ORIGINAL ARTICLE

Is it necessary to use specimen retrieval bag for reducing surgical site infection in laparoscopic appendectomy? A randomized controlled trial

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ABSTRACT

BACKGROUND: The aim of the study was to investigate the comparison the effects of the extraction of specimen by using a specimen retrieval bag (SRB) or direct extraction through trochar in terms of surgical site infection (SSI) in patients who underwent laparoscopic appendectomy.

METHODS: A total of 165 patients were randomly allocated into two groups. A SRB was used in 77 patients (Group 1, 46.7%) and not used in 88 patients (Group 2, 53.3%). Demographics, comorbid diseases, laboratory results, preoperative diameter of appendix, intraoperative observations, intraoperative procedures, hospitalization times, SSIs, pathology results, culture results, and findings of the patients who developed complications and the treatments given to the patients due to complications during the post-operative period were recorded.

RESULTS: The mean age of the patients was 33.95 SD 13.25 (min-max: 18–78) years. No significant difference was observed in the demographics, hospitalization times, distribution of the incidence rates of diabetes mellitus, perioperative perforation, perioperative fluid/abscess, drain insertion, aspiration-irrigation, superficial incisional SSI, drainage requirement, leakage, positive culture results, and post-operative intra-abdominal infection ($p>0.05$) between the groups. Neutrophil and leukocyte values were statistically significantly different between the groups ($p=0.044$ and $p=0.012$, respectively). There was a significant difference between the two groups in terms of the complicated appendicitis ($p=0.040$). There was no significant difference in terms of the positive culture results and incidence of post-operative intra-abdominal infection between the patients in Group 1 and Group 2 in both the complicated and uncomplicated appendicitis groups ($p>0.05$). The difference between the patients in Group 1 and Group 2 regarding the incidence of superficial incisional SSI was significant in the uncomplicated appendicitis group ($p=0.037$), whereas not significant in the complicated appendicitis group ($p=1.000$). In the multivariate model, only perioperative perforation was observed to be the effective parameter on post-operative intra-abdominal infection at the $p<0.05$ level ($p=0.045$).

CONCLUSION: The results of the present study revealed that the use of SRB does not prevent microbial seeding in patients who underwent laparoscopic appendectomy; therefore, it was concluded that using SRB is not associated with SSI at laparoscopic appendectomy.

Keywords: Abscess; intra-abdominal infection; laparoscopic appendectomy; specimen retrieval bag; superficial incisional surgical site infection.

INTRODUCTION

Acute appendicitis is one of the diseases that can occur in any age group, causes acute abdomen symptoms, and requires urgent surgical intervention.[1,2] Since it shows rather successive outcomes in appendectomy operations, minimal invasive surgery has been accepted by many surgical centers. Laparoscopic surgery is used as the gold standard in the surgical treatment of uncomplicated appendicitis in developed countries. However, surgical adjuncts used in the laparoscopic appendectomy operation are known to increase the cost.[3] Specimen retrieval bag (SRB), one of these adjuncts,

Cite this article as: Bostan MS, Uğurlu C. Is it necessary to use specimen retrieval bag for reducing surgical site infection in laparoscopic appendectomy? A randomized controlled trial. Ulus Travma Acil Cerrahi Derg 2023;29:203-211.

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Ulus Travma Acil Cerrahi Derg 2023;29(2):203-211 DOI: 10.14744/tjtes.2023.97828 Submitted: 26.09.2022 Revised: 11.12.2022 Accepted: 03.01.2023

is used to prevent surgical site infection (SSI) in laparoscopic gastrointestinal system surgeries and tumor seeding in malignancy surgeries. Taking its cost into account, it is seen in the literature that many studies have been conducted on the necessity of using SRB, especially in laparoscopic appendectomies.[4–6] In laparoscopic appendectomy, there are studies suggesting the use of SRB to prevent SSI, whereas studies revealing that the extraction of the specimen directly from the trochar without the use of a SRB is an applicable method are also present.[7–10] Large-scale retrospective studies conducted to investigate the effects of SRB use on SSI have not reached a consensus. In two retrospectives using the same database and conducted only 1 year apart, one has emphasized that the use of SRBs decreased the risk of intra-abdominal abscess formation, while the other study has revealed that their use had no effect on the development of SSIs including intra-abdominal abscess.[11,12]

Due to the fact that there is no consensus in the literature in terms of the effect of SRB use on the occurrence of SSI in laparoscopic appendectomy and the retrospective nature of the existed studies, we planned our study thinking that randomized controlled study can help enlighten this issue.

