

4 **Rectal prolapse**5 **Stavros Gourgiotis · Sotirios Baratsis**6 Accepted: 26 July 2006
7 © Springer-Verlag 200612 **Abstract**13 *Introduction* Rectal prolapse, or procidentia, is defined as a
14 protrusion of the rectum beyond the anus. It commonly
15 occurs at the extremes of age. Rectal prolapse frequently
16 coexists with other pelvic floor disorders, and patients have
17 symptoms associated with combined rectal and genital
18 prolapse. Few patients, a lack of randomized trials and
19 difficulties in the interpretation of studies of anorectal
20 physiology have made the understanding of this disorder
21 difficult.22 *Methods of treatment* Surgical management is aimed at
23 restoring physiology by correcting the prolapse and
24 improving continence and constipation, whereas in patients
25 with concurrent genital and rectal prolapse, an interdis-
26 ciplinary surgical approach is required. Operation should be
27 reserved for those patients in whom medical treatment has
28 failed, and it may be expected to relieve symptoms.
29 Numerous surgical procedures have been suggested to treat
30 rectal prolapse. They are generally classified as abdominal
31 or perineal according to the route of access. However, the
32 controversy as to which operation is appropriate cannot be
33 answered definitively, as the extent of a standardized
34 diagnostic assessment and the types of surgical procedureshave not been identified in published series. 35
Literature review This review encompasses rectal prolapse, 36
including aetiology, symptoms and treatment. The English- 37
language literature about rectal prolapse was identified 38
using Medline, and additional cited works not detected in 39
the initial search were obtained. Articles reporting on 40
prospective and retrospective comparisons and case reports 41
were included. 42**Keywords** Rectal prolapse · Aetiology · Symptoms · Surgery 43**Introduction** 44The classic description of rectal prolapse, or procidentia, is 45
a protrusion of the rectum beyond the anus [1]. Complete or 46
full-thickness rectal prolapse is the protrusion of all of the 47
rectal wall through the anal canal; if the rectal wall has 48
prolapsed but does not protrude through the anus, it is 49
called an occult (internal) rectal prolapse or a rectal 50
intussusception [2, 3]. Full-thickness rectal prolapse should 51
be distinguished from mucosal prolapse in which there is 52
protrusion of only the rectal or anal mucosa [1–3]. 53Rectal prolapse occurs at the extremes of age [1, 4]. In 54
the paediatric population, the condition is usually diagnosed 55
by the age of 3 years, with an equal sex distribution. The 56
incidence of rectal prolapse in children with cystic fibrosis 57
is almost 20%. In the adult population, the peak incidence 58
is after the fifth decade, and women are more commonly 59
affected, representing 80% to 90% of patients with rectal 60
prolapse [1, 4]. Female patients have an increasing 61
incidence with each decade until a crest in the seventh 62
decade [5]. Patients with complete rectal prolapse have 63
markedly impaired rectal adaptation to distension, which 64S. Gourgiotis (✉)
Clinical Attachment in Division of General
Surgery and Oncology, Royal Liverpool University Hospital,
21 Millersdale Road, Mossley Hill,
L18 5HG Liverpool, UK
e-mail: drsgourgiotis@tiscali.co.ukS. Baratsis
First Surgical Department,
'Evangelismos' General Hospital of Athens,
45-47 Ipsilantou Street,
Kolonaki, Athens, Greece

65 may contribute to anal incontinence, and consequently,
66 more than half of the patients with rectal prolapse have
67 coexisting incontinence [6–10]. Constipation is associated
68 with prolapse in 15% to 65% of patients [1, 9, 11–14].
69 Straining may force the anterior wall of the upper rectum
70 into the anal canal, perhaps causing a solitary rectal ulcer
71 due to mucosal trauma [1, 15].

72 This study reviews the pathophysiology, causations,
73 symptoms and treatment of rectal prolapse. A PubMed
74 database search was performed. All abstracts were reviewed
75 and all articles in which cases of rectal prolapse could be
76 identified were further scrutinized. Further references were
77 extracted by cross-referencing.

78 History

79 Complete rectal prolapse has been reported ever since the
80 Egyptian and Greek civilizations [16]. The first written
81 report for this disorder was found in the Ebers Papyrus of
82 1500 B.C. Even more graphic evidence of its historic nature
83 exists in the preservation of a Coptic mummy with rectal
84 prolapse (400–500 B.C.) [17]. The Hippocratic Corpus
85 describes a method of treatment that included hanging the
86 person by the heels and shaking the person until the gut
87 returned to its place. After the prolapse was reduced, a
88 ‘caustic potass’ was applied to the rectal mucosa, and the
89 thighs were bound together for 3 days.

90 Both Riolanus [18] and Fabricius ab Aquapendente [19]
91 burned the external anus to cause scarring and therefore
92 prevent prolapse. In 1634, Parey [20] attributed prolapse to
93 sitting on cold stones and failure to keep the buttocks
94 warm. His suggested treatment was the wearing of
95 breeches. In 1617, Woodall [21] met with reported success
96 by powdering the prolapsed rectum with the dry dung of a
97 dog that had been fed on bones. In 1676, Wiseman [22]
98 suggested that two sticks be carved in such a way that they
99 could be used to prevent prolapse during defecation.
100 Morgani [23], in 1763, described a truss made of soft
101 leather and iron wings to hold up the prolapse.

102 Salmon [24] championed the theory of a spasmodic
103 stricture of the rectum as the cause of rectal prolapse.
104 Mikulicz [25] popularized perineal amputation of rectal
105 prolapse in 1888, and Lockhart-Mummery [26], in 1910,
106 performed a perineal procedure for the treatment of rectal
107 prolapse. In 1912, Moschowitz [27] performed surgical
108 repair of rectal prolapse inside the abdomen. The concept
109 that a rectal prolapse was an intussusception was first
110 described by Hunter in the eighteenth century [28], and it
111 was confirmed by Broden and Snellman in 1968 [29].

