



# Controllable Risk Factor in the Development of Parastomal Hernia; Preoperative Marking

## Parastomal Herni Gelişiminde Kontrol Edilebilir Risk Faktörü; Preoperatif İşaretleme

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### ABSTRACT

**Aim:** Parastomal hernia is one of the most common ostomy-related late complications. Understanding the factors that play a role in development is very important in terms of preventing this complication. In this study, we aimed to determine the factors associated with the development of parastomal hernia and to reveal the relationship between herniation and preoperative stoma site marking.

**Method:** The data of 168 patients who underwent colostomy in our clinic were evaluated retrospectively. Demographic data, body mass index (BMI), malignant or benign disease status, emergency or elective operation, colostomy type, and preoperative stoma site marking were examined. Predictive factors in hernia development were determined by comparing patients with and without parastomal hernia.

**Results:** When the data of 168 patients were examined, the mean age was 59±26.2 years, the female/male ratio was 81/87, and the mean BMI was 29.8±16.2 kg/m<sup>2</sup>. One hundred eighteen patients (70.2%) had colostomy due to malignancy, and 50 (29.8%) had colostomy due to benign causes. Sixty-three patients (37.5%) were operated under urgent conditions while 105 (62.5%) had elective surgery. Loop colostomy was performed in 40 patients (23.8%) and end colostomy was performed in 128 patients (76.2%). One hundred six patients (63.1%) had preoperative stoma site marking, but 62 (36.9%) were not marked. The incidence of parastomal hernia in the study was 5.95%. Median follow-up was 18 months (11-29 months).

**Conclusion:** High BMI, emergency surgery, end colostomy, and not having preoperative stoma site marking were independent predictive risk factors for parastomal hernia development. Of these, the only controllable factor is preoperative marking. Performing preoperative stoma site marking in all possible cases will contribute to reducing the risk of parastomal hernia.

**Keywords:** Parastomal hernia, stoma site marking, stoma complications

### ÖZ

**Amaç:** Parastomal herni en sık görülen stoma ilişkili geç dönem komplikasyonlardan biridir. Gelişiminde rol oynayan faktörlerinin anlaşılması bu komplikasyonun önlenmesi açısından oldukça önemlidir. Bu çalışmada parastomal herni gelişiminde etkili faktörlerin saptanması ve özellikle preoperatif stoma yeri işaretlemesi ile herni gelişimi arasındaki ilişkinin ortaya konulması hedeflenmiştir.

**Yöntem:** Kliniğimizde kolostomi açılan 168 hastanın verileri retrospektif olarak değerlendirildi. Demografik veriler, vücut kitle indeksi (VKİ), malign veya benign hastalık durumu, ameliyatın acil veya elektif yapılması, kolostomi tipi ve preoperatif stoma yeri işaretlemesi yapıp yapılmadığı incelendi. Parastomal herni gelişen ve gelişmeyen hastalar karşılaştırılarak herni gelişiminde etkili prediktif faktörler tespit edildi.

**Bulgular:** Yüz altmış sekiz hastanın verileri incelendiğinde yaş ortalaması 59±26,2 yıl, kadın/erkek oranı 81/87, VKİ ortalaması ise 29,8±16,2 kg/m<sup>2</sup> olarak hesaplandı. Yüz on sekiz (%70,2) hastada malignite nedeniyle, 50 hastada (%29,8) benign nedenlerden dolayı kolostomi açıldığı görüldü. Yüz beş (%62,5) hasta elektif şartlarda ameliyat edilmişken 63 hasta (%37,5) acil şartlarda ameliyat edilmişti. Hastaların 40'ında (%23,8) loop kolostomi, 128'inde (%76,2) uç kolostomi mevcuttu. Yüz altı (%63,1) hastada preoperatif stoma yeri işaretlenmişken 62 (%36,9) hastada işaretleme yapılmadığı görüldü. Çalışmadaki parastomal herni insidansı %5,95 olarak saptandı. Medyan takip süresi 18 aydı (11-29 ay).

**Sonuç:** Artmış VKİ, acil ameliyat, uç kolostomi tipi ve stoma yerinin işaretlenmemesi parastomal herni gelişimi için bağımsız prediktif risk faktörleri olarak saptanmıştır. Bu değişkenler içerisinde kontrol altına alınabilir tek faktör preoperatif işaretlemedir. Mümkün olan tüm hastalarda preoperatif stoma yeri işaretlemesinin yapılması parastomal herni riskinin azaltılmasına katkı sağlayacaktır.

