

Comparison of Diverting Colostomy and Bowel Management Catheter Applications in Fournier Gangrene Cases Requiring Fecal Diversion

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Abstract In some patients of Fournier gangrene originated from perianal region, it is important to prevent fecal contamination in order to provide healing without wound infection. For this purposes, diverting colostomy or bowel management catheter methods were performed. In this study, it is aimed to carry out a comparison of prognosis and cost efficiency between diverting colostomy and bowel management catheter methods applied for preventing fecal contamination in Fournier's gangrene patients. Forty-eight patients with diagnosis of Fournier's gangrene, serious perianal infections, and preserved sphincters and without rectum injury after debridement were included in the study. The cases were divided into two groups as patients who were subjected to colostomy for fecal diversion and who were subjected to bowel management catheter without colostomy. Then, the groups were compared in terms of age, predisposing factors, duration of hospital stay, mortality, additional surgery requirements, and cost. Forty-eight patients were included the study. Sixteen patients were treated without colostomy. Decreased duration of total hospital stay, additional surgery requirements, and hospital expense in bowel management catheter group has determined. It is thought that preferring bowel management

catheter method instead of colostomy in patients without rectum injury, who require diverting colostomy and have undamaged anal sphincters, can relieve patients, patients' relatives, healthcare organizations, and the national economy of a serious burden. In addition, although patients' satisfaction and workforce loss factors are not taken into consideration in this study, the bowel management catheter method is thought to have positive effects also on these parameters.

Keywords Necrotising infection · Colostomy · Bowel management catheter

Introduction

Fournier gangrene (FG) is a polymicrobial-based necrotizing infection which may develop fatality if not treated promptly (Fig. 1). Urgent fluid therapy, aggressive surgical debridement, and antibiotherapy should be applied initially [1–4]. Some researchers emphasize that parenteral nutrition is also required for these patients [5, 6]. Management of fecal contamination can possibly be encountered as a hard-to-solve problem in serious perianal diseases such as burns, traumas, and necrotizing fasciitis. It may be important to prevent fecal contamination in order to provide healing without wound infection. Still no consensus on management of fecal contamination by colostomy or bowel catheterization has been achieved. While some surgeons strongly oppose performing colostomy [7], others suggest that colostomy application is a major part of the treatment in patients requiring wide debridement [4, 8–10]. Nowadays, in our practice, we intend to avoid performing colostomy; however, sometimes it could be inevitable.

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Fig. 1 Appearance of a Fournier gangrene case before surgical debridement

In the present study, we aimed to compare methods of preventing fecal contamination with respect to their prognosis and cost efficiency in patients with FG.

Patients and Method

Forty-eight patients with serious perianal necrotizing infections and preserved sphincters and without rectum injury after debridement and who were diagnosed as having FG between March 2002 and February 2009 were selected for the study. Cases which were not close to the anal channel were treated by the urology clinic and were excluded from the study together with the patients who were subjected to colostomy because of sphincter damage and rectum injury. The cases were divided into two groups: one group had patients who were subjected to colostomy for fecal diversion (the colostomy group) and the second group had patients who were subjected to bowel management catheter (BMC) instead of colostomy (the BMC group) (Fig. 2). Then, the groups were compared in terms of age, predisposing factors, duration of hospital stay, mortality, additional surgery requirements, and cost. Patients who were subjected to colostomy were rehospitalized for colostomy closure or complications of colostomy. Total hospital stay was calculated by adding these additional durations to the initial hospital stay. Cost calculation for colostomy group patients



Fig. 2 Appearance of the same case after debridement and BMC application

included initial hospitalization cost, cost of colostomy materials used until colostomy closure, cost of the surgery made for colostomy closure, and costs of extra hospital stay or operations needed as a result of colostomy complications. Workforce loss of patients and patients' relatives was not included in this cost calculation, since it was not possible to calculate these parameters.

For the BMC group, cost calculation was carried out by taking initial hospitalization costs into consideration. Costs calculated for each patient were converted into US dollars on the rate valid on discharge date.

