



Incidence and risk factors for incisional hernia after temporary loop ileostomy closure: choosing candidates for prophylactic mesh placement

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Abstract

Objectives The primary aim of this study was to identify the incisional hernia rate after temporary loop ileostomy closure. Secondary outcomes were determining the risk factors linked to this incisional hernia, which could improve the patient selection for mesh prophylaxis.

Methods Retrospective cohort study of all consecutive patients with temporary loop ileostomy reversal through a peristomal incision from 1st January 2011 to 1st January 2017 at our centre. Data were extracted from electronic clinical records: baseline patient characteristics, surgical factors and postoperative events. CT scans performed during follow-up were precisely analysed. Survival analysis was applied to identify risk factors for hernia development.

Results 129 patients were analysed of whom 15 (11.6%) developed an incisional hernia at previous ileostomy site. The median time for incisional hernia development was 11 months (IQR = 7–21) and the median follow-up time was 37 months (IQR = 22–57). The identified patient risk factors for hernia development in survival analysis were female sex, older age, higher Body Mass Index, clinically significant parastomal hernia, clinically detectable midline incisional hernia and major postoperative complications ranked as Clavien–Dindo grade III and IV.

Conclusions Incisional hernia after temporary loop ileostomy is a relevant problem that affects at least one in every ten patients. The previously cited risk factors might favour its development, therefore the use of a prophylactic mesh should be considered in those high-risk patients.

Introduction

Background

The confection of a temporary loop ileostomy is a frequently used surgical technique in colorectal surgery, made to reduce the morbidity associated to high-risk anastomosis leak. Short-term complications after ileostomy closure include leakage of the new anastomosis and surgical site infection (SSI) of previous ileostomy site. Long-term adverse events involve the development of an incisional hernia after ileostomy closure. The initially estimated rate was 4% [1] with a high variability among different studies

(0–50%). However, more recent articles quantified the incisional hernia rate after ileostomy closure between 5% [2] and 23.9% [3].

Risk factors for incisional hernia in previous ileostomy site detected until date were: higher body mass index (BMI) [2, 4, 5], lower age, open surgery, longer reversal time and a history of previous hernias [4], a higher blood pressure at preoperative assessment [3, 5], colorectal cancer surgery [5] and midline incisional hernia [3]. Purse-string skin closure has shown a reduction in SSI rates [6], but his effect over future hernia rates remains unknown.

Given the relevance of the problem, some authors began to reinforce the ileostomy closure with the placement of a prophylactic mesh, achieving hernia rates around 5% [7–9]. Nevertheless, the systematic use of mesh at the time of stoma closure has yet to be clarified by further studies.

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Objectives

The primary aim of this study was to identify the incisional hernia rate after ileostomy closure, defined according to the European Hernia Society (EHS) [10] as “any abdominal wall gap with or without a bulge in the area of a postoperative scar perceptible or palpable by clinical examination or imaging”. Secondary outcomes were determining the risk factors linked to this incisional hernia, which could improve the patient selection for mesh prophylaxis.

Methods

This article was written according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies [11].

Study design

Single-institution retrospective cohort study.

Setting and participants

All consecutive patients with temporary loop ileostomy reversal through a peristomal incision from 1st January 2011 to 1st January 2017 at a tertiary hospital. Patients were identified through a research in the clinical history records.

Excluded patients were those lost to follow-up, deceased within 30 days after surgery and those with a new stoma formation in previous ileostomy site within 30 days after the first surgery.

Follow-up

Patients were followed until the development of a hernia in previous ileostomy site, their last contact with the institution, new stoma creation in previous ileostomy site 30 days after stoma closure or the death of the patient.

Variables

Data were extracted from electronic medical records: age at ileostomy closure time, sex, Body Mass Index, comorbidity and ASA category, indication of the temporary loop stoma, time to stoma reversal, type of surgical approach, presence of parastomal or midline incisional hernia, and kind of skin closure. The analysed data during follow-up were: postoperative complications according to Clavien–Dindo classification [12], SSI according to the Centers for Disease

Control (CDC) definitions [13] with the treatment given to the SSI and incisional hernia in previous ileostomy site during follow-up.

The CT scans done to the patient were analysed from the ileostomy creation until the end of follow-up. In those patients in whom an incisional hernia was detected, CT scans were reviewed in detail to establish the approximate date of hernia formation.

Bias

There might be a selection bias since not every patient underwent a CT scan. The indication of the image studies was given by the baseline pathology of the patient, not by their inclusion in the study.

Study size

Most of previous articles quantified the hernia after ileostomy closure between 11.1% [14] and 14.9% [4]. Therefore, a minimum of 100 participants was needed to have at least 10 events of interest (hernia at the former ileostomy site) to analyse the risk factors.

