Hypothesis: The modified Delorme operation is a safe, effective, and durable treatment for complete rectal prolapse.

Design: Retrospective analysis of outcomes in adult patients undergoing the modified Delorme operation.

Setting: Community-based tertiary referral center with a 5-year general surgery residency program.

Patients: A total of 52 consecutive patients undergoing surgery for the treatment of complete rectal prolapse during the 26-year period ending December 2001.

Interventions: Modified Delorme operation.

Main Outcomes Measured: Method of anesthesia, morbidity, mortality, recurrence rates, length of follow-up, and incontinence.

Results: In the 52 patients, the mean length of prolapse was 8.2 cm. The mean operating time was 75 minutes. Forty-five patients were administered general anesthesia, 4 were administered spinal anesthesia, and 3 were administered local anesthesia. The mean postoperative stay was 4.9 days for 1975 through 2001 and 2.8 days for 1990 through 2001. No patients died as a result of the procedure. Patients were followed up for 61.4 months. Major medical comorbidities occurred in 40 patients. Preoperative incontinence was present in 12 patients, 10 of whom improved after the procedure, and postoperative incontinence in 8. The recurrent postoperative prolapse rate at 5 years was 6% (3/52) and the recurrent postoperative prolapse rate to the end of the study was 10% (5/52). Two patients (4%) had complications that required operative intervention in the postoperative period.

Conclusions: The modified Delorme operation is a safe and effective surgical treatment for complete rectal prolapse. The risk of recurrent prolapse is low, and the procedure may be safely performed in patients with significant medical comorbidities.

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Complete rectal prolapse (procidentia) is an uncommon and disabling condition associated with many longstanding functional bowel syndromes. Edmond Delorme,1 a French military surgeon, first described a mucosal stripping procedure for procidentia in 1899. Several authors have since modified the procedure, including authors from our institution.2 More than 130 procedures have been described for the correction of rectal procidentia; thus, it can be inferred that none is entirely satisfactory.

First viewed as a technically simple and relatively safe operation, the Delorme procedure fell out of favor when those performing the operation anecdotally described high recurrence and complication rates.4 Recent reports,5,5-13 however, have indicated that the procedure can be performed with low recurrence rates, low morbidity, and almost no mortality. The Delorme operation and its modifications have been used to treat rectal prolapse as a primary procedure and as an option for recurrent rectal prolapse.14,15 Furthermore, the modified Delorme operation can be performed in patients who are poor candidates for transabdominal repairs (eg, multiple prior laparotomies with known extensive adhesions) or in patients for whom general anesthesia would constitute a high risk because of cardiac or pulmonary comorbidities. Herein, we report the long-term follow-up results of a single institution’s experience with the modified Delorme procedure for repair of procidentia.
lapse were treated by the modified Delorme operation at 1 of 2 institutions affiliated with Gundersen Lutheran Medical Center in LaCrosse, Wis. A retrospective review of each patient's hospital record and outpatient clinical records was performed. Long-term follow-up was accomplished by telephone interview, mail questionnaire, medical record review, or examination. Last follow-up date was considered the date the returned questionnaire was received or the date of last documented clinical examination by a physician in our clinical network.

Authors at our institution have previously described the modified Delorme procedure. Patients were placed in the lithotomy or jackknife prone position and the prolapse was visualized. Babcock clamps were used to grasp the prolapsed mucosa and extract the prolapse to its full extent. General endotracheal anesthesia was used in most patients, but a few patients with severe comorbidities underwent surgery under spinal/epidural anesthesia or perianal block with local anesthetic agents. Intravenous injection of local anesthetic with epinephrine has been routinely administered for the last 10 years.

A circumferential incision was made in the rectal mucosa approximately 1 cm away from the dentate line. Using electrocautery, the mucosa was stripped to the apex of the prolapse. The muscular layers of the rectal wall were reduced as the mucosa was stripped. Mucosal stripping continued past the apex of the prolapse and then continued inside the prolapsed segment to a point internally that is equivalent to the point of the initial mucosal incision. In one case, the Cavitron Ultrasonic Surgical Aspirator (USA) was used (Valleylab, Boulder, Colo).

