Transrectal vacuum treatment for low colorectal anastomotic leaks

Ann. Ital. Chir., 2021 92, 6: 715-719
pii: S0003469X21035119

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BACKGROUND: *Anastomotic leakage after rectal resection is a major complication which increases the rates of morbidity and mortality. A small number of patients with generalised peritonitis need radical surgical treatments. Stable patients with local peritonitis can be treated conservatively. The aim of this study is to evaluate the effects of transrectal vacuum treatment on the healing of low colorectal anastomotic leaks.*
METHODS: *Medical records of fourteen patients managed conservatively with transrectal vacuum treatment for anastomotic leakage after rectal resection between September 2015 and September 2018, were retrospectively reviewed. Anastomotic leakage was documented and evaluated with computerised tomography and rectosigmoidoscopy.*
RESULTS: *10 of 14 patients had successful closure of the perianastomotic abscess cavity after a mean of 19 days of vacuum treatment. 2 patients in this group had stricture on the anastomotic site as a late complication which was successfully treated with repeated dilatations. 4 of 14 patients had eventually a permanent sigmoid colostomy.*
CONCLUSION: *Our results suggest that transrectal vacuum treatment can be safely used to all stable patients without generalised peritonitis in the management of low colorectal anastomotic leakages.*

KEY WORDS: Anastomotic leakage, Rectosigmoidoscopy, Vacuum treatment, VAC

Introduction

Colorectal cancer is the third most common malignancy in the world according to WHO data [1]. Rectal cancer accounts for 30% of all colorectal cancers [2]. Colon cancer and rectal cancer are often grouped together as colorectal cancer because they have many features in common but the therapeutic approach for rectal cancer is significantly different and difficult from colon cancer. Tight and narrow space where rectum is embedded complicates the treatment of rectal cancer.

Surgery, chemotherapy and radiotherapy, usually combined together are the treatment options for rectal cancers. Anastomotic leakage (AL) is the most important and disquieting complication from the surgeon's point of view which unfortunately encounters the patient to increased rates of morbidity and mortality, prolonged hospitalization and poor oncologic outcomes. The occurrence of leakage is reported up to 30% in the literature [3-8]. Degree and severity of leakage may vary from a small defect on the intestinal wall at the anastomotic site to a complete detachment of colon segments.
The treatment of leakage varies according to the clinical signs of the patient from just close observation to a permanent sigmoid colostomy. Broad spectrum antibiotics, pelvic drainage, proximal diverting loop ileostomy, transanal irrigation, endoscopic stenting, endoscopic clipping and transrectal vacuum therapy are the other techniques used for the management [9,10].
Transrectal vacuum treatment aims rapid control of pelvic sepsis via applying a controlled subatmospheric

Pervenuto in Redazione Novembre 2020. Accettato per la pubblicazione Dicembre 2020
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pressure into the wound. Together with repeated transanal irrigation, negative pressure in the wound removes the purulent fluid and edema from the wound, reduces bacterial load, reduces the cavity volume and stimulates the formation of granulation tissue [11].
In this study we first described a simple, low priced and non-commercial method of wound dressing for the application of negative pressure and then evaluated the effects of transrectal vacuum treatment of leakage after Low Anterior Resection (LAR) of rectal cancer.

Patients and Methods

The study was conducted in the Department of Surgery at Gaziosmanpasa University Hospital, Tokat, between September 2015 and September 2018. The study was approved by the Ethical Board of Gaziosmanpasa University. 15 consecutive patients who had leakage after elective LAR were identified and their records were examined retrospectively. High ligation of inferior mesenteric artery, full mobilisation of splenic flexure and temporary loop ileostomy are the routine practice of the clinic where the study conducted. Anastomotic leakage was defined as a feculent material obtained from a drain or the wound, a defect at the colorectal or coloanal anastomotic site directly visualised during rectosigmoidoscopy, or extravasation of contrast, presence of perianastomotic air and fluid on CT scan. When symptoms and signs are suggestive or suspicious for leakage such as fever, localised or generalised peritonitis, increased levels of CRP and WBC or purulent drainage from abdominal drains; an abdominal CT obtained and rectosigmoidoscopy procedure performed.

