Ventral Rectopexy: Indications, Surgical Considerations, and Outcomes

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Introduction

Laparoscopic ventral mesh rectopexy (LVR) was first described by D'Hoore [1] in 2004 as an alternative approach to the standard abdominal rectopexy for external rectal prolapse. This operation takes advantage of a critical innovation in surgical technique for rectal prolapse – sparing the sacral nerves by limited posterior rectal dissection. This novel approach avoids posterolateral rectal dissection, thereby avoiding rectal denervation and minimizing postoperative de novo constipation. Furthermore, the dissection allows for correction of middle compartment prolapse, elevation of the pouch of Douglas, and reinforcement of the rectovaginal septum. Since its description, LVR has been widely adopted by colorectal surgeons for treatment of external prolapse and other pelvic floor disorders such as internal rectal intussusception. In fact, the proportion of laparoscopic operations for rectal prolapse has increased from 10% to 40% since 2005 with very favorable outcomes [2]. In this chapter, we will describe the spectrum of rectal prolapse and indications for laparoscopic ventral

mesh rectopexy, detail operative technique, and review the literature with a focus on outcomes and complications of this operation.

The Spectrum of Rectal Prolapse

External rectal prolapse refers to a full-thickness intussusception of the rectal wall with evisceration through the anus. This disease is felt to represent the final stage in a series of progressive stages of prolapse, preceded by intrarectal and intra-anal intussusception as described in the Oxford rectal prolapse staging system [3]. While many agree that internal intussusception and external prolapse represent a disease on a spectrum, the true incidence of progression from intussusception to external prolapse is unknown.

Symptoms of external prolapse generally include incomplete rectal evacuation, incontinence of mucous and/or stool, and sensation of a mass that has prolapsed through the anus. On physical exam, the surgeon will find a full-thickness prolapse of the rectal mucosa, classically with a concentric ring of folds. If not evident on exam, the prolapse can be induced by the patient squatting and bearing down. A thorough examination of the perineum and digital rectal exam should also be completed to evaluate the integrity of the anal sphincter.

The clinical significance of internal intussusception has long been debated by the pelvic floor community. Many colorectal surgeons,

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particularly in Europe, feel that internal intus-susception is causative of symptoms consistent with obstructive defecation syndrome (ODS) including constipation and incomplete evacuation due to the telescoping of the intussuscepted rectum causing a mechanical obstruction [4]. In contrast, internal intussusception has been identified in 20–50% of asymptomatic volunteers on defecography [5, 6]. Furthermore, radiographic findings of intussusception have not been shown to correlate with rectal emptying, constipation severity, or balloon expulsion. Interestingly, increasing grades of intussusception have been shown to be associated with increasing severity of fecal incontinence [7].

Given the unclear relationship between internal intussusception and rectal prolapse, we recommend limiting your choice of patients for ventral rectopexy to those who have overt rectal prolapse or patients with nearly visible internal intra-anal intussusception. In those with internal intussusception, additional evaluation with radiographic studies (defecography, dynamic pelvic MRI), physiologic studies (manometry, anal sphincter EMG), colonoscopy, and sitz marker colonic transit studies is important to ensure that intussusception is not an incidental finding in the context of other coexisting pelvic floor disorders. These studies may reveal other anatomic disorders, such as rectocele or enterocele, and functional disorders such as anismus (paradoxical non-relaxation of the anal sphincters). A thorough history is a requisite, including screening for confounding disorders, such as irritable bowel syndrome, prior to any surgery.

Indications

At this time, the only indication for LVR that is agreed upon by the global colorectal surgery community is external rectal prolapse. As the operation's popularity has flourished since 2004, its use has been extended to other pelvic floor disorders on an institution and surgeon-dependent basis. In fact, a consensus statement from a group of European pelvic floor specialists listed high-

grade internal intussusception and solitary rectal ulcer syndrome (SRUS) as relative indications for LVR [8]. These additional indications are intriguing but have not been generally accepted by the international community as of yet, and there are an increasing number of studies examining the outcomes. As previously stated, we continue to feel that the clinical significance of internal rectal intussusception is debatable. Furthermore, there is an unfortunate lack of high-quality evidence supporting use of LVR for internal intussusception, and no studies have been able to document a clear correlation between surgical correction of anatomic abnormalities and improvement in obstructed defecation [9]. This same European consensus statement listed specific contraindications for LVR: pregnancy, no pelvic anatomical problems, severe adhesions, active proctitis, psychologic instability, and anismus resistant to conventional treatment.

