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Prospective Evaluation of Genito-Urinary Function after Laparoscopic Rectal Resection in the Elderly

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Rezumat

Evaluarea prospectivă a funcției genito-urinare după rezecție rectală laparoscopică la vârstnici

Rezecția anterioară rectală laparoscopică cu excizie mezorectală este corelată cu tulburări sexuale și urinare. Drenajul anastomotic și radioterapia neoadjuvantă sunt factori eficienți în cazul funcției pelvine deteriorate, cu agravare progresivă. Prezentăm o serie de 50 de pacienți în etate (vârsta > 70 ani), supuși exciziei totale laparoscopice a mezorectului, intervievați pre- și postoperator cu privire la funcția genito-urinară. Pacienții au fost intervievați preoperator, apoi la o lună și 9 luni post-operator, prin intermediul chestionarelor validate referitoare la funcția sexuală, urinară și la calitatea vieții. Au fost de asemenea supuși unui test urofluximetric ecografic pentru evaluarea volumului restant al vezicii urinare. Evaluarea geriatrică s-a efectuat prin indexul BARTHEL. Funcțiile urinară și genitală s-au deteriorat ușor după intervenție, dar nu semnificativ. Indicatorul mediu Gastrointestinal al Calității Vieții a scăzut semnificativ la o lună după operație comparativ cu valorile preoperatorii. Indexul BARTHEL nu s-a modificat semnificativ pe parcursul intervenției. Fluxul urinar maximal, fluxul urinar mediu, volumul vezical rezidual au fost afectate negativ postoperator, dar nu semnificativ. Rezecția rectală anterioară laparoscopică cu excizia totală a mezorectului afectează statusul genito-urinar al pacienților. Incidența disfuncțiilor severe este similară celei întâlnite în populația normală în etate.

Cuvinte cheie: populația în etate, chirurgie laparoscopică rectală, funcție genito-urinară

Abstract

Laparoscopic anterior rectal resection with total meso-rectal excision is related to sexual and urinary disorders. Anastomotic leak and neo-adjuvant radiation therapy are effective factors in worsening pelvic function. We report a series of 50 elderly (age > 70) patients who underwent laparoscopic total mesorectal excision inquired about pre and post-operative genito-urinary function. Patients were interviewed pre-operatively, 1 and 9 months post-operatively with validated questionnaires about sexual and urinary function and quality of life. They also underwent urofluximetric test with ultrasound measurement of the bladder remnant volume. The geriatric assessment was performed with the BARTHEL index. Urinary and sexual function slightly worsened after surgery although not significantly. Mean Gastrointestinal Quality of Life Indicator score decreased significantly from pre operative levels at 1 month from surgery. BARTHEL index did not change significantly across surgery. Maximum urinary flow, mean urinary flow, bladder residual volume worsened after surgery although not significantly. Laparoscopic anterior rectal resection with total mesorectal excision affects the genito-urinary status of elderly patients. Incidence of severe dysfunctions is similar to normal aged population.

Key words: elderly population, laparoscopic rectal surgery, genito urinary function

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Introduction

Colo-Rectal Cancer (CRC) is the third most commonly diagnosed cancer in males and the second in females (1) worldwide. Surgical treatment of rectal cancer has been changing in the past two decades. Rectal cancer management has become multifactorial since the introduction of Total Mesorectal Excision (TME) (2), neo-adjuvant therapy (3) and laparoscopy (4). While laparoscopic resection of colon cancer in recent years has been validated through several randomized clinical trials, the role of laparoscopic rectal anterior resections (LRAR) for cancer is still controversial (5,6) and raises specific issues related to its anatomical location: difficult exposure in a narrow pelvis, challenging nerve sparing, difficult intestinal transection and TME (7). Distal resection performed with a linear stapler, TME for tumors of the middle or lower rectal third, transanal end-to-end anastomosis [Knight-Griffen (8) technique] using a circular trans-anal stapler are routinely done in LRAR. Recent advances in rectal cancer surgery have improved preservation of the pelvic autonomic nerves and reduced the frequency of urinary and sexual dysfunction. However, they remain well-described complications of rectal surgery, especially in men. Intra-pelvic nerve sparing in fact is reported to be routinely attempted, but short and long term genito-urinary outcomes are widely lacking (9,10).