**Anahtar Kelimeler:** Parastomal herni, stoma yeri işaretlemesi, stoma komplikasyonları



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Received/Geliş Tarihi: 10.06.2018 Accepted/Kabul Tarihi: 07.08.2018

## Introduction

Parastomal hernia is defined as the protrusion of abdominal contents through a wall defect adjacent to a stoma.<sup>1</sup> It occurs at an incidence of 28.3% in permanent ileostomies and 48.1% in permanent colostomies.<sup>2</sup> This common complication adversely affects quality of life and often requires surgical treatment, which makes prevention even more important. Factors such as obesity, older age, wound infection, and steroid use are known to increase the risk of parastomal hernia.<sup>2,3</sup> Besides these patient-related factors, there are also risk factors related to surgical technique such as wide fascial opening, laparoscopic method, and transperitoneal route.<sup>4,5</sup> Preoperative stoma marking is shown to reduce the rate of complications, particularly skin problems, and to result in better quality of life.<sup>6,7,8</sup> Preoperative marking is easy to implement in both emergency and elective cases. In this study, we retrospectively analyzed patients who had colostomies in our center to identify the risk factors for parastomal hernia and especially to evaluate the relationship between preoperative stoma marking and hernia development.

## Materials and Methods

Data from the hospital's medical database system and stoma therapy unit records pertaining to 168 patients who underwent colostomy for various reasons in Zonguldak Bülent Ecevit University Medical School Health Application and Research Center between January 2013 and December 2016 were analyzed retrospectively. Patients with and without parastomal hernia were compared to identify predictive factors for hernia development. Presence of parastomal hernia was the dependent variable, while patient age, gender, body mass index (BMI), presence of benign or malignant disease, emergency or elective surgery, type of colostomy, and preoperative stoma marking were evaluated as independent variables. Patients with stomas created using percutaneous methods were not included in the study. Informed consent was obtained from all patients in the study.

All of the patients diagnosed with parastomal hernia had presented to the hospital with symptoms such as swelling around the stoma, pain, and asymmetry near the stoma. All patients in this group were examined by a surgeon after removing their stoma bags and adaptors in both erect and supine positions while performing the Valsalva maneuver. Asymmetry adjacent to the stoma, fascial defects, and reducibility were evaluated in abdominal examination. In addition, digital examination through the stoma was done to assess the relationship between the stoma and fascial planes. All cases with suspected hernia were examined by means of contrast-enhanced abdominal computed tomography (CT).

Findings of a hernial sac protruding into the abdominal wall were considered significant in radiological examination.

The group who had stoma site marking included patients whose preoperative marking was done by stomatherapy and wound care nurses certified by the Turkish Society of Wound, Ostomy and Incontinence Nurses. When marking, stoma site was determined such that it would anatomically pass through the rectus muscle, away from incision line, costal arch, bone spurs, skin folds and belt line, and be easily visible and accessible to the patient. The marking procedure is first done with the patient in supine position and the final site is determined with the patient in seated position. The unmarked patients had their stoma location determined by the surgeon intraoperatively.

## Statistical Analysis

Patients with and without parastomal hernia were compared. Categorical data were analyzed using  $\chi^2$  test and continuous data using Mann-Whitney U test. Factors found to be significant in univariate logistic regression analyses were included in multivariate logistic regression analysis to identify predictive factors. All data were analyzed using SPSS 19.0 (SPSS Inc., Chicago, IL, USA).  $P < 0.05$  was considered statistically significant.

## Results

According to the demographic data of the 168 patients included in the study, the mean age was  $59 \pm 26.2$  years, female/male ratio was 81/87, and mean BMI was  $29.8 \pm 16.2$  kg/m<sup>2</sup>. Median follow-up period was 18 months (minimum 11 months, maximum 29 months). One hundred eighteen (70.2%) of the patients had colostomy due to malignancy and 50 (29.8%) for benign disease. Surgery was elective in 105 (62.5%) cases and emergent in 63 (37.5%) cases. Only 1 patient who had elective surgery did not have preoperative stoma marking, while only 2 of the patients who had emergency surgery could be marked because their procedures were done during the working hours of the stomatherapy nurse. Forty (23.8%) of the patients had loop colostomy and 128 (76.2%) had end colostomy. In total, 106 patients (63.1%) had preoperative stoma marking and 62 (36.9%) did not (Table 1).