Statistical analysis

Categorical variables were described as percentages. Quantitative variables were described with mean and standard deviation if they followed a normal distribution and with median and interquartile range (IQR) if they followed a non-normal distribution.

To analyse the risk factors for incisional hernia development, survival analysis was applied. Log-rank test was used for dichotomous categorical variables and Cox-model regression for polytomous categorical and quantitative variables. Hazard ratios and their 95% confidence intervals (CI 95%) were calculated with Cox-model regression. $p < 0.05$ was considered statistically significant.

The analysis was performed with IBM® SPSS Statistics 23®.

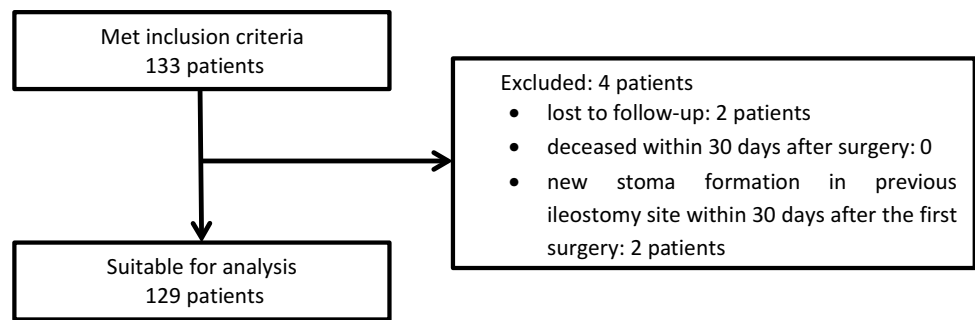
Results

Participants

133 patients met inclusion criteria. 4 patients were excluded. Therefore, 129 patients were analysed (Fig. 1).

Baseline characteristics at the moment of stoma closure are shown in Table 1.

20 patients of the total (15.5%) had a clinically detectable parastomal hernia before stoma closure or noticed during ileostomy reversal surgery. 84 patients underwent a CT scan

Fig. 1 Flowchart of participants in the study**Table 1** Baseline characteristics

	<i>n</i> median	% IQR
Male:female	87:42	67.4:32.6
Age (years)	67	55.5–75
BMI (kg/m ²)	26.29	24–28.5
Blood hypertension	57	44.2
Diabetes	19	14.7
Dyslipidemia	42	32.6
Smoking		
Active	20	15.5
Quitted smoking	40	31
Non-smoker	69	53.5
Coronary heart disease	7	7
Chronic obstructive pulmonary disease (COPD)	8	6.2
Inflammatory bowel disease (IBD)	7	5.4
History of prior hernia repair	16	12.4
ASA grade		
I	7	5.8
II	85	70.8
III	26	21.7
IV	2	1.7
Parastomal hernia		
Clinical	20/129	15.5
Radiological	50/84	59.5
Total	50/129	38.8
Midline incisional hernia		
Clinical	18/129	13.9
Radiological	54/120	45
Total	54/129	41.8

prior to stoma closure and of those, 50 of them (59.5%) had a radiologically detectable parastomal hernia.

During follow-up, 18 patients (13.9%) developed a clinically noticeable midline incisional hernia. The rate of a CT scan measurable midline incisional hernia was higher, with a total of 54 hernias among 120 patients with CT scans, which offers a rate of 45%.

Surgical factors are shown in Table 2.

Table 2 Surgical factors

	<i>n</i> median	% IQR
Temporary loop ileostomy indication		
Rectal resection due to rectal cancer	105	81.4
Rectal resection due to benign pathology	5	3.9
Other high-risk anastomosis	9	7
Total proctocolectomy and ileal-anal pouch	5	3.9
Anastomotic leakage	3	2.3
Perineal pathology	2	1.6
Timing of stoma creation		
Elective	121	93.8
Urgent	8	6.2
Surgical approach		
Open	88	68.2
Laparoscopic	41	31.8
Time to stoma closure (weeks)	33	24–44
Early (< 2 weeks)	2	1.6
Recommended (2–12 weeks)	12	9.3
Late (> 12 weeks)	115	89.1
Skin closure		
Purse-string	37	28.7
Lineal	73	56.6
Unknown	19	14.7

The rates of early and late postoperative events after ileostomy closure are listed in Table 3.

