Clinical assessment of short-term outcome of sphincter-sparing surgery in patients with low rectal carcinoma

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Introduction
Surgical oncology was born in excessive radicalism, but modern oncological surgery has become organ sparing and restorative. On this track, surgery for low rectal cancer is shifting from the abdominoperineal resection to the sphincter-sparing procedure. The new technique eliminates the need for permanent stoma and should provide cure rates equal to the more aggressive types of resection. The main aim of this study is to evaluate early outcome of sphincter-sparing surgery in patients with low rectal cancer.

Patients and methods
One hundred and fifty-three patients with low rectal cancer were enrolled in this prospective study. The lesions in all patients were located within 8 cm from the anal verge, and all the patients have disease-free sphincter. They were subjected to sphincter-sparing surgeries and followed up for a period ranging from 6 to 24 months to assess the oncological and functional outcome of the procedures.

Results
The mean distance of rectal carcinoma was 6 cm (4–8 cm) from the anal verge. Neoadjuvant chemoradiotherapy was needed in 49 patients as they had locally advanced lesions (T3 and T4), whereas the remaining 104 patients underwent primary resection. The safety margin ranged between 1.5 and 1.9 cm in 25% of the patients, 2–2.9 cm in 44% of the patients, and 3–3.5 cm in 31% of the patients. The mean safety margin was 2.5 cm. No local recurrence was reported in any patient during the follow-up period. Anastomotic leak was noted in 3.9%, pelvic abscess in 4.6%, anastomotic stenosis in 11.8%, incisional hernia in 9.8%, and grade II incontinence after 6 months of closing the stoma in 5.9% of the patients.

Conclusion
Patients with low rectal cancer have the chance to preserve their anal sphincter and practice normal defecation after sphincter-sparing surgery. The procedure did not compromise local control and has accepted oncological and functional outcomes.

Keywords:
intersphincteric resection, rectal cancer, sphincter sparing

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Introduction

Globally, colorectal cancer is ranked the third most common cancer among men and the second among women with almost 1.65 million new cases of the disease diagnosed in 2015. It is one of the cancers that have marked geographical variation with higher incidence among developed countries and high-income nations [1,2].

In Egypt, colorectal cancer is the sixth most commonly occurring malignancy in males and females representing 2–6% of all malignancies with marked high incidence among young people and higher affection of the rectum [3,4].

At first, surgical excision of the tumors was performed in a radical attitude. However, with modern concepts of sparing surgeries owing to realization and better understanding of cancer biology, surgery for tumors tends to be more restorative and less invasive [5].

The abdominoperineal resection of the rectum was the standard surgical option for patients with low rectal cancer for many years. However, clearer identification of the safe distal margin resulted in narrow range of its indications [6]. The evolution of surgical staplers and the possibility of performing very low coloanal anastomosis have led to wider range of sphincter-preservation procedures even in extremely low rectal lesions on the expense of abdominoperineal resection [7,8]. Moreover, the recent advances in the

neoadjuvant chemotherapy and its application in low rectal cancer together with the expanded approbation of the total mesorectal excision (TME) have shifted choices of the surgical oncologist toward the sphincter-sparing operations [9,10].

The shift toward sphincter-sparing procedures started after detailed studies of the anorectal physiology which revealed that the distal safety margin of 2 cm and preserving the upper part of the internal anal sphincter is not mandatory to keep continence. Based on this fact, it is now possible to excise carcinoma of the rectum which extends to the upper part of the anal canal without affecting continence leading to favorable functional outcome [11,12]. Sphincter-sparing procedure is currently considered the 'gold standard' operation for low rectal cancer [13]. The present study aimed to evaluate the early oncological and functional outcomes of this type of surgery.

