

Low Anterior Resection Syndrome. Anatomical Changes after Anterior Rectal Resection

Virgiliu-Mihail Prunoiu^{1*}, Mircea-Niculae Brătucu^{2*}, Dragoș Garofil², Victor Strâmbu², Eugen Brătucu¹,
Laurențiu Simion¹, Eduard-Georgian Chiru¹, Petru Adrian Radu²

¹st Department of General and Oncological Surgery, Prof. Dr. Alexandru Trestioreanu Oncological Institute,
Fundeni Street 252, 022328 Bucharest, Romania

²Department of General Surgery, Dr. Carol Davila Clinical Hospital, Calea Griviței 4, 010731 Bucharest, Romania
Carol Davila University of Medicine and Pharmacy, Dionisie Lupu Street 37, 020021 Bucharest, Romania

*Corresponding authors:

Virgiliu-Mihail Prunoiu, M.D.
1st Department of General and
Oncological Surgery
Prof. Dr. Alexandru Trestioreanu
Oncological Institute
Fundeni Street 252, 022328
Bucharest, Romania
E-mail: virgiliuprunoiu@yahoo.com

Mircea-Niculae Brătucu, M.D.
Department of General Surgery
Dr. Carol Davila Clinical Hospital
Calea Griviței 4, 010731 Bucharest
Romania
E-mail: bratucu_mircea@yahoo.com

Abbreviations:

LARS: low anterior resection syndrome;
ULAR: ultralow anterior resection;
TME: total mesorectal excision.

Rezumat

Sindromul rezecției rectale joase.

Modificări anatomice după rezecția anterioară de rect

În acest editorial, autorii aduc în atenția chirurgilor un punct de vedere personal cu intenția de a oferi o serie de argumente anatomice care să explice rata mare a complicațiilor funcționale consecutive rezecțiilor ultrajoase de rect, rezecții dominate de incontinența fecală cu diverse intensități. Având ca punct de plecare anatomia planșeului pelvin și a perineului posterior, autorii se preocupă de consecințele funcționale ale chirurgiei de rezecție rectală anterioară cu conservarea aparatului sfincterian, cu referire la sindromul rezecției rectale joase și ultrajoase. Tehnic, actualmente s-a ajuns la o chirurgie conservatoare adresată cancerului de rect inferior. Dacă în urmă cu 25 de ani pentru cancerul de rect situat sub 7 cm de orificiul anal se practica amputația de rect, în zilele noastre s-a ajuns la păstrarea canalului anal ca partener pentru anastomoza cu colonul. Progresiv, din dorința de a păstra un tranzit intestinal pe căi naturale, cât mai anatomic și mai fiziologic, rezecția a coborât până la 2-4 cm de orificiul anal și s-au construit anastomoze ultrajoase, în plin aparat sfincterian anal. Scopul declarat: îndeplinirea standardului de siguranță oncologică și, concomitent, evitarea colostomiei definitive. Plecând de la anatomia normală a planșeului pelvin și a segmentului ano-rectal, autorii fac o incursiune în alterările structurilor viscerale, musculare și nervoase consecința rezecției rectale joase și, mai ales, ultrajoase. Remarcăm un grad ridicat de consecințe funcționale privind defecația, cu instalarea

Received: 10.02.2024
Accepted: 14.04.2024

unor dizabilități marcate ale continenței anale, consecința majoră fiind incontinența anală (30-70%). Autorii inventariază principalele modificări anatomo-fiziologice care acompaniază rezecția anterioară a rectului.

Concluzii: Apar astfel următoarele întrebări: care este limita inferioară a rezecției pentru a evita incontinența fecală totală? O incontinență totală este preferabilă unei colostomii sau nu? Răspunsurile nu pot fi susținute deocamdată de argumente solide, dar se desprinde necesitatea inițierii unor viitoare studii dedicate acestei probleme.

Cuvinte cheie: low anterior resection syndrome (LARS), ultralow anterior resection (ULAR), low rectal cancer

Abstract

In this editorial, the authors bring to the attention of surgeons a personal point of view with the intention of offering a series of anatomical arguments to explain the high rate of functional complications following ultralow rectal resections, resections dominated by faecal incontinence of various intensities. Having as a starting point the anatomy of the pelvic floor and the posterior perineum, the authors are concerned with the functional outcomes of the sphincter-saving anterior rectal resection, regarding the low and ultralow resection. Technically, a conservative surgery for low rectal cancer has been currently performed. If 25 years ago the abdominoperineal resection was the gold standard for rectal cancer located under 7cm from the anal verge, nowadays the preservation of the anal canal as a partner for colon anastomosis has been accomplished. Progressively, from a desire to preserve the normal passage of stool into the anal canal, as anatomically and physiologically as possible, the distal limit of resection was lowered to 2-4 cm from the anal verge and ultra-low anastomoses were created, within the anal sphincter complex. The stated goal: keep the oncological safety standard and, at the same time, avoid definitive colostomy. Starting from the normal anatomy of the pelvic floor and the anorectal segment, the authors take a look at the alterations of the visceral, muscular, and nerve structures as a consequence of the low anterior resection and, particularly, the ultralow anterior resection. A significant degree of functional outcomes regarding defecation, with the onset of marked disabilities of anal continence, the major consequence being anal incontinence (30-70%), have been noticed. The authors go under review for the main anatomical and physiological changes that accompany anterior rectal resection.

