IRP included STARR in 20 patients, a revision rectopexy in seven, Delorme's procedure in four and the formation of a stoma in one patient owing to worsening of OD. The management of 47 cases of recurrence reported in one article [27] was not discussed.

Complications and mortality

One hospital death occurred in one [27] of the 14 studies. Of the 1301 patients having abdominal rectopexy, 230 complications were recorded, including one study [15] which gave the number of complications without any further detail. The weighted mean complication rate was 15% (95% CI: 10.2–19.7) and the median rate of complications was 18.1 (4–26)% (Table 4, Fig. 4).

Complications classified according to the Clavien–Dindo classification were Grade I/II in 13.7% of 1301 patients and Grade III/VI in 3.9% of 1301 patients. The most frequent complication was urinary tract infection followed by wound infection.

Mesh-related complications were reported in 13 (1.1%) of the 1147 patients after ventral mesh rectopexy. They included mesh detachment, erosion, infection, fistula formation and intestinal obstruction caused by adhesions to the mesh.

Ventral and resection rectopexy compared

The outcome of ventral mesh rectopexy and resection rectopexy was evaluated in nine and four studies, respectively. Their respective overall weighted mean recurrence rates were 3.9 (0.9–6.9) and 6.5 (4.4–8.6), but publication bias in the studies evaluating ventral and resection rectopexy regarding baseline characteristics and the type and duration of bowel symptoms may render the comparison between the two techniques unbalanced. Based on the reported evidence, comparison between the outcome of ventral rectopexy and resection rectopexy is shown in Table 5.

Discussion

IRP presents with a wide spectrum of clinical features, ranging from constipation to FI [33]. Most patients

Table 3 Weighted mean rates of improvement of obstructive defaecation (OD) and faecal incontinence (FI) after abdominal rectopexy in the 14 studies fulfilling the entry criteria for the study.

	Homogeneity *Q*-statistic	*P*-value	Total number of patients with OD or FI	No. of patients improved	Improvement rate (%) (95% CI)	±SE
Obstructed defaecation						
Abdominal rectopexy (overall)	56.5 (10 d.f.)	< 0.001	768	577	73.9 (65.9–81.9)	0.04
Ventral mesh rectopexy	45.9 (6 d.f.)	< 0.001	658	502	76.6 (66.6–86.6)	0.05
Resection rectopexy	5.82 (3 d.f.)	0.12	110	75	68.6 (56.7–80.5)	0.06
Faecal incontinence						
Abdominal rectopexy (overall)	181.2 (11 d.f.)	< 0.001	614	392	60.2 (45.6–74.9)	0.07
Ventral mesh rectopexy	171.2 (7 d.f.)	< 0.001	533	345	62.5 (44.1–80.8)	0.09
Resection rectopexy	5.38 (3 d.f.)	0.14	81	47	56.7 (40.9–72.6)	0.08

Table 4 Weighted mean recurrence and complication rates after abdominal rectopexy.

	Homogeneity *Q*-statistic	*P*-value	No. of patients	Total no. of recurrences or complications	Recurrence rate or complication rate (%) (95% CI)	±SE
Recurrence						
Abdominal rectopexy (overall)	13.2 (11 d.f.)	0.28	1204	84	5.8 (4.2–7.5)	0.009
Ventral mesh rectopexy	9.08 (7 d.f.)	0.24	1050	77	6.5 (4.4–8.6)	0.01
Resection rectopexy	1.62 (3 d.f.)	0.65	154	7	3.9 (0.9–6.9)	0.01
Complications						
Abdominal rectopexy (overall)	64.8 (13 d.f.)	< 0.001	1301	230	15 (10.2–19.7)	0.02
Ventral mesh rectopexy	59.5 (9 d.f.)	< 0.001	1147	200	13.6 (7.9–19.3)	0.02
Resection rectopexy	3.26 (3 d.f.)	0.35	154	30	18.4 (12–24.8)	0.03

with IRP do not respond to conservative treatments such as biofeedback, although this is often recommended as an initial therapy [34].

