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Absence of abdominal drainage after surgery for secondary lower gastrointestinal tract peritonitis is a valid strategy

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Abstract

Background Management of abdominal drainage after surgery for secondary lower gastrointestinal tract peritonitis (LGTP) is not a standardized procedure. A monocentric study was carried out in 2016 in our centre. (PI study) to evaluate the interest of drainage. Our objective was to revaluate, our actual use of abdominal drainage after peritonitis (PII study).

Study design We examined retrospectively patients who underwent surgery for secondary sub-mesocolic community-acquired peritonitis (January 2016–December 2019). Study exclusion criteria were primary peritonitis, peritoneal dialysis, nosocomial peritonitis, postoperative peritonitis, upper gastrointestinal tract peritonitis, peritonitis due to appendicitis, peritonitis requiring the implementation of Mikulicz's drain, and peritonitis in which the peritoneum was not described in the surgical report (i.e., the same criteria that the PI study which included 141 patients from January 2009 to January 2012). The primary endpoint was the rate of abdominal drainage. The secondary endpoints were the patient rate without a peritoneum description, major complications rate (Clavien ≥III), abscess rate, mortality rate and the length of stay in the non-drain group (D−) and in the drain group (D+) in PII study. Primary and secondary endpoints were also compared between PI and PII studies. Risk factors for post-operative abscess were also research.

Results Of the 150 patients included 33% were drained vs 84% of the 141 patients included in PI study ($p<0.001$). In PII study peritoneum was described in 80.3% of patients vs 69% in PI study (NS, $p=0.06$). Comparing the two groups D− and D+, no significant differences were found in major complications (respectively 45% vs 32%, $p=0.1$), reoperation rate (respectively 25% vs 22%, $p=0.7$), death rate (respectively 25% vs 14%; $p=0.1$) and mean length of stay (respectively 12 days vs 13 days, $p=0.9$). The abscess rate was significantly lower in the D− group (10% vs 30%, $p=0.002$). Comparing PI and PII studies, there was no difference about major complications (35% vs 35%, $p=0.1$), reoperation (16% vs 17.5%, p = 0.5), abscess rate (15% vs 8.5%, $p=0.1$) and mortality (14.5% vs 17.5%, $p=0.7$). The length of stay was longer in PI study than in P II (14 days vs 9 days, $p=0.03$). Drainage ($p=0.005$; OR = 4.357; CI [1.559–12.173]) and peritonitis type ($p=0.032$; OR = 3.264; CI [1.106–9.630]) were abscess risk factors.

Conclusion This study therefore showed that drainage after surgery for LGTP may not be necessary and that, at least at the local level, surgeons seem to be inclined to discontinue it systematically. It may therefore be worthwhile to conduct a randomised control trial to establish recommendations on drainage after surgery for LGTP.

Keywords Peritonitis · Drainage · Applicability · Lower gastrointestinal tract · Abscess

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Abbreviations

LGTP Lower gastrointestinal tract peritonitis

Secondary peritonitis is an absolute medico-surgical emergency, of which the management is based on identifying the source of infection, initiating antibiotic therapy, and then, in most cases, surgery to treat the source of infection and wash out the abdominal cavity. These steps constitute the reference procedure for the treatment of this condition [1–3].

However, there is little consensus on the value of abdominal drainage for lower gastrointestinal tract peritonitis (LGTP), with some claiming that it reduces postoperative complications [4], whereas others say that it does not bring any additional benefit to the patient [5]. Given such a lack of consensus and heterogeneity of practices, a monocentric study was carried out in 2016 by Rebibo et al. (Peritonitis I, PI) [6] to evaluate the interest of drainage. The installation of a drain in the abdominal cavity after surgery for LGTP was found to have no impact on postoperative complications and, in particular, on the frequency of developing postoperative abscesses.

Based on this observation, we wished to evaluate our current practices with respect to drainage in this indication a few years later in the same centre that carried out the previous study.

Patients and methods

Population

We retrospectively examined all patients who underwent surgery for secondary sub-mesocolic peritonitis from January 2016 to December 2019 at the Amiens University Hospital (Amiens, France). In line with the French legislation on retrospective studies of routine clinical practice, the study protocol was approved by a hospital committee with competency for studies not requiring approval by an institutional review board study (reference: PI2021_843_0014).