All patients were taken into operation under emergency conditions following information of patients and their relatives, and their consent was taken. Wounds were closed by the use of medical dressings after the wide debridement of all necrotizing tissues. Since BMC method became popular in our clinic practice in 2007, patients with preserved anal sphincters were subjected to BMC during or after operations. Daily maintenances were carried out for catheters and feces softener, and peristaltism-increasing medicines were administered. Besides, empirical antibiotic therapy was initiated. While oral intake was permitted postoperatively first day for the BMC group, it was permitted for patients who were subjected to colostomy when gas–feces discharge is determined to be sufficient.

Colostomies of patients who were successfully treated and discharged were closed 128 days later on average. For cases where BMC was used, tissue defects were closed through skin graft or with primary wound closure, after wound healing was ensured. BMCs were removed when wound healing processes were finished.

Statistical Analysis

Compliance of the data to normal distribution was tested; *t* test was applied for the analysis of continuous variables displaying normal distribution, Mann–Whitney *U* test was applied for the analysis of continuous variables not displaying normal distribution, and chi-square test was applied for the analysis of categorical variables. Results are presented in average±standard deviations, medians (min–max), *n*, and percentages. Situations with *P* value lower than 0.05 were considered to be statistically meaningful.

Findings

Thirty-two of the 48 patients included in the scope of the study were subjected to diverting colostomy, and BMC method was preferred for the remaining 16 patients. Demographical properties of the study group are given in Table 1. Average age was 52.5 years for the colostomy group and 56 years for the BMC group. Most frequently observed associated disease

Table 1 Demographic and clinical characteristic of the patients of the two groups

	Colostomy group (n=32)	BMC group (n=16)	P
Age ^a	49.5±13.3 52.5 (16–73)	53.9±18.1 56 (17–85)	0.342
Gender ^b			
Male	24 (75.0)	10 (62.5)	0.369
Female	8 (25.0)	6 (37.5)	
Comorbidity			
Not present	19 (59.4)	8 (50.0)	0.537
Present	13 (40.6)	8 (50.0)	
Total number of surgeries ^a	2.6±1.1 3 (1–5)	1.9±0.2 2 (1–2)	0.015
Duration of hospital stay ^a	30.8±18.8 30 (1–82)	24.1±11.1 16 (12–47)	0.216
Total duration of hospital stay ^a	40.5±23.4 38 (1–88)	24.1±11.1 16 (12–47)	0.008
Complications ^b			
Not present	27 (84.4)	16 (100.0)	0.154
Present	5 (15.6)	0 (0.0)	
Prognosis ^b			
Healing	24 (75.0)	15 (93.8)	0.117
Exitus	8 (25.0)	1 (6.3)	

^a Mean±SD and median (min–max)

^b Number (percentage)

was diabetes mellitus, with proportions of 31.35 % for the colostomy group and 43.7 % for the BMC group.

Average duration of hospital stay after the first surgery was found to be 30.8±18.8 days for the colostomy group and 24.1±14.1 days for the BMC group ($P=0.216$). When durations spent in the hospital for colostomy closure or complications were added, total duration of hospital stay for the colostomy group was calculated to be 40.5±23.4 days ($P=0.008$).

Average number of surgeries was 2.6±1.1 for the colostomy group and 1.9±0.2 for the BMC group ($P=0.015$) (Table 1).

When the complications connected with the diversion methods applied were analyzed, it was seen that five patients from the colostomy group experienced complications (15.6 %), while no complication connected with catheters was observed in the BMC group. Complications observed in the colostomy group were colostomy necrosis in one patient, colostomy prolapsus in one patient, parastomal hernia in one patient, and incisional hernia in two patients (Table 1).

The total number of mortalities was nine, eight of which developed in the colostomy group and one in the BMC group.

Statistically, no difference was determined between the two groups in terms of mortality ($P=0.117$) (Table 1).

