

# Adult Rectal Prolapse and Altemeier's Rectosigmoidectomy: Current Status and the Place of Perineal Repairs (Review)

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## Abstract

Rectal prolapse (RP) represents a disabling condition, most commonly seen in elderly women, with concomitant pelvic floor anatomic changes and functional difficulties. The presence of symptoms or an external protruding mass dictate the need for surgical intervention. A multidisciplinary diagnostic evaluation and a surgical repair that should be individualized to each specific RP patient are widely adopted to optimize results. However, research fails to confirm the superiority of transabdominal over perineal procedures due to poor quality and heterogeneity of the available studies. The aim has been to re-evaluate topics of current interest related to the place of perineal procedures in the treatment of RP. The most common perineal procedures, characterized by minimal invasiveness and surgical stress, traditionally reserved for elderly patients and poor candidates for general anaesthesia and abdominal surgery, allow simultaneous repair of concurrent pelvic floor disturbances with minimal risks. The Altemeier's perineal rectosigmoidectomy (PRS) is highly reasonable and strongly considered in emergencies. Currently, there is a trend towards proposing perineal repairs to healthier patients. In many reports, perineal repairs for RP, the PRS in particular, approach the effectiveness of abdominal repairs. There is still strong need for further high-quality studies in order to reach definite conclusions and provide clear recommendations to different patient groups.

**Key words:** Rectal prolapse, perineal rectosigmoidectomy, Altemeier's procedure

## Introduction

Rectal prolapse (RP), known as rectal procidentia and third-degree or complete or external rectal prolapse, can be defined as a circumferential, full-thickness intussusception of the entire rectal wall which protrudes outside the anal canal, either spontaneously or with Valsalva maneuver, and it was recognized as early as 1500 BC [1-7]. This distressing condition may lead to serious problems, such as fecal incontinence (FI), rectal discharge or disagreeable odor and painful/obstructed defecation (OD/obstructed defecation syndrome, ODS), and may be associated with a significant impact on patient's psychosocial status and quality of life (QoL) [8-14]. Actually, RP is a pelvic floor functional disorder [13,15], and more likely signals a generalized dysfunction rather than an isolated rectal problem. Its prevalence in the general population has been estimated to be less than 0.5% [16] and it is up to 1% in adults over 65 years old [6,14]. Among the patients with RP, 80-90% are women over the age of 50 years old [1,5,6,13,16-18]. In the general population, approximately 16% of women experience urinary incontinence, 9% FI, and 3% pelvic organ prolapse (POP) [15].

In view of the overwhelming number of surgical procedures used for the management of RP, a comprehensive update concerning the correct diagnostic approach and the available therapeutic options is required to draw recommendations for clinical practice. However, levels of evidence and grading of recommendations in literature appear to be considerably low and weak [5,6]. There is a strong need for high-quality research regarding queries for specific topics related to RP in randomized controlled trials (RCT). Functional outcomes after RP repair, either abdominal or perineal, are highly variable in literature.

Abdominal procedures have been traditionally considered as beneficial for younger and healthier patients, possibly due to a lesser risk of recurrence [3]. However, this has been challenged by perineal procedures with excellent outcomes approaching the effectiveness of the abdominal procedures, under regional anaesthesia [19,20]. The aim is to cover as comprehensively as possible areas and topics of current concern related to the perineal procedures, and more specifically the Altemeier's perineal rectosigmoidectomy (PRS). Diagnostic approach adapted to the patients' group

requirements, indications for perineal surgery, evaluation of functional results after perineal repairs, and comparison between the two main perineal procedures are intentionally discussed

### Aetiology and pathophysiology of RP

The exact etiology of RP is largely unknown, but it seems to be multifactorial, implicating both anatomical and functional factors [3,6,15,19,21-23].

The typical anatomic features of RP are: (i) the intussusception itself, (ii) weakness of the pelvic floor and/or anal sphincters, (iii) a deep cul-de-sac ("sliding hernia"), (iv) redundant rectum and sigmoid colon, and (v) absence of firm fixation of the rectum to the sacrum (mobile mesorectum) [19,21,22]. The constant finding shown by defecation proctography/cineradiography in patients with RP is a rectoanal intussusception of various degrees, starting well above the pelvic floor (6-8cm up in the rectum), usually accompanied with enterocele, rectocele or cystocele [3,15,19,21,22].

Weakness is due to laxity and atony of the pelvic/perineal musculature and of the sphincters connected with defecation mechanisms [1,19,21,22,24]. Elongation of the levators and pudendal neuropathy often coexist with perineal descent [21,22]. In addition, lack of the normal fixation of the rectum and sigmoid colon makes them mobile, interacts with the function of constipation, and may contribute to the genesis of a progressive sigmoidorectal intussusception [1,6,15,19,21,22,24]. Constipation may also result from the intussuscepting bowel in the rectum, which creates a blockade that is exacerbated by straining, pelvic floor dyssynergia, and colonic dysmotility [6]. Constipation is associated with RP in 15% to 65% of patients [1,19]. On the other hand, patients with RP have markedly impaired rectal adaptation to distention and more than half of them have coexisting anal incontinence [1,6]; it is not clear whether the incontinence predisposes to RP or if the intussuscepting bowel stretches the sphincter and causes the incontinence [19]. Usually, incontinence (urge, passive, fecal/soiling, mixed), combined or not with symptoms of constipation, appears late in the course of RP, and is related to several factors (patulous anus, rectal protrusion per se, impaired rectoanal inhibitory and excitatory reflexes, pudendal neuropathy) which may act synergistically [6]. Finally, conditions and disorders such as deterioration of the rectoanal inhibitory reflex, disorder of the anorectal sensation and high-pressure intermittent motor activity have been also implicated in the pathophysiology of RP [16,23]. Notably, the solitary rectal ulcer syndrome (1:100000 population per year) appears to be associated with disordered evacuation, leading to internal rectal intussusception and straining, sometimes causing a chronic mucosal trauma [1,6,21,22]. This entity suggests that, because of the patient's poor response to conservative treatments, surgery may be the best option [6,21].

