

ORIGINAL PAPER

OUR EXPERIENCE IN THE SURGICAL MANAGEMENT OF PATIENTS WITH RECTAL NEOPLASTIC DISEASE**Alina Cristina Tinca^{1,2}, R. Palade², D. Ion^{1,2}, Adriana Elena Nica^{1,2}, Alexandra Bolocan^{1,2}, Oana Adelina Ionescu², O. Andronic²**

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Abstract

Colorectal cancer is one of the most commonly incriminated neoplastic pathologies and it has a fairly high mortality rate. Although the therapeutic arsenal of rectal cancer has steadily improved through the acquisition of biology, technology and pharmacology, the central role of surgical technique is widely recognized in obtaining local control, on the one hand and a good quality of life of operated patient on the other hand. This article is a retrospective analysis of surgical procedures for rectal neoplasia conducted in order to determine to what extent technological development and continuous improvement of surgical techniques have influenced the evolution of patient management with this pathology. This study was retrospective, observational, descriptive, single-center and it was held in the Department of General Surgery and Emergency III of the University Emergency Hospital Bucharest during 1 January 2007 - March 31, 2016 and included a total of 127 patients.

Keywords: *colorectal cancer, resection of the rectum, amputation of the rectum***Introduction**

Colorectal cancer is reported to be the third leading cause of malignancy worldwide, representing 9.4% of cancers recorded among men and 10.1% of cancer diagnoses in women [1]. In 2012 there were reported 1.4 million new cases, with a mortality of 693 900 cases, rectal cancer accounting for about one third of them. In recent years there has been an increase in the incidence of rectal neoplastic disease in Eastern Europe, probably due to the higher prevalence of risk factors such as obesity, smoking, inadequate diet rich in saturated fats and animal proteins [2].

The implementation of screening programs, together with improved diagnostic imaging methods, and steady progress in the multi-

modular surgical oncologic treatment for rectal cancer, have resulted in a decrease of global mortality by this neoplasia. In our country, data from GLOBOCAN demonstrate an increased incidence and mortality of colorectal cancer with 10.256 new cases recorded in 2012 [3].

In the event of such high frequencies and considering the major implications which this type of neoplasia has on morbidity and mortality in patients who develop such an entity, there is a clear need for a correct management—standardized as well as personalized. All this legitimize the question whether "correct management of the patient with rectal cancer involves the application of general predetermined standards or the clinician's ability to make good decisions?"

From the historical moment in which Miles, in the early 20th century, proposed the radical surgical approach by excision of the rectosigmoid on mixed abdominoperineal way, a gradual process of knowledge accumulation followed, which has outlined more precisely the diagnostic and therapeutic coordinates for this neoplasia.

Although the therapeutic arsenal of rectal cancer has steadily improved through the acquisition of biology, technology and pharmacology, the central role of surgical technique is widely recognized in obtaining local control, on the one hand, and a good quality of life of patients operated on the other hand.

This article is a retrospective analysis of the surgical procedures for rectal malignancies conducted in order to determine to what extent technological development and continuous improvement of surgical techniques have influenced the evolution of patient management with this pathology.

Material and method

This study was retrospective, observational, descriptive, single-centre, and it was held in the General Surgery and Emergency Clinic III of the University Emergency Hospital Bucharest in the period 1 January 2007 - March 31, 2016. During this period we identified a number of 127 patients with rectal neoplasia who fulfilled all the inclusion criteria and none of the exclusion criteria listed in Table. 1.

Given that the purpose of the study was to analyze the evolution of surgical technique for rectal neoplastic disease in the last decade, and that the gold standard of operator's outcome is to achieve a R0 resection, we considered appropriate dividing the patients into two groups:

1. Group R0: patients in whom resection R0 was obtained regardless of the surgical procedure adopted;

2. Group non - R0: patients in whom a type R1 or R2 resection was achieved, regardless of the surgical procedure.

INCLUSION CRITERIA

- Patients whose discharge diagnosis was rectal cancer and whose surgical treatment was performed in the General Surgery and Emergency Clinic III;
- Existence in the observation charts and surgical registries of all the information about the surgical procedure;
- Patients aged over 18.