As for other major intra-pelvic resective procedures (12,13), incontinence, urinary obstructive symptoms, erectile disfunction, retrograde ejaculation, if not present before LRAR, can be attributed to surgery.

Major complications such as anastomotic leak can seriously affect genito-urinary function (GUF) after rectal surgery. Radiation therapy as well, (either neo-adjuvant or adjuvant) can be considered an affecting factor on GUF (14,15,16,17). Focusing on elderly patients, the Dutch TME Trial described a worst GUF after surgery in patient with a pre-operative already compromised function (18). This statement springs out from data regarding a general population. However it can surely be applied specifically to elderly patients for whom GUF is commonly impaired. Attention should therefore be paid on such an outcome in aged population.

Aim of this study is to evaluate the GUF before and after laparoscopic TME for rectal cancer performed according to a standardized technique in elderly patients.

Patients and methods

Between April 2012 and December 2014 115 patients underwent LRAR with TME for Adenocarcinoma of the lower or middle third of the rectum in our unit.

50 of them were older than 70 years old.

Investigated elderly patient's characteristics are described in *Table 1*.

Preoperative oncological staging was achieved by colonoscopy, computed tomography of chest and abdomen, magnetic resonance imaging (MRI) of the pelvis and endorectal ultra sound examination. A preoperative multidisciplinary team decided the indication for pre-operative chemo radiotherapy.

Exclusion criteria for neoadjuvant therapy were: bleeding tumor, radiological T1N0, T2N0 and T3NO with a MRI detected mesorectal invasion inferior to 5 mm, sub-stenotic tumors, age above 75 years.

GUF evalutation was prospectively carried out. All procedures were performed by the same surgeon who carried out over 500 rectal laparoscopic procedures.

Operative technique

Three trocars are inserted at the right flank, and 1 in the left iliac

Table 1. *Patients description*

Parameters	Male (34)	Female (17)	Total (51)
No	34	17	51
Age (median-range)	75 (70/87)	79 (71/84)	75 (70/87)
BMI (mean ± 1sd)	26,5 ± 4,8	26,0 ± 4,8	26,3 ± 4,8
ASA SCORE			
I	8	3	11
II	19	11	30
III	7	3	10
MIDDLE rectal tumor	20	11	31
LOW rectal tumor	14	6	20
Stage pre-op			
I	17	9	26 (52,2%)
II	11	5	16 (30%)
III	4	2	6 (10%)
IV	3	1	4 (7,5%)
Time of surgery (mean ± 1sd)	245 ± 40,6 (160/305)	229 ± 73,4 (130/390)	240 ± 52,9 (130/390)
Blood loss (mean ± 1sd)	120 ± 16	71 ± 22	96 ± 21
Postoperative hospital stay (mean ± 1sd)	6 ± 2,1 (3/12)	6 ± 2 (4/11)	6 ± 2 (3/12)

fossa. The dissection maneuvers are carried out by harmonic scalpel (Ultracivil, Ethicon Endosurgery, Cincinnati, OH). The first step is the opening of the left part of the gastrocolic ligament and the division of the left part of transverse mesocolon for mobilization of the splenic flexure. The splenocolic and phrenocolic attachments are then divided, achieving complete dissection of the left colonic angle. The pelvic peritoneum is opened below the sacral promontory. The opening of peritoneum proceeds cephalad towards the duodenojejunal angle of Treitz. The aortomesenteric window is opened. The inferior mesenteric artery (IMA) is clipped and divided at 1.5 cm from its origin (High Legation). The inferior mesenteric vein is clipped and divided below the pancreatic margin. Dissection of the rectum starts by incision of the peritoneal fold in the pelvis. Mesorectal excision starts posteriorly by dissection through Heald's "holy plane" and continues anteriorly. The rectum is sectioned by Echelon® 60 mm (Ethicon Endosurgery, Cincinnati, OH) linear stapler with green cartridge.

A double-stapled Knight-Griffen transanal anastomosis is performed with a proximate ILS® 29 mm – 31 mm (Ethicon Endosurgery) circular stapler. In all cases, a temporary ileostomy is fashioned in the right iliac fossa.