MATERIALS AND METHODS

Study Design and Participants

The present study is a randomized clinical trial aimed to investigate the effect of SRB use on SSI in patients who underwent laparoscopic appendectomy. The study was carried out in the Department of General Surgery in the Faculty of Medicine at Tokat Gaziosmanpasa University. An ethical approval was obtained from the clinical research ethics committee (21-KAEK-180) before commencing the study. The patients aged over 18 years who underwent laparoscopic appendectomy in our clinic between September 2021 and April 2022 were included in the study. All patients were informed about the study, and their informed consent forms were obtained. The patients, who did not want to participate in the trial, were included in the study but lost in follow-up and had to be converted from laparoscopic surgery to open surgery were excluded from the study. In addition, the patients whose pathology results indicated a malignancy, had inflammatory bowel disease and immunodeficiency were also excluded (Fig. 1).

Randomization

The randomization was carried out using the envelope method before surgery. The envelopes were prepared in the ratio of 1/1 for each of two groups, and the draw was performed by an employee who did not take part in the study. The patients were randomly allocated into two groups as those who SRB was used and not used. The patients and researchers were informed regarding the groups after randomization.

Surgery

All surgeries were performed by two surgeons experienced in laparoscopic surgery. Antibiotic prophylaxis with 1 g of cefa-