Endoscopic Procedure

When an AL was confirmed by CT, endoscopic evaluation of the leakage (i.e. location, extent and circumferential measurement) with flexible rectosigmoidoscopy was performed. The defect at the anastomotic site and the cavity around it were identified and evaluated. CT section and the initial endoscopic view of a diagnosed leak is given in Fig. 1.
If the patient was in unstable condition and/or the anastomosis was completely detached, the patients underwent reoperation. Pelvic irrigation, drainage and an end sigmoid colostomy performed. Repair or reinforcement of the anastomosis were not considered for unstable patients. One unstable patient who had generalised peritonitis was excluded from the study. Stable patients without complete detachment of the anastomosis were the main subjects of this study 14 patients who were treated with transrectal irrigation and endoscopic sponge placement were included in the study. First the purulent content of the cavity was aspirated; debridement of

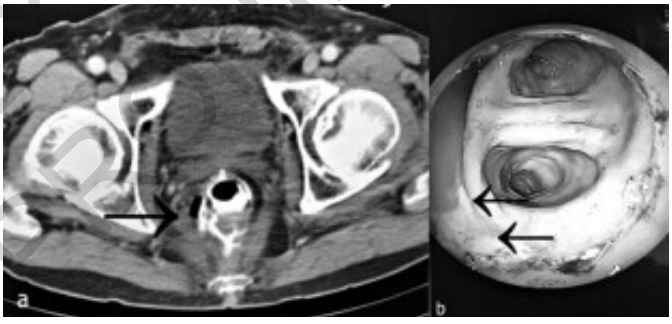

Fig. 1: A) CT image; B) endoscopic view of a leak.

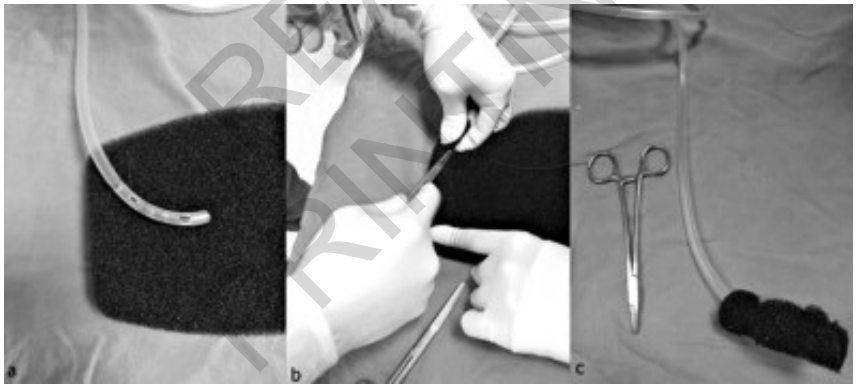

Fig. 2: Preparation of the sponge.

Fig. 3: Healing of a leak, A) postoperative 3rd week; B) 1st month; C) 3rd month.

the necrotic tissues was done if necessary especially in the first few sessions and then the cavity was irrigated with saline solution and aspirated again. A nasogastric catheter was surrounded with a pored sponge. Open pored sponge was used to apply the negative pressure to the entire wound bed. The sponge was stabilised on the catheter via full thickness sutures to avoid the catheter exit from the anal canal. The size of the sponge can be adjusted according to the size of the cavity (Fig. 2).
The catheter with the sponge was inserted to the anal canal and positioned into the cavity under direct vision by rectosigmoidoscopy. Perineum was covered and sealed with an adhesive drape. The other end of the catheter was placed to the vacuum device and a continuous suction of 100-125 mmHg was adjusted. The sponge was changed every 2 or 3 days. When the cavity was clean and covered with granulation tissue vacuum treatment was discontinued (Fig. 3).

Statistical Analysis

The quantitative variables were analysed using proportions. Categorical variables were analysed by chi-square tests. The student's t-test was used to compare parameters between the groups. All tests were two-sided. Differences were considered to be statistically significant at P <0.05. SPSS version 17.0 software was used for all analyses.