Technique

We follow the principles in surgical technique initially described by D'Hoore in 2004. Briefly, peritoneal access is obtained at the umbilicus. One working 12 mm port is placed in the right lower quadrant. Two additional 5 mm posts are in the LLQ and RUQ. The uterus is retracted anteriorly with suture. The rectosigmoid is retracted to the left side and out of the pelvis to expose the sacral promontory. The peritoneum over the sacral promontory is incised with an energy device, adjacent to the mesorectum and rectum. This peritoneal incision is carried down distally along the right side of the rectum and then extended transverse across the deepest portion of the pouch of Douglas (Fig. 28.1). At this point, we pay special attention to avoid damage to the hypogastric nerves. Next, Denonvilliers' fascia is incised, and the rectovaginal septum is opened using the energy device (Fig. 28.2). Contrary to the standard abdominal rectopexy, there is no lateral or posterior mobilization of the rectum. Once the ventral rectum is mobilized, we place either a Prolene (permanent) or a Biodesign®

(biologic) mesh into the abdomen. The mesh is sutured to the ventral aspect of the distal rectum using nonabsorbable 2-0 Vicryl or 2-0 PDS sutures (Fig. 28.3). Additional sutures are placed to fix the mesh to the lateral borders of the rectum more proximally in rows of two. We usually create about three to four rows of sutures to
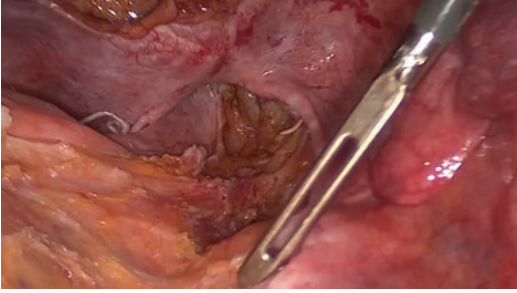

Fig. 28.1 Incision of the peritoneum along the right border of the rectum/mesorectum. The laparoscopic grasper indicates the sacral promontory
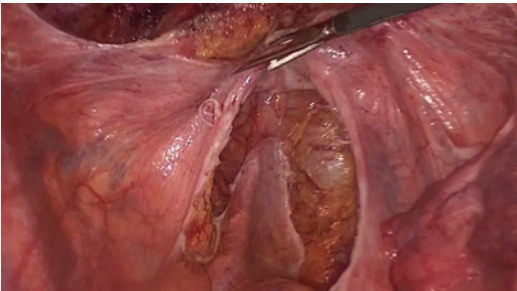

Fig. 28.2 Incising of the peritoneum carried anteriorly along the pouch of Douglas with the dissection of Denonvilliers' fascia. There is no posterior rectal dissection
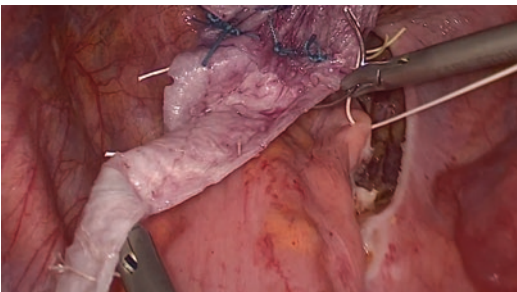

Fig. 28.3 Laparoscopic suturing of the mesh to the ventral rectum

each side of the rectum. The mesh is then fixed to the sacral promontory with a nonabsorbable 2-0 Gore-Tex suture (Fig. 28.4). It is key to have minimal traction on the rectum after placement of the mesh. Next, the posterior vaginal fornix may be sutured to the anterior aspect of the mesh to correct a coexisting middle-compartment prolapse, if present. Lastly, the edges of incised peritoneum are closed over the mesh which elevates the new pouch of Douglas, restoring anatomy and covering the foreign material of the mesh with peritoneum (Fig. 28.5).

