Surgical Management of Rectal Prolapse

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Background: The problem of complete rectal prolapse is formidable, with no clear predominant treatment of choice. Surgical management is aimed at restoring physiology by correcting the prolapse and improving continence and constipation with acceptable mortality and recurrence rates. Abdominal procedures are ideal for young fit patients, whereas perineal procedures are reserved for older frail patients with significant comorbidity. Laparoscopic procedures with their advantages of early recovery, less pain, and possibly lower morbidity are recently added options. Regardless of the therapy chosen, matching the surgical selection to the patient is essential.

Objective: To review the present status of the surgical treatment of rectal prolapse.

Data Sources: Literature review using MEDLINE. All articles reporting on rectopexy were included.

Study Selection: Articles reporting on prospective and retrospective comparisons were included. Case reports were excluded, as were studies comparing data with historical controls.

Data Extraction: The results were tabulated to show outcomes of different studies and were compared. Studies that did not report some of the outcomes were noted as “not stated.”

Data Synthesis: Abdominal operations offer not only lower recurrence but also greater chance for functional improvements. Suture and mesh rectopexy produce equivalent results. However, the polyvinyl alcohol (Ivalon) sponge rectopexy is associated with an increased risk of infectious complications and has largely been abandoned. The advantage of adding a resection to the rectopexy seems to be related to less constipation. Laparoscopic rectopexy has similar results to open rectopexy but has all of the advantages related to laparoscopy. Perineal procedures are better suited to frail elderly patients with extensive comorbidity.

Conclusions: Abdominal procedures are generally better for young fit patients; the results of all abdominal procedures are comparable. Suture and mesh rectopexy are still popular with many surgeons—the choice depends on the surgeon’s experience and preference. Similarly, the procedure may be done through a laparoscope or by laparotomy. Perineal procedures are preferable for patients who are not fit for abdominal procedures, such as elderly frail patients with significant comorbidities. The decision between perineal rectosigmoidectomy and Delorme procedures will depend on the surgeon’s preference, although the perineal rectosigmoidectomy has better outcomes.

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RECTAL PROLAPSE, OR PROCIDENTIA, IS DEFINED AS A PROTRUSION OF THE RECTUM BEYOND THE ANUS. Complete or full-thickness rectal prolapse is the protrusion of all of the rectal wall through the anal canal; if the rectal wall has prolapsed but does not protrude through the anus, it is called an occult (internal) rectal prolapse or a rectal intussusception. Full-thickness rectal prolapse should be distinguished from mucosal prolapse in which there is protrusion of only the rectal or anal mucosa.

Prerequisites for the development of rectal prolapse are (1) the presence of an abnormally deep pouch of Douglas, (2) the lax and atomic condition of the muscles of the pelvic floor and anal canal, (3) weakness of both internal and external sphincters, often with evidence of pudendal nerve neuropathy, and (4) the lack of normal fixation of the rectum, with a mobile mesorectum and lax lateral ligaments. With this abnormality, the small intestine, which lies against the anterior wall of the rectum, may force the rectum out through the anal canal.

Rectal prolapse occurs at the extremes of age. In the pediatric population, the condition is usually diagnosed by the age of 3 years, with an equal sex distribution. In the adult population, the peak incidence is after the fifth decade and women are more commonly affected, representing 80% to 90% of patients with rectal prolapse. Patients with complete rectal prolapse have markedly impaired rectal adaptation to distention, which may contribute to anal incontinence, and consequently more than half of the patients with rectal prolapse have coexisting inconti-
patients with rectal prolapse and incontinence noted a bet-
terior to the rectum.5 The rationale for rectal fixation is to
stipation. Briel et al11 in a review of suture rectopexy in 24
showing improvement, deterioration, or no effect on con-
fluence on constipation was variable, with different studies
ports showing an improvement in fecal continence. The in-
claimed rates ranging from 0% to 3%, with most of the re-
ties with a recurrence rate of 27%,23 the majority of reports
ranged from 0% to 27%.11,21-24 With the exception of one se-
lists series with more than 10 patients undergoing suture rec-
topexy. There was no reported mortality, and recurrence rates
in female patients with persistent anal incontinence after rec-
topy. These patients should be considered as candidates for
endoanal ultrasound and subsequent sphincter repair.

Prosthetic or Mesh Rectopexy

Insertion of a foreign material during rectopexy is com-
monly performed with the assumption that this mate-
rial evokes more fibrous tissue formation than ordinary
suture rectopexy.7 Materials used include fascia lata; non-
absorbable synthetic meshes such as nylon, polypropy-
lene (Prolene [Ethicon Inc, Somerville, NJ], Marlex [CR
Bard, Murray Hill, NJ]), polyvinyl alcohol (Ivalon; Dow
Corning, Midland, Mich.), and polytet (Teflon; CR Bard);
and absorbable meshes such as polyglactin (Vicryl; Eth-
icon Inc) and polyglycolic acid (Dexon; Davis Geck, Dan-
bury, Conn). There are 2 types of mesh rectopexy: pos-
terior mesh rectopexy and anterior sling rectopexy (Ripstein procedure).