Surgical treatment of IRP includes abdominal and perineal approaches. The indications for Delorme's procedure initially used for the treatment of external rectal prolapse have expanded to include IRP. Berman *et al.* [35] reported symptomatic relief in 71% of IRP patients at 3 years after Delorme's procedure. Similarly, Liberman *et al.* [36] reported that 75% of patients with combined IRP and rectocele were satisfied after Delorme's procedure. Delorme's procedure was related to complications including transient FI, anal stenosis, rectal bleeding and urinary retention [37].

Treatment of IRP by abdominal rectopexy dates back to 1984, when Detry *et al.* [38] applied Orr–Loygue rectopexy to eleven patients with external rectal prolapse and to nine with IRP. The authors stated that the technique was efficient and free of complications when used for incipient IRP or external rectal prolapse. McCue and Thomson [39] treated 12 patients with symptomatic IRP by posterior rectopexy with the insertion of polyvinyl alcohol sponge. No recurrence of IRP was recorded and only one patient remained incontinent to solid stool, although no improvement of OD was noted. Two patients developed complications, one of whom had an abscess, the other experiencing severe constipation necessitating a colostomy.

Orrom *et al.* [40] studied 17 patients with IRP presenting with OD, 11 of whom underwent anterior and posterior rectopexy while 6 had posterior rectopexy only. Despite the significant improvement of symptoms on initial follow-up, only two patients had long-term improvement at 30 months, whereas 15 patients experienced persistent defaecatory difficulty. The authors nevertheless concluded that abdominal rectopexy is ineffective in the treatment of IRP patients presenting with OD.

Christiansen *et al.* [2] emphasized that rectopexy does not relieve OD when associated with IRP following the treatment of 24 patients with OD due to rectal intussusception by abdominal rectopexy with polyvinyl sponge insertion ($n = 9$) or the Orr–Loygue procedure ($n = 15$). IRP was absent on postoperative

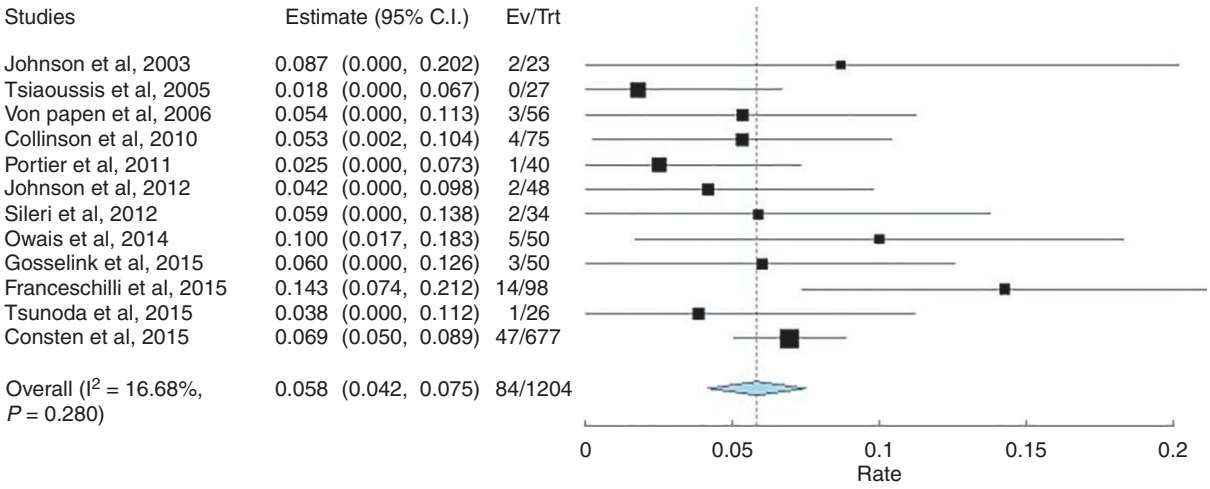

Figure 3 Forest plot of weighted mean recurrence rates of internal rectal prolapse after abdominal rectopexy.