### Clinical picture of RP

The main reported symptoms of RP are a feeling of

protruding rectal mass, when not seen, and FI in 35-100% of cases [1,6,11,14,15,17,19,25,26]. Major FI was present in 70% of Altomare's [26] large series of RP patients treated with Altemeier's procedure. The physical examination may demonstrate the protruding smooth rectal mass (Figure 1), and a patulous anus or anal sphincters with decreased tone. RP can be associated with significant morbidity, including intractable painful constipation (almost 50% of patients have a history of constipation) or OD, rectal bleeding (usually, as a result of rectal ulcer), and even dreaded complications such as incarceration, strangulation or gangrene of the prolapsed rectum in advanced cases [1,6,14,19,27-29]. Genital prolapse or POP may be associated with RP in up to 30% of patients [6]; in women with concurrent genital prolapse, urine incontinence is also frequent [17]. Proctoscopy may reveal a solitary rectal ulcer on the anterior surface of the rectum in 10-15% of cases [1].

Internal rectal prolapse is a different condition and refers to rectal intussusception which does not involve external protrusion, but may also be symptomatic with functional complaints such as ODS or FI; a concomitant rectocele or enterocele is frequently seen in these patients [5,19].

**Figure 1**



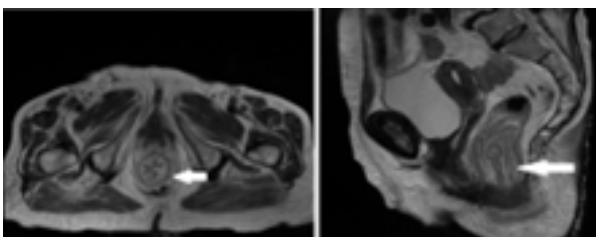
**Figure 1:** External RP (associated with chronic constipation and fecal/urine incontinence) in a woman 79 years old (own material)

### Diagnostic and preoperative evaluation of RP

Along with a detailed history, an anorectal examination (digital and using a procto-rectoscope) to find out the length and reducibility of prolapse, the presence of patulous or atonic anus or rectal sphincter with disturbed contractibility, coexistent POP, blood mixed with stools, or a rectal tumour is always essential [5,6,15,17,19,21]. The measured length of prolapse suggests which perineal technique to perform in case perineal approach is chosen [6]. If the rectal sphincter tone is poor, the anus patulous, or the patient unable to contract the puborectalis sling voluntarily, then the functional outcome of a given surgical repair may be suboptimal [6,15,17]. If the presence of paradoxical puborectalis is suggested by physical examination, only confirmatory

testing with a combination of anorectal electromyogram and dynamic defecography (magnetic resonance imaging, MRI) is diagnostic [15,21]. Vaginal examination, dynamic MRI, and even urodynamic studies may be used for the evaluation of females with coexistent POP (Figure 2). Routine rectoscopy, or rectoscopy for patients with RP and pain, may reveal a solitary rectal ulcer; this is an indication for surgery [1,5,6]. Associated altered defecation pattern or other alarm symptoms for colorectal malignancies impose the need for a full colonoscopy and a computed tomography of the abdomen [5,6]. All patients should be thoroughly interviewed for bowel function, specifically for the presence of FI (i.e. Wexner score, Vaisey-questionnaire, FI QoL, FI Severity Index), constipation (i.e. Wexner score, Altomare score), and for urinary continence; complex cases should even be discussed in a multidisciplinary team, taking into account any relative contraindication for surgery [3,5,6,8,13]. A preoperative evaluation of cardiopulmonary and surgical risks, including ASA and functional status, is mandatory to anticipate possible intraoperative problems and postoperative complications [13]. Most of the available abdominal tests are not performed in all RP patients, usually because of their advanced age, the obvious diagnosis by observation, which, along with the severity of complaints, consists an absolute indication for surgery, or the technical prohibition and the lack of time in advanced and emergent cases [5,6,13,17,18,27,28]. Specific anorectal function tests (ARFT) are not generally indicated for patients with external RP [5,6,21]. When physical examination gives insufficient information in RP patients with coexistent FI and/or ODS and the good health status permits further investigation, ARFT may add valuable information [5,6]. Intentionally, work-up for severe FI may include manometry (resting and squeezing pressures), endoanal ultrasonography, which might guide surgical management, and neurophysiological testing (pudendal nerve terminal motor latencies) [5,6,13,15,18,19,26,30]. For slow transit (=relative contraindication to surgery) or constipation/ ODS, work-up includes a conventional or dynamic defecography (used to rule out or evaluate concomitant POP), colonic transit study and manometry [5,6,13,15,17,29].