Ten patients had radiologically confirmed parastomal hernia. The demographic characteristics of these patients are given in detail in Table 2. Of the patients with parastomal hernia, 8 had malignant disease, 2 had benign disease, and 6 underwent emergency surgery. All of the patients with parastomal hernia had end colostomies, and half had the preoperative stoma site marking. Median time from colostomy procedure to parastomal hernia development was 15 months (minimum 6 months, maximum 22 months).

The incidence of hernia in our study was 5.95%. In univariate analyses, factors associated with parastomal hernia development included female gender, higher BMI, malignancy, emergency surgery, end colostomy, and unmarked stoma site (Table 3). Multivariate analyses showed that increased BMI, emergency surgery, end colostomy, and unmarked stoma site were statistically significant predictive factors (Table 4).

## Discussion

Parastomal hernia is a form of incisional hernia that develops at the site of an intestinal stoma. Many studies have shown it to be one of the most common late stoma-

related complications.<sup>9,10,11</sup> In surgical practice, it is difficult to identify the actual rate of parastomal hernia, and the incidence is higher than expected when radiology is used to support physical examination.<sup>12</sup> Parastomal hernia occurs at rates of 1.8-28.3% in permanent ileostomy, 4-48.1% in permanent colostomy, and 13.9% in urostomy.<sup>2,3</sup> In a study using CT examination as a criterion, the incidence increased from 52% to 78% after imaging.<sup>12</sup> Our study included both loop and end colostomy patients and the general incidence of parastomal hernia was 5.95%. Although this rate is near the lower limits reported in the literature, the actual incidence may have been higher because only symptomatic patients were included. Besides the positive contribution of marking, it is irrefutable that our study did not include patients who did not present to the hospital because their parastomal hernia was asymptomatic or did not have a marked impact on their quality of life.

Numerous studies have shown that the incidence of parastomal hernia is higher in end colostomies than in loop colostomies. According to a meta-analysis encompassing a follow-up period of 10 years, parastomal hernia rates range between 0% and 30.8% after loop colostomy, compared to 4% to 48.1% after end colostomy.<sup>2</sup> All of the patients in our study who developed parastomal hernia had end colostomies. When analyzed separately according to colostomy type, the incidence of parastomal hernia was 0% for loop colostomy and 7.81% for end colostomy. Not only is this finding consistent with the literature, but end colostomy was also identified as a predictive factor in both univariate and multivariate analyses, which is important evidence of the relation between colostomy type and parastomal hernia development.

**Table 1.** Clinical and operative characteristics of the study group

Age (years) (mean ± SD)	59±26.2
Female/male (n)	81/87
*BMI (kg/m <sup>2</sup> ) (mean ± SD)	29.8±16.2
Disease (%)	
Malignant	70.2%
Benign	29.8%
Surgery (%)	
Emergency	37.5%
Elective	62.5%
Patients with stoma site marking (n)	106
Patients without stoma site marking (n)	62
Ostomy type (n)	
Loop colostomy	40
End colostomy	128

\*BMI: Body mass index, SD: Standard deviation

**Table 2.** Characteristics of patients with parastomal hernia

Number of patients	Sex	Age (years)	BMI (kg/m <sup>2</sup> )	Disease	Surgery	Stoma site marking	Colostomy type	Time from colostomy to hernia development (months)
1	Female	43	29.4	Benign	Emergency	+	End	18
2	Male	67	30.2	Malignant	Emergency	+	End	22
3	Female	54	26.8	Malignant	Elective	+	End	9
4	Female	52	25.4	Malignant	Elective	-	End	15
5	Female	50	23.7	Malignant	Emergency	-	End	13
6	Female	57	31.6	Malignant	Elective	+	End	6
7	Female	36	27.1	Benign	Emergency	-	End	8
8	Male	77	26.7	Malignant	Emergency	-	End	15
9	Female	42	32.8	Malignant	Elective	+	End	18
10	Male	70	29.3	Malignant	Emergency	-	End	12

BMI: Body mass index

Parastomal hernia may be asymptomatic or may cause life-threatening complications such as strangulation, incarceration, obstruction, or perforation.<sup>1,10,11,13</sup> Furthermore, quality of life is significantly reduced by common stoma-related problems such as pain, leakage from the adaptor, peristomal irritation, and cosmetic concerns.<sup>4,7,8,9</sup> Unsatisfactory results have also been observed in patients with severe morbidity or who require surgical repair due to poor adaptation to ostomy devices.<sup>14</sup> These factors increase the importance of preventing or minimizing the risk of parastomal hernia. Multifactorial