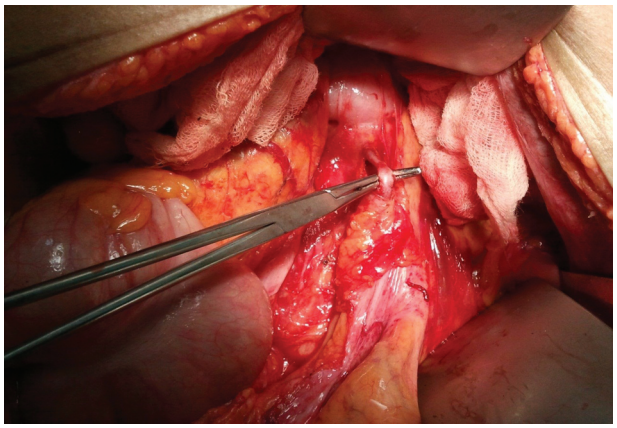
Patients and methods

This is a cohort prospective study that had been conducted on patients with low rectal cancer in the Department of Surgery, Suez Canal University Hospital, in the period between February 2014 and January 2017. One hundred and fifty-three patients with proven endoscopic biopsy for primary low rectal carcinoma had been enrolled in the study after obtaining an informed consent from all patients. This research project was reviewed by the Research Ethics Committee at the Faculty of Medicine, Suez Canal University at its meeting on 9/01/2014 with reference number 1642. We included all patients who presented to our hospital with malignant rectal tumor of any age, of both sexes, tumor located within 8 cm from the anal verge, cT1-2, N0, and with functioning, disease-free sphincter mechanism. Patients with cT3-4 or N1-2 tumors were enrolled after receiving neoadjuvant chemotherapy. Exclusion criteria were patients with invasion of the sphincter or pelvic floor as evidenced grossly or by MRI, patients with distant metastatic disease, patients with concomitant colon carcinomas, and patients having postoperative local recurrence.

The technique was performed by three competent surgeons where the abdomen was opened through lower mid-line incision with little extension above the umbilicus. The descending colon and sigmoid colon were retracted medially and dissected at their lateral edge from the peritoneal attachment. After full mobilization of the splenic flexure, the inferior mesenteric artery was dissected and highly ligated considering preserving the marginal artery (Fig. 1).

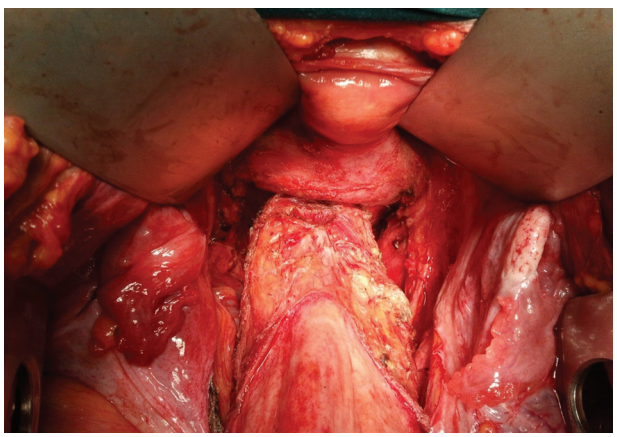
Dissection is continued into the pelvis under complete identification of the ureter to perform TME. This is achieved through sharp dissection of the avascular plane between the rectum and sacrum and dividing the mesorectal fascia. Anteriorly, the rectum is sharply dissected from the prostate and seminal vesicles in males and the vagina in females (Fig. 2). This fine sharp dissection protects the autonomic nerves of the pelvis from injury and traction which in turn minimize the chance of bladder dysfunction and sexual disorders. The sigmoid colon is divided proximally, and the rectum is resected with distal safety margin of at least 1.5 cm with the help of Ethicon Contour Curved Cutter Stapler to close the distal stump. Three main types of resections were performed in the study: low anterior resection, ultra-low anterior resection, and intersphincteric resection. In certain

Figure 1



High ligation of the inferior mesenteric artery.

Figure 2



Complete mobilization of the rectum using TME technique in a female patient. TME, total mesorectal excision.

cases (rectal cancer on top of colonic diverticular disease), panproctocolectomy is performed (Fig. 3).