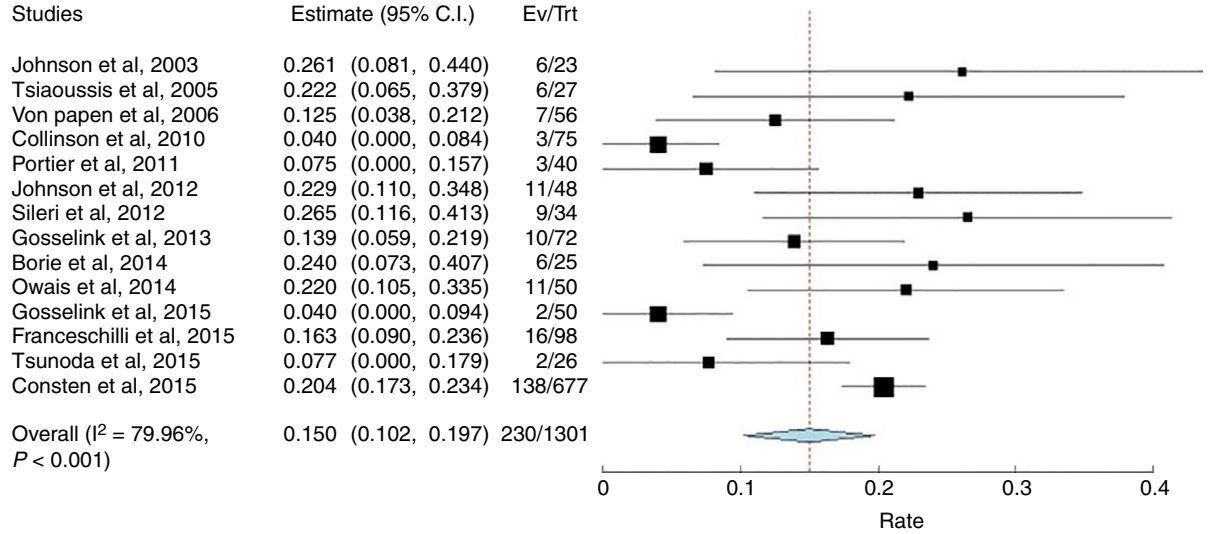

Figure 4 Forest plot of weighted mean complication rates after abdominal rectopexy.

defaecography in 22 patients, but despite this none reported complete relief of OD symptoms. Another study on 19 patients with IRP who underwent posterior abdominal rectopexy showed that despite anatomical correction of rectal intussusception the preexisting defaecation disorder was not relieved [41].

Function after abdominal suture rectopexy was evaluated by Graf *et al.* [42] on 33 patients with external rectal prolapse and 19 patients with IRP. After rectopexy, patients with external prolapse reported less constipation (30 *vs* 16%) and FI than those with IRP (36 *vs* 16%). It was clear that while rectopexy improved rectal emptying and continence in external rectal prolapse, it worsened bowel symptoms in patients with IRP.

The concept of rectovaginopexy was devised by Silvis *et al.* [43] after they observed poor amelioration of symptoms, particularly constipation, after abdominal rectopexy. One year after rectovaginopexy, only 4 of 17 patients with OD had residual symptoms, and 15 of 17 patients with FI reported significant improvement of continence. In addition, rectovaginopexy corrected associated enterocele, rectal intussusception and 60% of rectoceles. As their technique avoided dorsal and lateral mobilizations of the rectum, no inadvertent injury of the hypogastric or pelvic autonomic nerves was encountered.

In the present review, we systematically searched the literature for trials evaluating abdominal rectopexy in patients with IRP. A previous systematic review [12]

Table 5 Comparison between ventral mesh rectopexy and resection rectopexy for internal rectal prolapse.

Item	Ventral mesh rectopexy	Resection rectopexy
No. of studies	10	4
No. of patients	1147	154
Male/female	113/1034	8/146
Median (range) age (years)	59 (34.5–75)	56 (48–60)
Median duration of complaint (months)	132	84
Laparoscopic/open procedure	1124/23	114/40
Median operation time (min)	92.5	123
Median length of hospital stay (days)	2	4
Weighted mean rate of improvement of constipation (95% CI)	76.6 (66.6–86.6)%	68.6 (56.7–80.5)%
Weighted mean rate of improvement of FI (95% CI)	62.5 (44.1–80.8)%	56.7 (40.9–72.6)
New-onset or worsening of constipation (range)	0–11.5%	2–5%
New-onset or worsening of FI (range)	0–14%	4–14.5%
Incidence of recurrence	77/1050 (7.3%)	7/154 (4.5%)
Weighted mean recurrence rate (95% CI)	6.5 (4.4–8.6)%	3.9 (0.9–6.9)%
Incidence of complications	200/1147 (17.4%)	30/154 (19.4%)
Weighted mean complication rate (95% CI)	13.6 (7.9–19.3)	18.4% (12–24.8)
Median rate of complications (range)	14.3 (4–24)%	22.5 (12.5–26)%
Rate of conversion to open surgery (range)	0–2.9%	0–12%
Median follow-up in months (range)	17 (12–41)	44.5 (18–76)

evaluated the efficacy of abdominal ventral rectopexy only in patients with external and internal rectal prolapse combined. The evidence indicates, however, that external rectal prolapse and IRP are two separate entities, each of which therefore needs individual analysis.