**Figure 2**



**Figure 2:** MRI images (coronal and sagittal views) - External RP in a woman 78 years old (own material). Arrows indicate RP -level of internal intussusception, and thickening with edema of colonic wall

### Medical and preoperative treatment of RP

Non-operative management in external RP is useful as preoperative treatment for the reducible forms or can be reserved for poor surgical candidates and those refusing surgical repair [6]. Conservative treatment is also applied to patients with internal RP with FI and/or OD [5]. Improvement of constipation using osmotic laxatives, stool softeners and bulking agents, correcting bowel habits, and learning the technique of auto-reduction of the prolapsed rectum may offer some temporary relief for a period of time [5,6,21]; nevertheless, constipation eventually becomes intractable. None conservative treatment helps patients with RP and (mild) FI after at least 4-year duration of the disease [5,6]. Medical treatment in adults is much less successful than in children, and usually only postpones surgery to a later time and at a more advanced stage of the disease [5,6].

In view of irreducibility of the prolapsed rectum, regardless of whether there is already ischaemic necrosis or not, urgent surgical correction is advisable [3,12,27-29]. Only if there is certainly not necrosis, an initial attempt to manual reduction can be made, in order to reduce edema and the inherent risk of surgical complications, as well as to gain time for a semi-elective surgery [3,5,6,16,29]. Methods such as mannitol administration, hyaluronidase or table sugar application (for hyperosmolarity effect), and elastic compression (?) can be used for temporary reduction [3,6,16]. In some cases, an anal block with local anaesthetic along with intravenous administration of short-acting benzodiazepines may aid in successful reduction [31]. If that is not achieved rapidly, then the patient usually requires perineal rectosigmoidectomy [3].

### Surgical treatment of RP

#### I. Need and standing as candidate for surgical repair

A small, asymptomatic prolapse does not require surgical correction [15]. The concerns with persistent RP are the progressive sphincter damage resulting in worsening anal continence, mucus discharge, rectal bleeding and pruritus ani, and the occurrence of feared complications of the protruding mass, which require emergent difficult surgery [15,19]. Patient symptoms dictate the need for surgical treatment [15]. In general, surgical intervention for RP, as for every other pelvic floor disorder, should only be undertaken following a detailed diagnostic evaluation and when the deterioration in QoL is to such a degree that overcomes morbidity risks and functional consequences of a given type of repair [15]. Surgery is clearly recommended for patients with external RP [5]. For internal RP with functional complaints of ODS and/or FI, or accompanied with enterocele, rectocele and cystocele or pain, where conservative management fails, surgical repair is also the required option [5,19,21].

#### II. Aim of surgical repair and controversies

Surgical treatment of symptomatic RP aims at restoring deranged anatomy and disturbed physiology in order to improve anal continence and constipation [1,2,7,13,23,24,30].

These goals can be achieved by (i) resection or plication of the redundant movable colon, (ii) fixation or close approximation of the loose rectum to the sacrum, and (iii) restoration of a strong and functional pelvic floor [1,2,13,19,24,30]. Colonic resection immediately removes the protruding rectal mass. The rationale for the surgical fixation/approximation is to maintain the colon (rectum) attached to the sacrum [1]. The mechanical support to the pelvic floor and the anal sphincters may be achieved at some degree by rectopexy and by puborectalis muscle suture reinforcement or rectal muscle plication [1,13,23].

RP is specifically characterized by intractability to definite and consistent treatment. Although more than 100 different surgical techniques have been advocated for its repair, only very few have finally been accepted in practice [1,11,14,17,19,23,24,31]. A basic cause of unsatisfaction or disappointment is the poor state of rectal function of many of operated RP patients, even after successful cure of the actual prolapse [11]. Generally, the choice of a surgical technique is determined by the degree and condition of the protruding mass, the presence of other pelvic floor disorders (POP) or functional disturbances (FI, ODS) and other comorbidities, the symptoms that prompted the patient to seek medical advice, and the surgeon's experience, skill and preference [1,2,16,19,28,29]. Sometimes, informed patient's preference is also important [4]. The different approach to therapeutic decision makes mandatory careful consideration of the individual condition of the patient, their age, sex and history, as well as the current findings [5,6,15,17,27,28]. Surgical options to RP repair will continue to be controversial until a convincing control health-led trial demonstrates clear superiority of a single technique.

Most of the evidence for the surgical repair of RP is derived from mini case series. In the literature, there are only few series with a non-randomized concurrent cohort setting or a randomized controlled setting [31]. Besides, most of the randomized controlled trials focus on a specific topic, i.e. the evaluation of various methods of rectopexy or the comparison of rectopexy to resection-rectopexy[6]. Both the 2017 Dutch guidelines [5] and the 2018 Consensus Statement of the Italian Society of Colorectal Surgery [6] draw recommendations that are useful in the diagnostic evaluation and the selection of a treatment option for RP, either conservative or surgical. However, in both research works, many statements require a higher level of evidence due to the lack of relative well-designed studies. Moreover, as life expectancy is increasing and advances and novelties are made in medical and surgical approaches, traditional techniques need to be re-evaluated [9].