When cost calculations were carried out, initial total costs occurred at initial hospitalization, and discharging periods were found to display no difference between the two groups ($P=0.357$). However, final total cost of the BMC group was understood to be meaningfully lower than the BMC group, when the expenses for colostomy complications, colostomy closing surgery costs, the costs of colostomy materials used until colostomy closure, and hospital stay costs were taken into consideration ($P=0.006$) (Table 2).

Discussion

Many FG cases associated with perianal area may lead a serious problem of fecal contamination [4]. Besides in cases of which the rectum is seriously affected, comprehensive interventions such as abdominoperineal resection might be required [11, 12]. Many surgeons suggest that colostomy is a major part of the treatment in cases requiring wide debridement. In certain studies, various proportions of colostomy are reported [1, 4, 13, 14]. Colostomy could be performed for cases which have wide sphincter injuries or those requiring wide perianal debridement. In the literature, there are studies suggesting that the use of bowel management catheters for preventing fecal contamination can be favorable in serious perianal area damages other than FG [15, 16].

Table 2 Cost analysis

	Colostomy group Mean±SD median (min–max)	BMC group Mean±SD median (min–max)	P
Initial hospitalization cost (USD)	7,887.0±4,794.0 6,795 (2,270–19,111)	6,695.8±2,462.7 6,510 (2,653–11,279)	0.357
Additional cost for colostomy materials (USD)	1,391.2±1,390.0 900 (0–5,312)	–	
Additional cost for colostomy closure (USD)	1,732.5±1,411.8 1,872 (0–6,700)	–	
Total cost (USD)	10,950.5±5,571.4 9,341.5 (2,280–21,995)	6,695.9±2,462.7 6,510 (2,653–11,279)	0.006

Fecal diversion with the use of BMC method is reported to be quite effective and to be able to decrease the need for colostomy and loss of graft, especially for burns that occurred on the perianal area or on the adjacent area [16].

FG treatment is a process of long duration. In certain studies, hospital stay durations of the cases are evaluated, and average duration of hospital stay is reported to be between 15.2 and 30 days [17–20]. Initial hospitalization period was determined to be 30.8 days for the colostomy group, whereas the same parameter was 24.1 days for the BMC group. However, according to the comparison performed between the two groups in terms of total duration of hospital stay, the result was found to be 40.5 days for the colostomy group and 24.1 days for the BMC group ($P<0.05$). Hence, total hospital duration was significantly shorter in BMC group than colostomy group. Our results suggest that BMC method is able to shorten the total duration of hospital stay (Table 1).

When numbers of surgeries for the two groups were compared, average number of surgeries was found to be 2.6 for the colostomy group and 1.9 for the BMC group. Since there was no need to perform additional surgeries for colostomy closure and colostomy complications in the BMC group, average number of surgeries was found to be lower, as expected ($P<0.05$) (Table 1).

Intubation period of BMC in the anal channel is recommended to be 29 days by the manufacturer. In a study conducted on the subject, the maximum number of days of intubation is reported to be 59 days in one case. In the same study, possible effects of BMC on the rectum mucosa were examined, and no negative result was determined [11]. In our study, while the rectum was not evaluated endoscopically, no complication associated with the use of BMC was determined. No statistically meaningful difference was established according to comparison in terms of complications between the two groups.

In diseases and traumatic injuries of the perianal area, diverting colostomies might be required for preventing fecal contamination [3, 4]. However, colostomy opening is known to have a negative effect on life standards of patients, cost, and hospital duration. Besides, patients have to undergo at least one additional surgery for reaching their previous conditions. When the evaluation is made in terms of costs, materials used for the maintenance of colostomy application, additional hospital stays for the second surgery, and workforce losses are seen to place extra burdens on the patients. Hence, the BMC method was determined to decrease total costs by shortening total duration of hospital stay, as expected ($P<0.05$) (Table 2).

Conclusion

In conclusion, it is suggested that bowel management catheter method should be considered instead of colostomy in

suitable cases. It may relieve patients, patients' relatives, healthcare organizations, and the national economy of a serious burden, based on our experience.

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