

ORIGINAL ARTICLE

Risk factors for parastomal hernia: based on radiological definition

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Purpose: The aim of this study was to investigate the clinical and radiological incidence of parastomal hernia and to analyze the risk factors for parastomal hernia. **Methods:** We reviewed retrospectively 108 patients with end colostomy from January 2003 to June 2010. Age, sex, surgical procedure type, body mass index (kg/m²), stoma size, and respiratory comorbidity were documented. **Results:** There were 61 males (56.5%) and 47 females (43.5%). During an overall median follow-up of 25 months (range, 6 to 73 months), 36 patients (33.3%) developed a radiological parastomal hernia postoperatively and 29 patients (26.9%) presented with a clinical parastomal hernia. In multivariate analysis, gender (odds ratio [OR], 6.087; P = 0.008), age (OR, 1.109; P = 0.009) and aperture size (OR, 6.907; P < 0.001) proved to be significant and independent risk factors after logistic regression analysis. **Conclusion:** This study showed that the incidence of radiological parastomal hernia is higher than clinical parastomal hernia. Risk factors for parastomal hernia proved to be female, age, and aperture size.

Key Words: Hernia, Computed tomography, Colostomy

INTRODUCTION

Parastomal hernia is defined as the protrusion of abdominal contents through the abdominal wall defect in the vicinity of the stoma [1]. Contributing factors to the development of a parastomal hernia are obesity [2,3], chronic obstructive airway disease [2,4], ascites [4], site of stoma placement [5], and size of the fascial opening [6]. The incidence reported in the literature ranges from 10% to 56% for end colostomies [7]. These studies have been retrospective reviews of the clinical notes. As a result, asymptomatic parastomal hernias may not have been detected [8]. A recent study reported incidence of parastomal hernia up

to 78% detected either clinically or by computed tomography (CT) [9]. However, reports identifying these risk factors with radiological classification are lacking.

The aim of this study was to investigate the clinical and radiological incidence of parastomal hernia and to analyze the risk factors for radiological parastomal hernia (RPH).

METHODS

We reviewed retrospectively 108 patients with end colostomy from January 2003 to June 2010 at Ajou University Hospital. One hundred eight patients underwent colos-

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tomy for rectal or anal cancer (n = 104) or other diseases (n = 4). Diagnoses of other disease included ovarian cancer (n = 3), and volvulus (n = 1). Age, gender, surgical procedure type, body mass index (BMI, kg/m²), waist circumference, aperture size, and comorbidities were documented. Waist circumference was measured on the initial abdominal CT scan by using a medical imaging program that allows the measurement of the abdominal perimeter at the level of the umbilicus. The aperture sizes of all stomas were measured in millimeters using the first postoperative follow up CT scan. The data were collected during outpatient visits in Ajou University Hospital. Informed consent was obtained from patients, and the project was authorized by the Ethics Committee at Ajou University Hospital.

The stoma was marked preoperatively by an experienced stoma nurse. All colostomies were intraperitoneal with fixation to the fascia at two points with silk suture material. Clinical hernias were diagnosed on physical examination and symptom. The patient was examined in the supine and erect position while performing the Valsalva maneuver. Patients were asked about discomfort, pain, or protrusion of the abdominal contents caused by movement. RPH was defined as any intraabdominal content protruding beyond the fascia or the presence of a hernia sac. The development of a parastomal hernia was assessed by serial abdominal CT scans performed routinely every 6 to 12 months during follow-up.

We usually manage parastomal hernias conservatively using reassurance and education for the patients, with or without the use of an abdominal support belts or girdles. Indications for surgical intervention are strangulation, obstruction, and recurrent parastomal pain.

The SPSS ver. 15.0 (SPSS Inc., Chicago, IL, USA) was used for the analysis. Differences between groups were assessed by the chi-squared test and Fisher's exact test for categorical data and Student's t-test for continuous data. Interrelations between the risk factors were assessed with logistic regression analysis with a threshold of 5 percent for the inclusion of additional prediction into the model. The presence or absence of a parastomal hernia was used as the dependent variable, and the clinical characteristics (age, sex, BMI, type of procedure, and waist circumference) as the independent variable. P < 0.05 was consid-

ered statistically significant.