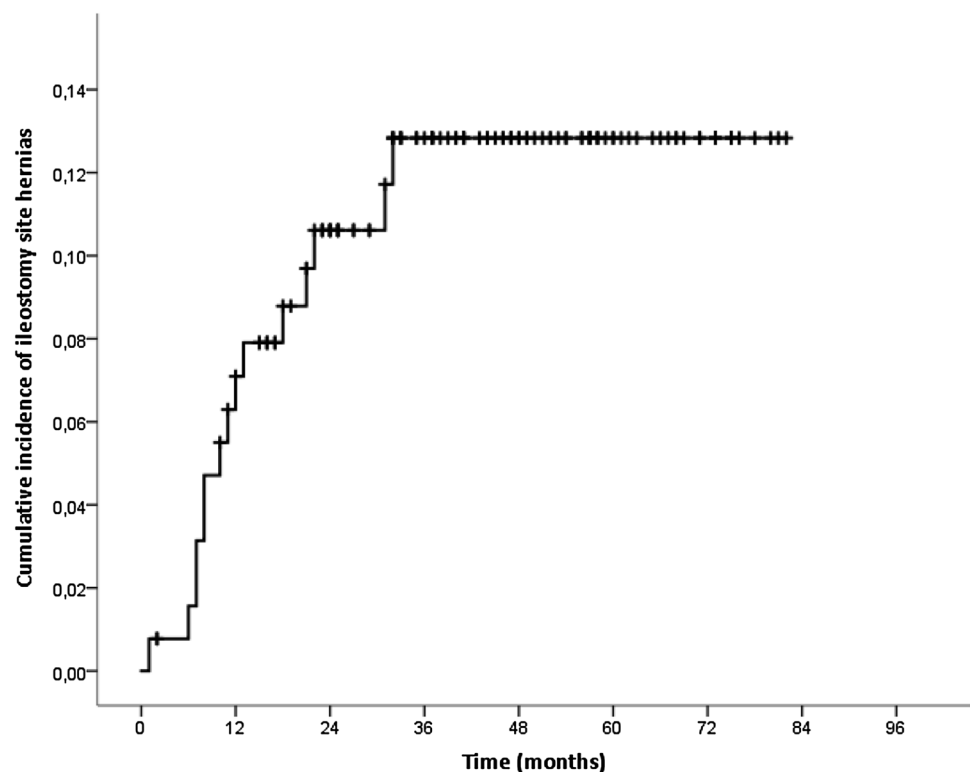
15 patients (11.6%) developed an incisional hernia in previous ileostomy site. Only 3 (3.1%) of them were diagnosed by clinical examination only. 120 patients underwent a CT scan examination during their follow-up and of those, 15 (12.4%) of them had a hernia at the former stoma site. The median time for incisional hernia development was 11 months (IQR = 7–21). The median follow-up time was 37 months (IQR = 22–57). The Kaplan-Meier curve demonstrating the ileostomy site incisional hernia development is given in Fig. 2.

For our cohort, the identified risk factor for ileostomy site incisional hernia are resumed in Table 4. Patient risk factors for hernia development in survival analysis were female

Table 3 Postoperative events

	<i>n</i>	%
Surgical site infection (SSI)	12	9.4
Conservative treatment	4	4.7
Requiring drainage	4	4.7
Clavien–Dindo complications		
Grade I	5	3.9
Grade II	16	12.4
Grade III	6	4.7
Grade IV	3	2.3
Grade V	0	0
Ileostomy site hernia		
Clinical	3/129	3.1
Radiological	15/120	12.4
Total	15/129	11.6

sex (HR 6.13 95% CI 1.95–19.23), age (HR 1.068 95% CI 1.012–1.127) and Body Mass Index (HR 1.218 95% CI 1.082–1.371). Clinically significant parastomal hernia prior to or noted during ileostomy closure was also a risk factor for hernia development (HR 4.16 95% CI 1.48–11.72). Those who had a clinically detectable midline incisional hernia were in an increased risk of ileostomy-site hernia (HR 5.05 95% CI 1.79–14.21). Patients with major postoperative complications, ranked as Clavien–Dindo III and IV, were in a higher risk of hernia (HR 3.95 95% CI 1.10–14.19).

Fig. 2 Kaplan–Meier curve showing time to ileostomy site incisional hernia

Discussion

Key results

The incisional hernia rate after ileostomy closure was 11.6% with a median time for incisional hernia development of 11 months (IQR = 7–21). Some risk factors were identified: older age, female sex, higher Body Mass Index, clinically detectable parastomal hernia, clinically detectable midline incisional hernia and the presence of postoperative complications grade III and IV according to Clavien–Dindo classification.

Strengths and limitations

One of the strengths of this study is the inclusion of a heterogeneous population sample, and not only patients with rectal cancer. Another aspect is that this study follows the recommendations given by the European Hernia Society [15] with a long follow-up period and the use of abdominal CT scan for the evaluation of the abdominal wall in the majority of the subjects. The main limitation of the study is a wide range in the confidence intervals due to a low rate of events in the patient's sample, which also prevents from performing a multivariate analysis.

