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RESEARCH

Score assessment and treatment in patients presenting with low anterior resection syndrome after sphincter-sparing rectal cancer surgery

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Abstract

Background Sphincter-sparing low anterior resection (SSLAR) with neoadjuvant radio-chemotherapy has been developed to avoid abdomino-perineal amputation and permanent colostomy in patients with low rectal cancer. However, many patients develop symptoms known as low anterior resection syndrome (LARS), including fecal urgency, incontinence, and a sensation of incomplete evacuation. The Low Anterior Resection Syndrome Score (LARS Score), a validated tool developed by Emmertsen and Laurberg, is used to assess symptom severity and guide treatment.

Materials and methods We present a single-center cohort study including patients having undergone SSLAR for rectal cancer between 2014 and 2021 at Fribourg Cantonal Hospital. Initial LARS-scores were obtained by completion of the QoL questionnaire. Patients with minor LARS (scores 21–29) were treated with electrostimulation and bio-feedback physiotherapy. Those with major LARS (scores > 29) were first investigated by anal manometry followed by physiotherapy. All treatments took place in 2022/2023. After treatment, LARS-scores were calculated again.

Results Of 54 patients included in the study, 18.5% had minor LARS, 40.8% major LARS, and 40.8% had no LARS. Of all patients with LARS, 18 (56%) completed pelvic physiotherapy, whereas 14 (44%) refused the treatment. Before and after pelvic physiotherapy, the median LARS score was 32 [interquartile range 29.50–38.50] and 22.5 [18.5–28], respectively ($p < 0.001$ according to Wilcoxon signed-rank test). Analysis of risk factors did not reveal any significant difference in age, gender, diabetes, nicotine or alcohol use, previous abdominal surgery, tumor stage, chemo/radiotherapy, type of operation and anastomosis, or anastomotic leakage.

Conclusions Approximately half of patients undergoing SSLAR experience LARS, and approximately one-third develop the major form. LARS scores may significantly improve with specific physiotherapeutic measures that have therefore been introduced as a standard procedure for all SSLAR patients at our institution.

Keyword Low anterior resection syndrome · Quality of life questionnaire · Sphincter sparing low anterior resection (SSLAR) · Rectal cancer

Introduction

Sphincter-sparing low anterior resection (SSLAR) with total mesorectal excision (TME) is currently the surgical treatment of choice in medium and high rectal cancer [1]. Despite successful oncological resection and anastomosis, anatomical preservation of the sphincter does not always allow proper anorectal function, resulting in "low anterior resection syndrome" (LARS) [2].

There are two categories of LARS described: the first consists in fecal urgency, incontinence, and increased frequency; the second one involves constipation, feelings of incomplete evacuation, and bowel emptying difficulties.

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Some patients report features of both categories, either alternating between the two categories or experiencing both simultaneously [3].

These symptoms may dramatically impair the quality of life particularly in good-prognosis-patients.

A review of the literature indicates the growing importance of this topic, with an estimated prevalence of major LARS after SSLAR of 10 to 72% [4–15]. These findings can be explained by reporting variability due to difficulties properly evaluating the subjective LARS symptoms [16]. The LARS Score, developed and validated by Emmertsen and Laurberg, has gained international recognition and has been translated into several languages, including French and German [16, 17].

Mechanical injury to the sphincters and related innervation and loss of reservoir are crucial for developing of LARS [18]. According to the literature and based on anorectal manometry profiles, patients with major LARS had considerably lower mean resting anal pressures, mean anorectal pressure gradients, and maximum squeeze pressures compared to patients with satisfactory functional outcomes; however, data regarding manometric findings remain conflicting [16].

Various other factors have been reported as possibly being associated with LARS. According to the meta-analysis published by Ye et al. [19], which included 21 studies with a total of 5102 patients, low tumor height, low anastomotic height, RT/chemotherapy, postoperative anastomotic leakage, and dysfunctional stoma were identified as high-risk factors for the prevalence of LARS.

The most important risk factors seem to be neoadjuvant and adjuvant RT, very low tumors, followed by a low anastomosis with a cut-off of < 8 cm depending on the different sources [2, 7, 20–23].

The aim of this study was to assess the LARS score of patients after SSLAR for rectal cancer. Our study emphasizes the importance of detection and treatment of LARS, and will be applied as systematic standard of care for SSLAR patients at our institution.

Materials and methods

The study is a monocentric, cross-sectional cohort study approved by the local ethics committee (CER-VD, project ID 2022–00615). Patients with medium (between 6 and 12 cm) or lower (beginning at the anal verge up to 6 cm) rectal cancer, based on anatomical cut point, who underwent SSLAR with curative intent at our institution between 2014 and 2021 were recruited for the study. Exclusion criteria were the presence of a permanent stoma, institutionalization for dementia, poor medical conditions preventing the patient from filling out the questionnaire or to perform the treatments, patients who refused to participate in the study, and age < 18 years (Fig. 1).