Study criteria

The inclusion criterion was surgery for community-acquired secondary LGTP in adult patients for whom a conservative approach was not discussed or performed. The exclusion criteria were primary peritonitis, peritoneal dialysis, nosocomial peritonitis, postoperative peritonitis, upper gastrointestinal tract peritonitis, peritonitis due to appendicitis, and peritonitis requiring implementation of a Mikulicz drain, (i.e., the same criteria as those of the PI study) [6].

Endpoint

The primary endpoint was the rate of the installation of abdominal drainage. The secondary endpoints were the rate of patients without a description of the peritoneum, and the rates of major complications (Clavien ≥ III) and abscess development (Clavien IIIb), and the length of stay in the non-drain group (D-) and drain (D +) groups in the PII study. The outcomes of the present study were compared to those of the PI study [6] to evaluate current practices. Risk factors for the development of postoperative abscesses were also sought [7].

Definition

Decision to drain

The decision to drain was left to the appreciation of the surgeon. As a retrospective study it was impossible to find the exact reasons for drainage.

Data collection

The preoperative data collected were age, sex, body mass index, American Society of Anaesthesiologists' score, cirrhosis, preoperative kidney failure, preoperative heart failure, preoperative use of corticosteroids, and clinical biochemistry (the white blood cell count, serum C-reactive protein level, and serum creatinine level). Intraoperative data consisted of the cause of peritonitis, surgical approach (laparoscopy vs laparotomy), operating time, description of the peritoneum by the surgeon, type of peritonitis (purulent vs stercoral), surgeon experience (a senior surgeon was defined as a surgeon with > 3 years of experience). Postoperative data consisted of the type and incidence of postoperative complications, reoperation rate, postoperative mortality, length of hospital stay, and follow-up procedures. Data concerning drainage consisted of the mean time to removal of the drainage and drainage-related complications. Data concerning risk factors for postoperative complication were obtained by analysing the preoperative and intraoperative data.

Statistical analysis

All statistical analyses were performed using SPSS software (version 20.0, SPSS Inc, Chicago, IL). Categorical variables were compared using a chi-square test. The results are expressed as the means ± standard deviations (range) or numbers (percentages). Quantitative variables were compared by variance analysis. Binary logistic regression was performed to determine the risk factor and their odds ratios and confidence intervals. All tests were two tailed and the threshold for statistical significance was set to $p < 0.05$.

Results

Study population

In total, 187 patients with primary LGTP were included in this study between January 2016 and December 2019.

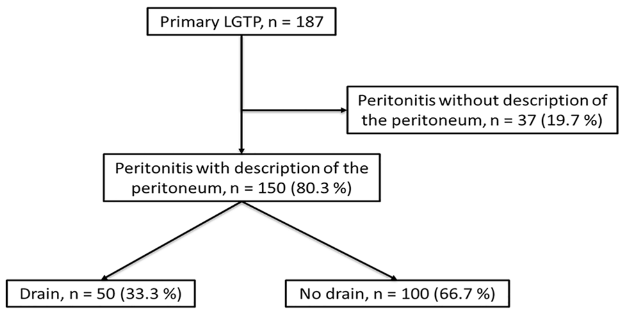

Fig. 1 Study flowchart

Table 1 Comparison of the study population between Peritonitis I and II

	Peritonitis I	Peritonitis II	*p*
Primary LGTP, *n*	205	187	
Peritoneal description, *n* (%)	141 (68.7)	150 (80.3)	0.06
Drain, *n* (%)	118 (83.6)	50 (33)	< 0.001
No Drain, *n* (%)	23 (26.4)	100 (67)	< 0.001

A description of the peritoneum was present in the operative report of 150 patients (80.3%) (Fig. 1). The following analyses were thus performed on this population of patients. There was a non-significant improvement ($p = 0.06$) in the rate of peritoneal description relative to the PI study, which was described for 141 of 205 (68.7%) patients (Table 1). There were no significant differences in the demographic parameters between the D – and D + groups (Table 2). The only significant difference in the preoperative and intraoperative parameters between the two groups concerned hemodynamic instability, which was more often present for group D – (21 patients, 21%) than group D + (three patients, 6%) (Table 2). In line with the French legislation on retrospective studies of routine clinical practice, the study protocol was approved by a hospital committee with competency for studies not requiring approval by an institutional review board study (reference: PI2021_843_0014).