Conclusions: Thus, the following questions arise: what is the lower limit of resection to avoid total fecal incontinence? Is total incontinence a greater handicap than colostomy or is it not? The answers cannot be supported by solid arguments at this time, but the need to initiate future studies dedicated to this problem emerges.

Key words: low anterior resection syndrome (LARS), ultralow anterior resection (ULAR), low rectal cancer

Introduction

Remarkable progress has been made in the treatment of rectal cancer following the introduction of the total mesorectal excision (TME), mechanical sutures, minimally invasive

surgery and radio-chemotherapy. All these relatively new approaches, combined, have led to changes in the surgical attitude, allowing the significant reduction of the tumor recurrence rate, given the fact that surgery has become more conservative by protecting

the anal sphincter complex. To preserve the anal continence and the normal evacuation of feces, thus avoiding the colostomy, the surgeons have significantly lowered the inferior limit of the resection to 3-4 cm and even 2 cm away from the anal orifice. Nowadays, coloanal anastomoses are no longer avoided, being unanimously recommended by the surgeons who treat rectal cancer. Thus, the patient avoids the inconveniences of the definitive colostomy, a genuinely disabling condition that is defined by the legislation as a medium handicap, with psychosocial and economic effects not to be disregarded. Partial or even total anterior rectal resection entails considerable anatomical and physiological changes in the terminal segment of the digestive system. The lower the anastomosis is, the more inconvenient its consequences can be – defecation disorders. Defecation is a personal physiological act, strictly private, which requires good control of the time and space where it takes place. The unpredictability or the urgency of this act can create unpleasant, embarrassing, shameful moments with psychological effects and much more than that. Losing or just altering anal continence, a function acquired in childhood, at the age of 3-4, can generate states of depression, isolation, and loss of self-esteem; concisely, it is perceived as a change in the human condition and an impairment in the quality of life.

However, the progress regarding the oncological result and the reduced sacrifice of the organ have also entailed a disturbance in the quality of the act of defecation meaning the occurrence of more or less expressed impairments of anal continence. These impairments were included in a nosological entity called "Low Anterior Resection Syndrome – LARS". The term LARS was introduced by Cl. Bryant in 2012 and is intended to define the existence of "intestinal dysfunctions following rectal surgery that led to impairment in the quality of life" (1,2).

The syndrome is relatively heterogeneous, in the sense that it includes many symptoms and their consequences. There are 8 symptoms: frequency of bowel movements, urgency,

unpredictable evacuations, changes in consistency, painful stools, difficulty in evacuation, incontinence of matter and flatus. The existence of some of these 8 symptoms can lead to some 8 possible consequences: toilet dependence, preoccupation, dissatisfaction, compromises, decrease of the state of well-being, alteration of social and intimate life, modification of responsibilities (3-7). LARS attempts to define the degree of the alteration of the function of anal continence following anterior rectal resection. „LARS score” uses a questionnaire addressed to the patients, a questionnaire according to which the degree of anal dysfunction may be assessed: no LARS 0-20 points, minor LARS 21-29 points, major LARS 30-42 points. LARS reflects the various degrees of anal incontinence (AI) and the intensity of these defecation impairments - LARS scoring system – according to Emmertsen K.J (3) (*Appendix 1*).

Pelvic Floor Anatomy

The pelvic floor, also known as the pelvic diaphragm, plays a major role in anal continence. The pelvis is the lower compartment of the abdominal cavity, extending from the line of the iliac crests and the lumbosacral promontory to the pelvic diaphragm of the levator ani which delimit it inferiorly. This anatomical space has the shape of a „washbowl” with a wide upper opening which narrows into a „funnel-shape” structure. Here, the pelvis contains the pelvic organs which are arranged in line, anteroposteriorly: the urinary bladder, the uterus and the appendages, and the rectum. All these viscera are intrapelvic but subperitoneal, and have evacuation ways at the level of the perineum. The subperitoneal pelvis is limited superiorly by the pelvic parietal peritoneum and inferiorly by the „funnel-shape” structure of the levator ani and the coccyx muscle which close the pelvic excavation. This anatomical space is also called the pelvic-subperitoneal or superior perirectal space. Finally, caudal to the levator ani, there is the lower perirectal space delimited inferiorly by the perineal aponeu-

roses which allow the passage of the urethra, vagina and anal canal. The anterior perineum (the urogenital diaphragm) has four muscles in its constitution, but it does not interfere with the operative act of rectal resection. The posterior or anal perineum is represented by the external anal sphincter which encases the anal canal for 2-3 cm and has three segments: deep, intertwined with the fibers of the puborectal bundle from the levator ani, a middle segment inserted on the sacrococcygeal ligament and a superficial segment inserted on the fibrotendinous nucleus of the perineum.

The Pelvic Diaphragm (Levator Ani)

This structure is common to both sexes. In the structure of the diaphragm, there are 2 muscles: the levator ani muscle and the coccygeal muscle. These structures delimit the pelvic cavity from the perineal space (inferior perirectal) and contain the anal canal. The levator ani muscles are composed of very important fascicles for the statics and function of the pelvic organs: the pubovaginal (puboprostatic) fascicle and the puborectal fascicle in the internal sector, and the pubic and ilio-coccygeal fascicles in the external sector. These latter fascicles are completed with fibers deriving from the coccygeal muscle (*Fig. 1*). This muscular complex fulfills important functions of sphincter and anorectal synergism. The pelvic diaphragm through the puborectal bundle ensures the "securing" of the lower rectum and the creation of the anorectal angle with the role of a valve. In light of these anatomical data, it is obvious that the operative act of resection which descends below the funnel of the levator ani muscle will be carried out with more or less marked alterations of the levator ani (the puborectal fascicle), of the external anal sphincter (the deep segment) and the internal anal sphincter (the upper segment).