Assessment of patient symptoms at study inclusion and during follow-up after treatment facilitated the identification of appropriate strategies to rehabilitate damaged mechanical and neural structures. The effectiveness of targeted physiotherapy was evaluated by comparing LARS scores before and after treatment. Additionally, potential risk factors associated with the development of LARS were investigated.

We collected patient's characteristics from the clinical database at our hospital such as age, sex, diabetes, tobacco, and alcohol consumption, T3 or T4 stage, previous abdominal operations, neoadjuvant chemo/radiotherapy, laparoscopy/laparotomy approach and anastomotic leakage (Table 1).

First, a clinical staff surgeon collected LARS scores using validated questionnaires available in French and German: all patients were contacted by phone, receive the initial information and give their verbal consent to participate in the study. Patients also had the option to fill out the LARS Score questionnaire at the time of the consultation or by e-mail. The questionnaire generated a score that characterized the absence or, if present, severity of LARS. Depending on the score, additional procedures and follow-up consultations were organized and took place between 2022 and 2023 regardless of the date of the operation of SSLAR or loop ileostomy closure.

If the LARS score was < 21, no further follow-up was organized, and the patients excluded from further investigations/treatments. If the LARS score was between 21 and 29, considered minor LARS, physiotherapy with biofeedback of pelvic muscles was proposed. If the LARS score was between 30 and 42, considered major LARS, an anorectal manometry was proposed to all patients and performed by the gastroenterologist to identify and score anal dysfunction by assessing the function of the anal sphincter[6].

No pharmacological or dietary interventions were used during the study. The physiotherapy protocol included biofeedback and electrostimulation, consisting of one session per week for five weeks, followed by two reinforcement sessions. All sessions were conducted by certified pelvic floor physiotherapists.

In biofeedback therapy, a pressure sensor probe was inserted into the anal canal. Patients were instructed to contract or relax their pelvic floor muscles, with real-time feedback displayed on a monitor. The therapist guided the patient to improve muscle strength, enhance coordination (by timing contractions appropriately), and normalize sensation (by identifying the urge to defecate).

Electrostimulation involved the application of a low-frequency current (10–50 Hz) through a probe inserted into the anal canal. This current stimulated the anal sphincter and pelvic floor muscles to promote muscle contraction, enhance

Fig. 1 Patient's selection

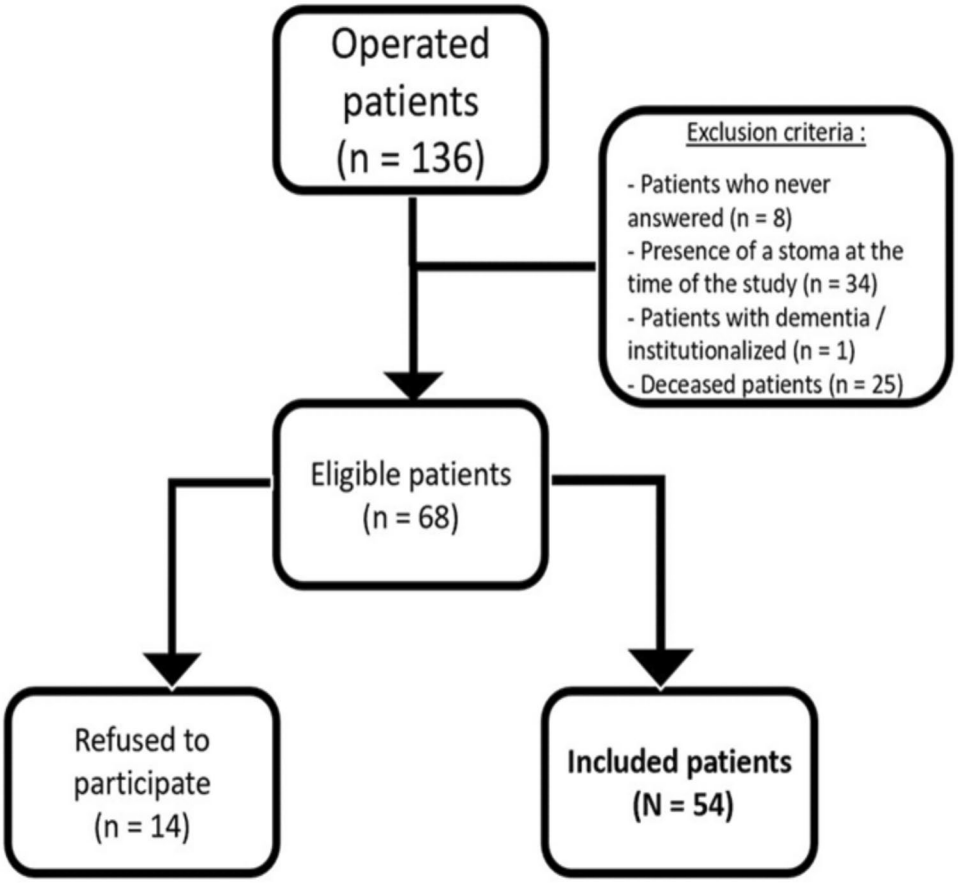

Table 1 Patients' characteristics. Variables were considered as risk factors in a logistic regression. A two-sided $p \leq 0.05$ was considered significant