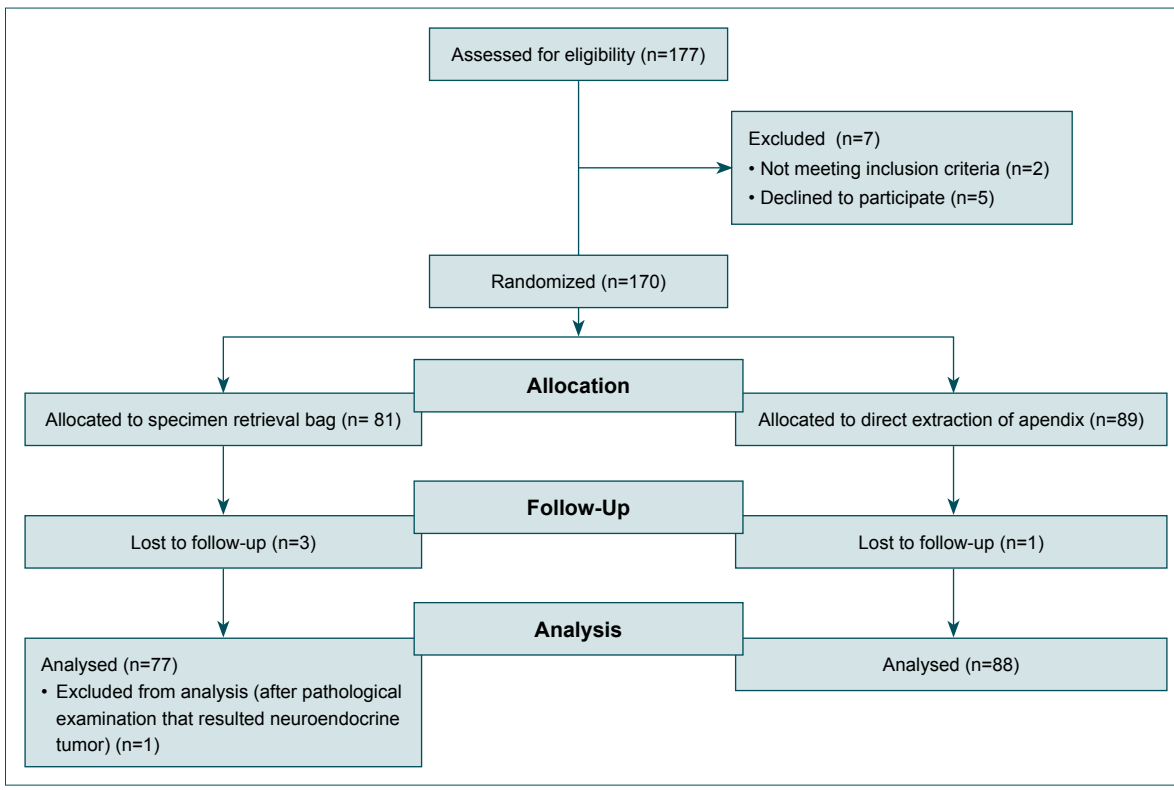

Figure 1. Participants flow diagram.

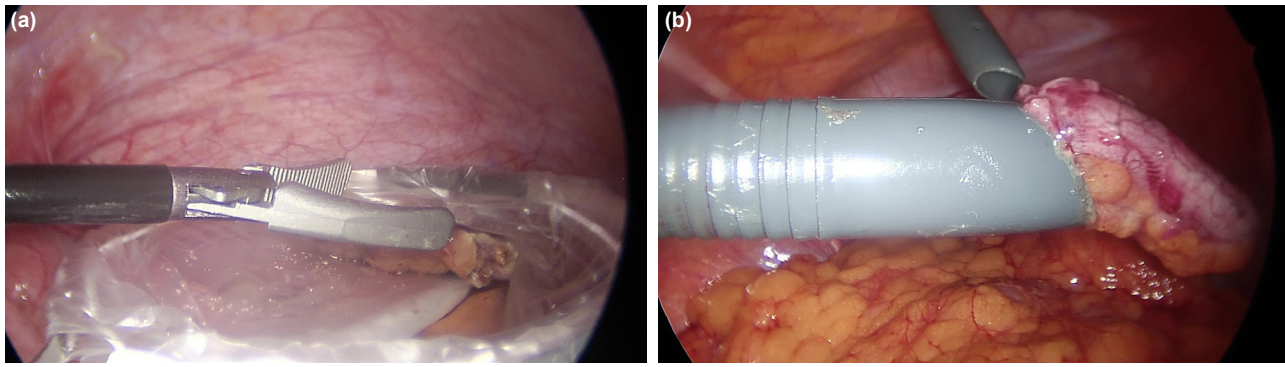

Figure 2. The Extraction of apendix during laparoscopic appendectomy: **(a)** With specimen retrieval bag **(b)** direct extraction without specimen retrieval bag (totally pulled in the trochar to avoid direct contact of appendix).

zolin was administered to the patients preoperatively. A standard laparoscopic exploration was conducted. Against the problem of the specimen not fitting into the 10 mm working trochar, the appendix was freed from the mesoappendix by dissecting it as close as to border of the appendix as possible without excising the mesoappendix. Two endoloopes were placed in such a way that the appendix remained in the stump, and one endoloop was placed at the proximal end of the specimen. The patients were randomly divided into two groups according to the appendectomy specimen extraction. Based on the randomization, the specimens were removed out of the abdomen by using a SRB in the Group 1, and by directly pulling into the trochar and taken out together with the trochar in the Group 2 (Fig. 2). The specimens were successfully extracted out of the abdomen without any morcellations in both groups. After extraction of the specimen, a culture was taken from the trochar site to check if there was microbial seeding.

After surgery, the patients were administered Cefdinir 600 mg tablet orally two a day for 5 days. The demographic data of the patients as well as comorbid diseases, laboratory results, diameter of appendix on radiological examinations, intraoperative observations (perioperative perforation, and perioperative fluid/abscess), and procedures (drain insertion and aspiration-irrigation) were recorded. In addition, hospitalization times, SSIs, pathology results, culture results, complications, and the treatments given to the patients due to complications during the post-operative period were noted. If a culture result showed the growth of skin flora, it was regarded negative culture result in that patient. The patients were classified into two subgroups as complicated and uncomplicated appendicitis according to the surgical findings and pathology results.