Results

Leakage was diagnosed on average 7 days (3-10) after LAR in these patients. The clinical data and the outcomes of the 14 patients treated with vacuum treatment are shown in Table I.
10 of 14 patients ensured the closure of the abscess cavity over a mean of 19 days [8-34] of vacuum treatment. Ileostomy of these patients except one was closed in a period of maximum 7 months. A 61-years old man who refused the adjuvant chemotherapy, developed early metastatic disease and died 14 months after LAR operation. Ileostomy of this patient could not be closed due to deterioration of his general medical condition. 2 patients in this group had stricture on the anastomotic site as a late complication which was successfully treated with repeated dilatations.
4 of 14 patients eventually had a permanent colostomy. A mean of 16 days (10-25) of vacuum treatment was applied before laparotomy and permanent stoma. One of these patients aged 79 years and who had multiple co morbidities died on the postoperative 53rd day of operation because of sepsis and multiple organ failure. There was not any other postoperative mortality related to AL. Initial rectosigmoidoscopy combined with CT findings revealed the locations of the leak. In 8 patients the leaks were located posteriorly, whereas 6 patients had leaks in the anterior side of colorectal anastomosis. Although only one patient progressed to permanent stoma in posteri-

Table I - *Clinical data and outcomes.*

		Total	Abscess cavity closed	Abscess cavity continued	P value
Number of patient		14	10	4	>0.5
	Male	10 (71%)	7	3	
	Female	4 (29%)	3	1	
Age, years					0.032
	Median	64	61	73	
	Range	49-84	49-70	60-84	
Tumour distance to anal verge, cm					0.094
	Median	8	9	6.5	
	Range	3-14	4-14	3-10	
Location of the fistula					0.245
	Anterior	6	3	3	
	Posterior	8	7	1	
Percentage of the defect on anastomosis (%)					0.559
	< 50 %	7	6	1	
	> 50 %	7	4	3	
Neoadjuvant radiotherapy		12 (86%)	8	4	>0.5
Diverting ileostomy with LAR		13(93%)	9	4	>0.5
Approach					>0.5
	Laparoscopic	13 (93%)	9	4	
	Laparotomy	1 (7%)	1	-	
Vacuum treatment duration, days		18	19	16	0.471
Permanent colostomy		4 (29%)	-	4	

TABLE II - *Patient characteristics and outcomes.*

Patients	Age	Location of the fistula	Percentage of the defect in anastomosis	Tumor distance to anal verge	Days of vacuum treatment	Abscess cavity	Stoma outcome
1	63	Posterior	> 50 %	14 cm	8	Healed	Loop ileostomy closed at 7. month
2	61	Posterior	< 20 %	7 cm	18	Healed	Early metastasis, died at 14. Months with loop ileostomy
3	68	Posterior	> 50 %	9 cm	12	Continued	Permanent colostomy
4	65	Posterior	< 20 %	10 cm	14	Healed	Loop ileostomy closed at 4. month
5	58	Anterior	20-50 %	10 cm	18	Healed	Loop ileostomy closed at 7. month
6	53	Anterior	> 50 %	5 cm	34	Healed	Loop ileostomy closed at 5. month
7	69	Posterior	20-50 %	11 cm	19	Healed	Loop ileostomy closed at 7. month
8	84	Anterior	> 50 %	4 cm	15	Continued	Permanent colostomy
9	79	Anterior	> 50 %	3 cm	25	Continued	Permanent colostomy
10	70	Anterior	> 50 %	6 cm	10	Healed	Loop ileostomy closed at 4. month
11	67	Posterior	> 50 %	8 cm	20	Healed	Loop ileostomy closed at 7. month
12	49	Posterior	20-50 %	11 cm	28	Healed	No stoma
13	60	Anterior	20-50 %	10 cm	10	Continued	Permanent colostomy
14	56	Posterior	< 20 %	4 cm	18	Healed	Loop ileostomy closed at 4. month

or-leak group, three patients in anterior-leak group ended up with permanent stoma due to the failure of the leak. The leak was due to > 50% dehiscence of anastomotic circumferences in seven patients, < 20% of dehiscence in three patients, and between 20-50% in four patients. Table II gives the patients characteristics and outcomes.

Increased age is associated with a higher risk of leakage ($p < 0.05$). Lower location of the tumor, anterior location of the leak, size of the defect in anastomosis (>50% dehiscence of anastomotic circumferences) and neoadjuvant radiotherapy are the suspected parameters for the leak and the continuation of abscess cavity but not statistically significant for our study group ($p > 0.05$).

Discussion

Negative pressure wound therapy (NPWT), also called vacuum assisted closure (VAC) of the wounds is a new, minimally invasive therapeutic technique which applies continuous or intermittent subatmospheric pressure to the wounds. NPWT was initially described for chronic and complex skin wounds in the early 1990's [12]. Nowadays vacuum treatment can be applied to deep musculoskeletal, abdominal and thoracic wounds [13].