Subjective parameters

Specific enquiry into Quality of Life (QOL), urinary and sexual function was recorded pre opinatively, 30 and 270 days post-operatively for all patients. QOL was investigated with the Gastrointestinal Quality of Life Indicator (GIULIA) developed to indicate QOL in patients undergoing major gastrointestinal surgery (19,20). The questionnaire is made of 36 questions divided into social, physical, emotional and symptomatic items. BARTHEL index (meant to measure performance in daily living activities) was assessed for all patients at the admission and at 1 and 9 months postopertively. International Index of Erectile Function (IIEF-5) was used in men to establish sexual potency (21). FSFI was used to inquire female sexual function. International Consultation on Incontinence Questionnaire (ICIQ) was used to describe postoperative urinary incontinence (22) in males and females. International Prostatic Symptom Score (IPSS) was used to describe obstructive urinary symptoms in both men and women. (23)

Objective parameters

Intra-operative parameters were collected for every patient (time of surgery, blood loss).

Urofluxometric test was performed to estimate urodynamic function pre-operatively 1 and 9 months post-operatively by one operator only.

Statistical analysis

All measures and results were documented into Microsoft Excel worksheets. Statistical analysis was performed by SPSS package. Student's pair t test was used to search for significance in changes of evaluated parameters. Statistical significance was ascribed at a level of $p < 0,05$. McNemar test was used to determinate differences in the percentage of severe GUF impairment across surgery in time.

Results

Mean time of surgery was 241,3 ± 52,8 min. and mean blood loss was 96 ± 21 ml.

Post-surgical and anatomo-pathological parameters are described in *Table 2*.

QoL index

2 of 40 patients (2M/0W 5%) had less than 80% of maximum GIQLI score 9 months from surgery. Mean GIQLI score decreased significantly from pre operative levels at 1 month after surgery. It returned to preoperative levels after 9 months after surgery (*Table 3*). BARTHEL index decreased after surgery without significant differences at 1 and 9 months compared to pre operative levels (*Fig. 1*).

Urinary function

The results about the urinary function measured by validated questionnaires are pointed out in *Table 4-5*. 20 out of 50 patients (10M/10W, 40%) referred moderate to severe obstructive urinary at 9 months from surgery. Only 7 out of 50 patients (6M/1W 14%) referred severe symptoms.

8 out of 50 patients (16%, 3M/5W) had severe or very severe incontinence at 9 months from surgery, while 28 out of 50 patients (15M/13W) had moderate to severe or very severe incontinence at 1 month from surgery

Mean IPSS and ICIQ-UI scores slightly worsened after surgery although not significantly (*Table 5*).

Urofluximetric test results are described in *Table* 6. 30 out of 50 patients (60%, 21M/9F) had a pathological maximum urinary flow (Qmax) 9 months from surgery. 15 out of 50 patients (30%, 11M/4W) presented a pathological mean urinary flow (Qave) at 9 months. Pathological US detected bladder residual volume was found in 10 patients (8M/2W; 20%) at 9 months after surgery.

Percentage of patients whit pathological urofluximetric parameters increased after surgery. Mean Qmax did not change significantly 1 and 9 months after surgery compared to preoperative levels (Qmax pre-op 13,6 ± 3,9 vs Qmax 1 month 12,5 ± 3,0 ns; Qmax pre-op 13,6 ± 3,9 vs Qmax 9 month 12,9 ± 4,9 ns). Mean Qave did not change significantly 1 and 9 months after surgery compared to preoperative levels (Qave pre-op 8,7 ± 4,1 vs Qave 1 month 7,9 ± 4,0 ns; Qave pre-op 8,7 ± 4,1 vs Qmax 9 month 8,7 ± 5,1 ns). Mean PVR did not change significantly 1 and 9 months after surgery compared to preoperative levels (PVR pre-op 82,5 ± 31 vs PVR 1 month 85,7 ± 28,3 ns; PVR pre-op 85,7 ± 28,3 vs PVR 9 month 89,4 ± 32,4 ns).