Statistical Methods

Statistical analyses of the data were performed using the Statistical Package for the Social Sciences (SPSS) (Version 22.0, SPSS Inc., Chicago, IL, USA) software package. Descriptive statistics of continuous variables were reported as mean ± SD or median (min-max) depending on the normal distribution of the data. Frequency distributions of categorical data were presented as frequencies and percentages (%). Relationships or proportion comparisons between categorical variables were performed using the Chi-square test or Fisher's exact test. The normality distribution of the data was evaluated with the Kolmogorov–Smirnov test. The Student's t-test was used to compare normally distributed data between two independent groups, and the Mann–Whitney U test was applied to compare non-normally distributed data. The statistical significance level was accepted as $p<0.05$.

Univariate and multivariate binary logistic regression analyses were performed to evaluate the effects of SRB use and other parameters on superficial incisional SSI and intra-abdominal infection. All variables that were found to be associated with superficial incisional SSI and intra-abdominal infection at a significance level of <0.10 according to univariate analysis were included in the multivariate binary logistic regression model. The odds ratio (OR) with 95% confidence interval (CI) was calculated for each parameter found statistically significant in the univariate and multivariate logistic regression models.

Sample Size Estimations (Priori Power Analysis)

The sample size was calculated for the Chi-square test, which was used to test the primary hypothesis of our study. As a result of the sample size analysis performed using the Cohen's effect size of 0.3 (medium effect size), it was found that a minimum of 141 patients (at least 71 patients in each group) should be included in the study to reveal significant differences between the groups with a minimum power ($1-\beta$ = 0.10) of 90% and a type I error (α) of 0.05 (95% CI). The G*power software (version 3.1.9.7) (Heinrich-Heine-Universität Dusseldorf, Dusseldorf, Germany) was used for sample size estimation.

RESULTS

Laparoscopic appendectomy was performed in a total of 177 patients. Of these patients two did not want to be included in the study, whereas two were excluded due to conversion from laparoscopic surgery to open surgery. Four patients

who did not come to the postoperative follow-ups were excluded from the study. In addition, one patient in the group in which SRB was used was expelled from the study because neuroendocrine tumor was detected in the pathology report. After exclusions, a total of 165 patients were included in the study. A SRB was used in 77 patients, (46.7%) while it was not

Table 1. Comparison of age, hospitalization stay, neutrophil, neutrophil %, leukocyte, and CRP values between specimen retrieval bag groups

Variables	No specimen retrieval bag (n=88)	Specimen retrieval bag (n=77)	p-value
Age	33.03 SD 12.1	34.99 SD 14.48	0.347[a]
Hospitalization stay (day)	1 (1–4)	1 (1–6)	0.663[b]
	1.59 SD 0.737	1.62 SD 0.974	
Neutrophil (10^9/L)	10637 SD 4406	12009 SD 4252	0.044[a]
Neutrophil %	76.96 SD 9.707	79.08 SD 8.394	0.138[a]
Leukocyte (10^9/L)	13310 (3620–25360)	15660 (5900–80950)	0.012[b]
	13613 SD 4676	16044 SD 8521	
CRP (mg/L)	18.08 (0.37–459)	17.68 (0.23–149.2)	0.554[b]
	44.90 SD 69.13	32.58 SD 37.45	

[a]Student's t test with mean SD, [b]Mann-Whitney U test with median (min-max) and mean SD. CRP: C-reactive protein; SD: Standard deviation.

Table 2. Comparison of some clinical features between research groups and the relationship between specimen retrieval bag and positive culture results, superficial incisional surgical site infection and postoperative intra-abdominal infection