Learning Curve

There have been two studies describing the learning curve for proficiency with the LVR. Mackenzie et al. [10] evaluated operative technique, as well as outcomes and improvement in quality of life after 636 LVR operations performed by a single senior colorectal surgeon. They developed proficiency gain curves and determined that the learn-
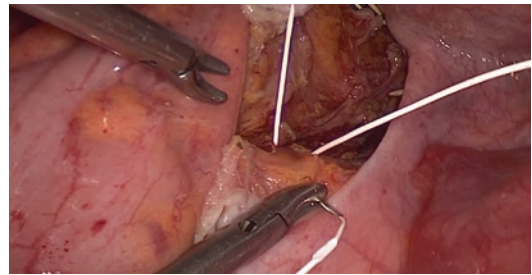

Fig. 28.4 Fixation of the proximal portion of the mesh to the sacral promontory with permanent suture
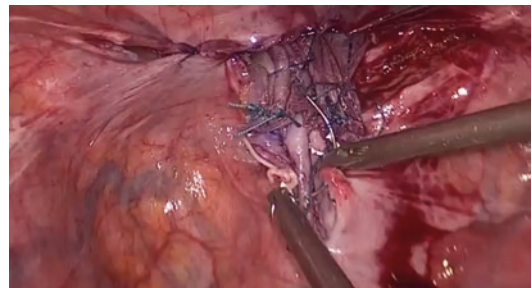

Fig. 28.5 Closure of the peritoneum over the mesh

ing curve for operative time was 54 cases but for other clinical and quality-of-life outcomes was between 82 and 105 cases. A more recent study in 2017 [11] looked at 311 LVRs performed at two district hospitals by two surgeons in the United Kingdom. Cumulative sum curve analysis suggested a learning curve of between 25 and 30 cases based on operative times and length of stay, and this was similar between both surgeons. They did not find a significant change point for morbidity or mortality. In our experience, technical proficiency with this operation was felt to be achieved at approximately 10 cases, but surgeons have been routinely performing laparoscopic suture rectopexies using posterior approach for decades prior to learning the LVR technique.

Types of Meshes

Synthetic mesh is typically used to fix the rectum to the sacral promontory. However, given the concern for mesh complications that have been reported with similar procedures in the pelvic floor, some authors have studied the feasibility of using biologic mesh. A systematic review [12] of 13 observational studies comprising 866 patients in 2013 (11 studies with 767 synthetic mesh, 2 studies with 99 biologic mesh) found no difference in recurrence (3.7% vs 4.0%, $p = 0.78$) or mesh complications (0.7% vs 0%, $p = 1.0$%) between synthetic and biological mesh repair.

Three more recent studies have further detailed the use of biologic mesh for LVR. Ogilvie et al. [13] matched 29 patients with permanent mesh with 29 patients with biologic mesh and found no difference in symptom resolution, recurrence, or mesh-related complication. Albayati et al. [14] studied 51 patients that underwent LVR with biologic mesh and reported a complication rate of 13.7% with an overall 25% reduction in obstructed defecation symptoms and 20% reduction in incontinence symptoms. Lastly, McLean et al. [15] reported on 224 patients that underwent LVR with Permacol mesh and documented a complication rate of 10.7%; however, mesh-related morbidity was only 0.5%. Recurrence

was 10.7% at 5 years, and there was significant improvement in patient-related constipation and incontinence symptoms.

Robotic-Assisted Surgery

After LVR proved to be a generally safe operation, some colorectal surgeons sought to utilize the benefits of robotic surgery to further enhance surgical technique. Perrenot [16] performed robot-assisted LVR on 77 patients between 2002 and 2010. After a learning curve of 18 cases, morbidity was found to be acceptably low (10%) with 13% recurrence at an average of 52 months. Similar to laparoscopic surgery, there was a 50% reduction in constipation. There were five conversions to open surgery. The authors concluded that robot-assisted LVR was safe with acceptable outcomes, warranting further studies. Two subsequent retrospective single-center studies found similar results supporting this conclusion [17, 18].

Outcomes

Patients undergoing LVR have had favorable outcomes, and while a concern for long-term mesh-related complications exists based on the FDA's warning for meshes placed for pelvic organ prolapse, there has been an acceptable morbidity profile with current follow-up data. The largest study of long-term outcomes after LVR was performed by Consten et al. [19] in 2015. This observational cohort study included 919 patients undergoing LVR for either external rectal prolapse or Oxford grade III/IV internal rectal prolapse with symptoms of fecal incontinence or obstructed defecation. Patients were followed for a median of 34 months, and there were 68 recurrences at a median 24 months. Using Kaplan-Meier methods, they estimated a 14.3% risk of 10-year recurrence for all patients and an 8.2% risk for patients with external prolapse. Mesh-related complications occurred in 4.6% of patients, including 7 mesh erosions into the vagina (5 of which had an associated perineotomy). Patients reported