The anal continence is dependent on keeping the pelvic diaphragm and the anal sphincter system as intact as possible, simultaneously preserving the critical neurological areas that are responsible for the

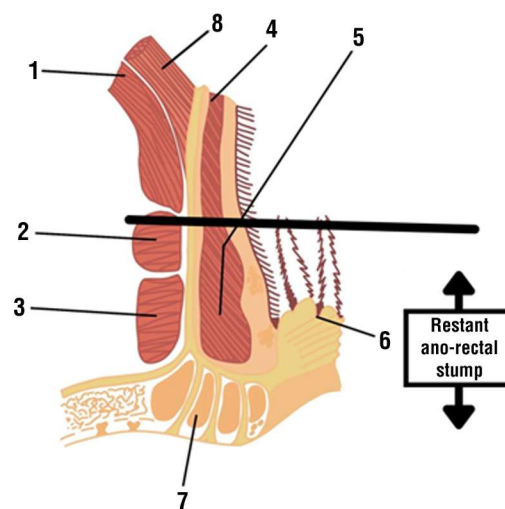


Figure 1. The anal sphincter. Another-rectal stump left after LAR (Low Anterior Resection) and ULAR (Ultralow Anterior Resection)

1. Deep bundle of the external anal sphincter, 2. Superficial bundle of the external anal sphincter, 3. Subcutaneous bundle of the external anal sphincter, 4. Internal anal sphincter, 5. Internal anal sphincter, 6. Columns of Morgagni, 7. Corrugator ani muscle, 8. Pubo-rectal bundle of levator ani muscle

innervation of the organs in the pelvic "wash-bowl" (8-16).

Comments and Discussions

Among the symptoms of LARS, the most difficult for patients to bear are: frequency of stools, anal incontinence for gas and seepage of stool, fecal urgency and incomplete evacuations (5,7,17,18). It is obvious that there has been a previous concern for AI following surgery. There are at least 3 other scores that aim to evaluate this anal dysfunction: the Wexner score, the Vaizey score and the BFI score (bowel function instrument). The Wexner score (The Cleveland Clinic Fecal Incontinence Severity Scoring System - CCIS) has a scale from 0-20, where 0 points are perfect continence and 20 points are complete incontinence. The Vaizey score (St. Mark's incontinence score) is 0-24 points. The BFI score was proposed by The Memorial Sloan Kettering Cancer Center (The Memorial Sloan Kettering Cancer Center Bowel Function Instrument - MSKCC BFI) and it also measures the anal sphincter dysfunction following sphincter sparing surgery (19-27). In

Romania, the legislation established criteria and norms for the assessment and classification of the degrees of disability (28). According to these norms, „anal incontinence is a chronic condition resulting from the inability to effectively restrict the passage of fecal stools through the anal canal, leading to involuntary defecation”. It is therefore a severe impairment of the quality of life, generating stress for the patient and his entourage. In the Romanian legislation, which uses the Wexner and Vaizey scores for evaluation, AI is classified as a medium impairment. That is, an adaptive capacity of 50-69% - this percentage expresses the possibility of adapting to the social environment, compared to a normal adaptive capacity of 100%. AI requires health services for curative treatments, and the disability considerably affects social and intimate relationships, modifying the behavior and daily schedule, and causing a 50% reduction in work capacity (28). According to this classification, AI is considered to be a third-degree disability. Mention should be made that the rules for classifying the degree of disability issued in 2011 placed AI in the second degree of disability, with a total loss of work capacity and a contraindication for any professional activity. *Nota bene* – colostomy is classified as severe disability (second degree), without the right to work. It results that both permanent colostomy and AI fall under disability, but in different degrees (29). What do LAR (Low Anterior Resection) and ULAR (ultralow anterior resection) aim to achieve? First of all, to remove the rectum affected by the tumor within the limits of oncological safety and, secondly, to maintain the intestinal transit under normal conditions, avoiding definitive colostomy.

Researching the literature, the following percentages of severe LARS (major 20-42 points) are recorded: Croese A.D. (2) - 42%, Emmertsen K.J. (3) - 46%, Wang A (6) - 35%, Juul T. (18) - 32%, Dilke S.M. (30) - 53.4%, Chatwin N.A. (31) - 47%, Ahmad Sakr (32) - 49.01% (76% intersphincteric resection, 49.31% ULAR), Fernandez-Martinez D. (33) - 36.9%. It is noticed that AI after LAR and