### III. Surgical approaches/options for RP repair

Surgical procedures to address RP can be broadly divided to two large categories: those performed using an abdominal approach, either the open or the laparoscopic, and those

performed using a perineal approach [3,6,19].

The many open abdominal repairs differ in the extent of rectal mobilization, the methods used for rectal fixation and the inclusion (i.e. Frykman repair) or exclusion (i.e. Ripstein repair) of rectosigmoid resection/anastomosis [2,3,5-7,9,19-21,29]. Most commonly, they include rectopexy with or without resection [3]. Traditionally, the rectum was mobilized down to the levator ani muscle, pulled up and fixed to the sacral promontory with either simple sutures or using a sling of synthetic mesh (non-absorbable or absorbable) [1,7,23]. Various postoperative complications have been reported, such as tight sling-constipation, mesh infection or migration, recurrence etc [1,7,23]. In their review, Madiba et al [1] reported mortality and recurrence rates of the different abdominal techniques as follows: suture rectopexy, 0% / 0-27%; suture rectopexy & resection/anastomosis, 0-6.7% / 0-5%; posterior mesh rectopexy, 0-3% / 0-6%; anterior sling rectopexy (Ripstein), 0-2.8% / 0-13%; laparoscopic rectopexy, 0-3% / 0-10%. As far as the functional results are concerned, most studies show an improvement in FI (suture or mesh rectopexy, resection) and variable influence on constipation after the use of different techniques[ 1]. It is widely considered that, abdominal repairs of RP are "heavier" interventions with higher perioperative morbidity and mortality, and higher risk of impotence in males and infertility in females; instead, they are followed by rather superior overall functional results and less recurrences than the perineal repairs [1,4,5,7,9,12,13,16,23,32]. Younger, more active and fit patients without severe comorbidities are suited to the abdominal approach [1-3,5,7,20].

Laparoscopic ventral rectopexy (LVR/D' Hoore repair) and robotic assisted repair for RP are recently added options that have been found to be as safe and effective as open surgery, but require advanced laparoscopic knowledge, skill and experience[ 1,5,6,16,23]. However, irrespective of advantages of minimal invasive surgeries, these techniques can be major operations in elderly patients with multiple comorbidities and frailty, as well as in infirm younger patients who pose serious anaesthetic risks [1,5,14]. To date, there are not many studies with long-term results concerning recurrence and mesh-related problems, but small series suggest that morbidity and short-term recurrence rate are similar to those reported after open laparotomy [1,5,6,13,14,16,20]. There is also no data comparing LVR to perineal procedures [5].

Classic perineal approaches mainly refer to two operations, the Altemeier's PRS and the Delorme operation [3,6,14,16,21]. The Altemeier's PRS involves full-thickness wall resection of redundant rectum and portion of sigmoid colon, followed by a coloanal anastomosis within the pelvis; the colon is not fixed to the sacrum (Figure 3). It was first advocated by Miles in 1933 and subsequently by Altemeier in 1971; the original procedure incorporates a levatorplasty [1,3,6,14,17,20,33]. Delorme operation entails a circular excision of only the mucosa and submucosa (mucosal sleeve resection) with subsequent plication of the rectal wall muscles and the denuded muscularis propria, giving the rectal wall

an “accordion-like” appearance [1,14]. Detailed surgical techniques are described in the review article of Jacobs et al [19].

Perineal approaches have the advantage of being technically possible with the use of spinal (regional) anaesthetic or even sedation with a local anaesthetic [3,28]. In most single studies comprising elective cases, the perineal procedures for the treatment of external RP have zero or lower mortality rates, minimal morbidity with shorter hospital stays and periods of convalescence, but rather higher recurrence rates and comparatively poorer functional results than abdominal operations [13-15,26,34,35]. Currently, perineal repairs are found to approach the effectiveness of the abdominal operations [19]. In the recent Consensus Statement of the Italian Society of Colorectal Surgery for the management and treatment of RP[6], it is suggested that, in expert hands and with the correct indications, perineal and abdominal procedures may achieve similar results in terms of perioperative complications, bowel function, recurrence rate, and QoL (level of evidence II; grading of recommendation B). Perineal procedures are generally reserved for older debilitated patients or those with significant comorbidities, while the Altemeier's procedure has been described as the optional treatment of the irreducible/strangulated RP unresponsive to conservative treatment or complicated by necrosis, and of specific cases such as females with coexistent genital and rectal prolapse [ 1,3,6,10,14,16,17,19,21,23,26-28].

**Figure 3**



**Figure 3:** Intraoperative views - Altemeier's PRS: a) dissection and one-layer coloanal anastomosis of anterior bowel wall, b) inspection of complete coloanal anastomosis before reduction (own material)

#### **Contraindications for either abdominal or perineal treatment of RP**

##### **(i)Absolute**

- Pregnancy or active proctitis and contraindication for general or spinal anaesthesia (i.e. severe cardiopulmonary disease) in internal or external RP

- Dyssynergia of pelvic floor muscles in internal RP

##### **(ii)Relative**

- History of rectal radiotherapy or inflammatory bowel disease in internal and external RP, mental instability or pain unrelated to solitary rectal ulcer in internal RP
- For abdominal approach: Morbid obesity, endometriosis, severe episode(s) of (sigmoid) diverticulitis, adhesions after abdominal surgery or peritonitis (internal or external RP)
- For perineal approach: History of recto(colpo)pexy for both internal RP (apart from a Delorme procedure or complaints of urge FI) and external RP [5,6,36].