improvements in both fecal incontinence (11.1% vs 37.5%) and obstructed defecation (15.6% vs 54.0%). A 2018 study [20] analyzing long-term outcomes in pelvic floor function studied 508 patients with either external rectal prolapse or symptomatic internal rectal prolapse with a median follow-up time of 44 months. Subjective symptom severity was quantified with Wexner score, obstructive defecation score, and quality-of-life scores. Approximately 76% of patients experienced subjective symptom relief, with higher rates of relief in patients with external prolapse compared to internal prolapse/intussusception (86% vs 68%). Complications occurred in 11% of patients, and mesh-related complications occurred in 7 patients – 5 of which were mesh erosions into the vagina and 2 of which were rectovaginal fistulas. Of note, three of the five mesh erosion complications occurred in patients with intraoperative vaginal perforation. The overall recurrence rate was 7% for external prolapse during the study period. Interestingly, de novo symptoms were reported in 124 patients – two-thirds of these patients reported an urge sensation, and this was more common in patients with internal intussusception, while 13 patients reported loss of a sensation to defecate. The authors of both studies similarly concluded that LVR was a safe and effective treatment for both external and internal rectal prolapse with an acceptable rate of mesh-related complications. However, based on these studies, there does seem to be some heterogeneity in outcome based on indication. The literature regarding outcomes for specific indications will be reviewed in subsequent sections.

While recurrence rates for LVR have been acceptable, they are not negligible. To date there has been one study attempting to decipher risk factors for recurrence. Fu et al. [21] studied 231 consecutive patients undergoing LVR by a single surgeon for either external rectal prolapse, internal intussusception, SRUS, or rectocele. Despite the heterogenous population, they reported a complication rate of 5.2% over a median follow-up time of 47 months and a recurrence rate of 11.7%. All but two of the recurrences occurred in patients with full-thickness external rectal prolapse. On univariate analysis, predictors of recur-

rence included age >70 years, worse preoperative Cleveland Clinic Incontinence Score, prolonged pudendal nerve terminal motor latency (PNTML), and the use of synthetic mesh. On multivariate analysis, only prolonged PNTML and the use of synthetic mesh were independently found to be associated with recurrence. On reoperation for recurrence, the most common findings during laparoscopy were that either the mesh/graft used for LVR had detached from the sacral promontory or the mesh/graft had come off the mid-rectum. This highlights the importance of technical proficiency for positive results after LVR.

Most patients spend one night in the hospital after their operation; however, we often discharge patients to home on the day of surgery if they are hemodynamically stable with their pain well controlled and after passing a trial of void. This practice is supported in the literature: Powar et al. [22] reported that 23% of LVRs are discharged home on the day of surgery with no increase in complications or readmissions.

In line with improvements in constipation and incontinence symptoms, patients similarly report higher scores on quality-of-life instruments. In a 2016 study [23], patients documented significantly higher scores on the Short Form 36 Health Survey scales (including physical functioning, bodily pain, health perception, social functioning, emotional and mental health) at 3, 6, and 12 months postoperatively. Similarly, all of the Fecal Incontinence Quality of Life and Patient Assessment of Constipation-Quality of Life scales significantly improved after LVR. A separate study [24] specifically evaluated sexual function after LVR for either external prolapse, internal intussusception, rectocele, or enterocele and found that the number of patients being satisfied with their sexual function was similar before and after surgery (91% vs 85%). Approximately 13% of respondents felt that sexual function decreased after surgery.

Complications

Driving much of the surge in volume of LVR since its description is the fact that patients

have enjoyed relatively few complications. Laparoscopy-associated complications such as port site hernia, hematoma, and iatrogenic bowel injury seldom do occur. It is important to keep in mind, however, that although rare, serious procedure-specific complications have been reported after this operation, specifically for mesh-related complications. These procedure-specific complications have significant consequences for long-term functional outcomes, and patients must be counseled appropriately.