Posterior Mesh Rectopexy. After rectal mobilization, a
prosthetic material or mesh is inserted between the sacrum
and the rectum, sutured into the rectum, and then sutured
into the periosteum of the sacral promontory. Although
fascia lata was used in the early description of the
procedure in general, it is no longer used. Table 2 lists
series in which posterior mesh rectopexy was used with
more than 10 patients. Four series used polyvinyl alco-
hol sponge rectopexy and the rest used other meshes. The
sponge rectopexy, first described by Wells in 1959,13 in-
volve insertion of the polyvinyl alcohol sponge pros-
thesis in front of the sacrum, between the sacrum and
the rectum. Mortality rates ranged from 0% to 3%,22,30,31
and recurrence rates were reported at 3%.16,22,20,31 Im-
provement in continence occurred in 3% to 40%, but there
was a mixed response of constipation to this type of rec-
topy.10,16,22,20,31,34,38 Although the sponge rectopexy was
popular before 1980, it has lost popularity and is con-
strained to studies before 1994. Other nonabsorbable syn-
thetic meshes have replaced the sponge, and more re-

ter overall clinical outcome in males. They postulated that the
low success rate in female patients might be explained
by the presence of an occult sphincter defect. This assump-
tion was underlined by a history of obstetric tear or episiotomy
in female patients with persistent anal incontinence after rec-
topy. These patients should be considered as candidates for

Abbreviations: NS, not stated; (+), improvement; (−), worsening.

### Table 1. Results of Suture Rectopexy for Rectal Prolapse

<table>
<thead>
<tr>
<th>Source</th>
<th>N</th>
<th>Design</th>
<th>Mortality, %</th>
<th>Continence, %</th>
<th>Constipation, %</th>
<th>Recurrence, No. (%)</th>
<th>Follow-up, mo</th>
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<tr>
<td>Carter et al, 1983</td>
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<td>Novell et al, 1994</td>
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<td>Prospective</td>
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<td>15 (+)</td>
<td>31 (−)</td>
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</tr>
<tr>
<td>Graf et al, 1996</td>
<td>53</td>
<td>Retrospective</td>
<td>0</td>
<td>36 (+) 12 (−)</td>
<td>30 (+) 27 (−)</td>
<td>5 (9)</td>
<td>97</td>
</tr>
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<td>Khanna et al, 1996</td>
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<td>83 (+)</td>
<td>0</td>
<td>65</td>
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<td>Briel et al, 1997</td>
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<td>NS</td>
<td>0</td>
<td>67 (+)</td>
<td>NS</td>
<td>0</td>
<td>67</td>
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<td>70 (+)</td>
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<td>Heath et al, 2000</td>
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<td>Kessler et al, 1999</td>
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<td>NS</td>
<td>NS</td>
<td>2 (6)</td>
<td>48</td>
</tr>
<tr>
<td>Bruch et al, 1999</td>
<td>32</td>
<td>Prospective</td>
<td>0</td>
<td>64 (+)</td>
<td>76 (+)</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Benoist et al, 2001</td>
<td>18</td>
<td>Retrospective</td>
<td>0</td>
<td>77 (+)</td>
<td>11 (−)</td>
<td>NS</td>
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</tr>
</tbody>
</table>

Many abdominal techniques have been described, differ-
ing only in the extent of rectal mobilization, the meth-
ods used for rectal fixation, and the inclusion or exclu-
sion of resection.3

### Suture Rectopexy

This operation, first described by Cutait in 1959,20 involves a
thoracic mobilization and upward fixation of the rectum.
The mobilization and subsequent healing by fibrosis tends
to keep the rectum attached in the desired elevated position
until it becomes fixed by scar tissue. In incontinent pa-
tients, the patulous sphincter ani begins to regain its tone
approximately 1 month after the procedure, and full con-
tinence is generally restored within 2 to 3 months.19 Nu-
merous procedures have been described for the treat-
ment of rectal prolapse and are generally categorized into
perineal or abdominal approaches.

### ABDOMINAL PROCEDURES

Many abdominal techniques have been described, differ-
ing only in the extent of rectal mobilization, the meth-
ods used for rectal fixation, and the inclusion or exclu-
sion of resection.3

Insertion of a foreign material during rectopexy is com-
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and absorbable meshes such as polyglactin (Vicryl; Eth-
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popular before 1980, it has lost popularity and is con-
strained to studies before 1994. Other nonabsorbable syn-
thetic meshes have replaced the sponge, and more re-
cently absorbable meshes have been introduced. A number of authors have shown that the use of both absorbable and nonabsorbable meshes achieved similar results. The mortality rate was 0% to 1% and the recurrence rates were 0% to 6% for both absorbable and nonabsorbable meshes. There was an overall improvement in continence, with conflicting results in terms of constipation (Table 2).

A number of studies have evaluated the efficacy of absorbable mesh in posterior mesh rectopexy. Wind et al assessed 47 patients with rectal prolapse in whom they compared 2 types of absorbable meshes (poliglecaprone and polypropylene) and noted mortality and recurrence rates similar to those with other nonabsorbable meshes. Galili and Rabau compared poliglecaprone and polypropylene in the treatment of rectal prolapse in 37 consecutive patients and produced similar results with both types of meshes. These results have been reproduced by others. The mortality and recurrence rates are similar to figures reported after placement of nonabsorbable meshes.

Significant pelvic sepsis is a major contributor to postoperative morbidity, having been reported in 2% to 16% of patients with prosthesis rectopexy. Polyvinyl alcohol sponge placement carries an increased risk of infectious complications. In 1996, Athanasiadis et al performed posterior mesh rectopexy in 222 patients, with sigmoidectomy in 145. They used polyvinyl alcohol in 87 patients, poliglecaprone in 109, and polytet in 26. The infection rate associated with polytet mesh was 0% and that associated with absorbable material without resection was 0%, whereas the presence of resection increased the mortality rate to 1%. In patients with polyvinyl alcohol sponge rectopexy, the infection rate was 3% without resection and increased to 3.7% in the presence of resection. Insertion of a mesh during rectopexy without resection appears to be reasonable, as it was associated with a 0% or very low mortality.

Because the main predisposing factor for infection of the implant is an infected pelvic hematoma, drainage of the presacral pelvic region during surgery is recommended. The converse argument is that a pelvic drain may serve as a source of infection. If this complication does occur, however, removal of the foreign material is advisable, as sepsis does not resolve until all foreign material is removed. In general, other materials are preferred over the polyvinyl alcohol sponge as this material is highly prone to infection. Furthermore, in the presence of an anastomosis in patients having a synchronous resection, the theoretical risk of infection is increased.