The present review included four trials in which rectopexy with sigmoid resection was assessed, and ten trials that evaluated ventral mesh rectopexy according to the original technique described by D'Hoore *et al.* None of the trials involved posterior fixation of the rectum, whether by sutures or prosthesis such as mesh or sponge. This may have the important implication that posterior rectopexy is now obsolete for the treatment of IRP, as previous studies [2,39–42] have demonstrated its failure to improve the intractable constipation observed in patients with IRP.

Of the 1301 patients with IRP, around 90% were female in their fourth or fifth decade of life, which is in line with the statement of Varma *et al.* [44] that OD commonly affects middle-aged women. Most had mixed long-standing symptoms of OD and FI, sometimes for several years, which reflects the long period spent trying various conservative treatments without benefit.

Defaecography has been the gold standard for the diagnosis of IRP. Its use has extended to the detection of coexisting abnormalities such as anterior rectocele in around 70% of patients. The frequent association of rectocele with IRP is logical as most patients are middle-aged or postmenopausal women. Obstetric trauma alters the functional and anatomical position of the pelvic floor muscles, nerves and connective tissue, and also stretches the rectovaginal fascia, resulting in thinning and the subsequent development of anterior rectocele [45].

Improvement in bowel symptoms after abdominal rectopexy occurred in 73.9% of patients with OD and in 60.2% of patients with FI. The rates of improvement of OD and FI after ventral rectopexy, according to a previous review [12], were 24% and 45%. The difference between the two reviews, mainly in the improvement of OD, can be explained by the fact that the previous review included seven studies that reported the Orr–Loygue technique with posterior fixation, which is associated with poor resolution of constipation and even can induce new-onset constipation. In contrast, the improvement of OD after ventral mesh rectopexy without posterior mobilization reached up to 92% in the present review. It was noteworthy that better improvement of OD occurred after ventral mesh rectopexy than resection rectopexy, which may be because ventral mesh rectopexy results in elimination of the pouch of Douglas and creates a stiff rectovaginal septum that inhibits any associated enterocele or rectocele [46].

The weighted mean recurrence of symptoms of 5.8%, was slightly higher than the 3.4% reported in the previous review [12]. Since the other review included patients with external rectal prolapse in addition to IRP patients, the incidences of recurrence cannot be

objectively compared. One study [26] reported radiological evidence of IRP in the postoperative defaecogram in eight patients who were completely free of symptoms despite radiological evidence of IRP. This observation [47] highlights the poor correlation between evident IRP on proctography and symptoms. It also highlights the difficulty in evaluating the results objectively. The mean complication rate of 15% was mostly due to urinary tract infection. Ventral rectopexy achieved a lower rate of complications, which were mostly minor. In the case of resection rectopexy, however, half of the morbidity was major. Mesh-related complications were recorded in around 1% of those patients who underwent ventral mesh rectopexy [21], whereas no case of anastomotic leakage was reported following resection rectopexy.

Subgroup analysis has shown that resection rectopexy is followed by a lower rate of recurrence than ventral mesh rectopexy. Conversely, ventral mesh rectopexy achieved better improvement of OD and FI and a shorter operation time and hospital stay, lower rates of conversion to open surgery and lower complication rates than resection rectopexy. The largest trial to date [27] that evaluated laparoscopic ventral mesh rectopexy included 919 patients with external and internal rectal prolapse with an overall recurrence rate of 8.2% at 10 years' follow-up, which is close to the weighted mean recurrence rate of ventral mesh rectopexy found in the present review. The higher complication rate and longer operation time of resection rectopexy can be attributed to the greater technical involvement of the procedure. Two trials [20,25] assessed laparoscopic ventral rectopexy using biological mesh or synthetic mesh. Rates of improvement of constipation were 82% and 92%, and of FI were 60% and 86%, respectively. Both, however, reported recurrence of IRP in 5.8% and 14.2% of patients, higher than the mean recurrence rate of abdominal rectopexy. Complications occurred in 26.5% and 16.3% of patients; although no case of mesh-related complications such as infection or erosion were recorded, 13 patients developed mesh-related complications after ventral rectopexy using synthetic mesh.