112 The twentieth century was the time for the development
113 of more effective abdominal and perineal procedures for

rectal prolapse, and at the end of twentieth century, there 114
was a trend towards minimal access operation. 115

Causes 116

The search for a single common theory for the cause of 117
rectal prolapse has not been fruitful. In a review of the 118
literature, one well-documented physiologic study seeming- 119
ly contradicts another study that is equally well performed. 120
The lack of an international classification system makes a 121
comparison of results between series difficult, and perhaps, 122
the truth will be found if rectal prolapse is defined more as a 123
symptom rather than a diagnosis. 124

The anatomical basis for rectal prolapse is a deficient 125
pelvic floor through which the rectum herniates [3, 29–31]. 126
A redundant sigmoid colon lying within a deep pelvic cul- 127
de-sac, together with a resulting acute retrosigmoid junc- 128
tion, causes the patient to strain excessively to defecate, and 129
the eventual prolapse is the result of herniation through the 130
weakened pelvic floor. This anatomical concept, which was 131
proposed by Moschowitz [27], led to attempts to obliterate 132
the sliding hernia by obliteration of the pouch of Douglas. 133
The high recurrence rate associated with this type of 134
surgery was responsible for the demise of the ‘sliding 135
hiatus hernia’ theory as the cause of rectal prolapse [32]. 136

Another view is that complete rectal prolapse may be the 137
endpoint of a spectrum. The theory that a rectal prolapse was 138
an intussusception was first described by Hunter [28], 139
whereas Broden and Snellman confirmed it using cinera- 140
diography [29]. Complete rectal prolapse was the result of a 141
complete circumferential intussusception starting 6–8 cm 142
from the anal verge and continuing through the anal canal, 143
everting onto the perineum [29, 33, 34]. Support for this 144
theory is found in articles that note that patients with rectal 145
prolapse have lower basal and squeeze pressures with 146
anorectal manometry than normal control subjects [35]. The 147
theory is probably not correct. Mellgren et al. [36] followed 148
38 patients with defecography for various defecation disor- 149
ders, and their conclusion was that the risk of the develop- 150
ment of rectal prolapse in patients with intussusception was 151
small. Another study in 90 patients noted similar results [37]. 152

Parks [38] suggested that rectal prolapse was in part due 153
to injury to the pudendal nerves from repeated stretching of 154
the pelvic floor. Supporters of this theory note the frequent 155
association between neurogenic faecal incontinence and 156
rectal prolapse [30, 31]. Detractors of this theory emphasize 157
the patients who have normal innervation and rectal 158
prolapse and the fact that incontinence often improves after 159
most procedures for rectal prolapse. 160

Another theory supports that the lax lateral ligaments 161
combined with the atonic condition of the muscles of the 162
pelvic floor and anal canal may be the cause of rectal 163

164 prolapse [29, 30]. Finally, some authors believe that the
 165 lack of normal fixation of the rectum, with a mobile
 166 mesorectum and lax lateral ligaments, can cause rectal
 167 prolapse [4, 30, 39]. With this abnormality, the small
 168 intestine, which lies against the anterior wall of the rectum,
 169 may force the rectum out through the anal canal [29].

170 Symptoms, associations and evaluation

171 The symptoms of rectal prolapse closely mimic the warning
 172 signs that the public is taught for rectal cancer; a mass, a
 173 bleeding, a protrusion and a change in bowel habits.
 174 Earliest symptoms include a reducible protrusion that may
 175 be associated with a mucous discharge. Early in the course,
 176 the rectal prolapse may only occur in association with
 177 bowel movements. The patient may complain of a feeling
 178 of incomplete evacuation or tenesmus. Later, after the
 179 prolapse has been present for some time, the patient may
 180 experience loss of control of stool because of stretching of
 181 the sphincter muscles and pudendal nerves. Finally, as the
 182 rectum spends more time prolapsed, there may be bleeding.

183 In 8% to 27% of patients, rectal prolapse may be asso-
 184 ciated with concomitant pelvic floor disorders [40]. Previous
 185 pelvic surgery, obstetric trauma, elevated intra-abdominal
 186 pressure, increasing age and chronic constipation are
 187 known to be aetiological factors for both genital and rectal
 188 prolapse [40]. In these patients, denervation of the pelvic
 189 floor muscles is observed, [40] whereas high rates of pelvic
 190 organs prolapse and urinary incontinence have been
 191 described in patients with Marfans syndrome and Ehlers-
 192 Danlos disease due to laxity of pelvic organ supportive
 193 tissues [41]. Gonzalez-Argente et al. [42] reported that the
 194 patients operated on for rectal prolapse had high prevalence
 195 rates of urinary incontinence (58%) and genital prolapse
 196 (24%). Altman et al. [41] observed that 48% of the patients
 197 with rectal prolapse suffered from genital prolapse, whereas
 198 31% of patients suffered from urinary incontinence.

199 Bladder stones were identified as one of the first
 200 problems associated with rectal prolapse in adults. Later,
 201 other urologic problems were discovered to be associated
 202 with rectal prolapse including phimosis, urethral stricture
 203 and prostatic enlargement or obstruction. Problems associ-
 204 ated with the gut that have also been associated with rectal
 205 prolapse include constipation, diarrhoea, pinworm and
 206 polyps. In addition, motility disorders arising from abnor-
 207 malities of the spinal cord such as spina bifida are
 208 associated with a higher than expected incidence of rectal
 209 prolapse. Bulimia nervosa [43] and progressive systemic
 210 sclerosis have also been associated with rectal prolapse
 211 [44]. Problems that are traditionally associated with
 212 children with rectal prolapse include cystic fibrosis,
 213 whooping cough, tuberculosis and nutritional disorders.

214 There have been reports of blunt abdominal trauma of
 215 sufficient force to cause acute rectal prolapse [45] and reports
 216 of spontaneous rupture of long-standing rectal prolapse [46]
 217 and of rupture during attempted reduction [47].