EXCLUSION CRITERIA

- Patients hospitalized in the Surgery Clinic III of the Bucharest University Emergency Hospital where surgery was practiced with a palliative intent;
- Patients who were initially hospitalized and possibly operated in another health facility and there are no accurate records of pre-operative assessment and therapeutic attitude before their transfer to the clinic where the research was conducted;
- Patients hospitalized and/or operated from the beginning in the Surgery Clinic III of the University Emergency Hospital diagnosed with rectal cancer but there are no accurate records of the parameters quantified and the attitude held;
- Patients who had limited resections practiced.

Table 1 - Criteria for inclusion and exclusion in / from study

Results

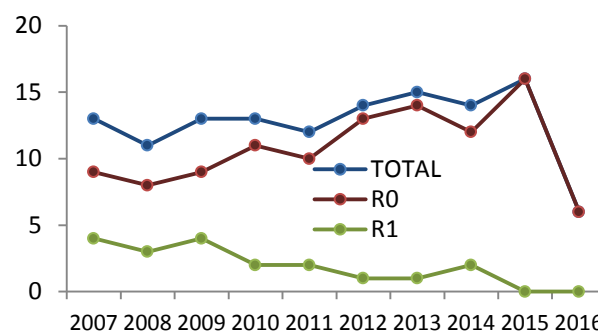


Figure 1 - Distribution of the cases included in the study by year and type of resection achieved

While the study was conducted, we observed an increase in the frequency of cases and thus a growing addressability of patients with rectal cancer to the clinic where the research was performed (Figure 1).

Looking at the distribution of cases in which R0 resection type was obtained it is observed a gradual increase in their number compared with the number of patients who could not get an R0 resection type.

In the group studied by us, including 127 patients who met the inclusion and exclusion

criteria, we identified a total of 108 patients in which R0 resection type was obtained, accounting for 85.04 % of the general group and a number of 19 patients, representing 14.96 % , in which a R0 resection was not achieved.

Type of intervention	R0		NON-R0		TOTAL	
	Number	%	Number	%	Number	%
High anterior resection with partial excision of mesorectum	10	7,87	0	0	10	7,87
Low anterior resection with total excision of mesorectum	49	38,58	5	3,93	54	42,51
Hartmann's procedure	11	8,66	5	3,93	16	12,59
Abdominoperineal amputation	38	29,92	9	7,08	47	37,03

Table 2 - Distribution of the cases included in the study by year and type of resection achieved

Given that we found no significant statistical correlation recommending any of the surgical procedures as bringing a major benefit in terms of R0 result, we considered practical to combine in a single batch of all resections, regardless of the localization of the cancer and thus total or partial resection of the mesorectum and the realization of two courses of study: amputations and resections (Table 2).

Analysis of the evolution in time of the type of surgery in relation to these two directions highlights the increasing frequency of cases of resection with anastomosis compared with the decreasing rates of cases of amputation.

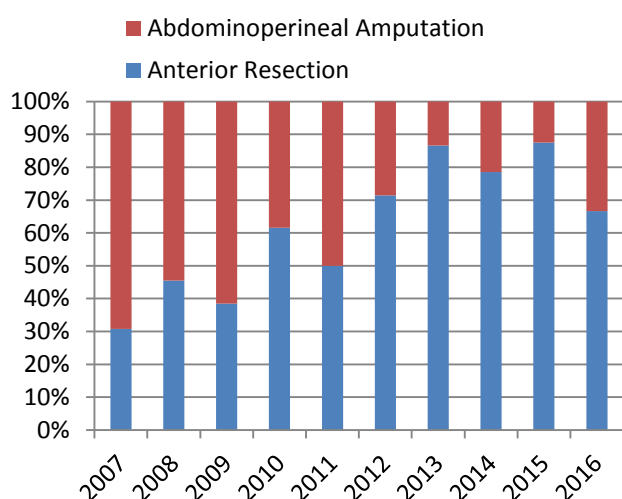


Figure 2 - Percentage distribution by years of the cases based on the practiced surgical procedure

Figure 3 reveals a greater distribution of resection with anastomosis during 2012-2015, a relatively uniform distribution of the two types of surgery practiced between 2010-2012, and a cast of mostly abdominoperineal amputation in 2007-2009.