Considering the high-profile reports of complications from transvaginal meshes placed into the pelvis, many authors have focused on mesh complications after LVR. Evans et al. [25] followed 2203 patients at multiple centers undergoing LVR. Approximately 80% of meshes placed were synthetic. Mesh erosion into the rectum or vagina occurred in 2% of cases over a 14-year study period, and 40% of these patients underwent reoperation for major mesh morbidity (12 laparoscopic mesh removal, 3 mesh removals with colostomy, and 3 anterior resections). The remainder required minor revisions with local excision of a stitch or exposed mesh. A 2017 meta-analysis [26] compiled eight studies with close to 4000 patients and similarly found mesh-related erosion rates of 1.87% in synthetic meshes and 0.22% in biologic meshes. There was a range in time of diagnosis from 2 to 124 months. When a mesh complication is encountered, it is crucial that colorectal surgeons are comfortable with management. Amoudi et al. [27] proposed specific principles of management for variations in mesh-related complications. In all patients, dissection should be carried down to the pelvic floor with removal of the original mesh. A new lightweight Teflon-coated polypropylene mesh may be used to replace the original mesh. If the complication is due to mesh detachment or poor fixation, the detached site can be fortified using a new mesh tacked to the promontory and then sutured to the old mesh. Rectal injury/erosion should be managed with anterior resection and a limited LVR with a new mesh to prevent recurrent prolapse. Rectovaginal fistulae following mesh erosion have been described and reported to be difficult to manage. Some have argued for

control of the local sepsis with a defunctioning ostomy and removal of the mesh [28], in addition to transabdominal or transvaginal repair of the rectum depending on the site of the fistula. Others argued that biologic mesh can be considered in reoperation in a contaminated field to manage the initial prolapse symptoms [27]. We have not yet had to deal with any of these complications at our institution but are monitoring the literature on the topic with significant attention.

A variety of other rare complications have been reported after LVR and should be mentioned. Lumbar discitis has been described in several instances [29, 30]. This seems to occur at the site of fixation of the mesh into the promontory, leading some to believe that bacteria are translocating at the site of rectal fixation onto the mesh. High-grade hemorrhoids requiring surgical intervention may be common with an actuarial 5-year estimated incidence of 24% in one study [31]. Other rare complications include SBO [32] and RP fibrosis [33].

External Prolapse

In their original description of LVR, D'Hoore et al. [1] operated on 42 patients with full-thickness external rectal prolapse with favorable results. There were no postoperative mortalities and two postoperative complications, both urinary tract infections. Two patients developed recurrent rectal prolapse at 54 and 91 months – both of these patients had prior failed Delorme procedure. Before surgery, 31 patients were incontinent, and 28 of these patients reported improved continence after LVR. Sixteen patients achieved normal continence. Likewise, of the 19 patients with preoperative obstructed defecation, 16 reported that their symptoms resolved. As expected, the four patients with slow transit constipation observed no improvement. Importantly, only two patients reported de novo mild ODS symptoms. Surprisingly, even in this initial description, conversion to laparotomy was rare, occurring in two cases.

Since then, LVR has been adopted by the colorectal surgeon community, and a number of

single-institution studies sharing outcomes for external prolapse have been published, all with similar results. Boons et al. [34] performed LVR on 65 consecutive patients with external rectal prolapse. At a median follow-up of 19 months, there was one recurrence. Outcomes were assessed at 3 months, and constipation was improved in 72% with a decrease in median Wexner score from 9 to 4. De novo constipation was noted in one patient. Similarly, continence was improved in 83% of patients. Improvements in these functional parameters continued at 24 months of follow-up. Importantly, there were no mesh infections, erosions, or other mesh-related complications in this cohort. Faucheron et al. [35] operated on 175 patients with external prolapse and followed them for a median of 74 months. Recurrence occurred in two female patients – one at month 6 and one at month 24. The overall complication rate in this population was 5%, including urinary tract infection, transient brachial plexus palsy, and small bowel perforation from adhesiolysis. One patient presented with erosion of the mesh into the rectum at 9 months – she had a reportedly uneventful transanal removal of the mesh. Randall et al. [36] published their results from 190 LVRs for external rectal prolapse. Of their patients, 120 had follow-up for >5 years and 16 had follow-up for >10 years. Incontinence scores improved by a median of 8 points ($p < 0.001$) with a 93% improvement overall. QOL scores assessed at 1 and 4 years improved by 46%. Sexual function was improved in 37% of patients. Five patients developed a partial recurrence limited to the left side, and the overall recurrence rate was 3%. Four additional patients developed posterior lateral intussusception. Seven patients developed mesh complications – four meshes eroded into the vagina, two meshes eroded into the rectum, and one rectovaginal fistula was noted. Three of these were treated by transvaginal mesh removal, and three were managed by laparoscopic mesh removal. The authors of the three aforementioned studies independently concluded that LVR is a safe approach to manage full-thickness external rectal prolapse with favorable long-term improvements in constipation, incontinence, and quality of life. Recurrence rates are comparable to other transabdominal approaches. The complication rate is low – importantly however, there are some documented mesh complications, and additional studies on long-term outcomes are needed to quantify the true risk of mesh complications, which can be devastating. Interestingly, a 2016 study [37] showed that one-third of LVR patients have postoperative internal intussusception on defecography, which was associated with less improvement in functional measures.