RESULTS

There were 108 patients with a mean age of 60.1 years (range, 22 to 86 years). There were 61 males (56.5%) and 47 females (43.5%). The mean BMI was 23.9 kg/m² (range, 16.4 to 36.6 kg/m²). The mean body weight was 62.2 kg (range, 37 to 115 kg). Operation type was Hartmann's procedure in 49 patients (45.4%) and abdominoperineal resection in 59 patients (54.6%) (Table 1). Median follow-up period was 25 months (range, 6 to 73 months). The mean aperture size was 2.9 cm (range, 1.8 to 4.8 cm).

Table 1. Patients characteristics

Variable	Patients with PH (n = 36)	Patients without PH (n = 72)	P-value
Age (yr)	64.7 ± 8.5	57.8 ± 12.6	0.001
Gender			0.001
Male	12 (33.3)	49 (68.1)	
Female	24 (66.7)	23 (31.9)	
Body mass index (kg/m ²)	25.4 ± 6.0	23.2 ± 3.3	0.013
Waist circumference (cm)	88 ± 10	83 ± 10	0.017
Aperture size (cm)	3.4 ± 0.7	2.7 ± 0.6	<0.001
Operation			0.133
Hartmann's procedure	20 (55.6)	29 (40.3)	
APR	16 (44.4)	43 (59.7)	
Smoking history			0.054
No	33 (91.7)	55 (76.4)	
Yes	3 (8.3)	17 (23.6)	
Hypertension			0.121
No	19 (52.8)	49 (68.1)	
Yes	17 (47.2)	23 (31.9)	
Diabetes			1
No	31 (86.1)	62 (86.1)	
Yes	5 (13.9)	10 (13.9)	
Clinical hernia			<0.001
No	7 (19.4)	72 (100)	
Yes	29 (80.6)	0	
Radiation history			0.051
No	30 (83.7)	47 (65.3)	
Yes	6 (16.7)	25 (34.7)	
Operation type			0.661
Elective	35 (97.2)	67 (93.1)	
Emergency	1 (2.8)	5 (6.9)	
Follow-up (mo)	23.0 (6-63)	25.5 (11-73)	0.174

Values are presented as mean ± standard deviation or number (%). PH, parastomal hernia; APR, abdominoperineal resection.

Table 2. Multivariate analysis for risk factors predicting parastomal hernia

Variable	Odds ratio	95% Confidence interval	P-value
Gender			0.005
Male	1		
Female	4.406	1.563-12.416	
Age	1.077	1.020-1.138	0.008
Aperture	4.278	1.964-9.317	<0.001
Body mass index	1.066	0.915-1.243	0.413
Waist circumference	1.002	0.996-1.009	0.521

During the follow-up, 36 patients (33.3%) developed a RPH postoperatively and 29 patients (26.9%) presented clinical parastomal hernia. In most cases, we managed the clinical parastomal hernia conservatively. Intervention was required for strangulation in two cases. One patient is a 62-year-old male with 4 cm sized aperture and the other is a 68-year-old male with 3.5 cm sized aperture. The two patients were discharged uneventfully after resection of strangulated bowel and relocation of a stoma to a new position on the abdominal wall with laparotomy.

In univariate analysis, gender ($P = 0.001$), age ($P = 0.001$), BMI ($P = 0.013$), waist circumference ($P = 0.017$) and aperture size ($P < 0.001$) proved to be significantly higher in patients in whom a parastomal hernia occurred (Table 1).

In multivariate analysis, gender (odds ratio [OR], 4.406; $P = 0.005$), age (OR, 1.077; $P = 0.008$), and aperture size (OR, 4.278; $P < 0.001$) proved to be significant and independent risk factors after logistic regression analysis (Table 2).

DISCUSSION

At clinical examination, parastomal hernia was defined as any protrusion beyond the fascia in the vicinity of the stoma. Parastomal hernia is the most frequent problem following stoma formation [10]. The actual parastomal hernia rate in surgical practice is difficult to establish and is probably commonly underestimated [9,11].