#### **Perineal repairs for RP-The Altemeier's rectosigmoidectomy**

##### **I. Indications for perineal repair**

External RP is a definite indication for surgery due to the obvious diagnosis of the protrusion and its inherent severity of complaints [5]. Candidates for surgical repair are also some symptomatic patients with internal RP accompanied with enterocele, rectocele, and cystocele, or with pain [19,21]. PRS is considered as the best surgical option for elder patients with profound comorbidities, whose the prolapse is excessive and associated or not with other pelvic floor disorders, and in whom an abdominal approach is contraindicated or might be insufficient [3,17]. It is suitable for FI and for significant constipation [1,3,6,17,26]. Recently, there has been a trend towards offering PRS to healthier patients [1,21]. Following a systematic literature search in the MedLine and PubMed databases, the indications for perineal repair of RP, either the Altemeier's PRS or the Delorme operation, should be listed as follows:

1. Elderly patients with significant comorbidities that pose anaesthetic risk making general anaesthesia undesirable or an option to be avoided .  
The choice of Altemeier's PRS under spinal anaesthesia in older age groups and patients who are debilitated or with short life expectancy provides significant advantages as a treatment option [11,16]. In very frail patients for whom the risk for colonic resection is considered to be too high, a Delorme operation could be chosen instead [14].
2. Emergent patients with irreducible RP, either incarcerated or strangulated or gangrenous, where it is not advisable to attempt manual reduction.  
The presence of such complications, in either early or advanced cases, clearly influences the treatment choice, which is urgent surgery including resection [3,16,29]. Relative reports are rare [3,27]. For most of the researchers, the abdominal approach is not suitable even in fit patients, while the Altemeier's PRS by spinal

or general anaesthesia, is highly reasonable and strongly considered as the only safe option and the procedure of choice [3,11,12,16,29]. Patients presenting with gangrene and bowel loaded with feces should be considered for a (temporary) diverting ostomy after the PRS, particularly if they have risk factors of poor healing (i.e. tissues with questionable viability) or exhibit signs of early sepsis on presentation [3,6,27,29].

3. Elderly or high risk patients with major FI, in whom an abdominal approach that does not include a levatorplasty is considered inadequate.

The original Altemeier's procedure incorporates the levatorplasty, while abdominal operations do not [1, 14]. For the optimal operation for RP, some have suggested that it is time to consider a combined abdominal and perineal approach [37].

4. Patients with recurrence of RP after an abdominal or perineal repair.

A repeated colorectal resection can be chosen to remove redundant sigmoid colon and the previous anastomosis; when needed, a levatorplasty is combined for better sphincter function [1,6,36,38]. After the redo PRS, the anastomotic complications are low (2.3%), but the relapse rate may be double of that after the primary resection (39% versus 18%) [6,39].

5. Women with concurrent genital and rectal prolapse who could be treated with a combined perineal surgical repair including a vaginal hysterectomy and levatorplasty.

In light of the sparse and often inadequate case material presented in very few relative reports, it is difficult to draw definite recommendations considering the best repair option for concomitant pelvic prolapses (rectum, vagina or uterus, small intestine, bladder) [1,12-14,17,26,29,30,35]. Dekel et al [17] reported the results of 10 women with genital and rectal prolapse treated with vaginal hysterectomy followed by Altemeier's procedure with levatorplasty, conducted under regional anaesthesia; postoperatively, improvement of sphincteric tone was achieved in all cases, and bladder and rectal continence was maintained. All accompanying pelvic prolapses may be surgically treated either in one session or in two sessions, three to four weeks apart, starting with the gynaecologic procedure [6,17,29]. The restoration of FI and even of the urine function is enhanced by the levatorplasty [1,3,12,14,26,30].

6. Young patients who want to avoid even minimal risk of nerve injury and its associated clinical manifestations during a transabdominal dissection.

There is a higher risk of impotence in males and infertility in young females in the abdominal approach than in the perineal [1,11,12,16].

7. Infirm non-elderly patients with significant comorbidities, probably institutionalized or with short-life expectancy, who are not good candidates for a major abdominal operation; patients with hostile abdomen or whose the kyphosis/scoliosis discourages transabdominal access [1,11, 14,35].

Specifically for the patients with internal RP and indication for surgery (i.e., with OD), a perineal approach is also preferred when a transabdominal procedure is contraindicated. In this patients' group, perineal procedures recommended are the Contour Transtar (stapled trans-anal rectal resection, STARR), the double-stapling Procedure for Prolapse and Haemorrhoids (PPH), and the Delorme operation [5].

## II. Comparison of the perineal procedures. The combined levatorplasty

In Madiba's et al [1] review of RP patients treated with PRS, the overall mortality rates ranged from 0% to 5% and recurrence rates from 0% to 16%. In early days, PRS alone yielded poor functional results with respect to incontinence, urgency and soiling, as well as rather high recurrence rates. The loss of colonic reservoir capacity and some degree of reduction in anal sphincter function have been implicated. The posterior levatorplasty, when combined with PRS, recreates the anorectal angle and improves not only incontinence but also recurrence rates [1,6,26]. Notably, in incontinent patients, the weakened and patulous sphincters begin to regain their tone approximately one month after a justified repair, and full continence is generally restored within 2 to 3 months [1].