### Ripstein Procedure (Anterior Sling Rectopexy)

This operation was first described by Ripstein in 1952. After complete mobilization of the rectum, an anterior sling of fascia lata or synthetic material is placed in front of the rectum and sutured to the sacral promontory. The rationale is to restore the posterior curve of the rectum to minimize the effect of increased intra-abdominal pressure. The operation provides a firm anterior fascial support in patients with atrophic pelvic structures and restores the normal anatomical position of the rectum. Table 3 lists series with more than 10 patients undergoing the Ripstein procedure. Mortality rates ranged between 0% and 2.8% and recurrence rates between 0% and 13%, and there was a trend toward improvement in continence and a mixed response to constipation. Although the Ripstein procedure has been denigrated on the grounds that it causes ob-

### Table 2. Results of Posterior Mesh Rectopexy for Rectal Prolapse

<table>
<thead>
<tr>
<th>Source</th>
<th>N</th>
<th>Design</th>
<th>Mesh*</th>
<th>Mortality, No. (%)</th>
<th>Constipation, %</th>
<th>Constipation, %</th>
<th>Recurrence, No. (%)</th>
<th>Follow-up, mo</th>
</tr>
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<td>Penfold and Hawley</td>
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<td>Morg et al</td>
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<td>58 (+)</td>
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<td>Mann and Hoffman</td>
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<td>39 (+)</td>
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<td>NS</td>
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<td>Novell et al</td>
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<td>0</td>
<td>3 (+)</td>
<td>48 (+)</td>
<td>2 (3)</td>
<td>47</td>
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<tr>
<td>Scaglia et al</td>
<td>16</td>
<td>Retrospective</td>
<td>2</td>
<td>0</td>
<td>19 (+)</td>
<td>14 (+)</td>
<td>0</td>
<td>12</td>
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<tr>
<td>Notaras</td>
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<td>NS</td>
<td>NS</td>
<td>NS</td>
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<td>Keighley and Shouler</td>
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<td>64 (+)</td>
<td>NS</td>
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<td>Sayfan et al</td>
<td>16</td>
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<td>0</td>
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<td>NC</td>
<td>75</td>
<td>NS</td>
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<tr>
<td>Luukkonen et al</td>
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<td>4</td>
<td>0</td>
<td>53 (+)</td>
<td>100</td>
<td>0</td>
<td>NS</td>
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<tr>
<td>Wind et al</td>
<td>47</td>
<td>Prospective</td>
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<td>17 (+)</td>
<td>NS</td>
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</tr>
<tr>
<td>Galili and Rabau</td>
<td>37</td>
<td>Prospective</td>
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<td>2</td>
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<td>NS</td>
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<td>44</td>
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<td>Yaku et al</td>
<td>48</td>
<td>Retrospective</td>
<td>2</td>
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<td>(+)</td>
<td>NC</td>
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<tr>
<td>Aitola et al</td>
<td>96</td>
<td>Retrospective</td>
<td>2</td>
<td>1</td>
<td>26 (+)</td>
<td>24 (+)</td>
<td>6 (6)</td>
<td>78</td>
</tr>
<tr>
<td>Mollen et al</td>
<td>18</td>
<td>Prospective</td>
<td>5</td>
<td>NS</td>
<td>NS</td>
<td>NC</td>
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<td>Himpen et al</td>
<td>37</td>
<td>Prospective</td>
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<td>0</td>
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<td>38 (+)</td>
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<td>26</td>
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<td>Darzi et al</td>
<td>29</td>
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<td>NS</td>
<td>0</td>
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<td>Bocca et al</td>
<td>10</td>
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<td>2</td>
<td>0</td>
<td>(+)</td>
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<td>NC</td>
<td>1 (4)</td>
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<td>Benoist et al</td>
<td>14</td>
<td>Retrospective</td>
<td>2</td>
<td>0</td>
<td>10 (+)</td>
<td>21 (+)</td>
<td>NS</td>
<td>NS</td>
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</table>

*Abbreviations: NC, no change; NS, not stated; (+), improvement; (−), worsening.

1 indicates polyvinyl alcohol sponge (Ivalon); 2, polypropylene (Prolene [Ethicon Inc, Somerville, NJ], Marlex [CR Bard, Murray Hill, NJ]); 3, polyglactin (Vicryl; Ethicon Inc); 4, polyglycolic acid (Dexon; Davis & Geck, Danbury, Conn); 5, polytef (Teflon; CR Bard); 6, silk (Mersilene; Ethicon Inc).
difficulties at the time of the original operation were implying the rectum in the narrow male pelvis. Technical difficulties with a narrow pelvis might be difficulty in mobilization of the rectum, with a gap deliberately left between the ends to obviate narrowing. Intraoperative rigid proctoscopy can help determine the snugness of the wrap and caliber of the rectal lumen. Male patients exhibit a higher incidence of recurrent prolapse because of technical difficulties with a narrow pelvis.15,53,60

In 1988, Roberts et al53 reviewed their experience with the Ripstein procedure in 135 patients during a 22-year period at the Lahey Clinic, Burlington, Mass; they noted a 52% complication rate, the most serious complication being presacral hematoma, which occurred in 8% of cases. The overall recurrence rate was 10%. However, the recurrence rate in men was 3 times that in women (24% vs 8%, respectively). They postulated that the reason for a high failure rate in men might be difficulty in mobilizing the rectum in the narrow male pelvis. Technical difficulties at the time of the original operation were implicated in 50% of cases of male patients with recurrence.53