Primary endpoint

Abdominal drainage was performed on 50 of the 150 patients included (33%) (Table 1). This represents a clear improvement ($p < 0.001$), with a reversal in the number of drained/undrained patients relative to the PI study, in which a drain was placed in 118 of 141 (83.6%) included patients (Table 1).

Secondary endpoints

The postoperative parameters are presented in Table 3. Comparison of the D– and D + groups showed no significant differences in major complications (45% vs 32%, respectively, $p = 0.1$), reoperation rate (25% vs 22%, respectively, $p = 0.7$), death rate (25% vs 14%, respectively, $p = 0.1$), or mean length of stay (12 days vs 13 days, respectively, $p = 0.9$). The rate of abscess formation was significantly lower in the D – group (10% vs 30%, $p = 0.002$).

Comparison of post-operative data between Peritonitis I and Peritonitis II

The postoperative data of the two studies are presented in Table 4. There were no differences in terms of major complications (35% vs 35%, $p = 0.1$), reoperation rate (16% vs 17.5%, $p = 0.5$), rate of abscess formation (15% vs 8.5%, $p = 0.1$), or mortality (14.5% vs 17.5%, $p = 0.7$). The length of stay was longer in the PI than P II study (14 days vs 9 days, $p = 0.03$).

Abscess risk factors

The significant risk factors for abscess development in univariate analyses were drainage ($p = 0.004$) and the type of peritonitis ($p = 0.008$) (Table 5). Multivariate analysis showed both drainage ($p = 0.005$, OR = 4.357, 95% CI [1.559–12.173]) and the type of peritonitis ($p = 0.032$, OR = 3.264, 95% CI [1.106–9.630]) to have an influence on the occurrence of postoperative abscesses (Table 6).

Discussion

This series is the second to evaluate the practice of drainage after surgery for secondary LGTP. It represents a reevaluation of practices after publication of the first series by our group [6].

The main outcome of this study is that the local practice of not performing abdominal drainage for LGTP was generally well adhered to, with only 33% of patients drained versus 83.6% in the PI study ($p < 0.001$). This is a good outcome, given the difficulty in applying the recommendations, notably because of clinical inertia, as already shown by our group on the prescription of postoperative antibiotics after cholecystectomy for grade I and II cholecystitis (ABCAL 2 study) [8]. The second result confirms that the absence of abdominal drainage for LGTP does not lead to more death (14% vs 25%, respectively, $p = 0.121$), major complications (35% vs 40%, respectively, $p = 0.882$), or reoperations (22% vs 25%, respectively, $p = 0.685$). On the contrary, there were fewer abscesses in the D- than D + group (10% vs 30%, $p = 0.002$). Moreover, patients in the D- group had a shorter length of stay, although the difference was not statistically significant (12 days vs 13 days, $p = 0.877$). It can be noted that the groups were

Table 2 Pre-operative and per-operative data in the Peritonitis II study

	D − (n = 100)	D + (n = 50)	p
Male, n (%)	55 (55)	24 (48)	0.4
Age, mean ± SD	62 ± 17	60 ± 17	0.6
ASA, median (min − max)	3 (1 − 5)	3 (1 − 5)	0.9
Altemeier, median (min–max)	4 (2 − 4)	3 (1 − 4)	0.1
Mannheim peritonitis index, mean ± SD	22.62 ± 6.3	21.88 ± 6.2	0.5
Operation length, mean ± SD	125 ± 56	138 ± 60	0.2
BMI, mean ± SD	27 ± 6	27 ± 6	0.5
Cirrhosis, n (%)	0	1 (2)	0.2
Kidney failure, n (%)	15 (15)	3 (6)	0.1
Cardiac insufficiency, n (%)	3 (3)	1 (2)	0.7
Pre-operative white blood cell count (10.3/mm^3), mean ± SD	15 ± 9	13 ± 7	0.7
Serum C-reactive protein (mg/l), median (min − max)	115 (0 − 576)	122 (0 − 462)	0.6
Lactates (mmol/l), median (min − max)	2.5 (1 − 134)	2 (1 − 15)	0.5
Creatinine (µmol/l), median (min − max)	79 (25 − 579)	71 (29 − 1132)	0.6
Junior surgeon, n (%)	68 (68)	34 (68)	1
Surgical approach			
Laparotomy, n (%)	6 (6)	1 (2)	0.4
Laparoscopy, n (%)	88 (88)	46 (72)	0.6
Conversion, n (%)	6 (6)	3 (6)	1
Causes of peritonitis			
Diverticulitis, n (%)	36 (36)	20 (40)	0.6
Tumour perforation, n (%)	10 (10)	7 (14)	0.5
Small bowel perforation, n (%)	22 (22)	7 (14)	0.2
Ischemic colitis, n (%)	10 (10)	5 (10)	1
Crohn disease, n (%)	7 (7)	4 (8)	0.8
Ogilvie, n (%)	1 (1)	0	0.5
Other, n (%)	14 (14)	7 (14)	1
Peritonitis type			
Stercoral, n (%)	41 (41)	23 (46)	0.6
Purulent, n (%)	59 (59)	27 (54)	
Stercoral, localized, n (%)	18 (18)	6 (12)	0.4
Stercoral, generalized, n (%)	23 (23)	17 (34)	0.1
Purulent, localized, n (%)	17 (17)	5 (10)	0.2
Purulent, generalized, n (%)	42 (42)	22 (44)	0.9
Surgical management			
Anastomosis, n (%)	29 (29)	10 (20)	0.3
Stoma, n (%)	71 (71)	40 (80)	
Source of the infection			
Small bowel, n (%)	69 (69)	39 (78)	0.2
Colon, n (%)	31 (31)	11 (22)	
Hemodynamic instability, n (%)	21 (21)	3 (6)	0.018