The current review included only one non-randomized trial [22] that compared STARR with ventral rectopexy in IRP patients complaining of outlet obstruction. STARR was offered to patients with an intact anal sphincter mechanism, while ventral rectopexy was undertaken in patients with sphincter damage. The study concluded that both techniques were comparable in relation to improvement of OD, postoperative morbidity and patient satisfaction. Although this single non-randomized study cannot be a proof of concept, linking the results of this particular study with the results of Delorme's procedure for IRP [35,36], nevertheless it indicates the value of perineal procedures in the treatment of IRP.

The present review is limited by the lack of well-designed randomized controlled studies as well as the poor quality of most of the included studies. The absence of uniform assessment of bowel function meant that no meaningful comparison was possible between the studies. Moreover, most studies that assessed the outcome of ventral rectopexy had a duration of follow-up of less than 18 months. Although the comparison between ventral and resection rectopexy in some of the include studies may shed some light on the superiority of one approach over the other, the selection bias in the studies and the small number of patients included prevent any firm conclusions on which technique is superior. Clearly large multicentre randomized controlled trials comparing the two techniques are needed.

Abdominal rectopexy for IRP achieves satisfactory results in most patients, with improvement of OD and, to a lesser extent, FI. There is a low incidence of recurrence and an acceptable morbidity rate. Ventral mesh rectopexy appeared to have higher recurrence rates but fewer complications, better improvement of bowel symptoms and a shorter operation time than resection rectopexy. No meaningful conclusions can be drawn, however, in this regard owing to publication bias and the small number of patients included in most studies. Furthermore there is an almost complete lack of randomized trials comparing the two techniques.

Authors' contribution

S.H.E., M.F. and S.D.W. designed the review; S.H.E., H.A.E. and M.Y. conducted acquisition and analysis of data; S.H.E., H.A.E. and M.Y. wrote the manuscript; M.F. and S.D.W. contributed to writing, drafting and critical revision of the manuscript. All authors approved the final version of the manuscript.

Conflict of interest

None to be declared by the authors.

References

1 Weiss EG, McLemore EC. Functional Disorders: rectoanal Intussusception. *Clin Colon Rectal Surg* 2008; **21:** 122–8.
2 Christiansen J, Zhu BW, Rasmussen O, Sorensen M. Internal rectal intussusception: results of surgical repair. *Dis Colon Rectum* 1992; **35:** 1026–8; discussion 1028-9.
3 Hwang YH, Person B, Choi JS *et al.* Biofeedback therapy for rectal intussusception. *Tech Coloproctol* 2006; **10:** 11–6.