### Table 3. Results of the Ripstein Procedure for Rectal Prolapse

<table>
<thead>
<tr>
<th>Source</th>
<th>N</th>
<th>Design</th>
<th>Mortality, No. (%)</th>
<th>Continence, %</th>
<th>Constipation, %</th>
<th>Recurrence, No. (%)</th>
<th>Follow-up, mo</th>
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<tr>
<td>Launer et al.51 1982</td>
<td>54</td>
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<td>0</td>
<td>41 (+)</td>
<td>10 (-)</td>
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<td>64</td>
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<td>108</td>
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<td>4 (4)</td>
<td>83</td>
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<td>Roberts et al.53 1988</td>
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<td>Retrospective</td>
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<td>13 (10)</td>
<td>41</td>
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<td>17 (-)</td>
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<td>Schultz et al.57 1996</td>
<td>24</td>
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<td>NS</td>
<td>NS</td>
<td>NS</td>
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<tr>
<td>Schultz et al.58 2000</td>
<td>69</td>
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<td>0</td>
<td>20 (+)</td>
<td>37 (+)</td>
<td>1 (2)</td>
<td>82</td>
</tr>
</tbody>
</table>

**Abbreviations:** NA, not applicable; NS, not stated; (+), improvement; (-), worsening.

### Table 4. Results of Suture Rectopexy With Resection

<table>
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<tr>
<th>Source</th>
<th>N</th>
<th>Design</th>
<th>Mortality, No. (%)</th>
<th>Continence, %</th>
<th>Constipation, %</th>
<th>Recurrence, No. (%)</th>
<th>Follow-up, mo</th>
</tr>
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<tr>
<td>Watts et al.52 1985</td>
<td>138</td>
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<td>0</td>
<td>78 (+)</td>
<td>NS</td>
<td>2 (2)</td>
<td>48</td>
</tr>
<tr>
<td>Sayan et al.53 1990</td>
<td>13</td>
<td>Prospective</td>
<td>0</td>
<td>66 (+)</td>
<td>80 (+)</td>
<td>NS</td>
<td>NS</td>
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<tr>
<td>Luukkonen et al.55 1992</td>
<td>15</td>
<td>Prospective</td>
<td>1 (6.7)</td>
<td>33 (+)</td>
<td>60 (+)</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Tjandra et al.56 1993</td>
<td>18</td>
<td>Retrospective</td>
<td>0</td>
<td>11 (+)</td>
<td>56 (+)</td>
<td>NS</td>
<td>50</td>
</tr>
<tr>
<td>Deen et al.57 1994</td>
<td>10</td>
<td>Prospective</td>
<td>0</td>
<td>90</td>
<td>NS</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Huber et al.58 1995</td>
<td>42</td>
<td>Prospective</td>
<td>0</td>
<td>44 (+)</td>
<td>18 (+)</td>
<td>0</td>
<td>54</td>
</tr>
<tr>
<td>Yakut et al.59 1998</td>
<td>19</td>
<td>Retrospective</td>
<td>0</td>
<td>(+)</td>
<td>(+)</td>
<td>0</td>
<td>38</td>
</tr>
<tr>
<td>Kim et al.60 1999</td>
<td>176</td>
<td>Retrospective</td>
<td>NS</td>
<td>55 (+)</td>
<td>43 (+)</td>
<td>9 (5)</td>
<td>98</td>
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<tr>
<td><strong>Laparoscopic</strong></td>
<td></td>
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<td>Stevenson et al.61 1998</td>
<td>34</td>
<td>Prospective</td>
<td>0</td>
<td>70 (+)</td>
<td>64 (+)</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Xynos et al.62 1999</td>
<td>10</td>
<td>Prospective</td>
<td>0</td>
<td>100 (+)</td>
<td>NA</td>
<td>NS</td>
<td>12</td>
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<tr>
<td>Benoit et al.63 2001</td>
<td>16</td>
<td>Retrospective</td>
<td>0</td>
<td>100 (+)</td>
<td>0</td>
<td>NS</td>
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**Abbreviations:** NA, not applicable; NS, not stated; (+), improvement.

Resection

The concept of rectosigmoid resection is based on the observation that after low anterior resection, a dense area of fibrosis forms between the anastomotic suture line and the sacrum. Other advantages include (1) resection of the abundant rectosigmoid, which avoids torsion or volvulus; (2) achieving a straighter course of the left colon and little mobility from the phrenocolic ligament downward, which acts as yet another fixation device; and (3) relief of constipation in a selected group of patients. It is well suited to patients with a long redundant sigmoid and a long history of constipation. However, sigmoid resection alone for rectal prolapse has not been popular and is confined to studies before 1980.

The addition of sigmoid resection to rectopexy (resection rectopexy; Frykman-Goldberg procedure) combines the advantages of mobilization of the rectum, sigmoid resection, and fixation of the rectum. Most of the series describe resection rectopexy in which resection is combined with suture rectopexy. Few studies have addressed a combination of resection and posterior mesh rectopexy. Table 4 lists series with more than 10 patients undergoing resection rectopexy (suture rectopexy and resection rectopexy).
section). The mortality rates ranged from 0% to 6.7%, with an associated recurrence rate of 0% to 5%, and there was an overall reduction in continence, which was attributed to resection of the redundant sigmoid colon. Continence was also improved in most patients. Luukkonen et al in a comparative study between rectopexy with sigmoidectomy vs rectopexy alone showed that sigmoid resection did not increase morbidity but tended to diminish postoperative constipation, possibly by causing less outlet obstruction.

In a prospective randomized study of rectopexy with and without rectopexy, McKee et al in 1992 showed that patients with rectal prolapse who underwent abdominal rectopexy alone had a high incidence of constipation. They also showed that patients having rectopexy alone had a higher pressure in the rectum for a given volume of isotonic sodium chloride solution infused. They postulated that this was due to kinking between the redundant sigmoid colon and the rectum at the rectosigmoid junction, and that the addition of sigmoidectomy appeared to alleviate this possibility by removing the redundant loop of colon that may kink and cause delay in passage of intestinal content.