Table 2. *Post-operative parameters*

Parameters	Male (31)	Female (19)	Total (50)
Stage post-op			
I	14	7	21
II	9	6	15
III	6	5	11
IV	2	1	3
Tumor dimension			
< 2 cm	7	4	11
2 – 5 cm	18	14	32
> 5 cm	6	1	7
Quality of mesorectum (Quirke)			
3 – Complete	26	15	41
2 – mild incomplete	3	3	6
1 – Incomplete	2	1	3
Distal resection margin negative	31	19	50
Distal resection margin ≥1cm	29	16	45
Circumferential margin negative (≥ 1mm)	27	18	45
Lymph node analysed			
N° lymph node analised (mean ± sd)	17,8 ± 7,1	25 ± 12,6	21,2 ± 9,7
N° lymph node ≥ 12	25	15	40
Tumoral is to type			
Intestinal adenocarcinoma	27	15	32
Mucinous adenocarcinoma	4	4	8
Grading			
G1	7	4	11
G2	14	9	23
G3	10	6	16
Major complication	5	3	8
Anastomotic leak	2	2	4
Adjuvant chemotherapy	8	3	11
Neoadjivant chemotherapy	6	4	3

Table 3. *Gastro-intestinal quality of life index (GIQLI) and BARTHEL index*

	No	Time	Mean ± sd	p-value
GIQLI	50	Pre -op	124 ± 7,4	
	50	1	118,4 ± 10,1	0.0058
	50	9	122 ± 8,6	ns
BARTHEL	50	Pre-op	89,2 ± 2.36	
	50	1	82,4 ± 4,8	ns
	50	9	82,1 ±7,3	ns

Comparison of the average value of the questionnaires pre operatively, at 1 month and 9 months: GIQLI (Gastro-intestinal Quality of Life Index).
BARTHEL index: performance in daily living activities

Table 4. *Urinary function*

		Pre-op			1			9		
	Symptoms scale	M (31)	F (19)	Tot (50)	M (23)	F (19)	Tot (50)	M (31)	F (19)	Tot (50)
IPSS	≥ 20 (severe)	4	0	4	3	0	3	6	1	7
	19 – 8 (moderate)	12	3	15	11	2	13	15	5	20
	≤ 7 (mild)	15	13	29	12	12	24	10	10	20
ICIQ-UI	21 – 19 (very severe)	0	1	1	0	1	1	0	1	1
	18 – 13 (severe)	3	3	6	4	5	9	3	4	7
	12 – 6 (moderate)	9	4	13	12	7	19	12	8	20
	5 – 1 (mild)	15	11	26	12	6	18	11	5	16

Classification of urinary dysfunction according to the functional classes of questionnaires: Ipss (International prostatic symptom score);
ICIQ-UI (Iciq-urinary incontinence)

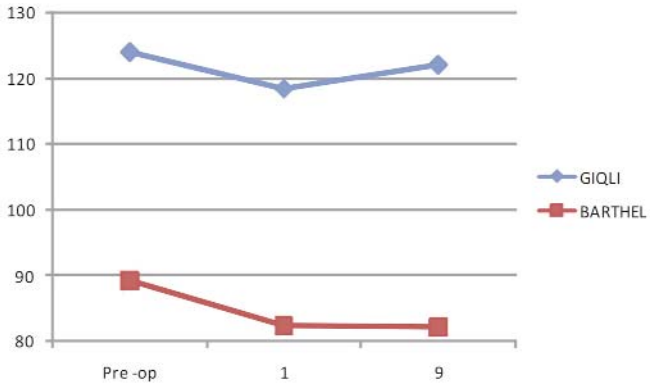

Figure 1. *Gastro-intestinal quality of life index (GIQLI) and BARTHEL index. Comparison of the mean GIQLI (Gastro-intestinal Quality of Life Index) score and mean BARTHEL index score across surgery*