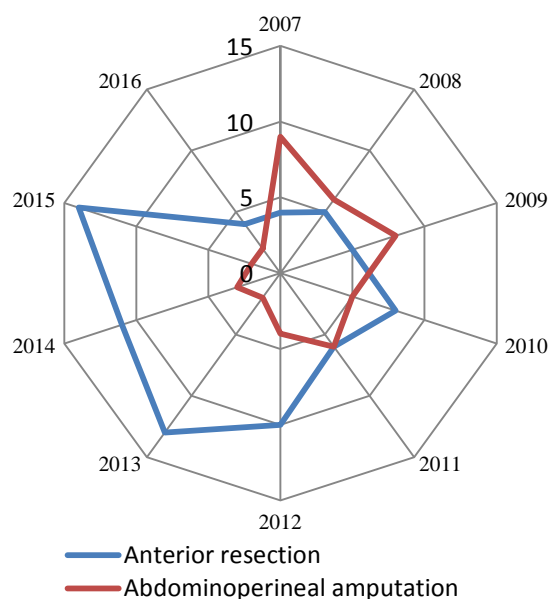


Figure 3 - Distribution of cases by years based on the practiced surgical procedure

Comparative analysis of the two types of surgery reveals a dynamic and inversely proportional evolution. Thus, 2009 - 2011 was a period of transition in the choice of the optimal surgical management for patients with rectal cancer.

Technical equipment of the clinic where the research was conducted benefited starting 2012 from Heald valve- retractor, bipolar forceps, instruments for vascular sealing-ligasure, devices for mechanical suturing and thus altered the type of surgery chosen, practicing resection with sphincter preservation increasing exponentially, in contrast to the development in the number of cases subjected to amputation of the rectum (Figure 4).

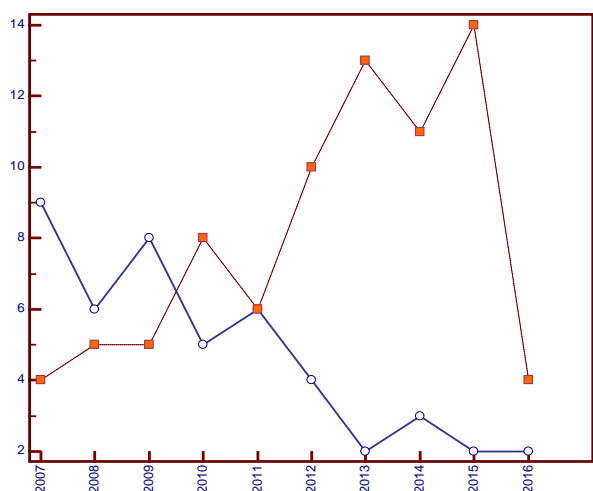


Figure 4 - Comparative distribution of the evolution of the types of surgical procedures practiced (blue=amputation, orange=rezection)

The analysis of the graph in Figure 5 highlights a decreasing number of cases in which the abdominoperineal excision of the rectum was practiced in the researched period, and an uneven distribution in terms of time.

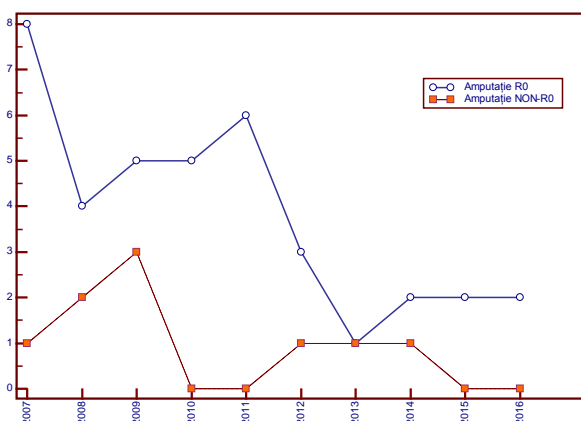


Figure 5 - Distribution by years of the cases in which the amputation was practiced in relation to the type of rezection obtained

The improvement of the technical capacity of the clinic where the research was conducted, put a mark also on achieving the "gold standard" of rectal cancer surgery namely R0 rezection.

During the entire research, assessing of patients who underwent rezection and anastomosis, revealed an increased number of cases of rezection with restoration of digestive continuity, and a decrease in the rate of obtaining rezection type non-R0 (Figure 6).

Another observation consistent with previous discussions about 2012 when the clinic where the research was conducted benefited from a technical improvement is that starting with 2012 the anterior rezections showed a success rate of 98,07% in obtaining R0 rezection (Figure 6).

The analysis of Tables 3 and 4, containing statistical data on the duration of the surgical procedures, both for rezections and abdominoperineal excisions, reveals a mean duration significantly lower in case of rezections (148 min) compared with amputations (153 min).