The Delorme operation represents a surgical alternative for RP patients who are unable to tolerate a more extensive (perineal) operation, such as the elderly very frail patients with or without FI and those with a concurrent solitary rectal ulcer [1,11,14,19,21]. It is technically feasible in the setting of small-sized rectal prolapses ( $\leq 5$ cm), when there is insufficient length of prolapse to perform a PRS, with the case of major perineal descent ( $>9$  cm on straining) consisting a basic contraindication [1,6,15,23,40]. In the absence of factors such as FI, chronic diarrhea, sphincter with weak or absent tone, excessive prolapse or prolapse with retrosacral separation (defecography), the Delorme operation may provide satisfactory and durable outcome [1,6], with morbidity (up to 32%) being minor in studies and similar to PRS [3]; the reported mortality rates are 0-4% [1]. Reviewing data for recurrence rates after the Delorme operation, Madiba et al [1] reported a range from 4% to 38%, while Melton and Kwaan [3] found a rate of 7%, which is more than 20% when patients are followed up for a decade after surgery.

Results reported at the Cleveland Clinic Foundation [6,41] showed that recurrence following perineal procedures was time-related, and after 10 years follow-up the recurrence rate was 18.5% for PRS and double (36.4%,  $p=0.16$ ) for the Delorme operation; functional outcomes, including incontinence and constipation scores, were similar in the two latter groups [42].

There is evidence to support that a levatorplasty in

conjunction with a perineal repair of RP provides not only a more valuable improvement in continence but also a lower (short-term) recurrence rate [1,3,43]. It has also been supported that the addition of the levatorplasty to a perineal repair is particularly beneficial for the Delorme operation, while it also substantially diminishes the risk of recurrence [44]; a levatorplasty added to an Altemeier's repair is thought to have a similar effect, but this is less strongly evidence supported [45]. When comparing the perineal procedures in use (PRS with or without levatorplasty, Delorme operation), PRS with levatorplasty yields the lowest recurrence rate, the largest recurrence-free interval and the most profitable effects on incontinence and constipation; PRS alone is the next best choice, and the Delorme operation is the worst of the three perineal options [1,3,26,43]. In Agachan et al [43] series of 61 patients (55 women), the postoperative incontinence was improved in all three procedures, but the incontinence score after surgery was lowest in patients who had undergone PRS with levatorplasty; the recurrence rates were 5% for PRS with levatorplasty, 13% for PRS alone, and 38% for the Delorme operation. Moreover, the functional results of the perineal repairs, especially those with levatorplasty, compare favorably to those of abdominal procedures in terms of restoration of continence, with less severe morbidity [1].

One must match the operation to the subject, balancing patient's tolerance, mortality, morbidity, function and recurrence. Following perineal procedures, the very low mortality rates would appear to be acceptable considering the health status of the patient in whom the procedure is done. On the other hand, recurrence rates mandate that RP patients be forewarned that there may be need for a second surgical intervention for this complex disease [1,40].

### III. Complications other than RP recurrence after PRS

Overall morbidity varies among series [3]. Postoperative complications are usually rare and minor [1,26,34]. In their series of 63 RP patients treated with Altemeier's PRS, Kimmins et al [32] encountered anastomotic leak, anal stenosis, (endo-anal) bleeding and rectovaginal fistula as postoperative complications in 11%. In the series of Altomare et al [26] comprising 93 RP patients treated with Altemeier's PRS, complications reported were major in 8.6% (pelvic haematoma: 3 patients, anastomotic dehiscence: 1, sigmoid perforation: 1, pararectal abscess: 1, late anal stricture: 2) and minor in 14%; no mortality was reported. A recent series from Cleveland Clinic Florida reported a leak rate in 3.2% and anastomotic bleeding in 0.7% [3,46]. In a most recent "National Surgical Quality Improvement Program" (NSQIP) study of 706 RP patients undergoing perineal repair, the rate of return to operating room was 2.4%, of postoperative sepsis 2.7%, and of mortality 1.4% [3,42].

The most dreaded intraoperative pitfall is the resection or suturing or stapling (perineal stapled prolapse resection, PSPR) of a portion of small bowel, entrapped into the anastomosis, that might cause massive abdominal haemorrhage and require urgent abdominal exploration; it is very rarely

reported, but highlights the need for always taking care to recognize and exclude any deep enterocele [3,6,11,47]. One case of pelvic haematoma that required reoperation has been also reported by Johansen et al [34].

The anastomotic leak-dehiscence is similarly very rarely reported [1,3,12,14,18]. Although this leak normally drains through the anus, in cases that conservative means (antibiotics, digital exploration, etc) or attempts for topical drainage of a perirectal abscess fail, a laparotomy is required, which may involve washout without taking down of the coloanal anastomosis, or even an end colostomy as a definite solution [14].

Impotence after Altemeier's procedure has been very rarely reported; instead, there is an increased risk of impotence in males and of infertility in young females in the abdominal approach of repair [1,12,13,16].