The mucosa and muscular rectal wall were rejoined circumferentially with interrupted absorbable sutures using approximately 3 sutures per quadrant. No imbricating or plicating sutures were placed in the demuded muscular layer, allowing this layer to form a long cylindrical cuff around the distal rectum just above the anorectal ring. Postoperatively, minimal pain medication was required. Early ambulation was encouraged, and patients' diets were advanced as tolerated. Enemas were not given. Laxatives were given as needed after 48 hours. Rectal sphincter exercises were encouraged.

RESULTS

Fifty-two patients underwent the modified Delorme procedure at our institution during the 26-year period ending December 2001. Forty-six patients (88%) were women. The mean age was 68 years (range, 19-90 years). The average length of prolapse was 8.2 cm (range, 3-18 cm). The average operative time was 75 minutes (range, 40-150 minutes). The average blood loss was 244 mL (range, 50-1000 mL). Thirty-day operative mortality was nil. The average length of stay was 6.8 days; however, earlier study patients were routinely admitted before the operative date for bowel preparation. The average postoperative stay was 4.9 days (range, 1-16 days). The average postoperative stay for the years 1990 through 2001 was 2.8 days (range, 1-6 days). Twenty patients (38%) had major cardiac morbidities (congestive heart failure, coronary artery disease, or prior myocardial infarction). Twelve patients (23%) had major pulmonary comorbidities. Overall, 40 patients (77%) had significant medical comorbidities. The method of anesthesia varied. Forty-five patients (86%) underwent general anesthesia. Four patients (8%) underwent spinal anesthesia and 3 patients (6%) had perianal local anesthesia.

FOLLOW-UP

Twenty-six patients (50%) died of various causes before commencement of this retrospective review. No deaths were related to the procedure. Of the 26 patients still alive, 18 patients were able to be contacted either by telephone or questionnaire. Two of these 18 patients subsequently died after information was gathered by interview. Eight of the 26 patients still alive were unable to be contacted for current follow-up. However, based on the last recorded physical examination, these 8 patients have an average length of follow-up of 63 months. Average length of follow-up for all patients in the study was 61.4 months (range, 1-290 months). Eleven patients died during the short-term follow-up (range, 1-8 months). Excluding these 11 patients, the average length of follow-up for the remaining 41 patients was 77 months. Of the 18 patients recently contacted by telephone or returned questionnaire, only 2 (11%) were dissatisfied with their results. Both patients had early recurrences that required further operative interventions. Eighty-nine percent of patients were satisfied with their results.

CONTINENCE

Twelve patients (23%) described incontinence to liquid stool, solid stool, and/or flatus preoperatively. Eight patients (15%) described incontinence postoperatively. Five of these patients were incontinent before their operation. Three patients (6%) developed possible “new” incontinence during follow-up (Figure). These 3 patients included a 51-year-old man with severe mental retardation, an 83-year-old woman with senile dementia, and a 78-year-old woman with incontinence accompanying a recurrent prolapse 13 years after her initial operation.
Only 1 patient (6%) had complaints of postoperative diarrhea.

**COMPLICATIONS**

Thirteen patients (25%) had 17 complications (Table 1). Four patients (8%) had a bleeding complication, but only 1 required operative intervention. There was 1 rectovaginal hematoma, 1 buttck hematoma, and 1 rectal bleeding episode on the 10th postoperative day. All resolved spontaneously without specific treatment. The fourth patient had suture line bleeding that required resuturing of the mucosa on the first postoperative day. She was discharged on postoperative day 6 but readmitted on postoperative day 10 for rectal bleeding. She received 2 units of packed red blood cells with stabilization of her hemoglobin and was discharged home 1 week later without recurrent bleeding. Four patients (8%) had urinary retention postoperatively. All of these resolved after treatment with short-term Foley catheter drainage with no long-term adverse sequelae.