218 The complete history and a physical examination are
 219 required. An assessment of specific risk factors should be
 220 considered. A screening evaluation of the colon with
 221 endoscopy or barium enema is recommended in adults to
 222 exclude coexisting conditions such as diverticular disease,
 223 which may influence the choice of procedure. Finally, a
 224 preoperative evaluation for rectal prolapse requires testing
 225 of the pelvic floor and colon transit. Common testing
 226 options include cinedefecography (to check movement of
 227 the pelvic floor and look for unsuspected pathologic
 228 features) [48], anorectal manometry (to measure the
 229 pressure generated by the sphincter muscles), electromyog-
 230 raphy (to check for denervation) and colon transit studies (it
 231 is postulated that an increased sigmoid transit time is a
 232 significant factor in the cause of incontinence that is
 233 associated with prolapse) [12].

Non-operative treatment

234 The idea of treating patients without operation has great
 235 appeal because many patients with rectal prolapse are
 236 elderly or carry high operative risk. However, non-
 237 operative treatment has been shown to produce only
 238 temporary or symptomatic relief.

239 There have been reports of the reduction in incarcerated
 240 rectal prolapse with the use of table sugar [49]. The goal of
 241 this technique would be to reduce the oedema of the tissues
 242 so that the rectum can be returned to its normal anatomic
 243 location and a more elective procedure could be considered.

244 ‘Transindolor’ [50] was used early in 1960s for the treat-
 245 ment of patients who had little or no ability to voluntarily
 246 contract the sphincter. The battery-operated unit was report-
 247 ed to simulate the sphincter and then allow it to rest before
 248 the next surge. It was reported to have improved the resting
 249 tone and voluntary contractions of the sphincter muscles.

250 Finally, biofeedback was used to improve postoperative
 251 function but was not reported for use as primary therapy
 252 [51].

Surgical treatment

254 More than 100 different operative procedures have been
 255 described for rectal prolapse [52–58]. The aim of treatment is
 256 to control the prolapse, restore continence and prevent
 257 constipation or impaired evacuation [30, 39]. This goal can
 258 be achieved by resection or plication of the redundant bowel
 259 and/or fixation of the rectum to the sacrum [30, 39]. A strong
 260

261 and functional pelvic floor may be restored by plicating the
 262 puborectalis anterior to the rectum [30]. The rationale for
 263 rectal fixation is to keep the rectum attached in the desired
 264 elevated position until it becomes fixed by scar tissue. In
 265 incontinent patients, the patulous sphincter ani begins to
 266 regain its tone approximately 1 month after the procedure,
 267 and full continence is generally restored within 2 to
 268 3 months [58].

269 The operative procedures are classified as abdominal
 270 [52–54] or perineal [55–57], according to the route of
 271 access. Abdominal operations involve dissection and
 272 fixation of the rectum and may include sigmoid/colonic
 273 resection. Perineal operations may include repair of the
 274 pelvic floor/anal sphincters with or without bowel resec-
 275 tion. Although there are proponents for each approach,
 276 there have only been few comparative trials, and to date,
 277 there are no guidelines as to which operation should be
 278 used in any given clinical situation.

279 **Abdominal procedures**

280 Improvements in anesthetic techniques have created the
 281 opportunity to approach the treatment of rectal prolapse
 282 from inside the abdomen. A summary of the outcomes of
 283 abdominal procedures (suture rectopexy, posterior mesh
 284 rectopexy, Ripstein procedure and suture rectopexy with
 285 and without resection) is shown in Tables 1, 2, 3 and 4.

286 **Suture rectopexy**

287 This operation, first described by Cutait in 1959 [59],
 288 involves a thorough mobilization and upward fixation of
 289 the rectum. The mobilization and subsequent healing by
 290 fibrosis tend to keep the rectum fixed in an elevated
 291 position as adhesions form, attaching the rectum to the pre-
 292 sacral fascia [1]. There was no reported mortality, and

294 recurrence rates ranged from 0% to 27%, [8, 59–63]; the
 295 majority of reports claimed rates ranging from 0% to 3%,
 296 with most of the reports showing an improvement in faecal
 297 continence. The influence on constipation was variable,
 298 with different studies showing improvement, deterioration
 299 or no effect on constipation.

300 Loygue et al. [64] modified this procedure. In this
 301 variation, the mobilized rectum is suspended from the
 302 longitudinal ligament in front of the sacral promontory by
 303 strips of nylon. A total of 257 patients underwent this
 304 procedure, with two postoperative deaths and an uneventful
 305 recovery in 96% of patients. The recurrence rate was 4.3%.

306 **Posterior mesh rectopexy**

307 The sponge rectopexy was first described by Wells in 1959
 308 [65]. This technique is especially popular in the UK. After
 309 rectal mobilization, a prosthetic material or mesh is inserted
 310 between the sacrum and the rectum, sutured into the rectum
 311 and then sutured into the periosteum of the sacral
 312 promontory. The strong fibrous reaction between the
 313 rectum and the sacrum restores the normal anorectal angle.
 314 Mortality rates ranged from 0% to 3% [61–67], and
 315 recurrence rates were reported at 3% [13, 61–67]. Improve-
 316 ment in continence occurred in 3% to 40%, but there was a
 317 mixed response of constipation to this type of rectopexy [7,
 318 13, 61, 67–70].

319 Other non-absorbable synthetic meshes have replaced
 320 the sponge, and more recently, absorbable meshes have
 321 been introduced. A number of authors [54, 71–73] have
 322 shown that the use of both absorbable and non-absorbable
 323 meshes achieved similar results. The mortality rate was 0%
 324 to 1%, and the recurrence rates were 0% to 6% for both
 325 absorbable [54, 71, 72] and non-absorbable [7, 10, 39, 54,
 326 69, 71, 72, 74] meshes. A number of studies have evaluated
 327 the efficacy of absorbable mesh in posterior mesh recto-
 328 pexy. Winde et al. [71] assessed 47 patients with rectal