### IV. Evaluation of functional results after PRS

The PRS repair of RP provides immediate relief with resolution of the preoperative protruding rectal "mass" and may solve the problem of soiling due to rectal discharge and disagreeable odor [12-14]. The postoperative course is generally uneventful with minimal pain, patients receive oral intake within 24 to 48 hours and regain normal bowel function within a few days from surgery [1,6]. In most studies, morbidity rates range from 3% to 35% and mortality rates range from 0% to 5% [1,13,32,34].

In many relative reports, the failure of the surgical repair to correct all the deranged functional scores indicates that the protrusion itself is not the only important factor in the bowel and urine dysfunction often observed in RP patients [13]. The Altemeier's PRS involves removal of the rectal ampulla with loss of its function as a fecal reservoir and reduced rectal/colonic wall compliance; thus, despite the significant improvement of the continence scores (specifically with combined levatorplasty), a full restoration of continence may rarely be achieved [1,12,13,17,18,26,30,34]. Besides, the anal sphincter complex, which is weakened due to the exertion of chronic endoanal pressure from the protruding "pelvic mass", but is preserved with surgery, may postoperatively strengthen with subsequent beneficial effect on both bowel and urine function [1,12,13,17].

Improvement of incontinence ranges from 28% [26] to 90% [34] of patients, and even cases with pudendal neuropathy could postoperatively benefit from the procedure. In most series, postoperative manometric measurements show improved outcomes, either with respect to the incontinence score or to the resting anal squeezing pressures, particularly in patients who had postoperative maximal squeeze pressures > 60mmHg or belonged to the group with levatorplasty [3,6,17,18,26,30].

The long-term reliability of the procedure seems uncertain when evaluating many reports with small number of patients treated in each center [26]. Over the years, significant bias in RP patient selection associated with choosing a perineal versus an abdominal approach result in lack of

well-conducted prospective RCTs (i.e. comparing PRS and levatorplasty with abdominal rectopexy and pelvic floor repair in groups of elderly females with RP and FI) [3,48]. Furthermore, apart from differences in patient selection and the mostly retrospective study design, postoperative resultant constipation is not well and widely reported as a significant functional problem [3]. Notably, only few publications have reported detailed data on the effect of Altemeier's PRS on this function [5,13,32,39,49,50].

In their large series of 93 patients treated with PRS, incorporating levatorplasty in 72 (78%), Altomare et al [26] reviewed their results of mean follow-up of 41 months. They reported no mortality, major and minor complications in 8.6% and 14% of patients respectively, recurrence rate in 18% (with repeated PRS being the most common therapeutic option), and improved incontinence in 28%; they concluded that PRS is a safe and effective treatment with low morbidity, in particular for frail and older patients, but the recurrence rate is not negligible and the restoration of continence is unpredictable. In their series of 103 consecutive RP patients of all ages treated with PRS and levatorplasty, Cirocco et al [35] reported excellent results during a mean follow-up of 43 months: no mortality, no recurrence, minimal morbidity (14%) with short hospital stay and periods of convalescence, and improvements in preoperative constipation (61% of patients) in 94% and in preoperative FI (47% of patients) in 85%. Similarly, Trompetto et al [13] reviewed long-term results of 43 consecutive RP patients treated with PRS and levatorplasty, and reported no mortality, low complication rate, statistically significant reduction in ODS score with no statistically significant changes in the Vaizey score, no improvement of fecal and urinary continence, and recurrence of 40% at four years. Alwahid et al [14] treated 45 elderly unfit RP patients and reported low morbidity with good functional results, including improvement in constipation (4.4% vs 26.7%) and FI (15.6% vs 46.7%) and a low recurrence (13%); no data was recorded with respect to levatorplasty. In our experience with a recent mini-series of six RP patients treated with PRS (levatorplasty: two patients), absence of intraoperative or early complications, minimal discomfort and early convalescence were the case; improvements in constipation or fecal/urine incontinence and no recurrence were documented at 35 months of mean follow-up [51].

In a series of 63 patients (61 females) treated with PRS where the anastomosis was stapled in 83% of cases, Kimmins et al [32] reported excellent results during a mean follow-up of 20.8 months: early discharge on the day of surgery (62% of patients) or within 24 hours (80%), complications in 10% with no perioperative mortality, resolution or improvement of prolapse in all patients, and a 6.4% recurrence rate. Similarly, Bajaj et al [11] performed PSPR in 12 patients with RPs up to 8-10cm, and reported postoperative improvement of severe constipation and FI in 66% and 90% of patients respectively, and a minor complication in one patient. Ding et al [39] reviewed on the results after PRS for primary and recurrent RP; they concluded that, Redo PRS is as safe and feasible

as the primary PRS in elderly and fragile RP patients, but its recurrence rate is substantially higher (39% vs 18%;  $p=0.007$ ). Using data from the American College of Surgeons NSQIP, Fleming et al [42] examined the perioperative outcome of RP patients and have determined the safety and efficacy of different surgical procedures. They showed that a perineal approach was independently associated with a lower major and minor complication rate than any abdominal procedure. Specifically, in study on 1275 patients from this NSQIP database, the 706 patients in the perineal group were older with more comorbidities than those undergoing an abdominal repair; nevertheless, they had fewer minor and major complications ( $p=0.0038$ , in both) compared with the abdominal cohort [3,6,13,42,52].