ULAR is found at an average frequency of 35-50% in the most important statistics. At the same time, according to Fernandez, the symptoms that do not remit after 1 year persist, and 47.5% of the patients are symptomatic 13.7 years after monitoring. Ahmad states that he recorded 75.9% AI after intersphincteric resection and 49.3% after ULAR, and Chatwin estimates that 47% of the patients have major AI and 9% have incontinence (32,33). These percentages reveal that LARS constitutes a complete lot of discomforts that can occur after low and ultralow resections of the rectum, and among them, AI is distinguished as the most debilitating condition. At least during the first 12-18 months postoperatively, major LARS is seen with percentages of 30-50%. It can also be noticed that as the exeresis extends caudally, the percentage of LARS also increases, especially, its severity. The ultralow, coloanal anastomoses are those that provide the highest percentages of major and unrecoverable LARS over time. If after ULAR, major LARS is recorded in 49.3% of the cases, after intersphincteric anastomoses it can reach an incidence of defecation impairments of 75.9% (32). The persistence of LARS more than 1 year postoperatively signifies, in general, the continuance of the presence of this syndrome in the following years, 47.5% of these patients having LARS even after 13.7 years of postoperative monitoring (33). If 27% urinary dysfunctions and 30% sexual dysfunctions are added, an unsatisfactory picture is obtained in terms of the functional outcomes after LAR and, especially, ULAR (34).

Quality of Life (QoL) „expresses the degree to which a person is healthy, comfortable and able to participate and enjoy the events of life”. This definition has a high degree of ambiguity because the perception of QoL is different from one individual to another, each having personal standards for assessing QoL (35). The quality of life is a strictly subjective measure for assessing „happiness” following individual preferences. The notion includes both health criteria and social, family, professional and financial life conditions. In our field of

interest, the health care field, the assessment of QoL involves ratings of the impact of the disease, the treatment and the patient's status. WHO (The World Health Organization) (35) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". This is neither the place nor the time to examine the disputed issue of QoL. However, the inclusion in the QoL definition allows the placement of LARS in the category of discomforts that occur as a result of the impairments produced by the surgical act and thus places the syndrome in the degree of disability (handicap). For a better understanding of the causes of LARS, an analysis of the anatomical and physiological changes occurring following low and ultralow rectal resections is required.

Consequences of ULAR

Fundamentally, ULAR involves the total resection of the rectum and the mesorectum to achieve the oncological objectives. As a consequence, the following changes in the anatomical structures are recorded:

- a. The complete absence of the rectum;
- b. The destruction of some muscular structures in the pelvic floor;
- c. Possible injuries of the plexus and pelvic nerve structures.

The effect of neoadjuvant radiation therapy on the anatomical, sphincteric and nerve elements that ensure anal continence should be added to these newly created conditions. Radiation proctitis occurs in a percentage of up to 20%: rectal pain and tenesmus, imperious stools and sometimes fecal incontinence (36-38). These disorders attributable to radiotherapy appear at least 6 months after irradiation and are caused by damage to the microvascular endothelium. Radiotherapy and the low level of the anastomosis (< 6 cm) have been associated with the alteration of anal continence (37).

- a. The complete absence of the rectum is followed by the restoration of transit through a coloanal anastomosis. Thus, the function of being a reservoir, of receptive

relaxation of the rectum, disappears, this function being insufficiently compensated by its partner, the anastomotic colon. The absence of the rectum disrupts sensory perception with a major role in ensuring continence as well as normal evacuations. The diminished perception of the neo-rectum (the colon) is registered in approximately 60% of the patients (39). Rectal compliance cannot be replaced by the adaptive capacity of the anastomotic colon. The recto-colonic inhibitory reflex is cancelled, as well as the excitatory one. The inhibitory reflex causes the relaxation of the internal anal sphincter in response to the rectal distension. The components of the aforementioned reflux are cancelled by the posttraumatic surgical or neurological injuries. At the same time, there is a nerve disconnection between the anastomosed colon and the anal canal. A dyssynergia is established in the sphincter activity. The residual pressure regime of the internal sphincter is disturbed, which decreases during periods of rest, while the external sphincter controls only voluntary continence (40). Thus, a decrease in the involuntary control of anal continence occurs. On the other hand, in patients with LARS, fecal incontinence in its various forms and intensities is much more frequent than constipation. The high-pressure zone of the anal canal is the essential element in ensuring continence. The length of the anal canal is essential in maintaining involuntary sphincter control (41,42). Aside from that, the anorectal ring, along with the flap valve, contributes to continence to a lesser extent. The puborectal bundle, the median segment of the levator ani funnel, maintains the angulation between the anal canal and the overlying rectum, additionally generating a check valve effect (41). The anatomical anal canal is 3 cm long, up to the dentate line. However, surgical anatomy claims that there is sphincter activity on another 2 cm above the dentate line, which means that a total length of 5 cm of the anal canal can be

considered - 3 cm of the anatomical canal and 2 cm of the physiological canal (41,43). LAR places the anastomosis 4-5 cm away from the anal verge, essentially 1-2 cm above the dentate line, practically removing the rectal reservoir completely and cancelling the physiological area of the anal canal. ULAR is even more radical, saving only 2-3 cm of the anatomical anal canal, placing the coloanal anastomosis within the sphincter complex, destroying the puborectal strap from the levator ani and sacrificing the upper segment of the internal sphincter.