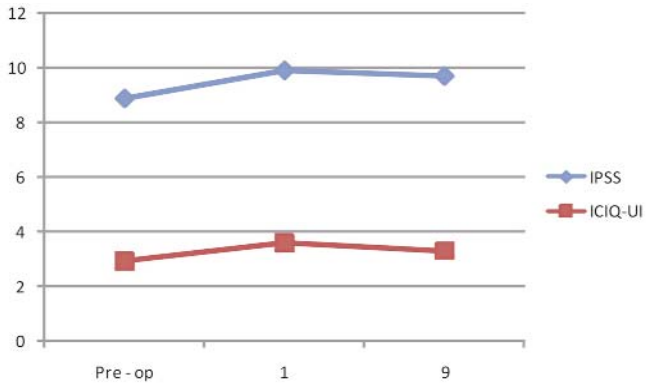

Figure 2. *Figure 2. Urinary function*
Comparison of the mean IPSS (International prostatic-symptom score) score and mean ICIQ-UI(Iciq-urinary incontinence) index score across surgery

Sexual function

The results of sexual function are described in *Table 7*. Results related to sexual function are deeply affected by the mean sample age. Sexual function worsened after surgery even if it was already strongly impaired pre operatively (*Fig. 3*).

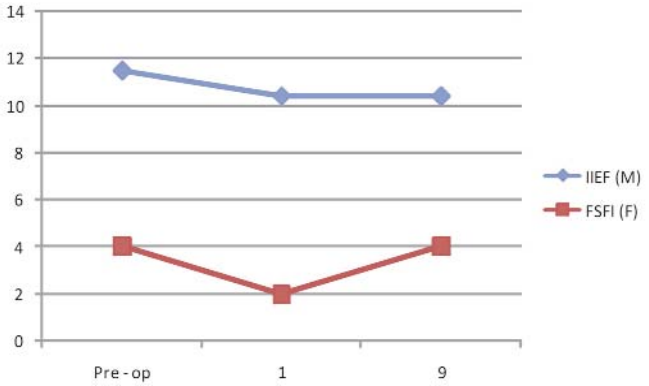

Figure 3. *Sexual function*
Comparison of the mean IIEF (International Index Erectile Function) score and mean FSFI (Female Sexual Function Index) index score across surgery

Discussion

The autonomous pelvic nerves are in direct contact to the visceral pelvic fascia that surrounds the mesorectum. TME in rectal cancer treatment has led to a substantial improvement of autonomous pelvic nerve sparing. Ligation of the inferior mesenteric artery 2 cm far from the aorta together with a careful windowing of the Told-Gerota plane help to prevent hypogastric plexus injury. Good genito-urinary function after rectal surgery, although significantly improved compared to the past, is still far from been achieved (24,25).

In this series of patients all procedures were performed by the same surgeon, who had already performed more than 500 laparoscopic RAR + TME. Therefore the issue of the learning curve, reported by some authors as a risk factor related to post-operative pelvic function, is unaffecting here (10).

Functional outcomes after colorectal surgery represent a main concern for patients. As seen in our study median age of patients was 75 years, higher than that in other published series (8,9,10,26).

As described by some authors laparoscopy seems to improve GU function after colo-rectal surgery when compared to open surgery (27,28).

Laparoscopy in fact offers an excellent surgical view that

Table 5. *Urinary function*

	No	Time	Mean ± sd	p-value
IPSS	50	Pre - op	8.9 ± 4.3	
	50	1	9,9 ± 6,9	ns
	50	9	9,7 ± 7,3	ns
ICIQ-UI	50	Pre - op	2.9 ± 4.7	
	50	1	3,6 ± 5,8	ns
	50	9	3,3 ± 5,3	ns

Comparison of the average value of the questionnaires pre operatively, at 1 month and 9 months: Ipss (International prostatic symptom score); ICIQ-UI (Iciq-urinary incontinence)

Table 6. *Urofluxometric test 1 and 9 months after surgery*

		Pre-op			1			9		
	Symptoms scale	**M (31)**	**F (19)**	**Tot (50)**	**M (23)**	**F (19)**	**Tot (50)**	**M (31)**	**F (19)**	**Tot (50)**
Qmax	< 10 ml/s	6	2	8	8	3	11	5	2	7
	< 15 ml/s	15	6	21	17	8	25	16	7	23
Qave	< 7 ml/s	12	2	14	14	5	19	11	4	15
PVR	≥ 100 ml	8	2	10	10	3	13	8	2	10