**Table 3.** Risk factors for parastomal hernia development (univariate analysis)

Variable	Patient number		Univariate p value
	Parastomal hernia (+)	Parastomal hernia (-)	
<b>Gender</b>			
Female	7	74	<0.001
Male	3	84	
<b>Age (years) (mean ± SD)</b>	54.8±13.1	58.2±26.1	0.897
<b>BMI (kg/m<sup>2</sup>) (mean ± SD)</b>	28.3±2.8	29.7±15.9	<0.001
<b>Disease</b>			
Malignant	8	110	<0.001
Benign	2	48	
<b>Surgery</b>			
Emergency	6	57	<0.001
Elective	4	101	
<b>Stoma site marking</b>			
(-)	5	57	<0.001
(+)	5	101	
<b>Colostomy type</b>			
End colostomy	10	118	<0.001
Loop colostomy	-	40	

BMI: Body mass index, SD: Standard deviation

**Table 4.** Independent predictive factors of parastomal hernia development in multivariate analysis

Variable	Odds ratio	95% Confidence interval	p value
BMI (kg/m <sup>2</sup> )	1.8	1.2-2.7	<0.001
Surgery (emergency/elective)	1.9	1.5-2.5	<0.001
Stoma site marking (yes/no)	1.4	1.1-1.8	<0.001
Colostomy type (Loop/end colostomy)	3.15	1.05-9.5	<0.001

BMI: Body mass index

mechanisms have been implicated in its development. Patient-related risk factors include older age<sup>3,5,10,11,12,13,14,15,16</sup>, elevated intraabdominal pressure<sup>2,15,17</sup>, higher BMI and obesity<sup>2,3,4,11,15,16,17</sup>, malignancy<sup>2,9,11,15</sup>, chronic obstructive lung disease<sup>2,11,17</sup>, ascites<sup>2,17</sup>, wound site infection, corticosteroid use<sup>2,11,17</sup>, smoking, diabetes<sup>11</sup>, malnutrition<sup>2,17</sup>, female gender<sup>5,16</sup> and other accompanying abdominal wall defects<sup>10</sup>. Technical factors include emergency surgery<sup>2,15</sup>, transperitoneal route<sup>4</sup>, laparoscopic method<sup>4</sup>, diameter of stoma window<sup>5,15,17</sup> and exposing the stoma through the resection site.<sup>18</sup> In our study, factors associated with parastomal hernia development in univariate analyses were female gender, increased BMI, malignancy, emergency surgery, end colostomy, and lack of stoma site marking. In multivariate analyses, high BMI, emergency surgery, and lack of stoma site marking were identified as predictive factors for parastomal hernia.

Of these, preoperative stomal site marking stands out as the only modifiable risk factor. Evidence indicates that preoperative stoma site marking reduces the general complication rate and improves quality of life.<sup>6,7,8,19</sup> Parastomal hernia and other stoma-related complications occur at higher rates in patients who do not undergo stomal marking.<sup>7,8,19,20</sup> Accurate determination of the stoma site is important to enable the creation of a functional stoma even in the most challenging circumstances.<sup>20</sup> Prior to elective surgery, most patients have an opportunity to see a stomatherapist for preoperative stoma site marking and education. However, if a stomatherapy unit is not available or if surgery is emergent, the marking must be done by the surgeon. It should be kept in mind that in such cases, marking done in the operating room will not be sufficiently effective; therefore, care must be taken to have marking done preoperatively whenever possible.<sup>21</sup> In our study, it was determined that parastomal hernia risk was higher in patients who underwent colostomy opened without preoperative stoma site marking. The key feature that distinguishes this factor from the other significant predictive factors identified in multivariate analysis is that it is modifiable.

Limitations of this study are that it included only patients with symptomatic hernia, was retrospective in design, and involved a relatively short follow-up period.

In conclusion, our multivariate analysis results show that preoperative stoma site marking was the only modifiable risk factor associated with parastomal hernia. We believe that the routine implementation of this quick and easy procedure with as many patients as possible will help minimize the risk of stoma-related complications, especially parastomal hernia.

## Ethics

**Ethics Committee Approval:** Retrospective study.

**Informed Consent:** Consent form was filled out by all participants.

**Peer-review:** External and internal peer-reviewed.

## Authorship Contributions

**Surgical and Medical Practices:** F.A.G., **Concept:** R.K., F.A.G., **Design:** R.K., F.A.G., **Data Collection or Processing:** R.K., F.A.G., **Analysis or Interpretation:** F.A.G., **Literature Search:** R.K., **Writing:** R.K., F.A.G.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

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