Table 1 Rectal prolapse: results after suture rectopexy

t1.1	Author/year	No. of patients	Mortality (%)	Continence (%)	Constipation (%)	Recurrence (%)
t1.2	Open					
t1.3	Carter, 1983	32	0	NS	NS	1
t1.4	Novell, 1994	32	0	15	31	1
t1.5	Graf, 1996	53	0	36	30	5
t1.6	Khanna, 1996	65	0	75	83	0
t1.7	Briel, 1997	24	0	67	NS	0
t1.8	Laparoscopic					
t1.9	Kessler, 1999	32	0	NS	NS	2
t1.10	Bruch, 1999	32	0	64	76	0
t1.11	Kellokumpu, 2000	17	0	82	70	2
t1.12	Heah, 2000	25	0	50	14	NS
t1.13	Benoist, 2001	18	0	77	11	NS

NS not stated

Table 2 Rectal prolapse: results after posterior mesh rectopexy

	Author/year	No. of patients	Mortality (%)	Continence (%)	Constipation (%)	Recurrence (%)
t2.1	Open					
t2.2	Penfold, 1972	101	0	22	NS	3
t2.3	Morgan, 1972	150	4	42	58	3
t2.4	Keighley, 1984	100	0	64	NS	0
t2.5	Mann, 1988	59	0	25	39	NS
t2.6	Sayfan, 1990	16	0	75	75	NS
t2.7	Luukkonen, 1992	15	0	53	100	0
t2.8	Winde, 1993	47	0	17	NS	0
t2.9	Novell, 1994	31	0	3	48	2
t2.10	Scaglia, 1994	16	0	19	14	0
t2.11	Galili, 1997	37	0	NS	NS	1
t2.12	Yakut, 1998	48	0	NS	NS	0
t2.13	Aitola, 1999	96	1	26	24	6
t2.14	Mollen, 2000	18	NS	NS	NS	0
t2.15	Laparoscopic					
t2.16	Himpens, 1999	37	0	92	38	0
t2.17	Darzi, 1995	29	0	NS	NS	0
t2.18	Boccasanta, 1999	10	0	NS	0	0
t2.19	Benoist, 2001	14	0	10	21	NS
t2.20	NS not stated					

329 prolapse in whom they compared two types of absorbable
 330 meshes (polyglycolic acid and polyglactin) and noted
 331 mortality and recurrence rates similar to those with other
 332 non-absorbable meshes. Galili and Rabau [72] compared
 333 polyglycolic acid and polypropylene in the treatment of
 334 rectal prolapse in 37 consecutive patients and produced
 335 similar results with both types of meshes. These results
 336 have been reproduced by others [54, 73, 75, 76].

337 One of the chief concerns about the insertion of foreign
 338 material is the incidence of sepsis. Sepsis has been reported
 339 in 2% to 16% of patients with prosthetic rectopexy [29, 30,
 340 67, 71, 73, 75, 77–79]. Polyvinyl alcohol sponge placement
 341 carries an increased risk of infectious complications [77,
 342 78]. Many authors reported that the infection rate associated
 343 with polytetrafluoroethylene mesh was 0% and that associ-
 344 ated with absorbable material without resection was 0%,
 345 whereas the presence of resection increased the mortality rate
 346 to 1%. In patients with polyvinyl alcohol sponge rectopexy,
 347 the infection rate was 3% without resection and increased to
 348 3.7% in the presence of resection. Insertion of a mesh during
 349 rectopexy without resection appears to be reasonable, as it
 350 was associated with a 0% or very low mortality [71, 73, 75,
 351 80]. Because the main predisposing factor for infection of

the implant is an infected pelvic haematoma, drainage of 352
 the pre-sacral pelvic region during surgery is recommended 353
 [61, 71, 75]. However, if sepsis occurs, removal of the 354
 foreign material is advisable [71–73, 77–79]. Furthermore, 355
 in the presence of an anastomosis in patients having a 356
 synchronous resection, the theoretical risk of infection is 357
 increased [61, 75]. 358

Ripstein procedure (anterior sling rectopexy) 359

This operation was first described by Ripstein in 1952 [58]. 360
 After complete mobilization of the rectum, an anterior sling 361
 of fascia lata or synthetic material is placed in front of the 362
 rectum and sutured to the sacral promontory. The rationale 363
 is to restore the posterior curve of the rectum to minimize 364
 the effect of increased intra-abdominal pressure. The 365
 operation provides a firm anterior fascial support in patients 366
 with atrophic pelvic structures and restores the normal 367
 anatomic position of the rectum. Mortality rates ranged 368
 between 0% and 2.8% and recurrence rates between 0% 369
 and 13%, and there was a trend towards improvement in 370
 continence and a mixed response to constipation [7, 14, 57, 371
 71, 74, 75, 81, 82]. 372

Table 3 Rectal prolapse: results after Ripstein procedure

	Author/year	No. of patients	Mortality (%)	Continence (%)	Constipation (%)	Recurrence (%)
t3.1						
t3.2	Winde, 1993	47	0	23	17	0
t3.3	Tjandra, 1993	142	1	18	NS	10
t3.4	Scaglia, 1994	16	0	23	NS	0
t3.5	Schultz, 2000	69	0	20	37	1
	NS not stated					

Table 4 Rectal prolapse: results after suture rectopexy with and without resection

	Author/year	No. of patients	Mortality (%)	Continence (%)	Constipation (%)	Recurrence (%)
t4.1	Open					
t4.2	Frykman, 1969	80	NS	NS	NS	0
t4.3	Sayfan, 1990	13	0	66	80	NS
t4.4	Luukkonen, 1992	15	1	33	60	0
t4.5	Tjandra, 1993	18	0	11	56	NS
t4.6	Deen, 1994	10	0	90	NS	0
t4.7	Huber, 1995	42	0	44	18	0
t4.8	Yakut, 1998	19	0	NS	NS	0
t4.9	Kim, 1999	176	NS	55	43	9
t4.10	Laparoscopic					
t4.11	Stevenson, 1998	34	0	70	64	0
t4.12	Xynos, 1999	10	0	100	NS	NS
t4.13	Benoist, 2001	16	0	100	0	NS
t4.14	NS not stated					

373 To limit the incidence of obstruction, McMahan and
 374 Ripstein modified the procedure to include posterior
 375 fixation of the mesh to the sacrum [83]. In this situation,
 376 the lateral mesh is anteriorly sutured to the rectum, with a
 377 gap deliberately left between the ends to obviate narrowing.
 378 Intraoperative rigid proctoscopy can help determine the
 379 snugness of the wrap and caliber of the rectal lumen.