	Total	No LARS	Minor LARS	Major LARS	*p*-value
		(% total group)			
Total patients	54	22 (40.75%)	10 (18.5%)	22 (40.75%)	-
Average age	60.6	61	60	61	0.46
Male	35	12 (54.50%)	7 (70%)	16 (73%)	0.18
Female	19	10 (45.50%)	3 (30%)	6 (27%)	0.18
Diabetes	5	2 (9%)	0	3 (14%)	0.91
Nicotine	16	5 (22.7%)	4 (40%)	7 (31%)	0.90
Alcohol > 70 g/week	6	1 (4.5%)	2 (20%)	3 (14%)	0.38
Therapeutic anticoagulation	5	1 (4.5%)	1 (10%)	3 (14%)	0.34
Previous abdominal operation	25	7 (32%)	5 (50%)	13 (59%)	0.22
T stage ¾	26	13 (59%)	5 (50%)	8 (36%)	0.15
Neoadjuvant RT	41	16 (73%)	7 (70%)	18 (82%)	0.59
Chemotherapy	46	19 (86%)	7 (70%)	20 (90%)	0.67
Type of operation: laparoscopy (laparotomy)	27	13 (59%)	3 (30%)	11 (50%)	0.10
Type of anastomosis laterotterminal	41	14 (63.6%)	7 (70%)	20 (90.91%)	0.08
Anastomotic leakage	2	0 (0%)	1 (10%)	1 (4.5%)	0.99

nerve conduction, and restore neuromuscular control. Each session lasted approximately 15–30 min and was repeated several times per week.

We considered the combination of electrostimulation and biofeedback to be more effective than either modality alone.

Anorectal manometry was performed with the patient in the lateral position, using a water-perfused 16-channel manometry system (Trace Manometry System) equipped with a circumferential array catheter (Dentsleeve). A balloon was positioned 5 cm above the first manometry channel at the tip of the catheter. Following a stabilization period, mean maximum resting and squeeze pressures (mmHg) were recorded. Subsequently, the cough reflex test and the push test were performed to measure the recto-anal pressure gradient (RAPG) and to assess for anorectal dyssynergia. Patients with minor LARS received physiotherapy alone and did not undergo anorectal manometry. Anorectal manometry was proposed for patients with major LARS for exploratory purposes, primarily to detect potential anal sphincter lesions. For all patients with major LARS, a more intensive pelvic physiotherapy regimen, including electrostimulation, was recommended. Secondly, we analyzed potential risk factors for developing LARS, such as age, gender, diabetes, nicotine and alcohol use, previous abdominal operation, T score, neoadjuvant/adjuvant chemo/RT, type of operation (laparoscopy or laparotomy), type of anastomosis, and anastomotic leakage.

Finally, for patients with minor and major LARS who accepted and completed the physiotherapy treatment, the LARS score was evaluated one month after pelvic physiotherapy to determine the difference in the scores.

Statistical analysis

LARS scores were expressed as the median and interquartile range (IQR). The difference between the LARS score before and after treatment was calculated by the Wilcoxon sign rank test with a two-sided $p \leq 0.05$ indicating significance. The analysis of risk factors was performed by logistic regression in a binary division of 'LARS' and 'No-LARS-patients' to decrease the bias between the number of variables and the sample size of the population. A two-sided $p \leq 0.05$ was considered significant and verified by full Glmnet logistic regression.

The RStudio® program 2023 edition, version 2023.12.0 + 369 (Posit Software (PBC)) was used for these calculations.

Results

We identified 136 patients who underwent SSLAR at our institution between 2014 and 2022. Sixty-eight patients were eligible according to the inclusion criteria. Fourteen refused to participate to the study, resulting in 54 patients being included in the study. Reasons for refusal included comorbidities, logistical challenges, and underestimation of symptom severity.

Risk factor analysis did not reveal any significant difference between patients with major, minor or no LARS (Table 1).

We observed that 18.5% of patients had minor LARS, 40.8% major LARS, and 40.8% no LARS. The prevalence of LARS is associated with the timing post-surgery. Assessments were conducted between 2022 and 2023, with a minimum of 3 months following surgery.