Cupping therapy or glass cupping therapy which is an alternative medicine treatment modality widely used in Middle East and Oriental medicine may be accepted as to be the pioneer of vacuum treatments. Cupping for skin abscesses, extracting poisons from bites of wild animals, dirty wounds and musculoskeletal diseases are the most familiar usages. Mechanical or thermally generated negative pressure inside the cups increases local blood flow, improves microcirculation, accelerates granulation and angiogenesis in the regional tissues likewise NPWT [14].

Anastomotic leakage after rectal surgery like any other abdominal operation is a life-threatening complication which also increases the rates of other morbidities, prolongs hospitalisation and worsens oncologic outcomes. Vacuum therapy has been proven to facilitate the healing period of various types of wounds. Intra-abdominal use of negative pressure has been reported in increasing numbers in the last decade. Andreano et al. [15] reported lower death rates and improved local parameters with negative pressure therapy in the management of severe peritonitis. Beneficial aspects of negative pressure therapy were indicated as decreasing IL-6, IL-10, TNF-alpha levels and bacterial load, also reducing abdominal inflammation and adhesions.

Negative pressure can be applied through the abdominal incisions, abdominal wall defects or natural openings such as anal canal in our study. We have shown in this study that AL can be treated with home-made transrectal vacuum application, although the success rate of closure of the abscess cavity was 71%, lower than reported in the literature. The reason for this discrepancy might be due to patient selection. We applied vacuum therapy to all AL without regarding the detachment degree of anastomosis except the complete detachment. All 7 cases who had a partial defect in the anastomosis had a perfect follow up period with a 100% of closure of the abscess cavity. 3 of 7 patients with > 50% circumferential detachment group had the closure of abscess cavity. Other 4 patients in this group eventually had a permanent end sigmoid colostomy. Nerup et al. [16] used this technique in 13 patients with leakage after rectal cancer surgery. They used a commercial product, Endosponge (B. Braun Medical B.V., Melsungen, Germany) and reported a successful treatment with a stoma closure rate 92%. Their inclusion criteria for the study were highly selective for the leakage excluding the major symptomatic patients for the leakage. Nagell et al. [11] reported 4 cases successfully treated with transrectal VAC for a median of 13 days and Mussetto et al. [17] reported 11 cases treated for a median of 37 days. In our study the vacuum therapy lasted for a median of 18 days. We discontinued vac-

uum treatment when the abscess cavity was covered with granulation tissue, but endoscopic controls with saline irrigation of the granulated cavity continued until the closure of the ileostomy. The cost of vacuum treatment in our study is minimal involving the VAC devices and single use catheters, sponges. Main difficulty with the procedure is time and energy consumption for the medical staff involving in this treatment. But the idea of saving even one patient from a permanent stoma is worth this challenge.

Conclusion

In the management of colorectal anastomotic leakages, simple and low-priced home-made transrectal vacuum treatment can be used safely to all stable patients without generalised peritonitis. However, a careful selection of patients was required to avoid time consuming and patient discomfort.

Riassunto

La deiscenza anastomotica dopo resezione rettale è una complicanza importante che aumenta i tassi di morbilità e mortalità. Un piccolo numero di pazienti con peritonite generalizzata necessita di trattamenti chirurgici radicali. I pazienti stabili con peritonite locale possono essere trattati in modo conservativo. Lo scopo di questo studio è valutare gli effetti del trattamento sottovuoto transrettale sulla guarigione delle deiscenze perdite anastomotiche colorettali basse.

Sono state riviste retrospettivamente le cartelle cliniche di quattordici pazienti gestiti in modo conservativo con trattamento sottovuoto transrettale per deiscenze anastomotiche dopo resezione rettale tra settembre 2015 e settembre 2018. La deiscenza anastomotica è stata documentata e valutata con tomografia computerizzata e rettosigmoidoscopia.

Risultati: In 10 dei 14 pazienti si è avuto il successo della chiusura della cavità ascessuale perianastomotico dopo una media di 19 giorni di trattamento sotto vuoto. 2 pazienti in questo gruppo presentavano una stenosi nel sito anastomotico come complicanza tardiva, e trattata con successo con dilatazioni ripetute. In 4 pazienti su 14 si è provveduto alla fine alla confezione di una colostomia sigmoidea permanente.

Conclusione: I nostri risultati suggeriscono che il trattamento sottovuoto transrettale può essere tranquillamente utilizzato a tutti i pazienti stabili senza peritonite generalizzata nella gestione delle deiscenze anastomotiche colorettali basse.

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