There have been two randomized control trials comparing LVR with other common operations for external rectal prolapse. One trial [38] randomized 50 patients to either LVR or Delorme procedure, the most common perineal approach in the country the study was performed (Egypt). The majority of patients (66%) had fecal incontinence. Given the small sample size, there were no noted differences in recurrence rates or outcomes; however, recurrent prolapse was observed in 16% of the LVR patients and 8% of the Delorme patients. Postoperative incontinence and constipation scores were similarly improved from preoperative scores in both groups. Lundby et al. [39] randomized 75 patients to either LVR or laparoscopic posterior sutured rectopexy. Interestingly, in this study, LVR and posterior sutured rectopexy had similar postoperative ODS scores and de novo constipation despite the sacral nerve-sparing approach. Lastly, a 2014 study (24500726) retrospectively compared laparoscopic resection rectopexy (the most common abdominal approach in the United States) with LVR (the most common approach in Europe). Each operation was performed at a single center, either in the United States or the Netherlands. In all, there were 28 resection rectopexy patients and 40 LVR patients. The resection rectopexy group was younger; however, the groups were otherwise similar. A significant reduction in constipation and incontinence occurred in both groups. A comparison of the two operations showed a trend to significance favoring resection rectopexy for improvement of incontinence ($p = 0.09$). The complication rate was significantly higher after resection rectopexy compared to LVR (9 vs 3, $p < 0.05$). The authors concluded that LVR and laparoscopic resection rectopexy are safe options with acceptable out-

comes for external rectal prolapse; however, further prospective, randomized controlled trials are needed to compare the two operations.

Traditionally, transabdominal approaches are often reserved for younger patients with limited comorbidities, while older patients were managed with perineal approaches. However, perineal procedures suffer from significantly higher recurrence rates and worse functional outcomes. With the technical advances provided by laparoscopy in terms of reduction of comorbidity, surgeons began to reappraise the appropriateness of transabdominal approaches for elderly patients. Wijffels et al. [40] examined a prospectively collected database from two tertiary pelvic floor centers and evaluated outcomes in patients over the age of 80 with external rectal prolapse. In this age group, the median LOS was 3 days. There were no mortalities, and there was a complication rate of 13% (3 pneumonias, 3 UTIs, 3 port site hernias, 1 SBO, 1 MI, 1 wound infection, and 1 fluid overload). Recurrence occurred in 3 patients at a mean of 23 months. Similarly, Bjerke [41] studied 46 patients with a median age of 83 – of these patients, 14 had previously undergone a prolapse operation and 12 had perineal procedures. Median LOS was 2 days and the 30-day complication rate was 15%. There were four major complications that were intraoperative complications – one trocar bladder perforation, one thermal rectal injury, one hematoma, and one small bowel thermal injury. Two patients died within 30 days – one 93-year-old woman died from cardiac arrest on POD3 and one 85-year-old who underwent reoperation for small bowel thermal injury and died on POD10 from cardiac arrest. Functional outcomes were favorable with a significant reduction in incontinence scores at 2 months and 1 year. There were 2 recurrences at a median follow-up of 1.5 years. Gultekin et al. [42] retrospectively compared 1263 patients over the age of 70 to younger patients undergoing LVR and found no significant difference in mortality or complications between groups on multivariate analysis. Taken together, the data suggest that LVR is safe, well-tolerated, and efficacious in older, frail patients and may be an alternative to perineal approaches with more durable results.

While LVR seems to be an excellent therapeutic option for external rectal prolapse, some have identified patients in which results may not be optimal. Gurland [43] studied 108 LVRs, 36 of which were on patients with recurrent prolapse. When comparing patients with primary repair vs repair of recurrent prolapse, prolapse recurrence rates for primary repairs were significantly lower: 1.4%, 6.9%, and 9.7% compared to 13.9%, 25%, and 25% at 1, 3, and 5 years. Time to recurrence was significantly shorter in patients undergoing LVR for recurrent prolapse, 8.8 vs 30.7 months. The authors noted that the majority of recurrent prolapse occurred secondary to technical errors, primarily with failure to adequately fix the mesh to the sacral promontory. While they concluded that LVR still had reasonable outcomes to repair recurrent prolapse, they emphasized that patients should be counseled that they are at increased risk for prolapse recurrence. Additionally, the importance of technical proficiency was stressed, as many of the recurrences were due to inadequate fixation. Two studies have specifically studied outcomes in men (25175930, 27641548). Both studies reported that LVR is a safe and effective operation for external prolapse in men; however, Rautio et al. [44] found that men were at higher risk for reoperation in the postoperative period (33%). The majority of reoperations were for recurrent prolapse and persistent postoperative mucosal anal prolapse symptoms. Importantly, LVR did not impact sexual function and did not cause any voiding or urinary symptoms.