well balanced for severity based on the ASA classification, Altemeier classification and Mannheim peritonitis index. The only difference between groups was for hemodynamic instability which was more frequent in the D − group. Another result from this study is that the length of stay (in the overall population D − and D + groups) was shortener in the PII than PI study, this might be due to a bigger proportion of patients in the D- group in the PII study.

This study also shows that drains do not perform their intended function to reduce the rate of postoperative abscesses or avoid reoperation by draining a postoperative abscess. In this study, on the contrary, it was associated with a higher rate of abscesses in the D + group. Drain might be a door to infections from outside to inside. This inability to perform their intended function has already been shown in several indications. We published a post-hoc analysis of the

Table 3 Post-operative data in the Peritonitis II study

	D − (*n* = 100)	D + (*n* = 50)	*p*
Major complication, *n* (%)	45 (45)	16 (32)	0.1
Reoperation rate, *n* (%)	25 (25)	11 (22)	0.7
Abscess, *n* (%)	10 (10)	15 (30)	0.002
Mortality, *n* (%)	25 (25)	7 (14)	0.1
Length of stay (days), median (min − max)	12 (1 − 109)	13 (3 − 71)	0.9

Table 4 Comparison of the post-operative data between the Peritonitis I and II studies

	P I (*n* = 141)	P II (*n* = 150)	*p*
Major complication, *n* (%)	49 (35)	61 (35)	0.1
Reoperation rate, *n* (%)	23 (16)	36 (17.5)	0.5
Abscess, *n* (%)	21 (15)	25 (8.5)	0.1
Mortality, *n* (%)	21 (14.5)	32 (17.5)	0.7
Length of stay (days), median (min − max)	14 (1 − 94)	9 (1 − 109)	0.03

Table 5 Univariate analysis of abscess risks factors

	Abscess (*n* = 25)	No abscess (*n* = 125)	*p*
Male, *n* (%)	14 (56)	58 (46.4)	0.5
Age (years), mean ± SD	58 ± 18	62 ± 17	1.5
BMI (kg/m^2), mean ± SD	28.45 ± 8.5	27 ± 5.8	0.4
Junior surgeon	17 (68)	86 (68.8)	0.8
Surgical approach (laparotomy), *n* (%)	23 (92)	111 (88.8)	0.4
Diverticulitis, *n* (%)	10 (40)	46 (36.8)	0.6
Tumour perforation, *n* (%)	4 (16)	13 (10.4)	0.7
Small bowel perforation, *n* (%)	5 (20)	24 (19.2)	0.8
Ischemic colitis, *n* (%)	3 (12)	12 (9.6)	0.7
Crohn disease, *n* (%)	1 (4)	10 (8)	0.4
Other cause, *n* (%)	1 (4)	21 (16.8)	0.2
Peritonitis type (stercoral), *n* (%)	17 (68)	47 (37.6)	0.008
Drainage, *n* (%)	15 (60)	35 (28)	0.004