Qmax (Maximum urinary flow); Qave (Average urinary flow); PVR (Postvoid residual urine)

Table 7. *Sexual function*

FSFI	**No**	**Time**	**Mean ± sd**	**p-value**
	19	Pre - op	4 ± 0,2	
	19	1	2 ± 0	ns
	19	9	4 ± 0,2	ns
IIEF	31	Pre - op	11,5 ± 8.4	
	31	1	10,4 ± 9,0	ns
	31	9	10,4 ± 8,7	ns

Comparison of the average value of the questionnaires pre operatively, at 1 month and 9 months: FSFI (Female Sexual Function Index); IIEF (International Index Erectile Function)

allow to identify and preserve the pelvic autonomic nerves. However, laparoscopic rectal surgery is considered technically challenging, and its effects on GU functional outcomes are debated.

Tumor stage, anatomy of the pelvis can lead to a difficult nerve sparing. In the present study men presented an higher incidence of GU symptoms after surgery mainly due, in our opinion, to the pelvic anatomy. In men a narrow pelvis can be frequently found making dissection more challenging. Although in line with other reported results (29,30), data we collected confirmed that GUF was affected by the laparoscopic procedure (32). Disfunctions seem to gradually recover with more post-operative time. Almost all parameters assessed at 9 months slightly improved when compared to those collected at 1 month. Partial functional recovery surely happens for mild postoperative dysfunctions. However, severe dysfunctions seem to remain stable through time. Regarding sexual function, the small percentage of sexual active patients, deeply affected the collected data. The high incidence of post-operative GU dysfunction found in our series is surely due to age related impaired GU function before surgery. However the worsening in data collected across surgery, even if not significant, is to be connected to surgical neural injuries. 3 male patients who developed severe incontinence not present before surgery had anastomotic leak treated conservatively. 1 of them had received neo adjuvant chemo-radio therapy. 2 male patients developed severe obstructive sympthoms not present before surgery that required the defininitive placement of bladder catheter. 1 of them had conservatively treated anastomotic leak. The correlation between anastomotic failure, pre operative chemo radiation and urinary disfunction represents a main issue in rectal surgery.

Urinary toxicity, althought reported as transient, is a well-described side effect of pelvic radiation therapy for rectal cancer as well as tissue induced fibrosis (16). In elderly patients however, nerve recovery form radiation could be delaied or even absent. Anastomotic leak resulting in pelvic abscess, even if treated conservatively, represent a prolonged patential injury toward intrapelvic nerves.

Taken together, these findings suggest that surgeons should be aware of the risk of severe urinary dysfunctions in elderly patients after rectal cancer surgery, specially in those who underwent neo adjuvant radiation therapy or in those who developed anastomotic fistula.

GU function impairment in the elderly, if we consider the onset of new dysfunctions, is nevertheless comparable to what we noticed in a non elderly population reported by our group (33).

We believe that pre operative GUF evaluation for patients undergoing RAR + TME is important to really know patients status. Adding Urofluximetric tests to subjective perceptions collected through questionnaires is rarely done in other studies. In our opinion it can be an easy and affordable examination to enquire unrinary function.

Intra operative practices such as neuro-monitoring or nerve stimulation during TME are reported attempts to improve the nerve sparing technique. Further experiences are needed to reach evidence about it (34,35,36).

The strength of our paper is the focus on an elderly population operated by minimally-invasive surgery and the accuracy in pre and post-operative evaluations leading to previously unpublished data.

Patient-reported outcomes in fact, such as quality of life or genito-urinary disfunctions are often underestimated or are not

noticed by physician-reported measures.

Limitations of this study are the difficulty in assessing sexual function in a scarcely active population and the number of patients enrolled. Porpose of the authors is to continue to prospectivelly inquire GUF in elderly patients in order to collect a stronger statistical sample. However it whould be highly advisable that colorectal units start to routinaly assess pelvic function in elderly patients undergoing laparoscopic colorectal surgery perhaps in large multicentre trials.

Conclusion

Laparoscopic RAR + TME affects genito-urinary function in elderly patients. A precise inquiring of quality of life is mandatory not to underestimate the real impairment of these patients after surgery.

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