Anterior resection was first described by Muir in 1955, although the first successful operation was performed by Stabins in 1947. In a retrospective study of 28 patients, Theuerkauf et al in 1970 noticed a 4% mortality rate and 4% recurrence rate after anterior resection with improvement of continence in 63% of cases. Schlinkert et al in 1985 reviewed the Mayo Clinic experience with anterior resection for complete rectal prolapse in 113 patients during a 12-year period. There was a 9% recurrence rate, a 1% mortality rate, and a 50% improvement in continence. Cirocco and Brown in 1989 performed anterior resection in 41 patients with complete rectal prolapse. All of these authors claimed that the advantages of this operation was that it was familiar and frequently performed, did not require a foreign body or rectal suspension, and had withstood long-term scrutiny in terms of both recurrence and associated complications. As with sigmoid resection, this operation has not gained popularity.

**Laparoscopic Rectopexy**

Compared with laparotomy, laparoscopic rectopexy has the advantages of reduced pain, shortened hospital stay, early recovery, and early return to work. The procedure involves either suture or posterior mesh rectopexy, with or without resection. It has gained popularity as it is relatively simple and easily accomplished and resection with anastomosis is avoided. The mortality for laparoscopic rectopexy ranged between 0% and 3%, with recurrence rates ranging from 0% to 10% in follow-up of between 8 and 30 months. These studies have demonstrated that this approach is as effective as the open method in the treatment of rectal prolapse, and the effect on continence and constipation depends on the type of rectopexy performed.

In 1999, Bocca et al compared the functional and clinical results of laparoscopic rectopexy with those of the open technique in 2 similar groups of patients with complete rectal prolapse. The laparoscopic approach was associated with a reduction in postoperative hospitalization, but there was a nonsignificant prolongation of operative time and the higher cost of surgical materials. The shorter postoperative hospital stay determined an overall reduction in the total cost of laparoscopic rectopexy. In the same year, Xynos et al compared open and laparoscopic resection rectopexy and concluded that resection rectopexy for rectal prolapse can be performed safely via the laparoscopic approach.

In 2002, Solomon et al reported on a randomized controlled study of 39 patients undergoing abdominal rectopexy. Nineteen underwent open procedures and 20 had laparoscopic procedures. They concluded that the laparoscopic technique had short-term benefits in terms of return to normal diet and mobility, earlier discharge from the hospital, and less morbidity. These results were paralleled by a reduced neuroendocrine and immunologic stress response. No long-term differences in constipation, recurrent prolapse, or improvement in continence scores between open and laparoscopic approaches were identified. Laparoscopically assisted rectopexy has also been described with good results, equivalent to those of open and laparoscopic rectopexy.

**Place of Prosthetic Meshes in Rectopexy**

The use of prosthetic material in rectopexy has been challenged in recent years. There is evidence that complete encirclement of the rectum (Ripstein procedure) may lead to erosion of the foreign material with subsequent fistula formation and stenosis in approximately 7% of patients. Furthermore, Kuijpers reoperated on 4 patients who had had posterior rectopexy with T-shaped polytet mesh several years previously. None of the patients had actual prolapse recurrence, but both of the “horizontal” legs of the mesh had retracted to the promontory and were ineffective as a fixation device. Therefore, Kuijpers believed that the purpose of using an implant to evoke an intense fibrous tissue formation is not always achieved by using prosthetic material. In 1972, Penfold and Hawley conceded that the polyvinyl alcohol sponge tends to fragment but persists in human tissues for 5 years. Indeed, many authors now believe that rectal fixation by suture only seems sufficient, with reported recurrence rates of 3% or less.

**Role of Division of Ligaments**

The left colon and rectum receive retrograde innervation from neural efferents running through the lateral ligaments; thus, lateral ligament division during rectopexy has been suggested to denervate the rectum, causing postoperative continence. A number of studies have looked at the effect of the division or preservation of ligaments and are shown in Table 5 and Table 6. The results shown in Table 5 suggest that the lateral ligaments were usually divided, perhaps because there is a trend toward improved continence. Although fecal incontinence may have been decreased, constipation either worsened or remained the same. Only 4 studies addressed changes in resting and squeeze pressures. Three of these studies showed improvement in both pressures, while only 2 showed improvement in squeeze pressures. Table 6 shows studies of more than 10 patients in whom rectopexy was accompanied by pres-
dressing lateralligament division or preservation were included was that only 2 studies (one of which was an abstract) addressed anorectal physiological changes after rectopexy; there was a tendency toward reduction of constipation. Again, only 4 studies addressed anorectal physiological changes after rectopexy; there was an overall increase in resting and squeeze pressures. Brazzelli et al performed a meta-analysis of articles reporting on surgery for rectal prolapse. They concluded that division, rather than preservation, of the lateral ligaments was associated with less recurrent prolapse but more postoperative constipation, although these findings were found in small numbers. The major limitation of this meta-analysis was that only 2 studies (one of which was an abstract) addressing lateral ligament division or preservation were included in the meta-analysis. In summary, it would appear that preservation of ligaments is associated with an improvement in continence and a reduction of constipation.