Severe nausea and vomiting were experienced by 1 patient in the postanesthesia care unit, which resulted in suture line dehiscence and recurrent prolapse. She was taken back to the operating room and immediate resuturing was followed by a benign convalescence. Her initial repair included only mucosa-to-mucosa approximation and did not include the muscularis on each side as required. Postoperative suture line obstruction has not occurred. One suture line stricture has occurred but has not required any intervention.

Perineal cellulitis developed in 1 patient and resolved with short-term oral antibiotic therapy. Another patient was febrile for 3 days postoperatively without identification of a source. This patient was treated with intravenous antibiotics for 4 days. Her fever resolved and there were no sequelae. One patient had mucosal prolapse 6 months after her Delorme operation. This was treated with rubber band ligation in the office. She had no further problems. The remaining complications were as follows: hypokalemia, atrial fibrillation, and bradyarhythmia with new left fascicular heart block. All were treated appropriately without incident.

**RECURRENT**

Five recurrences (10%) occurred in 52 patients (Table 2). One recurrence occurred 2 months postoperatively in the only patient whose operation was conducted with the aid of the CUSA. This patient subsequently underwent a Rippstein abdominal procedure, but rectal prolapse recurred. A low anterior sigmoid resection was performed 1 year after her initial modified Delorme operation, and she has had no further recurrence in a 15-year follow-up. Another patient had early recurrence 1 month postoperatively. She underwent a subsequent modified Delorme procedure with good results. She was lost to follow-up 1 month after undergoing her second Delorme procedure. An additional patient experienced a recurrence 5 months after her initial Delorme procedure. She underwent another uncomplicated modified Delorme procedure with good results. She has had no recurrence since her operation 18 months ago. Another patient experienced recurrence 13 years after her initial operation. Her prolapse is asymptomatic, and she currently wishes no further treatment. The last patient experienced recurrent prolapse 8 years after her initial procedure. She underwent a successful repair by low anterior sigmoid resection. She has not had a recurrence. She recently was evaluated in our clinic (after the study period) for recurrent prolapse. She was found to have moderate external hemorrhoidal tissue in addition to a small rectal prolapse. She is currently undergoing further evaluation.

**COMMENT**

Complete rectal prolapse was first described in the Ebus papyrus in 1500 BC. Since then many interesting treatments have been described. One treatment described by Hippocrates included shaking the affected patient by the heels until reduction occurred. More than 130 procedures have been described for the correction of rectal prolapse. No consensus of opinion exists for which procedure is best, but the majority opinion is that abdominal procedures yield the best results in fit patients. Laparoscopic approaches to abdominal repair have recently been described. Perineal approaches to rectal prolapse have some safety advantages compared with abdominal approaches. The modified Delorme operation can be performed under local and/or regional anesthesia, making it ideal for patients with significant comorbidities. In addition, a laparotomy is avoided in patients with previous laparotomies, and risk of acute small bowel injury and future small bowel obstruction are avoided. Postoperative hospital stay and convalescence are generally shorter with perineal approaches. Reports of high recurrence rates, high complication rates, poor anatomic and functional outcomes, and lack of sufficient data regarding the durability of the Delorme repair have kept it from being universally accepted as the initial treatment for rectal prolapse. Recent reports including ours, indicate that the procedure can be performed with low recurrence rates, low morbidity, and almost no mortality.