Table 6 Multivariate analysis of abscess risks factors

	p	OR	CI
Drainage	0.005	4.357	1.559–12.173
Peritonitis type (stercoral/purulent)	0.032	3.264	1.106–9.630

ABCAL trial evaluating the value of abdominal drainage after laparoscopic cholecystectomy for mild or moderate acute calculous cholecystectomy in 2016. After matching for PS, the rates of deep incisional site infections, superficial incisional site infections, distant infections, overall morbidity, and readmission were not improved by drainage, whereas the hospital length of stay was significantly longer for the drainage group (3.3 vs 5.1 days, $p = 0.003$) [9]. In 2017, Denost et al. published the outcomes of the GRECCAR 5 study evaluating the effect of pelvic drainage after rectal excision and anastomosis for cancer. In this study, the rate of pelvic sepsis was similar between the drain and no-drain groups (16.1% vs 18.0%, $p = 0.58$). There were no differences in the rates of surgical morbidity (18.7% vs 25.3%, $p = 0.83$), reoperation (16.6% vs 21.0%, $p = 0.22$), or stoma closure (80.1% vs 77.3%; $p = 0.53$) or the length of hospital stay (12.2 vs 12.2, $p = 0.99$) between the two groups [10]. In 2020, Brustia et al. evaluated the risk factors for postoperative collections after liver surgery. Surgical drainage was not a protective factor against postoperative collections [11].

This study had several limitations. The first was the retrospective design, which poses a risk of bias in the distribution of the population of patients in the D + and D − groups. However the demographic data did not appear to be different between the two groups. The second limitation was the single-centre design. However, this study clearly demonstrates that the outcome of the first study facilitated the modification of practices. Moreover, all decisions and surgeries (planned or emergency) are discussed during dedicated daily staff meetings and are thus not based on the decision of a single surgeon.

Conclusion

This study shows that drainage after surgery for LGTP may not be necessary and that surgeons appear to be inclined to systematically discontinue it, at least at the local level. It may therefore be worthwhile to conduct a randomised control trial to establish recommendations on drainage after surgery for LGTP.

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Declarations

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Conflict of interest Authors stated no financial relationship to disclose.

Consent to participate All patients included in the study provided their informed consent to participate.

References

1. Dupont H, Vael C, Muller-Serieys C et al (2008) Prospective evaluation of virulence factors of enterococci isolated from patients with peritonitis: impact on outcome. Diagn Microbiol Infect Dis 60:247–253
2. Marshall JC, Maier RV, Jimenez M et al (2004) Source control in the management of severe sepsis and septic shock: an evidence-based review. Crit Care Med 32:S513–S526
3. Malangoni MA, Inui T (2006) Peritonitis—the Western experience. World JEmerg Surg 1:25
4. Okumura K, Hida K, Kunisawa S et al (2018) Impact of drain insertion after perforated peptic ulcer repair in a Japanese nationwide database analysis. World J Surg 42(3):758–765
5. Schein M (2008) To drain or not to drain? the role of drainage in the contaminated and infected abdomen: an international and personal perspective. World J Surg 32:312–321
6. Rebibo L, Ebosse I, Iederan C et al (2017) Does drainage of the peritoneal cavity have an impact on the postoperative course of community-acquired, secondary, lower gastrointestinal tract peritonitis? Am J Surg 214(1):29–36
7. Dindo D, Demartines N, Clavien PA (2004) Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 240(2):205–213
8. Dembinski J, Guérin O, Slim K et al (2020) Are the recommendations for post-operative antibiotics in patients with grade I or II acute calculous cholecystitis being applied in clinical practice? HPB (Oxford) 22(7):1051–1056
9. Prevot F, Fuks D, Cosse C et al (2016) The value of abdominal drainage after laparoscopic cholecystectomy for mild or moderate acute calculous cholecystitis: a post hoc analysis of a randomized clinical trial. World J Surg 40(11):2726–2734
10. Denost Q, Rouanet P, Faucheron JL et al (2017) To drain or not to drain infraperitoneal anastomosis after rectal excision for cancer: the GRECCAR 5 randomized trial. Ann Surg 265(3):474–480
11. Brustia R, Fleres F, Rhaiem R et al (2020) Postoperative collections after liver surgery: risk factors and impact on long-term outcomes. J Visc Surg 157(3):199–209

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