- b. The destruction of some muscular structures in the pelvic floor and the alteration of the sphincter complex. Given the absence of the rectal reservoir, LAR and ULAR are able, by lowering the resection, to determine changes in the pelvic floor with the disruption of the levator ani functions and the reduction of the anal sphincter apparatus. A weakening of the pelvic diaphragm results in the descent of the perineum (descending perineum syndrome) and, consequently, of the anal canal below the pubococcygeal line, which induces insufficient anal containment (44,45). On the other hand, the puborectal muscle, part of the levator ani muscles, is an essential component of the pelvic diaphragm, encasing the rectum at the anorectal limit, near the dentate line. The puborectal bundle is essential in ensuring the quality of continence. At the moment of defecation, this muscle relaxes and allows the ano-rectal angle to be erased with the deflection of the anorectal junction simultaneously with the relaxation of the anal sphincters. The lowering of the resection below the dentate line is responsible for the „breaking” of the puborectal bundle, concurrently with the destruction of the deep segment of the external anal sphincter and the reduction of the upper pole of the internal sphincter (30,33,34,39-42,46).
- c. Injuries to nerve structures. Both surgery and radiation therapy can cause injuries to the nerve structures responsible for the complexity of normal defecation. Thus, the inferior rectal nerve, a branch of the pudendal nerve (S2-S4), provides the motor innervation of the external anal sphincter and the sensory innervation of the lower 1/3 of the anal canal, below the dentate line. Essentially, it ensures the voluntary continence. It is clear that if the resection is performed below the dentate line, the terminal branches of the inferior rectal nerve are intercepted and thus the sensitivity of the remaining anal canal is making possible the uncontrolled evacuation of gas and feces. Besides these inherent nerve interferences attributable to LAR and ULAR, there is also a series of possible injuries of the nerve structures during a rectal resection performed by a surgical team less trained in this type of surgery. Consequently, injuries to the hypogastric nerves and the inferior mesenteric (pelvic) plexus may occur (47). All these possible injuries may occur while performing the rectal-mesorectal resection, thus adding them to the unavoidable nerve injuries during LAR and ULAR. By synthesizing, the following percentages of morbidity are obtained after LAR and ULAR: major LARS up to 26%, stenoses and/or anastomotic fistulae 16%; in total a percentage of 42% of complications (48-51). Because in 80% of the patients undergoing LAR or ULAR a temporary protective ileostomy is also associated, the complications of this surgical procedure will be added as well: the prolapse or retraction of the stoma, stenosis, parastomal infections, and occlusions. These are registered with a non-negligible frequency – 16-20%. In 11.6% of ostomy patients, reoperation is necessary to correct the complication (52). Likewise, closing the ileostomy imposes a new surgical procedure that has its possible complications: parietal abscesses, occlusions, stenoses, and eventrations. Fistula complications after closing the ileostomy alone have a frequency of 6.3% (53,54). Totalling the number of complications after ULAR

with protective ileostomy a percentage of approx. 50% of the patients who will have a complicated evolution are recorded (55-58).

What are the consequences of post-surgical AI? Some of them: are fear, highly affected daily activities, isolation and frustration, humiliation and, finally, depression. There is a rich array of procedures aimed at improving the degree of incontinence. Starting with a diet change up to low-tech biofeedback procedures to train the muscular ligamentous structures of the pelvic floor. Other procedures include the electrostimulation of the sacral nerve to determine an increase in the anal sensitivity and the activity of the external anal sphincter. These first-line approaches, with medical and behavioural treatments, frequently do not give the expected results. Furthermore, if these non-surgical techniques did not prove satisfactory, the following procedures were undertaken: placing an artificial anal sphincter and/or anal graciloplasty and/or myorrhaphy of the levator ani muscles and reconstructions of the external anal sphincter. Unfortunately, after the above-mentioned rehabilitation techniques, only 23.8% of the AI patients no longer presented symptoms, and 42% remained with a third-degree disability with serious impairments and severe disability. Moreover, it was found that anal pressure remains unchanged, at low values, after the anal continence rehabilitation procedures (59). A study conducted by F. Pucciani in 2018, based on the exploration of 169 persistent post-surgical AIs over 27 months found that urge incontinence was present in 82.2% and passive incontinence in 26%, structural defects of the external anal sphincter in 33.1%, defects of the internal anal sphincter in 44.3% and associated sphincter lesions in 23% (60).

All this display of the complications peculiar to LAR and, especially ULAR, is not a reason to justify disregarding rectal conservative surgery. It should be noted that currently, to appreciate the expertise of a surgical department in the surgical treatment of rectal cancer, the essential criterion is the percentage of abdominal perianal resections (APRs).

The high percentage of APR qualifies that department in the lower class of surgical performance (19). But, what about the percentage of severe LARS with fecal incontinence responsible for marked disability with severe damage to the patient's life? In what class does the surgeon who registers percentages of 30-40% severe AI qualify? The review of LAR and ULAR morbidity only aims to express a real situation, not an enhanced one, of the results of these surgical interventions. There is a limit at which conservative surgical procedures of the anal sphincter apparatus should no longer be indicated. What should this limit be? We believe that the anastomoses placed less than 4 cm distance from the anal verge do not offer a functional guarantee of quality, rather being perineal colostomies, with no possible prosthesis, impossible to be cared for, and with a major impact on the quality of life. Anal incontinence, in such ULAR cases, occurs in approx. 50% of the patients, being a major, if not severe debilitating condition. Abdominal colostomy is much easier to care for than fecal incontinence which leads to serious psychosocial changes in the patient's life.