Assessment of incidence is also distorted by the definition of parastomal hernia, with up to 78% reported when the diagnosis was established on CT criteria in a small ser-

ies of 23 patients [9]. The only clinical classification available in the literature was published by Devlin and Kingsnorth [12]. However, because of its complexity, it has not been widely used in clinical studies. The lack of a proper definition of parastomal hernia in reported cases makes it difficult to compare rates of parastomal hernia between different series and to estimate the true rate of herniation. Radiological methods such as CT scan have been utilized as an aid in detecting parastomal hernia and results have been reported in a few studies [9,13,14]. The use of a CT scan may have contributed to the high hernia rates as it can detect subclinical parastomal hernias. It seems that with a CT scan, more parastomal hernias can be detected than perceived by clinical examination alone.

This study of prospectively collected data by well-trained stoma nurse specialists has estimated a 33.3% prevalence of parastomal hernia. Twenty-seven of the 36 patients were found to have clinical hernia. Adequate follow-up of these patients may be necessary to determine whether or not they will develop a more advanced parastomal hernia. It is generally agreed that follow-up should be no less than 12 months after the index operation to detect a ventral incisional hernia. Likewise, the definition of parastomal hernia should be included at a follow-up that is no less than 12 months after the index operation. In this study, the follow-up period is acceptable because median follow-up period is 25 months and follow-up is no less than 11 months in patients without parastomal hernia.

Although there is no scientific evidence supporting various risk factors, many factors have been suggested as important. The etiology of parastomal hernia is known to be multifactorial and involves factors related to the patient and factors associated with surgery [2]. Conditions thought to be relevant in predispositions to parastomal hernia include: obesity [2-4], raised intraabdominal pressure (prostatic hypertrophy, constipation, and ascites), chronic obstructive airways disease [2,4], postoperative sepsis [2,4], corticosteroid use [2,4], and malignancy [4]. Patient factors, such as age, smoking status [15], and degree of malnutrition [2,5], have also been suggested as an independent factor in multivariate analysis. Technical factors, such as whether the case was performed as an emergency [4,16] and aperture size [6], are also reported as

important. We analyzed the risk factors influencing the radiologic parastomal hernia including age, gender, aperture size, BMI, waist circumference, and comorbidity.

Smoking status, hypertension and diabetes mellitus were not different between patients with parastomal hernia and those without parastomal hernia.

The mean BMI was significantly higher in those with radiologic parastomal hernia than those without hernia. BMI may be related to the surgical difficulty and diagnostic problems of evaluating by clinical examination. However, BMI was not a significant independent factor for radiologic parastomal hernia in multivariate analysis [17].

Waist circumference was also significantly higher in those with radiologic parastomal hernia. However, it was not a significant independent risk factor for radiologic parastomal hernia in multivariate analysis. This result is contradictory to a previous study suggesting that the waist circumference can be a simple method to accurately assess the risk of developing a parastomal hernia [18].

In this study, aperture size is significantly associated with a higher parastomal hernia rate. With an area larger than 3 cm, herniation was much more common than with a smaller opening. It was, however, also evident that a large stoma opening alone was not sufficient to declare a RPH being present. In this study, the stoma opening size was an independent risk factor for RPH. Martin and Foster [2] suggested a 2 cm aperture for ileostomies and a 1.5 cm aperture for colostomies. Currently there are few data by which to judge about the appropriate size of the abdominal wall opening to minimize parastomal hernia formation. The smallest opening that allows the creation of a viable stoma without ischemia appears to be the best guide.

Most parastomal hernias are asymptomatic but may produce problems ranging from mild parastomal discomfort to life-threatening complications, such as strangulation, perforation and obstruction [1,19]. Intervention is required for strangulation or obstruction, although most parastomal hernias can be managed conservatively. Therefore, it is important to evaluate the state of colostomy before the development of complicated parastomal hernia. Long-term follow-up of patients with subclinical parastomal hernia may develop a more advanced clinical parastomal hernia. CT is a reliable method to detect and man-

age this parastomal hernia.