380 Male patients exhibit a higher incidence of recurrent
 381 prolapse because of technical difficulties with a narrow
 382 pelvis [12, 84, 85]. In 1988, Roberts et al. [84] reviewed
 383 their experience with the Ripstein procedure in 135
 384 patients; they noted a 52% complication rate, the most
 385 serious complication being pre-sacral haematoma, which
 386 occurred in 8% of cases. The overall recurrence rate was
 387 10%. However, the recurrence rate in men was three times
 388 that in women (24% vs 8%, respectively). They postulated
 389 that the reason for a high failure rate in men might be
 390 difficulty in mobilizing the rectum in the narrow male
 391 pelvis. Technical difficulties at the time of the original
 392 operation were implicated in 50% of cases of male patients
 393 with recurrence [84].

394 Resection

395 The concept of rectosigmoid resection is based on the
 396 observation that after low anterior resection, a dense area of
 397 fibrosis forms between the anastomotic suture line and the
 398 sacrum, securing the rectum to the sacrum [30]. Other
 399 advantages include resection of the abundant rectosigmoid,
 400 which avoids torsion or volvulus; achieving a straighter
 401 course of the left colon and little mobility from the
 402 phrenocolic ligament downwards, which acts as yet another
 403 fixative device [1, 30, 52, 86–88]; and relief of constipation
 404 in a selected group of patients [30]. It is well suited to
 405 patients with a long redundant sigmoid and a long history
 406 of constipation [88]. However, sigmoid resection alone for

rectal prolapse has not been popular and is confined to 407
 studies before 1980. 408

Resection and rectopexy 409

Originally described by Frykman [89] in 1955, the 410
 procedure of abdominal rectopexy and anterior resection 411
 attempts to treat the most common anatomic problems that 412
 are associated with rectal prolapse. The addition of sigmoid 413
 resection to rectopexy combines the advantages of mobi- 414
 lization of the rectum, sigmoid resection and fixation of the 415
 rectum. Most of the series describe resection rectopexy in 416
 which resection is combined with suture rectopexy. Few 417
 studies have addressed a combination of resection and 418
 posterior mesh rectopexy; the mortality rates ranged from 419
 0% to 6.7% [14, 39, 54, 69, 72, 90–92], with an associated 420
 recurrence rate of 0% to 5% [39, 54, 69, 90, 92–94]. There 421
 was an overall reduction in constipation, which was at- 422
 tributed to resection of the redundant sigmoid colon. Con- 423
 tinence was also improved in most patients. Luukkonen et 424
 al. [54] in a comparative study between rectopexy with 425
 sigmoidectomy vs rectopexy alone showed that sigmoid 426
 resection did not increase morbidity but tended to 427
 diminish postoperative constipation, possibly by causing 428
 less outlet obstruction. McKee et al. [53] showed that 429
 patients with rectal prolapse who underwent abdominal 430
 rectopexy alone had a high incidence of constipation. 431
 They also showed that patients having rectopexy alone 432
 had a higher pressure in the rectum for a given volume of 433
 isotonic sodium chloride solution infused. They postulated 434
 that this was due to kinking between the redundant 435
 sigmoid colon and the rectum at the rectosigmoid 436
 junction, and that the addition of sigmoidectomy appeared 437
 to alleviate this possibly by removing the redundant loop 438
 of colon that may kink and cause delay in the passage of 439
 intestinal content. 440