### PERINEAL PROCEDURES

The advantage of perineal procedures is that they avoid laparotomy, which makes them well suited for high-risk patients. There are 2 widely used perineal procedures: the Delorme procedure and perineal rectosigmoidectomy (Altemeier operation). The Thiersch procedure, which entails encircling and thereby narrowing the anal canal, does not eradicate prolapse but merely prevents its further descent.
by providing mechanical support, and hence it is associated with a high recurrence rate (33%-44%). Given the safety of modern anesthetic techniques, there is no role for its use.5

Delorme Operation

This procedure was described by Delorme in 1900 and involves dilation of the anus, separation of the mucosa from the sphincter and the muscularis propria, and the division of the mucosa together with the plication of the muscularis propria. It has an additional advantage of excision of a concomitant rectal ulcer if present.82

The Delorme procedure represents a surgical alternative for patients with prolapse who may be unable to tolerate a more extensive operation, such as the elderly, frail patients, and those who are medically unfit for major surgery.56,82,83

Table 7 lists patients undergoing the Delorme operation, with reported mortality rates of 0% to 4% and recurrence rates of 4% to 38%.56,57,82,84,86-88 Oliver et al successfully performed the Delorme procedure in 41 patients with a mean age of 82 years who were deemed unfit for major surgery because of age or comorbidity. They pointed out that important pitfalls in performing the procedure were weak or absent sphincter tone, perineal descent, and previous sphincter injury. There was a general improvement in continence.

Pescatori et al combined the Delorme procedure with sphincteroplasty in 33 patients, with good results achieved in 79% of patients. Continence improved in 70%, and in 44% constipation was cured. They concluded that the Delorme procedure combined with sphincteroplasty seemed indicated when both clinical and physiological findings showed a concomitant severe pelvic floor dysfunction. However, many other series without sphincteroplasty have shown improvement in continence.84-87

Factors associated with failure for the Delorme procedure include proximal procidentia with retrosacral separation on defecography, fecal incontinence, chronic diarrhea, and major perineal descent (>9 cm on straining). In the absence of these factors, the Delorme procedure provided a satisfactory and durable outcome.89

Perineal Rectosigmoidectomy

This procedure was first advocated by Miles in 1933 and subsequently by Altemeier et al in 1971.91 It involves a full-thickness excision of the rectum and, if possible, a
portion of the sigmoid colon. It has gained general acceptance for use in elderly patients in North America. Table 8 summarizes the data on patients who underwent perineal rectosigmoidectomy. The reported overall mortality rates ranged from 0% to 5% and recurrence rates from 0% to 16%. 66,68,85,87,92,93,95

The postoperative course after perineal rectosigmoidectomy is generally uneventful, patients have minimal pain, oral intake can generally be commenced within 24 to 48 hours after surgery, and bowel function returns within a few days of surgery. 66 The potential complications include anastomotic bleeding and pelvic sepsis and, although leakage is uncommon, tension and poor blood supply can cause anastomotic dehiscence. 66 Extreme care must be taken not to pull the bowel too tightly while avoiding ligation of the mesentery too far proximally. Since recurrence probably reflects inadequate resection, care must be taken to mobilize the entire redundant rectum and to perform the anastomosis within the pelvis. 80 Perineal rectosigmoidectomy is well suited for male patients; patients with incarcerated, strangulated, or even gangrenous prolapsed rectal segment; and patients who have had recurrence after another transperineal repair. 60,92,95

Perineal rectosigmoidectomy has yielded poor functional results with respect to incontinence, urgency, and soiling, as well as high recurrence rates because of the loss of reservoir capacity due to a rather narrow colon above the anal anastomosis, together with some reduction in anal sphincter function. 20,26,68 Yoshioka et al 60 described puch rectosigmoidectomy as a means of overcoming this problem and suggested that this procedure reduced recurrent prolapse probably because rectopexy sutures were used to fix the transected colon against the presacral fascia. However, a prospective randomized trial at the institution of 2 of the 3 of us (M.K.B. and S.D.W.) had to be discontinued because of the large number of patients randomized to puch anal anastomosis in whom a viable pouch could not be made to reach the anus.

Reduction in resting anal pressure and compromised compliance make conventional perineal rectosigmoidectomy an unphysiologic procedure that results in increased soiling and frequency of defecation. 66 Some authors 15,60,85,92,95 have therefore suggested the addition of levatorplasty to perineal rectosigmoidectomy. The advantage of posterior levatorplasty is that it recreates the anorectal angle, which seems to improve anal continence. 92 This concomitant levatorplasty achieves not only a more significant improvement in continence but also a lower short-term recurrence rate than either the Delorme procedure or perineal rectosigmoidectomy alone. 85 When comparing the various perineal options (perineal rectosigmoidectomy, perineal rectosigmoidectomy with levatorplasty, and Delorme procedure), the perineal rectosigmoidectomy with levatorplasty has the largest recurrence-free interval, the lowest recurrence rate, and the most salutary effects on constipation and incontinence. Perineal rectosigmoidectomy is therefore next best and the Delorme procedure is the worst of the 3 perineal options.

There is general agreement that perineal rectosigmoidectomy is often the best operation for extremely elderly patients or individuals with profound comorbidity, in whom an abdominal procedure might be contraindi- cated. 93-95 It is also suitable for the elderly or high-risk patients with incontinence because a concomitant levatorplasty can be performed. 15,60,94

COMPARISON OF DIFFERENT PROCEDURES AND APPROACHES

Scaglia et al 12 compared 16 patients who underwent posterior mesh rectopexy with 12 who had Ripstein rectopexy. Neither procedure improved symptoms of constipation or evacuation problems. The criticism of that study is the very small numbers of patients. Novell et al 22 compared the polyvinyl alcohol sponge technique in 31 patients with the sutured rectopexy in 32 patients. There was marginal improvement in continence and reduction of constipation with the suture technique. Those authors concluded that because of the small but definite risk of infection associated with the sponge procedure, it should be abandoned. In a prospective randomized study, Luukkonen et al 35 in 1992 compared abdominal rectopexy with sigmoidectomy in 15 patients vs posterior mesh rectopexy without resection in 15 patients. Sigmoid resection in conjunction with rectopexy did not seem to increase operative morbidity but tended to diminish postoperative constipation. Sayfan et al 34 prospectively compared 11 patients who underwent sutured rectopexy and resection with 12 patients who had posterior polypropylene mesh rectopexy and concluded that resection rectopexy was comparable with posterior mesh rectopexy.