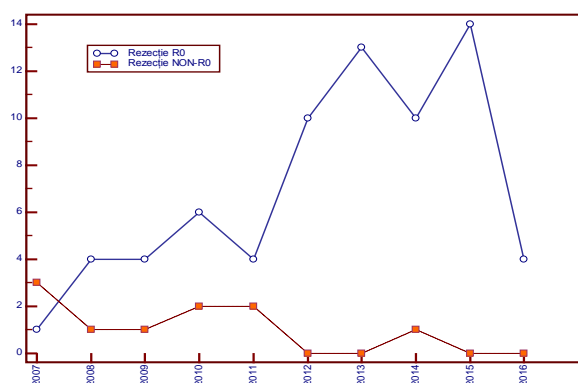


Figure 6 - Distribution by years of cases where restorative rezection was practiced in relation to the type of rezection achieved

Sample size	47
Lowest value	112,0000
Highest value	211,0000
Arithmetic mean	158,1702
95% CI for the mean	149,0769 to 167,2636
Median	153,0000
95% CI for the median	143,3155 to 165,1601
Variance	959,1878
Standard deviation	30,9708
Relative standard deviation	0,1958 (19,58%)
Standard error of the mean	4,5175

Table 3 - Statistical data regarding duration of the procedure in patients who underwent amputation

Sample size	80
Lowest value	110,0000
Highest value	186,0000
Arithmetic mean	148,1875
95% CI for the mean	142,7574 to 153,6176
Median	151,0000
95% CI for the median	136,5216 to 162,0000
Variance	595,3948
Standard deviation	24,4007
Relative standard deviation	0,1647 (16,47%)
Standard error of the mean	2,7281

Table 4 - Statistical data regarding duration of the procedure in patients who underwent resection with anastomosis

Assessing the group of patients who underwent resection with reestablishment of the digestive continuity, in terms of the type of anastomosis performed, revealed a predominance of manual anastomoses - 42 cases, accounting for 65.62%, compared to mechanical anastomoses - 22 patients, accounting for 34.38%.

Development during the course of our study was made by means of preferential use of mechanical anastomoses. Thus, the ratio of use of manual and mechanical anastomoses, evolved from 25% in 2008 to a percentage of 83.33% in 2015 (Figure 7).

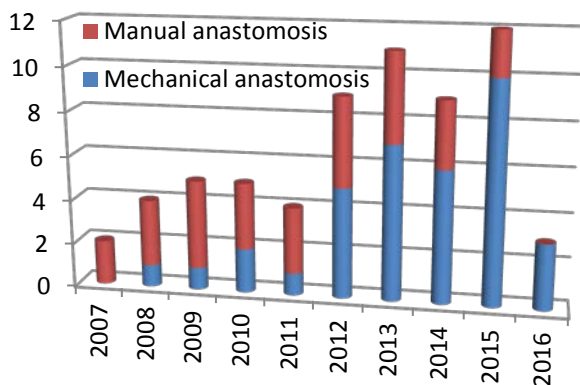


Figure 7 - The distribution by years of patients who underwent anterior resection in relation with the type of anastomosis performed

Out of the 64 patients who underwent rectal resection with anastomosis, on a total of 50 patients (78.12%), proximal temporary evacuation of the bowel through ileostomy was carried out. While analyzing the distribution of achieving it, the analysis indicates a progressive

increase in the number of cases per year, the maximum value being objectified in 2015 (12 patients - 24%) (Figure 8).

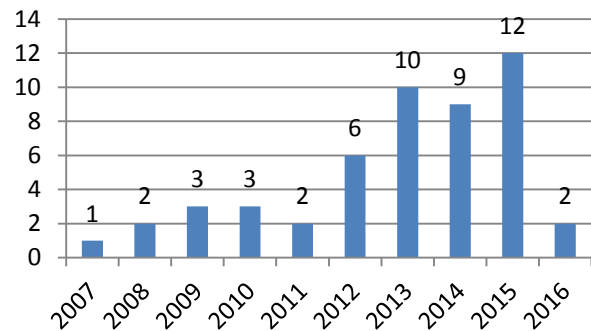


Figure 8 - The distribution by years of patients in whom temporary ileostomy was performed

The analysis of surgical protocols in terms of identifying pelvic autonomous nerve plexus, showed a steady increase during the study. This is due, on the one hand, to the correct execution of the surgical resection determined both by technological development and the accumulation of surgical experience, and on the other hand, understanding the importance of notifications in surgical registries.