Table 4 Risk factors for hernia

	Hazard ratio	95% CI	<i>p</i> value
Female sex	6.13	1.95 – 19.23	0.002
Age	1.068	1.012 – 1.127	0.017
Body mass index	1.218	1.082 – 1.371	0.001
Clinical parastomal hernia	4.16	1.48 – 11.2	0.007
Clinical midline incisional hernia	5.05	1.79 – 14.21	0.002
Postoperative complications Clavien–Dindo grade III–IV	3.95	1.10 – 14.19	0.035

Interpretation

In our study, the incisional hernia rate after temporary ileostomy reversal was 11.6%. This is consistent with the rates found by De Keersmaecker et al. (11.1%) [14], Brook et al. (13.5%) [5] and Fazekas et al. (14.9%) [4]. Consequently, we consider the real rate of ileostomy site hernia as 10–15%, higher than rate offered by De Robles et al. (5%) [2] and lower than the one reported by Kaneko et al. (23.9%) [3].

For our cohort, an older age and female sex were risk factors for hernia development. These results are consistent with those offered by others studies about midline incisional hernia [16]. However, they differ from the findings of Fazekas et al. [4], in which a younger age was a risk factor for incisional hernia. Body Mass Index remains as a risk factor for hernia at ileostomy site, as previously affirmed by Brook et al. [5] and De Robles et al. [2].

In our patients, none of their comorbidities was a hernia risk factor, and neither oncological surgery was linked to future hernia development. Interestingly, the intervention of patients with inflammatory bowel disease did not have a higher incisional hernia rate.

Clinically detected parastomal hernia prior to stoma reversal or discovered during ileostomy closure surgery was a statistically significant risk factor. Therefore, the treatment of these parastomal hernias should be taken into consideration, and probably a mesh might be required.

Classifying postoperative adverse events according to Clavien–Dindo classification [12] allowed this study to identify grade III (requiring surgical, endoscopic or radiological intervention) and grade IV (life-threatening complications requiring intensive care management) complications as variables associated with a higher risk of ileostomy-site incisional hernia. Thus, we suggest that patients requiring reintervention may benefit from the placement of a prophylactic mesh.

For our cohort, neither skin-closure (log-rank = 0.497), postoperative SSI (log-rank = 0.073) or the treatment given to the SSI (log-rank = 0.564), were statistically associated with incisional hernia. Currently, purse-string closure is

known as a protection factor for surgical site infection after stoma closure, as stated by Rondelli et al. [6] and Hajibandeh et al. [17]. However, purse-string closure had not shown any reduction in future hernia development in the randomized control trials made until date [18, 19]. In these studies, this variable was a secondary outcome, so new studies should be initiated to address this topic.

Recognising the relevance of incisional hernia after ileostomy closure, some authors began to place a prophylactic mesh during ileostomy reversal, showing their results in non-randomized trials. Liu et al. [7] reduced the incisional hernia rate from 36.1% to 6.4% with an onlay polypropylen mesh. Moreover, Maggiori et al. [8] achieved a 3% hernia rate starting from 19% with a retromuscular biological mesh. Besides, Warren et al. [9] diminished the incisional hernia rate from 13 to 0% with either a retromuscular or preperitoneal polypropylene mesh, although their results were not statistically significant. Further evidence is expected to be collected from the randomized controlled ROCSS [20] and ILEOCLOSE [21] trials.

Meanwhile, according with the results from our study we suggest that a prophylactic mesh might be used in those patients with a higher risk of incisional hernia after ileostomy closure: older patients, females, higher BMI, those with a clinically detectable parastomal hernia and those with major postoperative complications. Moreover, if a midline incisional hernia is detected during follow-up, the presence of an ileostomy site hernia should be considered prior to surgical repair, given the association between them.

Conclusion

Incisional hernia after temporary loop ileostomy is a relevant problem that affects at least one in every ten patients. In this study we identified female sex, older age, higher Body Mass Index, clinically significant parastomal hernia, clinically detectable midline incisional hernia and major postoperative complications ranked as Clavien–Dindo grade III and IV as risk factors for hernia development. Therefore the use of a prophylactic mesh should be considered in those high-risk patients.

Compliance with ethical standards

Conflict of interest Barranquero, Tobaruela, Bajawi, Muñoz, Die Trill, Garcia-Perez declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Institutional Research Committee (Comité de Ética de la Investigación con Medicamentos, 050-19 resolution) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Human and animal rights This article does not contain any studies with animals performed by any of the authors.

Informed consent Informed consent was obtained from all participants before ileostomy closure. Permission to omit the informed consent for analysis of the already available data was obtained from the Institutional Research Committee (050-19 resolution).

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