441	Anterior resection		
442	It was first described by Muir in 1955 [22]. His rationale	recurrent prolapse but more postoperative constipation,	489
443	was that a dense reaction has been noted at the level of	although these findings were found in small numbers. The	490
444	anastomosis after other low anterior resections.	major limitation of this meta-analysis was that only two	491
445	Theuerkauf et al. [95] noticed a 4% mortality rate and	studies (one of which was an abstract) addressing lateral	492
446	4% recurrence rate after anterior resection, with improve-	ligament division or preservation were included in the	493
447	ment of continence in 63% of cases, whereas Schlinkert et	meta-analysis. In summary, it would appear that preserva-	494
448	al. [96] reviewed their experience with anterior resection for	tion of ligaments is associated with an improvement in	495
449	complete rectal prolapse, with a 9% recurrence rate, a 1%	continence and a reduction in constipation.	496
450	mortality rate and a 50% improvement in continence.		
451	Cirocco and Brown [11] performed anterior resection in	Perineal procedures	497
452	41 patients with complete rectal prolapse. All of these	Numerous procedures have been described for the perineal	498
453	authors claimed that the advantages of this operation were	treatment of a rectal prolapse. They have the advantage that	499
454	that it was familiar and frequently performed, did not	they are less invasive for unfit patients but have a high	500
455	require a foreign body or rectal suspension and had	recurrence rate [91]. This is unfortunate because the	501
456	withstood long-term scrutiny in terms of both recurrence	postoperative functional results, particularly with regard	502
457	and associated complications.	to constipation, are better than those reported after abdominal	503
		rectopexy [99, 100]. There are two widely used perineal	504
458	Place of prosthetic meshes in rectopexy	procedures: the Delorme procedure and perineal rectosig-	505
459	Insertion of a foreign material during rectopexy is com-	moidectomy (Altemeier operation). The stapled transanal	506
460	monly performed with the assumption that this material	rectal resection is a new perineal approach to symptomatic	507
461	evokes more fibrous tissue formation than ordinary suture	rectocele and intussusception with limited data. The	508
462	rectopexy [30]. There is evidence that complete encircle-	Thiersch procedure, which entails encircling and thereby	509
463	ment of the rectum (Ripstein procedure) may lead to	narrowing the anal canal, does not eradicate prolapse but	510
464	erosion of the foreign material with subsequent fistula	merely prevents its further descent by providing mechanical	511
465	formation and stenosis in approximately 7% of patients	support, and hence, it is associated with a high recurrence	512
466	[30]. Furthermore, Kuijpers [30] re-operated on four	rate (33–44%) [1, 4, 30, 101, 102]. A summary of the out-	513
467	patients who had had posterior rectopexy with T-shaped	comes of perineal procedures is shown in Tables 5 and 6.	514
468	polytetrafluoroethylene mesh several years previously.		
469	None of the patients had actual prolapse recurrence, but	Delorme operation	515
470	both of the ‘horizontal’ legs of the mesh had retracted to	This procedure was described by Delorme in 1900 [103] and	516
471	the promontory and were ineffective as a fixation device.	includes a stripping of the mucosa of the prolapsed rectum	517
472	Kuijpers believed that the purpose of using an implant to	and sutured plication of the remnant bare muscle, which	518
473	evoke an intense fibrous tissue formation is not always	collapses the wall like an accordion. The mucosa is then re-	519
474	achieved by using prosthetic material. Penfold and Hawley	approximated to seal the anastomosis. It has an additional	520
475	[66] conceded that the polyvinyl alcohol sponge tends to	advantage of excision of a concomitant rectal ulcer if present	521
476	fragment but persists in human tissues for 5 years. Indeed,	[99]. This procedure can be performed with the use of local	522
477	many authors [97] now believe that rectal fixation by suture	anesthesia, if needed, on even the highest-risk patients [57,	523
478	only seems sufficient, with reported recurrence rates of 3%	99, 104]. It is ideal for a low or a small prolapse.	524
479	or less [1, 30, 60, 81].	Many studies reported mortality rates of 0% to 4% and	525
		recurrence rates of 4% to 38% [57, 82, 99, 105–108].	526
480	Role of division of ligaments	Factors associated with failure for the Delorme procedure	527
481	The left colon and rectum receive retrograde innervation	include proximal procidentia with retro-sacral separation on	528
482	from neural efferent running through the lateral ligaments;	defecography, faecal incontinence, chronic diarrhoea and	529
483	thus, lateral ligament division during rectopexy has been	major perineal descent (>9 cm on straining). In the absence	530
484	suggested to denervate the rectum, causing postoperative	of these factors, the Delorme procedure provided a	531
485	constipation [70, 80]. Brazzelli et al. [98] performed a	satisfactory and durable outcome [109].	532
486	meta-analysis of articles reporting on surgery for rectal	The most important disadvantage of the Delorme	533
487	prolapse. They concluded that division, rather than preser-	operation is that the procedure does not fix the rectum to	534
488	vation, of the lateral ligaments was associated with less	the sacrum or repair the pelvic floor, and the pleated muscle	535
		at the anal verge may provide a false sense of security when	536
		considering the potential for recurrence.	537

Table 5 Rectal prolapse: results after Delorme procedure

	Author/year	No. of patients	Mortality (%)	Continence (%)	Constipation (%)	Recurrence (%)
t5.1						
t5.2	Tobin, 1994	43	0	50	NS	11
t5.3	Oliver, 1994	41	1	58	NS	8
t5.4	Senapati, 1994	32	0	46	50	4
t5.5	Lechoux, 1995	85	1	45	10	11
t5.6	Kling, 1996	6	0	67	100	1
t5.7	Agachan, 1997	8	0	NS	NS	3
t5.8	Pescatori, 1998	33	0	NS	44	6
t5.9	Yakut, 1998	27	0	NS	NS	4
t5.10	Watts, 2000	101	4	25	13	30
t5.11	Liberman, 2000	34	0	32	88	0

NS not stated

538 Perineal rectosigmoidectomy

539 Although first performed by Mickulicz [25] in 1889 and
540 later advocated by Miles [110] in 1933 and Gabriel in 1948
541 [111], this procedure is most commonly associated with
542 Altemeier et al. in 1971 [112]. It involves a full-thickness
543 excision of the rectum and, if it is possible, a portion of the
544 sigmoid colon. It has gained general acceptance for use in
545 elderly patients in North America [85].

546 The reported overall mortality rates ranged from 0% to
547 5% and recurrence rates from 0% to 16% [94, 107, 113–
548 116]. Postoperatively, patients have minimal pain, oral
549 intake can generally be commenced within 24 to 48 h after
550 surgery and bowel function returns within a few days of
551 surgery [85]. The potential complications include anasto-
552 motic bleeding and pelvic sepsis, and although leakage is
553 uncommon, tension and poor blood supply can cause
554 anastomotic dehiscence [85].

555 Perineal rectosigmoidectomy is well suited for male
556 patients; patients with incarcerated, strangulated or even
557 gangrenous prolapsed rectal segment; and patients who have
558 had recurrence after another transperineal repair [85, 115, 116].
559 There is general agreement that perineal rectosigmoidectomy
560 is often the best operation for extremely elderly patients or
561 individuals with profound comorbidity, in whom an abdom-
562 inal procedure might be contra-indicated [56, 116, 117]. It is

also suitable for the elderly or high-risk patients with 563
incontinence because a concomitant levatorplasty can be 564
performed [12, 85, 117]. 565

Stapled transanal rectal resection

566
567 Longo [118] introduced the stapled transanal rectal resec-
568 tion (STARR) technique, suggesting a transanal resection of
569 the rectal wall for the treatment of symptomatic rectocele
570 and symptomatic distal intussusception based on the stapled
571 haemorrhoidectomy procedure. It involves the transanal use
572 of two circular staplers: the first stapler (anteriorly) reduces
573 the intussusception and the size of rectocele, whereas the
574 second one (posteriorly) corrects the intussusception.