The authors intend to make surgeons aware of a reality that, we believe, has been given too little attention. AI is, by no means, a major disability. It entails consequences serious enough to prompt a re-evaluation of the therapeutic act generating this invalidity. Is ultra-low resection surgery responsible for over 70% of AI, and 30-40% of these are with severe, irreducible disability? (61-63). In these circumstances, given these reports, should it be recommended that the act of rectal resection not be followed by a coloanal anastomosis - an anastomosis less than 4 cm away from the anal orifice? We do not wish to question the need to preserve, as much as possible, a part of the anorectal segment in rectal cancer surgery. Nevertheless, the only questionable part is represented by the ultra-low descent, too low, of the anastomosis and its placement within the anal canal, with the risk of anatomical and functional damage to the sphincter apparatus. A patient with severe AI,

specific to coloanal anastomosis, will have a significant limitation of his/her freedom of movement, being dependent on the permanent proximity of a toilet where he/she can ensure personal hygiene.

Conclusions

The question remains: is it worth creating a coloanal anastomosis less than 4cm away from the anal verge? The answer may be yes. But it may as well be no. The responsibility lies with the surgeon and, obviously, with the patient who should be very correctly informed about the possible disabilities and invalidities following the ultralow coloanal anastomosis.

It is natural that the material proposed by us offers the possibility of a debate, which we really believe is necessary.

Conflicts of Interest and Source of Funding

The authors declare that they have no conflicts of interest. No funding or not able to provide at the moment.

References

- Bryant CLC, Lunnis PJ, Knowles CH, Thaha MA, Chan CLH. Anterior resection syndrome. *Lancet Oncol*. 2012;13(9):e403-8.
- Croese AD, Lonie JM, Trollope AF, Vangaveti VN, Ho YH. A meta-analysis of the prevalence of low anterior resection syndrome and systemic review of risk factors. *Int J Surg*. 2018;56:234-241.
- Emmertsen KJ, Lauberg S. Low anterior syndrome: development and validation of a symptom-based scoring system for bowel dysfunction after low resection for rectal cancer. *Ann Surg*. 2012;255(5):922-8.
- Bregendahl S, Emmertsen KJ, Lens J, Lauberg S. Bowel dysfunction after low anterior resection with and without neoadjuvant therapy for rectal cancer. *Colorectal Dis*. 2013;15(9):1130-9.
- Keane C, Fearhead N, Bordeianu LG, Christensen P, Basany EE, Laurberg S, et al. International consensus definition of low anterior resection syndrome. *Dis Colon Rectum*. 2020;63(3):274-284.
- Wang A, Robitaille S, Liberman S, Feldman LS, Fiore Jr JF, Lee L. Does the low anterior syndrome score accurately represent the impact of bowel dysfunction on health-related quality of life? *J Gastrointest Surg*. 2023;27(1):114-121.
- Mege D. Syndrome de resection rectale : comme ameliorer la qualité de vie des patients Association Nationale Française de Formation Continue en Hepato-Gastro-Enterologie (FMC-HGE). *Post' U*. 2023; p. 293-297.
- Fritsch H, Höttinger H. Tomographical anatomy of the pelvis, visceral pelvic connective tissue, and its compartments. *Clin Anat*. 1995;8(1):17-24.
- Fritsch H, Lienemann A, Brenner E, Ludwikowski B. Clinical anatomy of the pelvic floor. *Adv Anat Embryol Cell Biol*. 2004;175:III-IX, 1-64.
- Davis K, Kumar D. Posterior pelvic floor compartment disorders. *Best Pract Res Clin Obstet Gynaecol*. 2005;19(6):941-58.
- Jorge JMN, Habr-Gama A. Anatomy and Embryology of the Colon, Rectum and Anus. In book: *The ASCRS Manual of Colon and Rectal Surgery*. Ed. Springer; 2007. p.1-22.
- Raizada V, Mittal RK. Pelvic floor anatomy and applied physiology. *Gastroenterol Clin North Am*. 2008;37(3): 493-509 vii.