4 Shorvon PJ, McHugh S, Diamant NE, Somers S, Stevenson GW. Defecography in normal volunteers: results and implications. *Gut* 1989; **30:** 1737–49.
5 Karlbom U, Graf W, Nilsson S, Pahlman L. The accuracy of clinical examination in the diagnosis of rectal intussusception. *Dis Colon Rectum* 2004; **47:** 1533–8.
6 Kelvin FM, Maglinte DD, Benson JT. Evacuation proctography (defecography): an aid to the investigation of pelvic floor disorders. *Obstet Gynecol* 1994; **83:** 307–14.
7 Farouk R, Duthie GS, MacGregor AB, Bartolo DC. Rectoanal inhibition and incontinence in patients with rectal prolapse. *Br J Surg* 1994; **81:** 743–6.
8 Jorge JMN, Habr-Gama A, Wexner SD. Clinical applications and techniques of cinedefecography. *Am J Surg* 2001; **182:** 93–101.
9 Hoffman MJ, Kodner IJ, Fry RD. Internal intussusception of the rectum: diagnosis and surgical management. *Dis Colon Rectum* 1984; **27:** 435–41.
10 Graf W, Karlbom U, Pahlman L, Nilsson S, Ejerblad S. Functional results after abdominal suture rectopexy for rectal prolapse or intussusception. *Eur J Surg* 1996; **162:** 905–11.
11 McCue JL, Thomson JPS. Rectopexy for internal rectal intussusception. *Br J Surg* 1990; **77:** 632–4.
12 Samaranayake CB1, Luo C, Plank AW, Merrie AE, Plank LD, Bissett IP. Systematic review on ventral rectopexy for rectal prolapse and intussusception. *Colorectal Dis* 2010; **12:** 504–12.
13 Liberati A, Altman DG, Tetzlaff J *et al.* The PRISMA statement for reporting systematic reviews and metaanalyses of studies that evaluate healthcareinterventions: explanation and elaboration. *BMJ* 2009; **21:** b2700.
14 Johnson E, Carlsen E, Mjåland O, Drolsum A. Resection rectopexy for internal rectal intussusception reduces constipation and incomplete evacuation of stool. *Eur J Surg Suppl* 2003; **588:** 51–6.
15 Tsiaoussis J, Chrysos E, Athanasakis E *et al.* Rectoanal intussusception: presentation of the disorder and late results of resection rectopexy. *Dis Colon Rectum* 2005; **48:** 838–44.
16 von Papen M1, Ashari LH, Lumley JW, Stevenson AR, Stitz RW. Functional results of laparoscopic resection rectopexy for symptomatic rectal intussusception. *Dis Colon Rectum* 2007; **50:** 50–5.
17 Collinson R, Wijffels N, Cunningham C, Lindsey I. Laparoscopic ventral rectopexy for internal rectal prolapse: short-term functional results. *Colorectal Dis* 2010; **12:** 97–104.
18 Portier G, Kirzin S, Cabarrot P, Queralto M, Lazorthes F. The effect of abdominal ventral rectopexy on faecal incontinence and constipation in patients with internal intra-anal rectal intussusception. *Colorectal Dis* 2011; **13:** 914–7.
19 Johnson E, Kjellevold K, Johannessen HO, Drolsum A. Long-term outcome after resection rectopexy for internal rectal intussusception. *ISRN Gastroenterol* 2012; **2012:** 824671.
20 Sileri P, Franceschilli L, de Luca E *et al.* Laparoscopic ventral rectopexy for internal rectal prolapse using biological mesh: postoperative and short-term functional results. *J Gastrointest Surg* 2012; **16:** 622–8.
21 Gosselink MP, Adusumilli S, Gorissen KJ *et al.* Laparoscopic ventral rectopexy for fecal incontinence associated with high-grade internal rectal prolapse. *Dis Colon Rectum* 2013; **56:** 1409–14.
22 Borie F, Bigourdan JM, Pissas MH, Guillon F. Laparoscopic ventral rectopexy for the treatment of outlet obstruction associated with recto-anal intussusception and rectocele: a valid alternative to STARR procedure in patients with anal sphincter weakness. *Clin Res Hepatol Gastroenterol* 2014; **38:** 528–34.
23 Owais AE, Sumrien H, Mabey K, McCarthy K, Greenslade GL, Dixon AR. Laparoscopic ventral mesh rectopexy in male patients with internal or external rectal prolapse. *Colorectal Dis* 2014; **16:** 995–1000.
24 Gosselink MP, Joshi H, Adusumilli S *et al.* Laparoscopic ventral rectopexy for faecal incontinence: equivalent benefit is seen in internal and external rectal prolapse. *J Gastrointest Surg* 2015; **19:** 558–63.
25 Franceschilli L, Varvaras D, Capuano I *et al.* Laparoscopic ventral rectopexy using biologic mesh for the treatment of obstructed defaecation syndrome and/or faecal incontinence in patients with internal rectal prolapse: a critical appraisal of the first 100 cases. *Tech Coloproctol* 2015; **19:** 209–19.
26 Tsunoda A, Ohta T, Kiyasu Y, Kusanagi H. Laparoscopic ventral rectopexy for rectoanal intussusception: postoperative evaluation with proctography. *Dis Colon Rectum* 2015; **58:** 449–56.
27 Consten EC, van Iersel JJ, Verheijen PM, Broeders IA, Wolthuis AM, D'Hoore A. Long-term Outcome After Laparoscopic Ventral Mesh Rectopexy: an Observational Study of 919 Consecutive Patients. *Ann Surg* 2015; **262:** 742–7 ;discussion 747-8.
28 Scottish Intercollegiate Guidelines Network (SIGN) guidelines, methodology checklist 3. http://www.sign.ac.uk/methodology/checklists.html (accessed February 2016)
29 National Institute for Health and Clinical Excellence. NICE clinical guidelines, Appendix 4 Quality of case series form. http://www.nice.org.uk/ nicemedia/pdf/Appendix_04_qualityofcase_series_form_preop.pdf. (accessed February 2016)
30 D'Hoore A, Cadoni R, Penninckx F. Long-term outcome of laparoscopic ventral rectopexy for total rectal prolapse. *Br J Surg* 2004; **91:** 1500–5.
31 Agachan F, Chen T, Pfeifer J, Reissman P, Wexner SD. A constipation scoring system to simplify evaluation and management of constipated patients. *Dis Colon Rectum* 1996; **39:** 681–5.
32 Rockwood TH, Church JM, Fleshman JW *et al.* Patient and surgeon ranking of the severity of symptoms associated with fecal incontinence: the fecal incontinence severity index. *Dis Colon Rectum* 1999; **42:** 1525–32.
33 van Tets WF, Kuijpers JH. Internal rectal intussusception–fact or fancy? *Dis Colon Rectum* 1995; **38:** 1080–3.
34 Choi JS, Hwang YH, Salum MR *et al.* Outcome and management of patients with large rectoanal intussusception. *Am J Gastroenterol* 2001; **96:** 740–4.