Whenever possible, the anastomosis is established through the abdomen using the Ethicon Circular staplers (ECSA-29 and ECSA-33 stapler) according to the diameter of rectum and sex of the patient (Ethicon Endo-Surgery Inc., Somerville, New Jersey, USA). If it is difficult because of very low lesions or narrow pelvis, a transanal approach for coloanal anastomosis is performed. The anastomosis may be fashioned as a straight coloanal anastomosis, coloanal anastomosis with coloplasty (Fig. 4), or J-pouch coloanal anastomosis (Fig. 5). Whenever panproctocolectomy is indicated, a J-pouch with stapling or hand-sewn ileoanal anastomosis is performed (Fig. 6). The procedure is completed by testing the anastomotic line through injecting diluted solution of povidone iodine from the anus. Finally, a temporary diverting stoma using terminal ileum is established. The excised specimen is sent to the laboratory for histopathological assessment. Throughout a median follow-up time of 15 months (range, 6–24 months), all patients were followed up for assessment of oncological and functional outcome of the procedure.

Results

One hundred and fifty-three patients with low rectal carcinoma located at a mean distance of 6 cm (4–7.8 cm) from the anal verge underwent sphincter-sparing resection. Radical excision of the tumor with aiming for cure was accomplished in all patients. The mean age was 52.3±6.38 years. Most of the recruited patients (64.1%) were males whereas 35.9% were females. The neoadjuvant therapy was required in

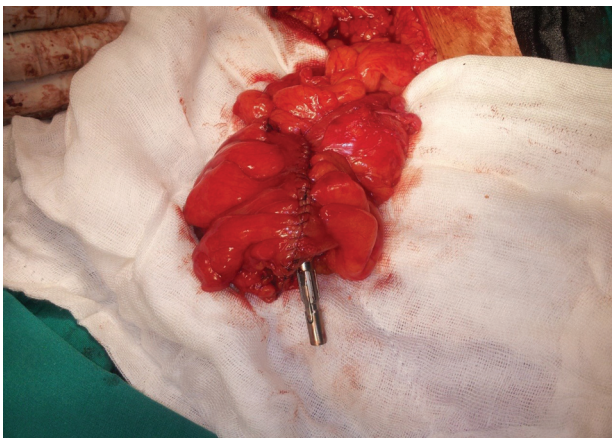
Figure 3

Opened rectum shows rectal carcinoma on top of familial polyposis.

Figure 4

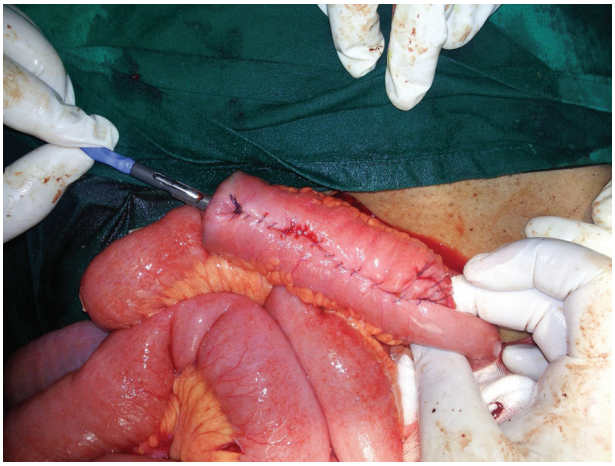
An anvil of stapler within coloplasty reservoir just before coloanal anastomosis.

Figure 5



An anvil of stapler within colonic J-pouch just before coloanal anastomosis.

Figure 6



An anvil of stapler within ileal J-pouch.

32% (49 patients) of the cases as they were judged locally advanced (T3 and T4) either clinically or radiologically using MRI, whereas it is not needed in 68% of the cases (104 patients). Seventy-two (47.1%) patients underwent low anterior resection, 48 (31.4%) patients underwent ultra-low anterior resection, 21 (13.7%) patients underwent intersphincteric resection, and 12 (7.8%) patients underwent panproctocolectomy with ileoanal anastomosis.