The relatively small number of patients in whom details of the identification of nerve elements are given, meaning 71 patients, is partly due to the deficit in recording the intraoperative details, typical mark for emergency surgical services (Figure 9).

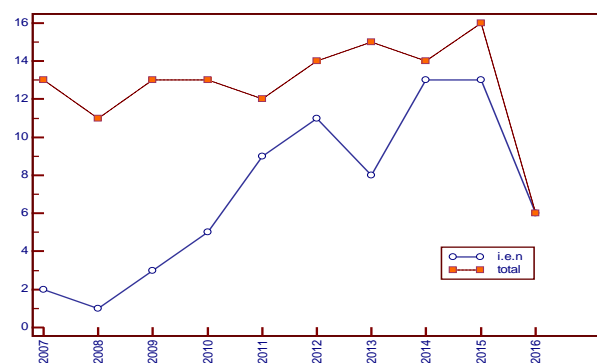


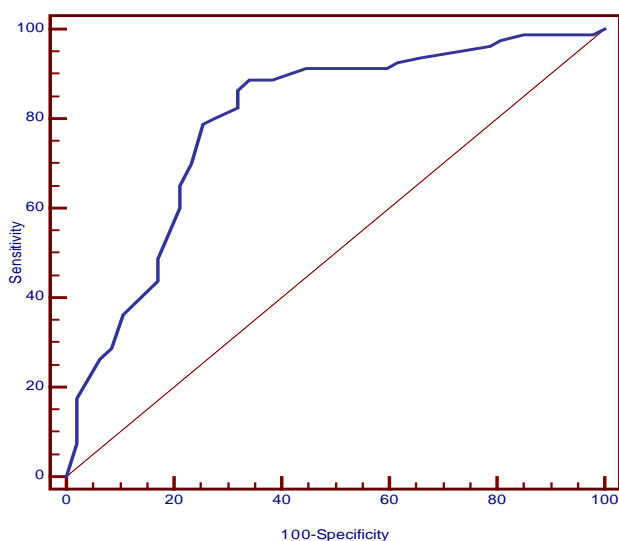
Figure 9 - Patient distribution by identifying the pelvic nerves elements

Accounting data provided by the surgical protocols allowed the identification of reports on incidents and accidents during surgery, requiring associated surgery or not while identifying extensive resection surgery imposed by local tumor evolution (Table 5).

To fulfill the purpose and objectives of our research, we found it necessary to quantify those whose frequency of occurrence was significant, and those who have imposed complex surgery, associating interdisciplinary consultation.

INTRAOPERATIVE INCIDENTS AND ACCIDENTS / ASSOCIATED OPERATIONS		
Type	Number	Frequency
Significant bleeding	5	3,93%
Wall perforation of the digestive tract	4	3,14%
Difficult dissection	18	14,17%
Ureteral injury with reimplantation	1	0,78%
Necessity of splenectomy	1	0,78%
Hysterectomy	14	11,02%
Partial cystectomy	5	3,93%

Table 5 - Intraoperative incidents and accidents / associated operations



Area under the ROC curve (AUC)	0,793
Standard Error	0,0437
95% Confidence interval	0,707 to 0,879
z statistic	6,702
Significance level P (Area=0.5)	<0,0001

Figure 10 - The relationship between total number of days of hospitalization in relation to the type of operation (resection / amputation)

Given the magnitude and complexity of the surgery such as an abdominoperineal mixed way amputation, we found it appropriate to check the correlation between the amputation and the total number of days of hospitalization.

The ROC curve identified a significant correlation between the two parameters (AUC = 0.793), which means that in our study, the type of surgery was a predictive factor for the duration of hospitalization, regardless of the stage of disease evolution (Figure10).

Discussions

Achieving the oncological goal in the surgical treatment of rectal cancer, namely the removal of rectal tumor along with the perirectal lymphatic atmosphere in order to provide a proximal, distal and especially circumferential microscopic tumor clearance, depends on the appreciation of the locoregional pre-therapeutic imaging extension of the disease with appropriate framing of the stage and applying appropriate therapeutic protocol: radical resection with or without neoadjuvant treatment. If in case of tumors T1 or T2, the treatment of choice is radical surgery: anterior resection with total / partial resection of the mesorectum (upper rectal tumors) and colorectal anastomosis or coloanal anastomosis with or without reservoir or abdominoperineal resection with ETM and final colostomy, tumors considered locally advanced (stage II / III ;T3 / T4 / N +) receive neoadjuvant CRT prior to surgical treatment. Subsequently, radical resection is performed according to the ETM principles.