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**Table 1. Complications in 52 Patients**

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of Patients</th>
</tr>
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<tbody>
<tr>
<td>No. (%) of patients with complications</td>
<td>13 (25)</td>
</tr>
<tr>
<td>No. of complications</td>
<td>17</td>
</tr>
<tr>
<td>Complication</td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td>4*</td>
</tr>
<tr>
<td>Urinary retention</td>
<td>4</td>
</tr>
<tr>
<td>Severe nausea or vomiting</td>
<td>1</td>
</tr>
<tr>
<td>Immediate postoperative suture</td>
<td>1</td>
</tr>
<tr>
<td>Line dehiscence</td>
<td></td>
</tr>
<tr>
<td>Suture line obstruction</td>
<td>0</td>
</tr>
<tr>
<td>Suture line stricture</td>
<td>1</td>
</tr>
<tr>
<td>Perineal cellulitis</td>
<td>1</td>
</tr>
<tr>
<td>Fever of unknown origin</td>
<td>1</td>
</tr>
<tr>
<td>Mucosal prolapse at 6 months requiring office</td>
<td>1</td>
</tr>
<tr>
<td>Rubber band treatment</td>
<td>1</td>
</tr>
<tr>
<td>Hypokalemia</td>
<td>1</td>
</tr>
<tr>
<td>Cardiac arrhythmia</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>

*One patient required transfusion or operation.
To our knowledge, no reports of the Delorme perineal repair have demonstrated a mean follow-up beyond 4 years. As a result, the durability of the operation has been questioned. Our average length of follow-up was 61.4 months. Review of the literature revealed average length of follow-up of 11 to 47 months. Our long duration of follow-up adds credibility to the durability of the Delorme operation.

Prior anecdotal reports of high recurrence rates led to less interest in the Delorme procedure as a primary treatment for all patients with rectal prolapse. However, improved techniques have led to recurrence rates between 5% and 22%. Abdominal rectopexy has been associated with recurrence rates of 0% to 20%. Low anterior resection for rectal prolapse results in variable recurrence rates, but reported recurrence is generally less than 10%. Many rectal prolapse studies are limited by their lack of long-term follow-up.

Factors that may contribute to recurrence after a perineal repair include inadequate or incomplete mucosal dissection, failure to correct pelvic floor and outlet defects, a mucosa-to-mucosa only repair, and length of follow-up. In our series, 5 (10%) of 52 patients experienced recurrence. Two of the 5 patients were successfully treated with another modified Delorme operation. One of our recurrences occurred in the patient in whom the CUSA was used to aid in the dissection. We no longer use this technique. Three of the 5 recurrences occurred early and, therefore, are likely due to technical factors. The remaining 2 recurrences occurred 8 and 13 years after their original operations. We have had only 1 recurrence in the last 10 years.

Thirty-day operative mortality was nil. The operation is extremely safe, especially given that it is usually performed in patients thought to be unfit to undergo an abdominal operation. Review of the literature reveals consistently low operative mortality for the Delorme operation, ranging from 0% to 3.5%. Watts and Thompson reported a 3.5% mortality rate, and only 1 of the 4 deaths was directly attributable to the operation. Mortality for abdominal rectopexy and low anterior resection has been reported to be less than 3%. Nonetheless, the Delorme operation is generally reserved for treatment of patients with significant comorbidities who are thought to be unable to undergo a major abdominal operation. These patients, in general, are probably at higher risk of mortality than those selected for abdominal rectopexy or low anterior resection.

Postoperative complications occurred in 25% of patients. This is comparable to other published reports. Complication rates vary depending on the definition of a complication. We were liberal with our definition and included any patient in whom postoperative convalescence was abnormal. The most common complications were bleeding and urinary retention. None of these patients had long-term sequelae. Only 1 patient had mucosal prolapse, which was successfully treated with banding. One patient had a suture line stricture, and 1 developed perineal cellulitis.

Improved continence occurred in 83% of patients who described incontinence before surgery. The literature is replete with evidence that the Delorme operation can and does improve continence. This occurs despite the observation that no change in anal sphincter pressure occurs and despite reductions measured in rectal compliance after the operation.

Interestingly, more than one quarter of patients with current follow-up reported problems with constipation. Generally, the Delorme operation has not been associated with constipation. In fact, the Delorme operation has even been used as a treatment for constipation. Two small series report constipation rates of 6% and 9%. Rates of constipation may be related to our longer length of follow-up. The cylindrical cuff of denuded muscle created during the operation may affect normal defecatory function. Constipation may also be related to rectal denervation and resulting dysmotility. Further studies need to be performed to elucidate the origin of constipation and to compare constipation rates in an aging population of patients undergoing other repairs for rectal prolapse.