J-pouch reservoir was conducted in 61 (39.9%) patients, coloanal anastomosis with coloplasty was conducted in 55 (35.9%) patients, and straight coloanal anastomosis was conducted in 37 (24.2%) patients. Almost a quarter of the tumors (38 patients) were resected with a safety margin ranged between 1.5 and 1.9 cm, in 44% (67 patients) of the tumors the margin ranged between 2 and 2.9 cm, whereas in 31% (48 patients) of the tumors, the safety margin ranged between 3 and 3.5 cm. The mean safety distance was 2.5 cm.

Regarding the oncological outcomes, none of the patients showed evidence of local recurrence during the follow-up period. However, six (3.9%) patients developed anastomotic leak, seven (4.6%) patients developed pelvic abscess, 18 (11.8%) patients showed anastomotic stenosis (mainly after stapling technique 66.7 vs. 33.3%), and 15 (9.8%) patients developed incisional hernia. No mortality was recorded among the studied patients during the follow-up period. Regarding the functional outcomes and according to Parks' incontinence scale [14] (Table 1), 26 patients developed various grades of incontinence immediately after closing the diverting stoma (16 patients had grade II, eight patients had grade III, and two patients had grade IV). However, only nine (5.9%) patients had grade II incontinence after 6 months of closing the stoma (Tables 1–3). Incontinence after intersphincteric resection is significantly higher than other types of resections at 6-month follow-up. Five (3.3%) patients developed symptoms of bladder atony, 11 (11.2% of the males) male patients developed retrograde ejaculation whereas 19 (34.5% of the females) female patients developed dyspareunia. The functional outcomes after straight anastomosis are significantly lower than J-pouch and coloplasty ($P<0.05$).

Table 1 Parks' incontinence scale

Grade I	Normal continence (i.e. continent for solids, liquid stools, and flatus)
Grade II	Continent for solid and liquid stools but not for flatus
Grade III	Continent for solid stools only. Usually presented with fecal leakage
Grade IV	Complete incontinence

Discussion

The emergence of TME was a milestone in the process of managing cases of rectal carcinoma. It leads to marked decrease in the incidence of local tumor recurrence and longer survival rate [15]. The most important component of TME is the sharp meticulous dissection – under complete direct vision – in the avascular plane over the sacrum between the presacral fascia and the enveloping visceral fascia [16,17].

Sphincter-sparing maneuvers with the help of TME for low rectal cancer have led to decrease in the number

Table 2 The relation between the degree of fecal continence and the type of resection (*N*=153)

Variables	Grade I [*n* (%)]	Grade II [*n* (%)]	Grade III [*n* (%)]	Grade IV [*n* (%)]
1 month after closure				
Low resection	63 (41.2)	6 (3.9)	3 (2)	0 (0.0)
Ultra-low resection	43 (28.1)	3 (2)	2 (1.3)	0 (0.0)
Intersphincteric	13 (8.5)	4 (2.6)	2 (1.3)	2 (1.3)
Panproctocolectomy	8 (5.2)	3 (2)	1 (0.7)	0 (0.0)
3 months after closure				
Low resection	68 (44.4)	4 (2.6)	0 (0.0)	0 (0.0)
Ultra-low resection	45 (29.4)	2 (1.3)	1 (0.7)	0 (0.0)
Intersphincteric	14 (9.2)	3 (2)	3 (2)	1 (0.7)
Panproctocolectomy	9 (5.9)	3 (2)	0 (0.0)	0 (0.0)
6 months after closure				
Low resection	72 (47.1)	0 (0.0)	0 (0.0)	0 (0.0)
Ultra-low resection	47 (30.7)	1 (0.7)	0 (0.0)	0 (0.0)
Intersphincteric*	15 (9.8)	6 (3.9)	0 (0.0)	0 (0.0)
Panproctocolectomy	10 (6.5)	2 (1.3)	0 (0)	0 (0.0)

*Statistically significant difference versus other types of resection at 6 months after stoma closure (*t* test, *P*=0.003).