In 2001, Benoist et al 29 published their results of laparoscopic rectopexy in 48 patients. They evaluated laparoscopic rectopexy using mesh, suture, and resection and concluded that laparoscopic rectopexy was safe and effective. They also found that there was no difference among the 3 groups in terms of continence; mesh rectopexy conferred no advantage over suture rectopexy.

In 1999, Kim et al 68 reviewed their experience with the treatment of 372 patients with complete rectal prolapse during a 19-year period. They looked at choice of operation, recurrence rates, and functional results and showed that abdominal rectopexy with bowel resection was associated with low recurrence rates. Perineal rectosigmoidectomy provided lower morbidity and shorter hospitalization, but recurrence rates were much higher. They pointed out that perineal rectosigmoidectomy has appeal as a less intensive procedure for elderly patients or patients in the high-risk category. They conceded that patients who underwent perineal rectosigmoidectomy were more likely to have associated medical problems.

Yakut et al 7 evaluated their results in 94 patients in 1998. They looked at the results of the Delorme procedure and of abdominal resection with or without rectopexy. They noted that the most important complications were sexual problems in male patients who underwent posterior rectopexy procedures. They concluded that the Delorme procedure, posterior rectopexy, and resection procedures were effective surgical operations for the treatment of rectal prolapse but that extensive pelvic dissection during the posterior rectopexy might create serious sexual dysfunction in male patients.

Deen et al 16 compared suture and resection rectopexy with perineal rectosigmoidectomy. They noted that
abdominal resection rectopexy with pelvic floor repair gave better functional and physiological results than did perineal rectosigmoidectomy by preserving both the internal sphincter and the rectal reservoir. There was a significantly higher maximum rectal resting pressure in patients with resection rectopexy.

In 1997, Agachan et al85 compared the Delorme procedure, the perineal rectosigmoidectomy, and perineal rectosigmoidectomy with levatorplasty. The recurrence rate was highest with the Delorme procedure; postoperative continence was improved in all 3 procedures. The postoperative incontinence score was lowest in patients with perineal rectosigmoidectomy with levatorplasty. The median hospital stay was similar for all groups. Recurrence rates were 38% for the Delorme procedure, 13% for perineal rectosigmoidectomy, and 5% for perineal rectosigmoidectomy with levatorplasty. Postoperative anorectal function and anorectal physiological characteristics were similar for all groups. The authors concluded that perineal rectosigmoidectomy with levatorplasty was a safe procedure, resulting in significantly better short-term functional outcome than either perineal rectosigmoidectomy alone or the Delorme procedure. Concomitant levatorplasty achieves not only a more significant improvement in continence but a lower short-term recurrence rate than the other 2 procedures. It would appear that the functional results of the perineal procedures compare favorably with those of abdominal procedures in terms of restoration of continence, with less frequent severe morbidity.57,66,72,83,84 However, high recurrence rates after both primary and repeat operations should be explained to patients when their surgical management is planned.7,56,66,82,83 Extensive diverticular disease may prohibit effective and complete proximal mucosectomy in the Delorme procedure. Inadequate resection may predispose to early recurrence of the prolapse.80

Since perineal rectosigmoidectomy is difficult to perform in patients with a small prolapse and in those whose prolapse is not full thickness in its entire circumference, Takesue et al86 suggested that if the prolapsing rectal segment is shorter than 3 to 4 cm, a modification of the Delorme procedure is a better approach than perineal rectosigmoidectomy. We agree with this assessment.

CHOICE OF OPERATION

It seems reasonable that patients who are fit for surgery without comorbidity should be offered abdominal rectopexy, as it is now associated with very low mortality rates. The abdominal operation with the lowest recurrence rate should be offered to the medically fit patient. Even though abdominal operations have a higher morbidity, the fit patient is presumably capable of withstanding complications and should be given the best chance to cure the prolapse. This review has established that abdominal operations not only offer lower recurrence but also a greater chance for functional improvements. Suture rectopexy is capable of giving good results, and the addition of the posterior mesh does not offer additional advantage; rather, it has the disadvantage of introducing a foreign body. There seems therefore little to choose between suture rectopexy and posterior mesh rectopexy. The polyvinyl alcohol sponge rectopexy is associated with an increased risk of infectious complications and has largely been abandoned. Posterior mesh rectopexy with other types of meshes has reasonable complication rates and recurrence rates. The advantage of adding a resection to the rectopexy seems to be a reduction in constipation. This procedure therefore seems suited to patients with a redundant sigmoid colon and a history of constipation. The Ripstein procedure has been associated with problems of constipation that either persist or postoperatively worsen.

Having chosen an abdominal resection rectopexy as the best option for the fit patient, the next decision is how to address the lateral ligaments. Preservation of the ligaments seems to have the advantage over their division in terms of continence and constipation. There are far fewer studies addressing the influence on resting and squeeze pressures after both approaches, but there seems to be benefit to preservation of ligaments. Further studies are required to assess the efficacy of division and preservation of lateral ligaments in these operations. However, for now the choice of division and preservation of ligaments depends on the surgeon’s experience and preference.

Laparoscopic surgery has the advantages of less pain, shorter hospital stay, early recovery, and early return to work as compared with laparotomy. Apart from these advantages, the results are similar to those with the open procedures irrespective of the method used (suture, resection, or posterior mesh). Therefore, where expertise is available, this approach may be preferred.