- García-Armengol J, García-Botello S, Martínez-Soriano F, Roig JV, Lledó S. Review of the anatomic concepts in relation to the retrorectal space and endopelvic fascia: Waldeyer's fascia and the rectosacral fascia. *Colorectal Dis*. 2008;10(3):298-302.
- Skandalakis LJ, Skandalakis JE, Skandalakis PN. *Surgical Anatomy and Technique: A Pocket Manual*. Ed. Springer; 2009. p. 415-497.
- Elneil S. Complex pelvic floor failure and associated problems. *Best Pract Res Clin Gastroenterol*. 2009;23(4):555-73.
- Marani E, Koch WFRM. *The Pelvis*. Ed. Springer; 2014. p. 407-422.
- Carillo A, Enríquez-Navascués JM, Rodríguez A, Placer C, Múgica JA, Saralegui Y, et al. Incidence and characterization of the anterior resection syndrome through the use of the Lars Scale (low anterior resection scale). *Cir Esp*. 2016;94(3):137-43. English, Spanish
- Juul T, Ahlberg M, Biondo S, Espin E, Jimenez LM, Matzel KE, et al. Low anterior resection syndrome and quality of life: an international multicenter study. *Dis Colon Rectum*. 2014;57(5):585-91.
- Murette G, Kirzin S. Sequeles fonctionnelles après proctectomie: evaluation des sequeles à l'aide des scores symptomes et de qualité de vie. *Cas particulier de la proctectomie sans retablisement de la continuité. Ass.Française de Formation Medecale Continue en Hepato-Gastro-Enterologie Accueil Post'U*; 2016. p. 55-64.
- Hull TL, Milsom JW. Pelvic floor disorders. *Surg Clin North Am*. 1994;74(6):1399-413.
- McNevin MS. Overview of pelvic floor. *Surg Clin North Am*. 2010;90(1): 195-205.
- Hugues D, Cornish J, Morris C. Functional outcome following rectal surgery - predisposing factors for low anterior resection syndrome. *Int J Colorectal Dis*. 2017;32(5):691-697.
- Popa F, Bratucu M, Radu P. Present and future tense in operable rectal cancer. *Chirurgia (Bucur)*. 2011;106(1):11-6.
- Desnoo L, Faithfull S. A qualitative study of anterior resection syndrome: the experience of cancer survivors who have undergone resection surgery. *Eur J Cancer Care (Engl)*. 2006;15(3):244-51.
- Jorge JM, Wexner SD. Etiology and management of fecal incontinence. *Dis Colon Rectum*. 1993;36(1):77-97.
- Viazey CJ, Carpati E, Cahil JA, Kamm MA. Prospective comparison of fecal incontinence grading systems. *Gut*. 1999;44(1):77-80.
- Quezada-Díez FF, Elfeki H, Emmertsen KJ, Pappou EP, Jimenez-Rodriguez R, Patil S, et al. Comparative analysis of the Memorial Sloan Kettering Bowel Function Instrument and the low anterior resection syndrome questionnaire assessment of bowel dysfunction in rectal cancer patients after low anterior resection. *Colorectal Dis*. 2021;23(2):451-460.
- Official Monitor Romania, nr.1243 bis/22 dec.2022. Guidelines and norms for degrees of disabilities and general invalidity.
- Official Monitor Romania, nr.224/31 mars 2011. Guidelines and evaluation norms for assessment of work capacity.
- Dilke SM, Hadjittofi C, Then M, Tozer PJ, Stearns AT; EQUiLAR Study Group. Anterior resection syndrome and quality of life with long-term follow-up after rectal cancer resection. *Dis Colon Rectum*. 2022;65(10):1251-1263.
- Chatwin NA, Ribordy M, Ginel JC. Clinical outcomes and quality of life after low anterior resection for rectal cancer. *Eur J Surg*. 2002;168(5):297-301.
- Sakr A, Yang SY, Kang JH, Cho MS, Han YD, Min BS, et al. Oncologic safety and bowel function after ultralow anterior resection, with or without intersphincteric resection for rectal cancer: comparative cross-sectional study. *J Surg Oncol*. 2020;121(2):365-374.
- Fernández-Martínez D, Rodríguez-Infante A, Otero-Díez JL, Baldonado-Cernuda RF, Mosteiro-Díaz MP, García-Flórez LJ. Is my life going to change? - a review of the quality of life after rectal resection. *J Gastrointest Oncol*. 2020;11(1):91-101.
- Chew MH, Yeh YT, Lim E, Seow-Choen F. Pelvic autonomic nerve preservation in radical rectal cancer surgery: changes in the past 3 decades. *Gastroenterol Rep (Oxf)*. 2016;4(3):173-85.
- World Health Organization. Measuring quality of life. 1 March 2012.