Table 3 Frequency distribution of the studied participants according to the personal data of the cases (*N*=153)

Variables	Frequency	Percentage
Age (years)		
25–30	2	1.3
31–40	5	3.3
41–50	30	19.6
51–60	79	51.6
> 60	37	24.2
Mean±SD	52.31±6.38	
Sex		
Male	98	64
Female	65	36

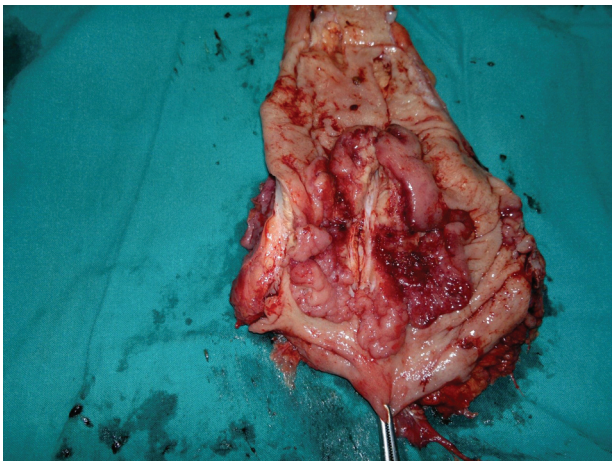
of performed abdominoperineal resection, and currently appears to replace it as a 'gold standard' operation for this type of cancer. Excision of the rectum can be extended to involve the upper part of the anal canal through the intersphincteric resection, and this further boosts the chance of sphincter sparing [18].

The sociodemographic data of the present study matches with other studies for colorectal cancer in Egypt [3,4,19]. The need for neoadjuvant therapy (32%) is somewhat lower than other studies such as Martin *et al*. [20] who performed a systematic review encompassing 14 studies with 1289 cases to assess the sphincter-saving procedures in low rectal cancer and found that 38% of cases were subjected to neoadjuvant radiochemotherapy. This may be attributed to the use of neoadjuvant therapy in early stages of the disease by other studies [21].

The decision to perform sphincter-sparing procedures depends mainly on the distance between the sphincter and the tumor because of the possible risk of intramural microscopic spread. The classic 5-cm distal margin was adopted for many years till the early of 1980s when 2 cm was considered enough. However, this 2-cm distal rule is now criticized by many authors [22–24]. Although the mean safety distance in the current study is 2.5 cm, we resected some cancers with margin ranged from 1.5 to 1.9 cm depending on these evidence-based studies, and the histopathological reports revealed free distal margins in all samples (Fig. 7).

In the current study, the type of resection is judged by the level of the lesions. Whenever possible, we performed low anterior resection (anastomosis just below the anterior rectal peritoneal reflection); in lower level cancer, we performed ultra-low anterior resection (anastomosis just above the levator ani

Figure 7



Opened rectum shows fungating cauliflower mass with narrow 1.5–1.9 cm distal margin.

muscle); and in extremely low cancer in which the upper part of the internal sphincter is involved, we performed intersphincteric resection (partial resection of the upper part of the internal sphincteric was done). Panproctocolectomy was performed in patients with rectal cancers on top of familial polyposis. The risk of local recurrence in rectal cancer is mainly attributed to circumferential spread of the tumor rather than its distal spread. If the external sphincter is not involved, clearance of this circumferential spread can be accomplished by excision of the upper part of the internal sphincter [20].

A lot of researches (>50) have been conducted to find out the best reconstructive technique after rectal resection. The most famous types are straight anastomosis, J-pouch reservoir, and coloanal anastomosis with coloplasty [25]. We used three types of reconstruction in the present study. Although the straight anastomosis is usually simpler than the others, yet its functional outcomes are inferior to them. The functional outcomes following J-pouch reservoir and coloplasty are almost similar which matches with other studies [25,26].