35 Berman IR, Harris MS, Rabeler MB. Delorme's transrectal excision for internal rectal prolapse: patient selection, technique, and three-year follow-up. *Dis Colon Rectum* 1990; **33:** 573–80.
36 Liberman H, Hughes C, Dippolito A. Evaluation and outcome of the Delorme procedure in the treatment of rectal outlet obstruction. *Dis Colon Rectum* 2000; **43:** 11.
37 Dippolito A, Esser S, Reed J 3rd. Anterior modification of Delorme procedure provides equivalent results to Delorme procedure in treatment of rectal outlet obstruction. *Curr Surg* 2005; **62:** 609–12.
38 Detry RJ, Vanheuverzwijn R, Mahieu P, Kestens PJ. The use of prosthetic material in rectopexies. *Int Surg* 1984; **69:** 301–4.
39 McCue JL, Thomson JP. Rectopexy for internal rectal intussusception. *Br J Surg* 1990; **77:** 632–4.
40 Orrom WJ, Bartolo DC, Miller R, Mortensen NJ, Roe AM. Rectopexy is an ineffective treatment for obstructed defecation. *Dis Colon Rectum* 1991; **34:** 41–6.
41 Scaglia M, Delaini GG, Ribero F, Comotti F, Hultén L. Occult rectal prolapse: functional results after rectopexy. *Chir Ital* 1993; **45:** 183–8.
42 Graf W, Karlbom U, Påhlman L, Nilsson S, Ejerblad S. Functional results after abdominal suture rectopexy for rectal prolapse or intussusception. *Eur J Surg* 1996; **162:** 905–11.
43 Silvis R, Gooszen HG, van Essen A, de Kruif AT, Janssen LW. Abdominal rectovaginopexy: modified technique to treat constipation. *Dis Colon Rectum* 1999; **42:** 82–8.
44 Varma MG, Hart SL, Brown JS, Creasman JM, Van Den Eeden SK, Thom DH. Obstructive Defecation in Middle-Aged Women. *Dig Dis Sci* 2008; **53:** 2702–9.
45 Karram M, Porter R. Pathophysiology, diagnosis and management of rectoceles. In: *Female Urology and Urogynaecology* (eds Cardozo L, Staskin D). London: Isis Medical Media, 2001. 616–25.
46 Xynos E. Functional results after surgery for obstructed defecation. *Acta Chir Iugosl* 2012; **59:** 25–9.
47 Emile SH. Asymptomatic radiologic recurrence of rectoanal intussusception after laparoscopic ventral rectopexy: is it relevant? *Dis Colon Rectum* 2016; **59:** 409–10.