The multicenter "Prolapse Surgery: Perineal or Rectopexy" (PROSPER) [44,53] prospective randomized study, the largest on RP, compares the perineal with abdominal approaches, suture rectopexy with and without resection, and Altemeier's PRS with the Delorme operation, with respect to QoL and recurrence. For both perineal and abdominal procedures, improvement in QoL with a similar incidence of recurrence (28% vs 19%,  $p=0.2$ ) but no significant difference in bowel function and QoL were found [3,6,13,44,53]. In addition, a recent Cochrane database systemic review [4] for adult RP failed to confirm the superiority of transabdominal over perineal procedures due to poor quality and heterogeneity of the available studies. Finally, an online survey of the Association of Coloproctology of Great Britain and Ireland (ACPGBI) showed no difference between abdominal and perineal surgery for RP [4,6,44,53]. The authors acknowledged that the choice of perineal versus abdominal approach is still strongly influenced by the lack of solid and convincing evidence[4].

To date, the available evidence in research of relevant studies does not allow us to draw definite conclusions and provide recommendations about which approach to prefer in different RP patients' groups. Further high-quality studies are needed.

## V. Evaluation of recurrence after PRS

Several single-center retrospective studies have observed lower recurrence rates with abdominal repair versus perineal repair [2,3,6,26]. However, numerous of them suffer from weak grade of recommendation based on level III-IV evidence, mostly due to profound heterogeneity [6]. In a large study of 1972 patients from a database in USA, the reoperation rate for recurrence was similar after abdominal and perineal approaches (11%) [6,54]. The assumption that abdominal procedures, when compared to perineal procedures, are found to be associated with reduced risk of recurrence, has been recently challenged by well conducted RCTs [6,44]. No difference in recurrence rates was demonstrated in the PROSPER study [6] or the last Cochrane review [4] on this topic. Moreover, in case of perineal repairs (particularly the PRS), recurrence rates should be balanced with the advantage of minimal invasiveness inherent in these techniques, the possibility to repeat them, the competence to easily add



a levatorplasty and the fact that, in many cases, they are performed either as the operation of choice or as the only available option [13,14,16,17,26,32].

Recurrence rates after PRS ranging between 0% and 20% are supported by a lot of current estimates [1,6,13,14,16,26,32,35,42]. Few studies collecting results from longer term follow-up report higher rates of recurrence with perineal procedures, ranging between 14% and 27% within 4 years after surgery [3,6,26,41,43,49].

Recurrence of RP following surgical repair is likely to be multifactorial, and contributing factors such as the inadequate mobilization of the protruding redundant rectum, the absence of a combined levatorplasty, female gender with wider pelvis and weak pelvic floor (multiparous with possible obstetric trauma, POP), previous hysterectomy, Redo repairs and the high ASA or BMI scores, have been implicated in many relative reports [6,13,14,26,33-6,39,49,50]. In most cases, recurrence is due to inadequate resection, and care must be taken in primary surgery to excise the entire redundant rectum and (portion of) sigmoid colon [20]. Johansen et al [34] and Kimmins et al [32] reported average length of resected specimens of 23 cm and 11.6 cm, respectively. On the contrary, PRS is difficult to perform in the setting of small-sized prolapse and when the prolapse is not of full-thickness in its entire circumference [1].

The Altemeier's PRS has been proposed as the minimally invasive technique which could be repeated without additional morbidity [13,14,17,32,35]. In large series, management options for recurrent RP after PRS include mainly a Redo PRS, while other treatments used (avoiding resection) are the Delorme operation, postanal repair, Well's rectopexy, laparoscopic suture or mesh rectopexy, sacral nerve stimulation (rarely), and bulking agents [3,6,26,32,38,41,49].

### Conclusions

Full-thickness RP is a disturbing syndrome of rectal intussusception, which is vastly more common in older ages and females. More likely, it signals a generalized pelvic floor dysfunction rather than an isolated rectal problem. Patients presenting with external RP and those with symptomatic internal RP associated with neighboring organ herniation should be considered for surgical repair. Treatment decision-making, choice of surgical approach and the type of operation to be performed should be individualized to each specific RP patient. Perineal repairs, either the Altemeier's PRS or the Delorme operation, are characterized by minimal invasiveness and surgical stress, lower pain and morbidity risks, and better patient's tolerance. Perineal procedures, which allow simultaneous repair of an enterocele or rectocele and performance of a levatorplasty, are excellent alternatives in poor candidates for abdominal surgery and general anaesthesia and cases choosing to avoid major operation and risks. The Altemeier's PRS is highly reasonable and considered in emergencies. With respect to postoperative function and RP recurrence, perineal repairs, particularly the PRS, approach in many cases the effectiveness of the abdominal

repairs. Further high-quality research with randomized controlled studies is needed to improve understanding of the natural history of RP and the outcomes after surgical repair, obtaining future high levels of evidence.

**Conflict of interest:** None declared

**Ethical approval:** This study was approved by our Institution Ethical Commission (Gen. Hosp. N. I."Constantopouleion-Patission-Aghia Olga", Athens-Greece)

**Informed Consent:** Written informed consent was obtained from patients included in the study (figures)

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**Abbreviations:** ASA-American Society of Anaesthesiologists, BMI-Body Mass Index

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