Most of the complications were resolved. Patients who developed anastomotic leak (all with hand-sewn coloanal anastomosis) are re-explored, and half of them were managed by repairing and saving the anastomosis whereas the other half were managed by definitive colostomy. Patients with pelvic abscess were treated by ultrasound-guided drainage. Anastomotic stenosis (66.7% with the stapling technique and 33.3% with hand-sewn technique) is treated by manual

dilatation. Incisional hernias were repaired with mesh-plasty. Other series [8,18,20] agree with our rate of complications as they reported in their reviews rates of leakages ranging from 3 to 15% after sphincter-saving surgery.

Sexual and urological complications following rectal surgeries are well recognized in all procedures; however, sphincter-sparing surgery using TME is associated with the least complication rate because this sharp meticulous dissection between the presacral fascia and the enveloping visceral fascia allows visualization and preservation of the autonomic nerves. Even when developed, they are usually temporarily and can be managed conservatively [27,28]. In the current study, patients who developed urine retention (bladder atony) were treated by urinary catheterization for 3 weeks and resolved spontaneously. Dyspareunia in females was treated by lubricants, whereas retrograde ejaculation in males was treated conservatively by medications.

Martin *et al*. [20] conducted a systematic review to study the functional data after intersphincteric resection. Eight studies (727 patients) out of the included 14 studies were concerned with postoperative incontinence. They found that perfect continence was ranging from 30 to 86.3%, fecal soiling from 11 to 59%, and incontinence to flatus was 11 to 29.1%. This marked variation in the results might be owing to different assessment tools as there are many scales to measure the fecal incontinence. We used Parks' incontinence scale in our study as it is simple, easy to use and expressed by the patients. Incontinence was assessed at 1, 3, and 6 months after closure of the stoma. The results showed gradual improvement of the degree of continence in all types of resections with slightly lower rate of recovery after intersphincteric resections. These measures match with many other studies, which reported gradual improvement of continence status upon monthly follow-up.

Conclusion

In conclusion, sphincter-sparing surgery for low rectal carcinoma is a good option to avoid permanent stoma with its associated morbidity and social and psychic effects. It has accepted oncological and functional outcomes. However, future research studies to evaluate the long-term functional outcomes and quality of life are still needed.

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Conflicts of interest
There are no conflict of interest.

References

1 Cronin KA, Lake AJ, Scott S, Sherman RL, Noone AM, Howlader N, *et al.* Annual report to the nation on the status of cancer, part I: national cancer statistics. Cancer 2018; 124:2785–2800.

2 Siegel RL, Miller KD, Fedewa SA, Ahnen DJ, Meester RG, Barzi A, Jemal A. Colorectal cancer statistics, 2017. CA Cancer J Clin 2017; 67:177–193.

3 Khafagy W, El-Ghazaly M, E-Shobaky MT, Khafagy M. Colorectal cancer in Egypt – does it differ? Coloproctology 2000; 22:109–115.

4 Gado A, Ebeid B, Abdelmohsen A, Axond A. Colorectal cancer in Egypt is commoner in young people: is this cause for alarm? Alexandria J Med 2014; 50:197–201

5 Di Betta E, D'Hoore A, Filez L, Penninckx F. Sphincter saving rectum resection is the standard procedure for low rectal cancer. Int J Colorectal Dis 2003; 18:463–469.

6 Perry WB, Connaughton JC. Abdominoperineal resection: how is it done and what are the results? Clin Colon Rectal Surg 2007; 20:213–220.

7 Rahman MS, Khair MA, Khanam F, Haque S, Alam MK, Haque MM, *et al.* Sphincter saving surgery is the standard procedure for treatment of low rectal cancer. Mymensingh Med J 2013; 22:281–288.