Internal Intussusception

As discussed above, the role of surgical management for internal rectoanal intussusception is not clear, at least in management algorithms in the United States. This practice is much more common in Europe, with 31 of 32 European colorectal surgeons reporting acceptance of ODS from internal intussusception as an indication for LVR [45]. As such, many studies evaluating the outcomes of LVR for internal intussusception have come from European centers. While the majority of these studies highlight very favorable out-

comes for both ODS and incontinence due to internal intussusception, we recommend caution in regard to adoption of LVR for internal intussusception, given the clouded understanding of how this radiologic anatomic finding impacts pelvic floor function and whether or not it represents a pathologic abnormality that needs to be corrected or a variant of normal anatomy. Our algorithm for management of ODS stresses the importance of maximum medical therapy, biofeedback, and recognition/management of confounding risk factors such as IBS. Only when these measures fail in high-grade internal intussusception do we consider offering surgery. Despite the controversy regarding surgical management of internal intussusception and lack of adoption of this practice in the United States, this section will summarize the existing literature detailing outcomes of LVR for intussusception.

One of the first studies to examine the role of LVR in ODS came in 2008 [46]. Seventeen patients with ODS were included, most of which were secondary to rectocele or internal intussusception. Of these patients, 15 had improvement in constipation in the short term. However, at a mean follow-up of 38 months, there was no significant difference in ODS scores. In fact, 12 patients had higher scores postoperatively than preoperatively, and one-third of patients complained of continued straining, incomplete evacuation, and digitation. A number of subsequent studies documented favorable outcomes, at least in the short term. Collinson [47] prospectively studied 75 patients undergoing LVR for high-grade rectoanal intussusception that failed medical therapy. Preoperative constipation and fecal incontinence both significantly improved at 3 and 12 months, and no patients reported worse function. Sileri et al. [48] similarly studied 34 patients undergoing LVR for high-grade internal intussusception with incontinence or constipation refractory to conservative management of an aggressive bowel regimen, laxative, and biofeedback from a pelvic floor therapist. Preoperative constipation and incontinence were significantly improved at 3 months. Two patients experienced persistent or recurrent prolapse, and the complication rate was comparable to that in the literature. Borie et al. [49] retrospectively compared LVR with stapled transanal rectal resection for ODS secondary to intussusception or rectocele. STARR was performed in 27 patients and LVR was performed in 25 patients. After surgery, ODS symptoms were significantly reduced in 56% undergoing LVR and 59% undergoing STARR in the short term. Approximately 80% of patients were very or moderately satisfied after LVR. Complication rates were similar between groups. A 2017 meta-analysis [50] of rectopexy for internal intussusception reviewed a total of 14 studies comprising 1300 patients, 1147 of which had an LVR and the remainder had resection rectopexy. Approximately 77% of patients undergoing LVR reported an improvement in ODS symptoms, and 63% reported an improvement in fecal incontinence. Recurrence occurred in 6.5% of patients and the overall complication rate was 13.6%. The mesh-related complication rate was 1.1% and included mesh detachment, erosion, fistula formation, and intestinal obstruction. A single study by Tsunoda et al. [51] performed postoperative defecography on 26 patients that underwent LVR for intra-anal internal intussusception and found that the high-grade intussusception was eliminated in all patients, although 8 developed intrarectal intussusception. These patients had an associated 50% reduction in ODS symptoms, possibly linking correction of the anatomy with improvement in symptoms. Adopters of LVR for internal intussusception cite these data for their satisfactory results in the majority of patients, low recurrence rate, and low morbidity rate.