Eighteen patients out of 32 accepted the indication to physiotherapeutic treatment and were assigned to undergo physiotherapy: 5 with minor LARS and 13 with major LARS ($n = 8$ out of 22 accepted and underwent manometry). Patients that refused the treatment dropped out to the study and didn't undergo the follow-up. A marked improvement (9.5 points) was observed from a median LARS score of 32 (IQR 29.50–38.50) to 22.5 (IQR 18.5–28) after treatment ($p < 0.001$; Table 2).

Manometry was performed in only 8 patients with major LARS, as many declined the examination. The procedure excluded anal sphincter lesions, and these findings did not

Table 2 Pre- and post-treatment LARS score. We indicate the average 1 st LARS score on the total number of patients, then in minor and major LARS patents; the number of patients that underwent physiotherapy and manometry and the median pre- and post-treatment LARS score. The median LARS score reduction was statistically significant ($p < 0.001$). 5 out of 10 patients with minor LARS and 13 out of 22 patients with major LARS accepted the physiotherapy, those who refused dropped out the follow up

	Total	Minor LARS	Major LARS
Total patients	32	10 (31.25%)	22 (68.75%)
1 st LARS score: av ± SD	32.66	25.5	35.91
Physiotherapy	18 (56%)	5 (50%)	13 (59%)
Manometry	8	-	8 (36%)
Pre-treatment LARS score: median	32.0	26.5	37
Post-treatment LARS score: median	22.5	21	26
LARS Score median reduction	9.5 (**$p < 0.001$**)	5.5	11

influence therapeutic decisions but were collected for exploratory analysis.

Discussion

In the present study, more than 50% of patients undergoing SSLAR experienced LARS, with over one-third affected by major LARS. Notably, we observed a significant reduction in LARS scores following targeted pelvic floor rehabilitation using biofeedback and electrostimulation. Although anal manometry helped characterize dysfunction, it did not influence therapeutic decisions. While reduced sphincter pressures and dyssynergia were observed, the clinical significance remains uncertain due to the small sample size. These findings align with previous studies that demonstrate the benefits of early intervention in improving anorectal function following rectal surgery.

However, several limitations must be acknowledged. First, the small sample size and the relatively high proportion of patients who declined participation introduce the potential for selection bias. Patients who agreed to undergo physiotherapy may have been more symptomatic or more motivated, which could skew the results. Additionally, the limited number of manometric exams and the absence of a comparison group diminish the contribution of manometry to the study's conclusions.

Additionally, due to the limited sample size, the study is likely underpowered to detect smaller but clinically meaningful differences between subgroups. The risk of a Type II error is therefore considerable, particularly in comparisons of baseline characteristics or response patterns. Future studies with larger cohorts and control groups are needed to validate our findings and to accurately quantify the true magnitude of the effect.

The LARS score, while widely used and validated in multiple languages [23], is not without limitations. Although it provides a standardized method for assessing postoperative bowel dysfunction, its reliance on weighted patient-reported symptoms—particularly responses to questions 4 and 5—may overestimate or underestimate the true impact of evacuatory dysfunction [24]. Nevertheless, given its robust psychometric properties and international validation, it remains a valuable clinical tool for quantifying functional impairment and treatment response, weighting symptoms based on the patient's reported impact.

Our decision to assess LARS scores one month after the completion of physiotherapy was informed by existing literature, which suggests that early improvements in anorectal function typically emerge within 4–6 weeks following the final session[25]. This time point also helped minimize dropout rates and optimize compliance. However, we acknowledge that long-term outcomes remain uncertain, and the potential for a placebo effect cannot be entirely ruled out, particularly given the subjective nature of LARS symptoms.

A key limitation was high dropout due to patient reluctance, often linked to comorbid conditions or misperception of symptom impact. Despite appropriate explanations provided by our staff regarding the severity of LARS symptoms, we observed difficulties convincing patients to accept the proposal to undergo manometry or physiotherapy.

To address these limitations, we initiated a prospective cohort study to determine the LARS score in the early postoperative period with close follow-up. Furthermore, we introduced early specific physiotherapeutic measures in all patients undergoing SSLAR.

Conclusions

Detection of LARS is crucial in the follow-up of SSLAR patients and LARS scores may significantly improve with specific physiotherapeutic measures.

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Author contributions List of contributions of each author (according to CRediT author statement) Sguinzi R: Conceptualization, Methodology, Software, Validation, Formal analysis, Funding acquisition, Visualization Fiechter J: Conceptualization, Methodology, Software, Validation, Formal analysis, Funding acquisition, Visualization Bafumi L: Visualisation, Resources, Data Curation Gremaud B: Methodology, Validation, Formal analysis Geng B: Data Curation Janiak P: Resources Bühler L: Validation, Investigation, Resources, Supervision, Writing - Review & Editing Egger B: Validation, Investigation, Resources, Supervision, Writing - Review & Editing.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Competing interests The authors declare no competing interests.

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