Perineal procedures are often useful for frail patients with extensive comorbidity and individuals who are not fit for major abdominal surgery. Mortality rates are acceptable considering the type of patient in whom the procedure is done. The higher recurrence rates mandate that patients be forewarned that there may be need for a second operation. Whether to do the Delorme procedure or the perineal rectosigmoidectomy will depend on the preference and experience of the surgeon and, to a lesser extent, on where the physician is practicing. However, the Delorme procedure is associated with even higher recurrence rates than is perineal rectosigmoidectomy. In addition to reducing the potential risk of injury to the pelvic nerves, a perineal approach may be preferable in young male patients.

Favorable outcome could be achieved after perineal procedures by applying stringent patient-selection criteria. Perineal procedures represent a surgical alternative for patients with total prolapse who may be unable to tolerate a more extensive operation such as the elderly, frail patients, and those who are medically unfit for major surgery such as abdominal rectopexy. The Delorme procedure may be useful if there is insufficient length of prolapse to perform a perineal rectosigmoidectomy.80,82,83

For all perineal procedures, the high recurrence rates for primary and repeat operations should be explained to patients when their treatment is planned. Perineal rectosigmoidectomy is well suited for patients with incarcerated, strangulated, and gangrenous rectal prolapse, whereas abdominal rectopexy cannot be used for these situations, even in fit patients.

In recent years, there has been a trend toward offering perineal rectosigmoidectomy to healthier patients.64 Although perineal rectosigmoidectomy can be per-
formed with minimal hospitalization and disruption in the patient's life, the recurrence rate is in the range of 16%.66 For younger female patients the benefits of perineal rectosigmoidectomy being a lesser procedure must be weighed against a higher recurrence rate.66 Among factors to consider in the selection of a treatment option are the age and health of the patient, functional results, and the benefits vs the advantages and disadvantages of the surgical technique.66

CONCLUSIONS

The problem of complete rectal prolapse is formidable, with no clear predominant treatment of choice. Abdominal procedures are ideal for young fit patients, whereas perineal procedures are reserved for older frail patients with significant comorbidities. Results after all abdominal procedures are comparable. Suture rectopexy seems adequate in curing rectal prolapse. The superiority of mesh rectopexy has not been demonstrated, and meshes add a foreign body and increase the risk of infection. Suture and mesh rectopexy are still popular with many surgeons, and the choice depends on the surgeon's experience and preference. Whereas sigmoid resection alone and anterior resection are obsolete, laparoscopic rectopexy has results equivalent to or better than those of open rectopexy. Laparoscopic suture rectopexy is preferable because it is simple and easy to perform. Perineal procedures are useful for patients who are not fit for abdominal procedures. Perineal rectosigmoidectomy seems better than the Delorme procedure and, if possible, levatorplasty should be added.

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REFERENCES


70. McKee RF, Lauder JC, Poon FW, et al. A prospective randomized study of ab-

73. Theuerkauf FJ Jr, Briters OH, Hill JR. Rectal prolapse: causation and surgical treat-

75. Baker R, Senagore AJ, Luchtfeid MA. Laparoscopic assisted vs open resection: rec-

77. Blatchford GJ, Perry RE, Thorson AG, Christensen MA. Rectal prolapse: rational th-

80. Dietzen CD, Pemberton JH. Perineal approaches for the treatment of complete re-

83. Kling KM, Rongione AJ, Evans B, McFadden DW. The Delorme procedure: a use-

86. Oliver GC, Vachon D, Eisenstat TE, et al. Delorme’s procedure for complete rec-

89. Witts AMI, Thompson MR. Evaluation of Delorme’s procedure as a treatment for full-

90. Ramanujam PS, Vankatesh KS, Fietz MJ. Perineal excision of rectal procidentia in the e-

92. Ramanujam PS, Vankatesh KS, Fietz MJ. Perineal excision of rectal procidentia in e-

94. Johansen OB, Wexner SD, Daniel N, et al. Perineal rectosigmoidectomy in the eld-

96. Williams JG, Rotheberger DA, Madoff RD, Goldberg SM. Treatment of rectal pro-

98. Williams JG, Rotheberger DA, Madoff RD, Goldberg SM. Treatment of rectal pro-

100. Prasad ML, Pearl RK, Abcarian H, et al. Perineal proctectomy, posterior rec-

102. Ross AH, Thomson JPS. Management of infection after prosthetic abdominal s-

104. Araki Y, Isomoto H, Tsuzi Y, et al. Trans-sacral rectopexy for recurrent complete re-

106. Schlinkert RT, Beart RW, Wolff BG, Pemberton JH. Anterior resection for complete re-

108. Schlinkert RT, Beart RW, Wolff BG, Pemberton JH. Anterior resection for complete re-


112. BB, Dijkstra P. Laparoscopic versus open abdominal rectopexy for rectal prolapse. 


116. Frykman HM, Goldberg SM. The surgical treatment of rectal procidentia. Dis Co-

118. Solomon MJ, Young CJ, Eyers AA, Roberts RA. Randomised clinical trial of lap-

120. Solomon MJ, Young CJ, Eyers AA, Roberts RA. Randomised clinical trial of lap-


132. Liberman H, Hughes C, Dippolito A. Evaluation and outcome of the Delorme pro-

134. Oliver GC, Vachon D, Eisenstat TE, et al. Delorme’s procedure for complete re-


140. Knie KM, Rongione AJ, Evans B, McFadden DW. The Delorme procedure: a use-

142. Liberman H, Hughes C, Dippolito A. Evaluation and outcome of the Delorme pro-


146. Williams JG, Rotheberger DA, Madoff RD, Goldberg SM. Treatment of rectal pro-

148. Johansen OB, Wexner SD, Daniel N, et al. Perineal rectosigmoidectomy in the eld-

150. Prasad ML, Pearl RK, Abcarian H, et al. Perineal proctectomy, posterior rec-