36. Ho Y, Lee K, Eu K, Seow-Choen F. Effects of adjuvant radiotherapy on bowel function and anorectal physiology after low anterior resection for rectal cancer. *Tech Coloproctol*. 2000;4(1):13-16.
37. Da Silva GM, Berho M, Wexner SD, Efron J, Weiss EG, Noguera JJ, et al. Histologic analysis of the irradiated anal sphincter. *Dis Colon Rectum*. 2003;46(11):1492-7.
38. Neves Jorge JM, Habr-Gama A, Bustamante-Lopez LA. Effects of radiation therapy for rectal cancer on anorectal function. In: Eli Daniel Ehrenpreis, R de W Marsh, William Small Jr, editors. *Radiation Therapy for Pelvic Malignancy and its Consequences*. Springer; 2015. p. 143–151.
39. Remes-Troche J, De Ocampo Sherrie, Satish SC. Rao: Recto-anal reflexes and sensori-motor response in rectal hyposensitivity. *Dis Colon Rectum*. 2010;53(7):1047-1054.
40. Cheeney G, Nguyen M, Valentin J, Rao SSC. Topographic and manometric characterization of the recto-anal inhibitory reflex. *Neurogastroenterol Motil*. 2012;24(3):e147-54.
41. Sangiwan YP, Collier JA. Faecal incontinence. *Surg Clin North Am*. 1994; 74(6):1377-98.
42. Huizinga JD, Liu L, Barbier A, Chen JH. Distal colon motor coordination. The role of the coloanal reflex and the rectoanal inhibitory reflex in sampling, flatulence and defecation. *Front Med (Lausanne)*. 2021; 8:720558.
43. Mandache F. Surgery of the rectum. Technique of anterior rectal resection (Dixon). Bucharest: Ed.Medicala; 1971. p. 255.
44. McNevin MS. Overview of pelvic floor disorders. *Surg Clin North Am*. 2010; 90(1):195-205.
45. Tracy H, Burgess A. Shackelford's Surgery of the Alimentary Tract (7th Edition). Pelvic floor dysfunction. 2013;2:1800-1808.
46. Burch J, Swatton A, Taylor C, Wilson A, Norton C. Managing bowel symptoms after sphincter-saving rectal cancer surgery: a scoping review. *J Pain Symptom Manage*. 2021;62(6):1295-1307.
47. Nikolouzakakis TK, Mariolis-Sapsakos T, Triantopoulou C, De Bree E, Xynos E, Chrysos E, et al. Detailed and applied anatomy for improved rectal cancer treatment. *Ann Gastroenterol*. 2019;32(5):431-440.
48. Park IJ, Kim JC. Intersphincteric resection for patients with low-lying rectal cancer: oncological and functional outcomes. *Ann Coloproctol*. 2018; 34(4):167-174.
49. Schiesel R, Karner-Hanusch J, Herbst F, Teleky B, Wunderlich M. Intersphincteric resection for low rectal tumors. *Br J Surg*. 1994; 81(9):1376-8.
50. Schiesel R, Novi G, Holzer B, Rosen HR, Renner K, Hölbling N, et al. Technique and long-term results after intersphincteric resection for low rectal cancer. *Dis Colon Rectum*. 2005;48(10):1858-65; discussion 1865-7.
51. Cura Pales CG, An S, Cruz JP, Kim K, Kim Y. Postoperative bowel function after anal sphincter preserving rectal cancer surgery: risk factors, diagnostic modalities, and management. *Ann Coloproctol*. 2019;35(4):160-166.
52. Carlsen E, Bergan A. Technical aspects and complications of end-ileostomies. *World J Surg*. 1995;19(4):632-6.
53. Burch J, Taylor C, Wilson A, Norton C. Symptoms affecting the quality of life after sphincter-saving rectal surgery: a systematic review. *Eur J Oncol Nurs*. 2021;52:101934.
54. Allart K., Sabbagh C., Demouron M. &coll. : Histoire naturelle des fistules anastomotiques après la fermeture des stomies par abord électif. Natural history of anastomotic leakage after elective stoma closure. *J Chir Viscérale*. 2023;160(2):104-109.
55. Ekkarat P, Boonpipattanap Ong T, Tantiphlachina K, Sangkhathat S. Factors determining low anterior resection syndrome after rectal cancer. *Asian J. Sur*. 2016;39(4):225-231.
56. Sturiale A, Martellucci J, Zurli L, Vaccaro C, Bruscianno L, Limongelli P, et al. Long-term functional follow-up after anterior rectal resection for cancer. *Int J Colorectal Dis*. 2017;32(1):83-88.
57. Pape E, Burch J, Van Ramshorst G, van Nieuwenhove Y, Taylor C. Intervention pathways for low anterior resection syndrome after sphincter-saving rectal cancer surgery: a systematic scoping review. *Colorectal Dis*. 2023;25(4):538-548.
58. Landers M, McCarthy G, Savage E. Bowel symptom experiences and management following sphincter-saving surgery for rectal cancer: a qualitative perspective. *Eur J Oncol Nurs*. 2012;16(3):293-300.
59. Pucciani F, Ringressi MN, Redditi S, Masi A, Giani I. Rehabilitation of fecal incontinence after sphincter-saving surgery for rectal cancer: encouraging results. *Dis Colon Rectum*. 2008;51(10):1552-8.
60. Pucciani F. Post-surgical fecal incontinence. *Updates Surg*. 2018;70(4): 477-484.
61. Cheong C, Oh SY, Choi SJ, Suh KW. Ultralow Anterior Resection and Coloanal Anastomosis for Low-Lying Rectal Cancer: An Appraisal Based on Bowel Function. *Dig Surg*. 2019;36(5):409-417.
62. Chen TYT, Wiltink LM, Nout RA, Kranenbarg EM-K, Laurberg S, Corrie AM, et al. Bowel function 14 years after preoperative short-course radiotherapy and total mesorectal excision for rectal cancer: report of a multicenter randomized trial. *Clin Colorectal Cancer*. 2015;14(2):106-14.
63. Bordeianou L, Holmes Maguire L, Alavi K, Sudan R, Wise PE, Kaiser AM. Sphincter-sparing surgery in patients with low-lying rectal cancer: techniques, oncologic outcomes, and functional results. *J Gastrointest Surg*. 2014;18(7):1358-72.

Supplementary Material

Appendix 1. LARS scoring system – according to Emmertsen K.J. (3)

LARS-score - Scoring Instructions

Add the scores from each 5 answers to one final score

Do you ever have occasions when you cannot control your flatus (wind)?	
☐ No, never	0
☐ Yes, less than once per week	4
☐ Yes, at least once per week	7
Do you ever have any accidental leakage of liquid stool?	
☐ No, never	0
☐ Yes, less than once per week	3
☐ Yes, at least once per week	3
How often do you open your bowels?	
☐ More than 7 times per day (24 hours)	4
☐ 4-7 times per day (24 hours)	2
☐ 1-3 times per day (24 hours)	0
☐ Less than once per day (24 hours)	5
Do you ever have to open your bowels again within one hour of the last bowel opening?	
☐ No, never	0
☐ Yes, less than once per week	9
☐ Yes, at least once per week	11
Do you ever have such a strong urge to open your bowels that you have to rush to the toilet?	
☐ No, never	0
☐ Yes, less than once per week	11
☐ Yes, at least once per week	16

Total Score:

Interpretation:

0-20:	No LARS
21-29:	Minor LARS
30-42:	Major LARS