Resection procedures with restorative digestive continuity, popularized by Dixon since 1948, have recorded a major breakthrough with the understanding of the distal parietal dissemination of rectal cancer, which according to studies is not greater than 1 cm. Moreover, the development of mechanical suturing tools allowed ultra-low anastomoses to be performed. A distal macroscopic tumor clearance of 2 cm is presently considered to be sufficient [4].

The following factors influenced the type of surgery chosen, and the practice of resection with anastomosis increased: technological advances in imaging, improvements in the clinic's technical equipment where the research was conducted, such as Heald valve- retractor, bipolar forceps, instruments for coagulation ligasure type, devices for mechanical suturing, increased training of surgeons in the field, and improving the surgical experience as operating volume is gained.

The decision of choosing resection restorative procedures is primarily made based on the distance from the tumor to the anocutaneous line but also on clinical judgment and experience of the practitioner of general surgery. The overuse of self technical performance and dissecting and suturing instruments, along with the psychological pressure of the patient, may alter the decision on the type of resection, leading to either a non-R0 resection, or a "perineal colostomy". Rectal surgery requires learning the proper ETM technique in training programs organized by specialized centers, the oncologic outcomes, reproducible according to the literature, improve while gaining experience.

During the study there is an evident tendency to increase the number of interventions in which mechanical suture was performed. In the future this trend is expected to continue, and the numbers of mechanically anastomoses performed to increase, at the expense of manual restoration of the digestive continuity, of course depending on technical possibilities.

Indication of proximal digestive diversion after rectal resection, especially those with subperitoneal anastomosis, is well supported by numerous studies demonstrating the utility of protective ileostomy in preventing anastomotic insufficiency. A meta-analysis published in 2008, the results of the risk of fistula in case of low and ultra-low anastomoses, with or without ileostomy: 6.3% versus 19.6% and 4.3% versus 9.3% [5]. In addition, temporary evacuation of intestinal contents through an ileostomy does not change postoperative and long-term mortality in patients with rectal cancer, that is why ileostomy is indicated in the prevention of anastomotic fistula in rectal resections with EMT and anastomosis below the reflection of the peritoneum [6].

In the surgical treatment of rectal cancer, either RA or RAP, following the mesorectum dissection plan helps identifying and sparing autonomous plexus. ETM requires a precise and standardized execution, which is best learned in training programs held by specialized centers. The correct oncologic R0 resections must be performed respecting the nearby anatomical structures which depend on the surgical experience. Conducting research in an emergency surgical service may explain

partially the deficit of intraoperative data recording.

Loco-regional extension of the tumor with the invasion of nearby organs may require associated resection like: segmental enterectomy, cystectomy or prostatectomy, with ureteral resection and reimplantation, hysterectomies and posterior colectomy as well as resections of the pelvic plexus unilateral or bilateral.

The type of surgery has been correlated with the period of hospitalization, in case of RAP the length of stay is greater than RA, independently of the stage of the neoplastic disease. The area under the ROC curve with a value of 0.793 indicates a significant correlation between these two parameters. The complexity of a surgery such as RAP, expressed also by the longer duration of surgery involving extensive dissection and wide excisions, require a longer period of healing surgical wounds, abdominal but especially perineal, their development being frequently marked by local abscesses.

Currently, teams who treat rectal cancer must pay attention in tracking each case in relation to financial parameters, because of the legislative changes that occurred during the study and are currently in place. These issues reinforce the idea proven and based on medical criteria that patients with rectal cancer undergoing therapies involving both social and economic costs should be treated in specialized treatment centers. Screening programs are becoming more and more important in determining early diagnosis which is primarily benefiting the patient by having the opportunity to use the application of multimodal therapy, compatible with the initial stages of the disease, while optimizing costs for each case.

Conclusions

Current data of surgical anatomy, physiology and anatomopathology allow a diversification of technical methods which lead to a rational balance between oncological safety margin and opportunities for reconstruction that are more beneficial to the patient.

Technical and tactical difficulties remain a clinical reality in the surgical approach to the patient with rectal cancer, independent of

technological progress and implementation of standardized therapeutic protocols.

The evolution of rectal cancer treatment to a medical and genetic personalized approach is obvious, the steps being multidisciplinary coordinated, where gene therapies will play an increasingly important place in the treatment plan. Surgery remains the main form of treatment with curative intent, oncologic and functional.

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