575 There are only few published studies about the STARR
576 procedure. Ommer et al. [119] reported 14 patients who
577 underwent this procedure; during the mean follow-up time
578 (19±9 months), only one patient with intussusception had
579 defecation disorder again 6 months postoperatively.
580 Boccasanta et al. [120] compared the STARR procedure
581 with the simple transanal stapled mucosal resection in
582 addition to a perineal levatorplasty. They observed that the
583 STARR group showed a significantly low pattern of
584 postoperative pain and that 88% of the STARR group
585 patients had an excellent/good outcome at 20 months.
586 Finally, a prospective multicentre trial with 90 patients

Table 6 Rectal prolapse: results after Altemeier procedure

	Author/year	No. of patients	Mortality (%)	Continence (%)	Constipation (%)	Recurrence (%)
t6.1						
t6.2	Takesue, 1999	10	0	NS	NS	0
t6.3	Ramanujam, 1994	72	0	67	NS	4
t6.4	Deen, 1994	10	0	80	NS	1
t6.5	Williams, 1992	56	0	46	NS	6
t6.6	Johansen, 1993	20	1	21	NS	0
t6.7	Agachan, 1997	32	0	NS	NS	4
t6.8	Altemeier, 1971	106	0	NS	NS	3
t6.9	Kim, 1999	183	NS	53	61	29
t6.10	Prasad, 1986	25	0	88	NS	0

NS not stated

587 reported that the STARR procedure is a safe and effective
588 technique in the treatment of outlet obstruction caused by
589 the combination of intussusception and rectocele [121].

590 Laparoscopic procedures

591 Laparoscopic procedures changed the way that surgeons
592 view operation. The goal of the laparoscopic surgical
593 approach to the treatment of rectal prolapse is to provide
594 the low recurrence rate of the abdominal approach with a
595 recovery period that is more like the perineal approach.
596 Any traditional abdominal procedure for the treatment of
597 rectal prolapse can be recreated with the use of laparoscopic
598 technique. Otherwise, any comorbid condition that would
599 preclude the use of general anesthesia becomes a contra-
600 indication to laparoscopy. These conditions often include
601 chronic obstructive pulmonary disease and severe coronary
602 artery disease. Conditions that are specific contra-indica-
603 tions to laparoscopy include coagulopathy, severe liver
604 disease, known formidable intra-abdominal adhesions and
605 pregnancy, whereas conditions that are relative contra-
606 indications include large mesenteric lymph nodes or a
607 thickened mesentery, patient obesity, fistula and any
608 procedure that would require the removal of a large
609 specimen.

610 Compared with laparotomy, laparoscopic rectopexy has
611 the advantages of reduced pain, shortened hospital stay,
612 early recovery and early return to work [122]. The
613 procedure involves either suture or posterior mesh recto-
614 pexy, with or without resection. It has gained popularity
615 because it is relatively simple and easily accomplished and
616 because resection with anastomosis is avoided [1, 22, 68,
617 87, 90, 101, 123–126]. The mortality for laparoscopic
618 rectopexy ranged between 0% and 3%, with recurrence
619 rates ranging from 0% to 10% in follow-up of between
620 8 and 30 months [22, 68, 87, 90, 101, 122–127]. These
621 studies have demonstrated that this approach is as effective
622 as the open method in the treatment of rectal prolapse, and
623 the effect on continence and constipation depends on the
624 type of rectopexy performed.

625 Boccasanta et al. [126] compared the functional and
626 clinical results of laparoscopic rectopexy with those of the
627 open technique in two similar groups of patients with
628 complete rectal prolapse. The laparoscopic approach was
629 associated with a reduction in postoperative hospitalization,
630 without a significant prolongation of operative time and the
631 higher cost of surgical materials. Solomon et al. [128]
632 concluded that the laparoscopic technique had short-term
633 benefits in terms of return to normal diet and mobility,
634 earlier discharge from the hospital and less morbidity.
635 These results were paralleled by a reduced neuroendocrine
636 and immunologic stress response. No long-term differences

in constipation, recurrent prolapse or improvement in
637 continence scores between open and laparoscopic
638 approaches were identified. 639

640 Stevenson et al. [87] studied their laparoscopic-assisted
641 resection and rectopexy experience. They felt that this
642 technique was feasible and safe, with a functional outcome
643 and recurrence rates equivalent to the reports of open
644 procedures. Xynos et al. [113] and Kellokumpu et al. [122]
645 compared open and laparoscopic resection rectopexy and
646 concluded that resection rectopexy for rectal prolapse can
647 be performed safely via the laparoscopic approach. A
648 summary of the outcomes of laparoscopic procedures
649 (suture rectopexy, posterior mesh rectopexy and suture
650 rectopexy with and without resection) is shown in Tables 1,
651 2 and 4.

652 Simultaneous surgical treatment of combined rectal 653 and genital prolapse

654 In the literature, very few series have reported a combined
655 simultaneous treatment of both rectal and genital prolapse.
656 Ayav et al. [129] proposed a simultaneous transabdominal
657 treatment: genital prolapse was treated by colpohystero-
658 pexy, and rectal prolapse was treated by mesh or sutured
659 rectopexy associated with sigmoid resection. After a
660 median duration of 17 months follow-up, only one out of
661 eight patients had a postoperative evacuation problem and
662 faecal incontinence. Tancer et al. [130] suggested a colpo-
663 recto-sacropexy, whereas Zhioua et al. [131] reported a
664 colpexy plus a mesh rectopexy for the treatment of
665 combined conditions in six and two patients respectively,
666 but there was no mention of functional results. Dekel et al.
667 [132] argued that the vaginal hysterectomy for genital
668 prolapse followed by the Altmeier procedure for the rectal
669 prolapse were easy and safe to perform in ten patients with
670 both conditions. Although there was no recurrence, they
671 reported a gas incontinence rate of 30% at 18–24 months
672 follow-up.

673 Choice of procedure

674 The modern literature focuses on the decision to weigh both
675 patient factors and procedures factors. The primary need to
676 remove the prolapse should take into consideration the
677 possibility of coexisting slow transit constipation, postop-
678 erative rectal compliance and the presence of pelvic floor
679 denervation. The possibility of postoperative sexual dys-
680 function in men is also important. The patient's age, cardiac
681 and pulmonary risk factors, prior abdominal surgical
682 procedures, pelvic irradiation, immune function, coagulop-
683 athy and liner function are basic concerns before operation.