In conclusion, this study showed risk factors for RPH proved to be age, gender and aperture size. CT is a useful method to detect the radiologic parastomal hernias, especially in asymptomatic patients without overt hernias. However, the clinical significance of radiologic parastomal hernias remains to be evaluated.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Pearl RK. Parastomal hernias. *World J Surg* 1989;13:569-72.
2. Martin L, Foster G. Parastomal hernia. *Ann R Coll Surg Engl* 1996;78:81-4.
3. Marimuthu K, Vijayasekar C, Ghosh D, Mathew G. Prevention of parastomal hernia using preperitoneal mesh: a prospective observational study. *Colorectal Dis* 2006;8:672-5.
4. Carne PW, Robertson GM, Frizelle FA. Parastomal hernia. *Br J Surg* 2003;90:784-93.
5. Sjudahl R, Anderberg B, Bolin T. Parastomal hernia in relation to site of the abdominal stoma. *Br J Surg* 1988;75:339-41.
6. Etherington RJ, Williams JG, Hayward MW, Hughes LE. Demonstration of para-ileostomy herniation using computed tomography. *Clin Radiol* 1990;41:333-6.
7. Cheung MT, Chia NH, Chiu WY. Surgical treatment of parastomal hernia complicating sigmoid colostomies. *Dis Colon Rectum* 2001;44:266-70.
8. Carne PW, Frye JN, Robertson GM, Frizelle FA. Parastomal hernia following minimally invasive stoma formation. *ANZ J Surg* 2003;73:843-5.
9. Cingi A, Cakir T, Sever A, Aktan AO. Enterostomy site hernias: a clinical and computerized tomographic evaluation. *Dis Colon Rectum* 2006;49:1559-63.
10. Londono-Schimmer EE, Leong AP, Phillips RK. Life table analysis of stomal complications following colostomy. *Dis Colon Rectum* 1994;37:916-20.
11. Israelsson LA. Preventing and treating parastomal hernia. *World J Surg* 2005;29:1086-9.
12. Devlin HB, Kingsnorth A. Parastomal hernia. In: Devlin A, Kingsnorth A, editors. *Management of abdominal hernias*. 2nd ed. London: Bulterworths; 1998. p.257-66.
13. Moreno-Matias J, Serra-Aracil X, Darnell-Martin A, Bombardo-Junca J, Mora-Lopez L, Alcantara-Moral M, et

- al. The prevalence of parastomal hernia after formation of an end colostomy. A new clinico-radiological classification. *Colorectal Dis* 2009;11:173-7.
14. Serra-Aracil X, Bombardo-Junca J, Moreno-Matias J, Darnell A, Mora-Lopez L, Alcantara-Moral M, et al. Randomized, controlled, prospective trial of the use of a mesh to prevent parastomal hernia. *Ann Surg* 2009;249:583-7.
 15. Gogenur I, Mortensen J, Harvald T, Rosenberg J, Fischer A. Prevention of parastomal hernia by placement of a polypropylene mesh at the primary operation. *Dis Colon Rectum* 2006;49:1131-5.
 16. Pilgrim CH, McIntyre R, Bailey M. Prospective audit of parastomal hernia: prevalence and associated comorbidities. *Dis Colon Rectum* 2010;53:71-6.
 17. Gurmu A, Matthiessen P, Nilsson S, Pahlman L, Rutegard J, Gunnarsson U. The inter-observer reliability is very low at clinical examination of parastomal hernia. *Int J Colorectal Dis* 2011;26:89-95.
 18. De Raet J, Delvaux G, Haentjens P, Van Nieuwenhove Y. Waist circumference is an independent risk factor for the development of parastomal hernia after permanent colostomy. *Dis Colon Rectum* 2008;51:1806-9.
 19. Lou JY, Wu YL, Wu D. Incarcerated internal hernia within a huge irreducible parastomal hernia with intestinal obstruction: a rare case report of "hernia within hernia". *J Korean Surg Soc* 2012;83:179-82.