Approximately 90% of our patients were satisfied with their results. With high patient satisfaction, acceptable morbidity, low recurrence rates, good durability, and almost no mortality, the Delorme operation should be considered as an option for the initial surgical treatment of adult patients with complete rectal prolapse.

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We thank Angela Kuhn for assistance in manuscript preparation.

Table 2. Recurrence of Prolapse in 5 Patients

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Time to Recurrence</th>
<th>Contributing Factors</th>
<th>Treatment</th>
<th>Last Follow-up, mo</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 mo</td>
<td>CUSA</td>
<td>Ripstein procedure and low anterior sigmoid resection</td>
<td>180</td>
<td>No prolapse</td>
</tr>
<tr>
<td>2</td>
<td>1 mo</td>
<td>None</td>
<td>Modified Delorme procedure</td>
<td>2</td>
<td>Unknown</td>
</tr>
<tr>
<td>3</td>
<td>5 mo</td>
<td>None</td>
<td>Modified Delorme procedure</td>
<td>12</td>
<td>No prolapse</td>
</tr>
<tr>
<td>4</td>
<td>13 y</td>
<td>Cystocele, uterine prolapse</td>
<td>None</td>
<td>198</td>
<td>Small prolapse</td>
</tr>
<tr>
<td>5</td>
<td>8 y</td>
<td>None (young age)</td>
<td>Low anterior sigmoid resection</td>
<td>105</td>
<td>No prolapse</td>
</tr>
</tbody>
</table>

Abbreviation: CUSA, Cavitar Ultrasonic Surgical Aspirator (Valleylab, Boulder, Colo.).
REFERENCES

in recurrence more frequently than if I perform what I believe is the gold standard: a sigmoid resection with rectopexy. The million-dollar question, therefore, is “whom do you consider candidates for this procedure?” Will you perform it on relatively young individuals?

In summary, I enjoyed this paper and hope it stimulates all of you to consider this important approach in your patients with rectal prolapse. I know it has convinced me to consider the Delorme procedure in a larger proportion of my patients.

Stanley M. Goldberg, MD, Minneapolis, Minn: I rise also to compliment the authors on really the largest series of Delorme procedures in the English literature and actually with the longest follow-up, considering some of the points that Dr Thirlby brought out in his discussion. I was surprised that no imbricating sutures were used at all in the rectal wall. Why did they stop doing this?

The other question I was going to ask is, why do they call it the modified Delorme procedure? I also am curious, during this period of time, did they offer an abdominal operation to any patients with rectal prolapse and, just as Dr Thirlby asked, to which patients do you offer an abdominal operation?

Another concern of mine has to do with the problem of incontinence. As we all know, approximately 60% of patients with rectal prolapse present with incontinence, and I am curious to know how your patients were studied for incontinence. Were there any cineradiography studies done preoperative or postoperative to prove that you actually had improved their incontinence? Actually, I happen to be an advocate of the rectosigmoidectomy, which allows me to do exactly what Dr Thirlby just talked about, namely, to tighten the levators at the same time. We have been strong advocates of that as opposed to the Delorme procedure because we feel we are actually removing an organ that is prolapsing. It has always bothered me with the Delorme procedure how just removing a bit of mucosa should make this kind of difference. Anyhow, I just wanted to say it’s one of the best studies that I have seen so far in the English literature on the Delorme procedure.

Thomas Russell, MD, Chicago, Ill: I enjoyed listening to this presentation on the modified Delorme procedure and would like to support the use of this procedure in selected patients. My only reservation with the presentation was the thought that this is done on all patients with rectal prolapse. Given our lack of understanding of the pathophysiology of this condition coupled with the large number of procedures available, it becomes clear that there is not one way to fix this condition. I commend the authors for alerting the surgical community to the condition of complete prolapse of the rectum, the varieties of procedures available, and for highlighting the value of this specific perineal approach to rectal prolapse. My questions to the authors revolve around their recommendation to offer this to all patients with rectal prolapse and also the question about why is this the modified Delorme procedure?