684 Colon transit, electromyographic evaluation and anorectal
685 manometry pressure studies are patients' factors that are
686 important considerations for postoperative function.

687 We believe that patients who are fit for surgery without
688 comorbidity should be offered abdominal rectopexy, as it is
689 now associated with very low mortality rates. In our view,
690 although abdominal operations have a higher morbidity, the
691 fit patient is presumably capable of withstanding compli-
692 cations and should be given the best chance to cure the
693 prolapse. Suture rectopexy is capable of giving good
694 results, and the addition of the posterior mesh does not
695 offer additional advantage; rather, it has the disadvantage of
696 introducing a foreign body. There seems therefore little to
697 choose between suture rectopexy and posterior mesh
698 rectopexy. The placement of foreign materials, such as
699 polypropylene or Marlex mesh, Ivalon sponge or Teflon
700 suspension, is associated with an increased risk of infection,
701 stenosis and constipation. Finally, there is the risk that the
702 hypogastric plexus might be affected when the mesh is
703 stapled to the pre-sacral fascia. Conversely, a suture
704 rectopexy provides distinct advantages: it does not use
705 foreign material, and therefore, sigmoid resection can be
706 safely performed without increasing the postoperative risk
707 of infection or constipation.

708 The advantage of adding a resection to the rectopexy
709 seems to be a reduction in constipation. This procedure
710 therefore seems suited to patients with a redundant sigmoid
711 colon and a history of constipation. The Ripstein procedure
712 has been associated with problems of constipation that
713 either persist or postoperatively worsen.

714 Preservation of the ligaments seems to have the
715 advantage over their division in terms of continence and
716 constipation. There are far fewer studies addressing the
717 influence on resting and squeeze pressures after both
718 approaches, but there seems to be a benefit to the
719 preservation of ligaments. Further studies are required to
720 assess the efficacy of division and preservation of lateral
721 ligaments in these operations. However, for now the choice
722 of division and preservation of ligaments depends on the
723 surgeon's experience and preference.

724 In the elderly and high-risk patients, perineal approaches
725 such as the Delorme procedure or perineal rectosigmoi-
726 dectomy (the Altemeier procedure) are preferred. The
727 Delorme procedure may be useful if there is insufficient
728 length of prolapse to perform a perineal rectosigmoi-
729 dectomy [54, 96]. Perineal rectosigmoidectomy is well suited
730 for patients with incarcerated, strangulated and gangrenous
731 rectal prolapse, whereas abdominal rectopexy cannot be
732 used for these situations, even in fit patients.

733 Laparoscopic surgery has the advantages of less pain,
734 shorter hospital stay, early recovery and early return to
735 work as compared with laparotomy. Apart from these
736 advantages, the results are similar to those with the open

procedures irrespective of the method used (suture, resec- 737
tion or posterior mesh). Therefore, where expertise is 738
available, this approach may be preferred. 739

740 The problem of recurrence is one of the most important
741 issues of prolapse surgery. However, such patients need to
742 be clinically re-examined so that it can be assessed whether
743 these recurrences are incomplete or complete. Previously
744 reported results of both open and laparoscopic resection-
745 rectopexy series have a comparable outcome, with accept-
746 able recurrence rates.

747 Additionally, the issue of whether surgery is indicated in
748 patients with incomplete or internal rectal prolapse is
749 controversial [8]. Some authors believe that surgery for
750 rectal prolapse is indicated only if clinical outlet obstruction
751 (e.g. sigmoidoceles, rectoceles) is associated. If internal
752 prolapse is an isolated finding, without associated disorders,
753 patients obviously do not benefit from surgery, and
754 consequently, surgery cannot be advised.

755 Conclusions

756 Despite its being a relatively uncommon condition, the
757 underlying pathophysiology and treatment of rectal pro-
758 lapse continue to generate much interest. Medical and
759 surgical literature documents a slow progress, with im-
760 provement noted in many facets of care. Many of the
761 reported series have concentrated on recurrence rates rather
762 than functional outcome, and all have reported only a short
763 follow-up. We know that prolapse has a spectrum of
764 physiologic presentations and that the centre of pelvic floor
765 disorders evaluation is the key to understanding the profile
766 of individual patients. Defecography and colon transit
767 studies may also reveal information that is important for
768 planning the surgical approach.

769 Three approaches are now available for the treatment of
770 rectal prolapse. Abdominal procedures are ideal for young
771 fit patients, whereas perineal procedures are reserved for
772 older frail patients with significant comorbidities. Results
773 after all abdominal procedures are comparable. The use of
774 laparoscopic techniques may permit surgeons to perform
775 procedures that were limited to the traditional approach,
776 with much lower impact on the patient.

777 Suture rectopexy seems adequate in curing rectal
778 prolapse. The superiority of mesh rectopexy has not been
779 demonstrated, and meshes add a foreign body and increase
780 the risk of infection. Suture and mesh rectopexies are still
781 popular with many surgeons, and the choice depends on the
782 surgeon's experience and preference. Whereas sigmoid
783 resection alone and anterior resection are obsolete, laparo-
784 scopic rectopexy has results equivalent to or better than
785 those of open rectopexy. Laparoscopic suture rectopexy is
786 preferable because it is simple and easy to perform. Perineal

787 procedures are useful for patients who are not fit for
788 abdominal procedures. Perineal rectosigmoidectomy seems
789 better than the Delorme procedure, and if possible,
790 levatorplasty should be added.

791 The STARR procedure is likely to become one standard
792 procedure in the future. Randomized trials and longer
793 follow-up are necessary to confirm the published good
794 perioperative and postoperative results.

795 In patients with combined simultaneous genital and rectal
796 prolapse, a multidisciplinary pelvic floor surgical approach
797 at the time of surgical treatment for rectal prolapse is
798 required. The collaboration between urologists or gynaecol-
799 ogists with special training in pelvic floor dysfunction and
800 colorectal surgeons may help overcome the simultaneous
801 problems inherent in pelvic floor disorders.

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