Fecal incontinence has been shown to correlate with worsening internal intussusception grade, and several studies have focused on incontinence as a primary endpoint. In a 2013 study [52] of 72 patients undergoing LVR for high-grade intussusception causing fecal incontinence refractory to medical management, the median fecal incontinence score 1 year after surgery was significantly lower than preoperative scores. A follow-up study [53] of 50 patients with incontinence and high-grade internal intussusception compared to 41 patients undergoing LVR for external prolapse showed that incontinence and quality-of-life scores were similarly reduced in both groups.

Data are relatively lacking in regard to long-term outcomes. A recent study in 2018 [20] attempted to answer this question. This study included 508 consecutive patients treated with laparoscopic ventral rectopexy for either external prolapse or internal intussusception. Symptomatic IRP was present in 214 patients, 79% of whom had obstructed defecation, 17% had incontinence, and 20% had combined symptoms. The median follow-up length was 44 months. Fewer patients with internal intussusception had relief of obstructed defecation symptoms compared to external rectal prolapse, 68% vs 86%; however, the raw rate of long-term relief in this population was still viewed as favorable. Of patients being operated on for internal intussusception, 6.1% required reoperation which was consistent with previous reports. De novo defecatory urge occurred more commonly after LVR for internal intussusception than external prolapse. From these data, the authors concluded that the results of LVR for internal intussusception were long-lasting, although they benefitted less than patients with external prolapse.

Rectocele

Parallel to the debate on the clinical significance of internal intussusception is a similar debate on rectocele. The majority of rectoceles is asymptomatic and found incidentally. Those that are symptomatic are reported to result in symptoms ranging from obstructed defecation to the sensation of a lump in the vagina. To the contrary, a prospective study of patients evaluated in a pelvic floor center found that rectoceles were not associated with worsening ODS severity, anorectal abnormalities, or pelvic floor dyssynergia [54]. In this context, after some surgeons observed favorable outcomes of LVR for internal intussusception, the operation was then applied to patients with rectocele to avoid the complications of incontinence and dyspareunia common to conventional rectocele repair. Wong et al. [55] were the first to report on LVR performed exclusively for rectocele. At a median follow-up of 29 months, they found a significant decrease in vaginal discomfort (86–20%) and ODS symp-

toms (83–46%), with no change in fecal incontinence or de novo symptoms. A subsequent study [56] included patients with rectocele in addition to external prolapse and internal intussusception as candidates for LVR. Patients with rectocele or internal prolapse had a significant reduction in incontinence and constipation postoperatively. Their complication rate was 4.6% and included two mesh infections complicated by discitis at the site of mesh fixation. The group from the former study went on to study the impact on anorectal and sexual function in two separate studies [57, 58]. They reported a significant relief in the predominant symptoms of vaginal bulge and sexual dysfunction with no de novo dyspareunia. These data are limited to a single center and should be generalized to other centers with caution until further studies are available.

Solitary Rectal Ulcer Syndrome

Solitary rectal ulcer syndrome (SRUS) is often associated with ODS and internal rectal intussusception with symptoms consisting of bleeding, mucous discharge, pain, and difficulty evacuating stool. There is little, if any, consensus on management of this entity. One study [59] reported an 86% improvement in SRUS symptoms after placement of a ventral mesh during a standard posterior open mesh rectopexy. This finding led to a subsequent study evaluating the efficacy of LVR for SRUS [60] – in 48 patients with SRUS refractory to biofeedback, LVR led to epithelial healing of the lesion at 3 months with improvement in ODS and QOL scores at 2 years. Recurrent lesions occurred in two patients on long-term follow-up. A similar study [61] showed healing of the ulcer in 90% of patients with significant improvements in functional scores.

Summary

Laparoscopic ventral mesh rectopexy is an innovative operative technique to avoid excessive rectal dissection and de novo constipation symptoms. Outcomes for management of external

rectal prolapse are favorable and comparable to traditional abdominal approaches. The limited dissection and minimally invasive approach have made this the operation of choice for many surgeons for this indication. Recurrence is low in this population (about 5%) and functional outcomes are excellent. Furthermore, there is less physiologic insult compared to open procedures, and it has been shown to be safe for older, frail patients who are a significant constituent of this population. Some surgeons have translated LVR to other indications including internal intussusception, rectal prolapse, and SRUS. Prospective data evaluating outcomes in these patients is limited and therefore this practice should be adopted with caution. Mesh complications are rare but have been shown to occur in the follow-up period documented in the current literature. Many of these mesh-associated complications require re-intervention, and surgeons must have an armamentarium of approaches for management. Fortunately, the overall complication rate is low, and LVR has reproducibly been shown to have a more than adequate safety profile.

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