Dr Landercasper: Dr Thirlby, I thank you for your insight and comments. You asked about suturing techniques of the levator ani, anterior reeling, plicating and imbricating stitches. These are all efforts to perhaps improve continence or perhaps increase durability of the operation. We have no experience with these suturing techniques; yet, even without using them, 10 of the 12 patients who reported incontinence preoperatively had improvement of incontinence or resolution of incontinence postoperatively, and we have only had 1 patient in the last 10 years with a recurrence of prolapse. Whether the techniques you describe improve the durability or restore continence compared with not placing these sutures, I don’t believe is well-known.

We also don’t believe that science and physiology of the disease of rectal prolapse and the disorders of defecation associated with it are very well understood. I hope that some day investigators of anorectal physiology and the anatomy of prolapse could categorize what I believe is a diverse set of disorders that all present with prolapse, and then based on good preoperative objective testing tell us which procedure is the best procedure for each individual patient.

Dr Thirlby, our median follow-up for all 52 patients was 42 months. If we exclude the 11 patients who died of comorbid disease within short-term follow-up, then the median follow-up of the remaining 41 patients is 71 months. We believe this long follow-up strengthens our contention that the modified Delorme operation is a durable procedure. Twenty-two patients were followed up for more than 5 years, and although some patients did not return a recent questionnaire or were unable to be contacted by telephone, there were actually no patients in this study lost to follow-up. All patients had documented follow-up clinical exams, either by the surgeons who performed the procedure or by other physicians in our clinical network who performed perineal exams.

The ages of the patients who had recurrence ranged from age 31 to 75, and there was no correlation between risk of recurrence and the age. At least one young woman had a vaginal delivery in my practice after a prolapse without recurrence. Another young woman had 2 pregnancies, both delivered by C-section without recurrence. We have had patients with chronic cough, end-stage lung disease, and patients on chronic ambulatory peritoneal dialysis, so we have had several different groups of patients who have had increased intra-abdominal pressure conditions, and that did not lead to recurrence of their prolapse. That leads to answering your last question. We therefore consider the modified Delorme operation an option for patients of all ages and all lifestyles.

Dr Goldberg, thank you for your very kind comments. We have never used imbricating sutures in our practice so we have no information about whether our results would be any better. Why is this called a modified Delorme? There are 2 reasons. The first is that in some of Dr Delorme’s original descriptions he did use plicating stitches. He had several different reports beginning in the year 1900. We do not use these stitches. The other reason we considered our procedure a modification is based on an inaccurate description and depiction of this procedure, the Delorme procedure, that was published in the journal, SGGO, in the early 1970s. Based on another author’s description and depiction of what was done with the Delorme operation, we have gone back to the original Delorme operation. There were institutions who published results of a different type of operation that they were calling the Delorme where they did not continue the mucosal sleeve resection past the apex of the prolapse. They did not continue it into the funnel of the prolapse, and they also had only a mucosal-to-mucosal anastomosis instead of including the muscular layer with their mucosal stitches.

I do not recommend the Delorme for all patients, but I discuss it as an option to all patients, including young women. I have no experience and we do not have an institutional experience utilizing this operation in pediatric patients. We have not performed real-time fluoroscopy studies of defecation to look for recurrent prolapse that we are not detecting clinically. Our follow-up has included office exams, perineal exams, sitting on a toilet and examining the patient with a plumb’s mirror.

Dr Russell, I believe I answered some of your questions in my other comments. Once again, we don’t recommend this operation to all patients and we do not perform plication. I would like to thank my coauthors, and I would also like to give credit to the late Dr Adolf Gundersen, who taught this procedure to me and to many other surgeons after he returned from the Massachusetts General Hospital.