8 Constantine PS. Intersphincteric resection for low rectal cancer: an overview. Int J Surg Oncol 2012; 2012:241512.

9 Gawad W, Fakhr I, Lotayef M, Mansour O, Mokhtar N. Sphincter saving and abdomino-perineal resections following neoadjuvant chemoradiation in locally advanced low rectal cancer. J Egypt Natl Cancer Inst 2015; 27:19–24.

10 Rullier E, Denost Q, Vendrely V, Rullier A, Laurent C. Low rectal cancer: classification and standardization of surgery. Dis Colon Rectum 2013; 56:560–567.

11 Cho HM. Anorectal physiology: test and clinical application. J Korean Soc Coloproctol 2010; 26:311–315.

12 Lestár B, Asztalos I, László S, Polányi C, Hornok L, Ritter L, Rózsa I. Possibilities in the preservation and restoration of anal continence. Magy Seb 2001; 54:168–173.

13 Sun Z, Yu X, Wang H, Ma M, Zhao Z, Wang Q. Factors affecting sphincter-preserving resection treatment for patients with low rectal cancer. Exp Ther Med 2015; 10:484–490.

14 Browning GG, Parks AG. Postanal repair for neuropathic fecal incontinence: correlation of clinical result and anal canal pressures. Br J Surg 1983; 70:101–104.

15 Cai Y, Li Z, Gu X, Fang Y, Xiang J, Chen Z. Prognostic factors associated with locally recurrent rectal cancer following primary surgery (review). Oncol Lett 2013; 7:10–16.

16 Lichliter WE. Techniques in total mesorectal excision surgery. Clin Colon Rectal Surg 2015; 28:21–27.

17 Havenga K, Grossmann I, DeRuiter M, Wiggers T. Definition of total mesorectal excision, including the perineal phase: technical considerations. Dig Dis 2007; 25:44–50.

18 Park IJ, Kim JC. Intersphincteric resection for patients with low-lying rectal cancer: oncological and functional outcomes. Ann Coloproctol 2018; 34:167–174.

19 Ibrahim AS, Khaled HM, Mikhail NN, Baraka H, Kamel H. Cancer incidence in Egypt: results of the national population-based cancer registry program. J Cancer Epidemiol 2014; 2014:437971.

20 Martin ST, Heneghan HM, Winter DC. Systematic review of outcomes after intersphincteric resection for low rectal cancer. Br J Surg 2012; 99:603–612.

21 Babaei M, Jansen L, Balavarca Y, Sjövall A, Bos A, van de Velde T, *et al.* Neoadjuvant therapy in rectal cancer patients with clinical stage II to III across European countries: variations and outcomes. Clin Colorectal cacer 2018; 17:e129–e142.

22 Rullier E, Laurent C, Bretagnol F, Rullier A, Vendrely V, Zerbib F. Sphincter-saving resection for all rectal carcinomas: the end of the 2-cm distal rule. Ann Surg 2005; 241:465–469.

23 Chowdri NA. Donuts and safe margins in rectal cancer resection. Clin Surg 2018; 3:1864.

24 Zhao GP, Zhou ZG, Lei WZ, Yu YY, Wang C, Wang Z, *et al.* Pathological study of distal mesorectal cancer spread to determine a proper distal resection margin. World J Gastroenterol 2005; 11:319–322.

25 de la Fuente SG, Mantyh CR. Reconstruction techniques after proctectomy: what's the best? Clin Colon Rectal Surg 2007; 20: 221–230.

26 Brown CJ, Fenech DS, McLeod RS. Reconstructive techniques after rectal resection for rectal cancer. Cochrane Database Syst Rev 2008; 2: CD006040.

27 Nesbakken A, Nygaard K, Bull-Njaa T, Carlsen E, Eri LM. Bladder and sexual dysfunction after mesorectal excision for rectal cancer. Br J Surg 2000; 87:206–210.

28 George D, Pramil K, Kamalesh NP, Ponnambatheyil S, Kurumboor P. Sexual and urinary dysfunction following laparoscopic total mesorectal excision in male patients: a prospective study. J Minim Access Surg 2018; 14:111–117.