Variables		No specimen retrieval bag (n=88)	Specimen retrieval bag (n=77)	Total	p-value
		n (%)	n (%)		
Sex	Women	31 (35.2)	28 (36.4)	59 (35.8)	0.879[a]
	Men	57 (64.8)	49 (63.6)	106 (64.2)	
Diabetes Mellitus	No	85 (96.6)	72 (93.5)	157 (95.2)	0.475[b]
	Yes	3 (3.4)	5 (6.5)	8 (4.8)	
Peroperative perforation	No	72 (81.8)	60 (77.9)	132 (80)	0.533[a]
	Yes	16 (18.2)	17 (22.1)	33 (20)	
Peroperative fluid/abscess	No	41 (46.6)	26 (33.8)	67 (40.6)	0.120[a]
	Reactive fluid	44 (50)	44 (57.1)	88 (53.3)	
	Abscess	3 (3.4)	7 (9.1)	10 (6.1)	
Drain insertion	No	63 (71.6)	50 (64.9)	113 (68.5)	0.359[a]
	Yes	25 (28.4)	27 (35.1)	52 (31.5)	
Aspiration-irrigation	No	45 (51.1)	36 (46.8)	81 (49.1)	0.574[a]
	Yes	43 (48.9)	41 (53.2)	84 (50.9)	
Complicated	No	78 (88.6)	59 (76.6)	137 (83)	0.040[a]
	Yes	10 (11.4)	18 (23.4)	28 (17)	
Superficial incisional surgical site infection	No	81 (92)	76 (98.7)	157 (95.2)	0.069[b]
	Yes	7 (8)	1 (1.3)	8 (4.8)	
Positive culture results	No	62 (70.5)	57 (74)	119 (72.1)	0.610[a]
	Yes	26 (29.5)	20 (26)	46 (27.9)	
Postoperative intra-abdominal infection	No	87 (98.9)	73 (94.8)	160 (97)	0.186[b]
	Yes	1 (1.1)	4 (5.2)	5 (3)	

[a]Chi-Square Test, [b]Fisher's Exact Test.

used in 88 patients (53.3%) (Fig. 1). The mean age of the patients was 33.95SD13.25 (min-max: 18–78) years. The mean age was 34.99SD14.48 (18–78) years in the Group 1 and 33.03SD12.1 (18–64) years in the Group 2 (p=0.347). The mean hospitalization time of the patients was 1.61SD0.85 (min-max: 1–6) days. No significant difference was found between the groups regarding the duration of hospital stay, neutrophil %, and C-reactive protein (CRP) values (p>0.05, Table 1). The difference between the groups in neutrophil and leukocyte values was statistically significant (p=0.044, p=0.012, respectively).

There were no statistically significant differences between the two study groups, the distribution of sex, the incidence rates of diabetes mellitus (DM), perioperative perforation, perioperative fluid/abscess, drain insertion, aspiration-irrigation, superficial incisional SSI, positive culture results, and post-operative intra-abdominal infection (p>0.05, Table 2). The difference in terms of the rate of complicated appendicitis was statistically significant between the two groups (p=0.040, Table 2).

The relationships between the use of SRB and positive culture results, superficial incisional SSI, and post-operative intra-abdominal infection were separately investigated in the patients with and without complicated appendicitis, and the results are presented in Table 2 and Figure 3. Appendiceal stump leakage was not observed in any of the patients. Superficial incisional SSI and intra-abdominal infection/abscess

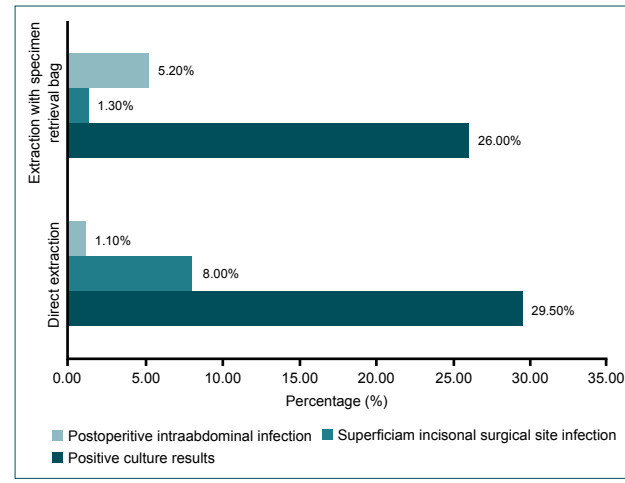

Figure 3. The relationships between the use of specimen retrieval bag and positive culture results, superficial incisional SSI, and postoperative intra-abdominal infection.

were defined in accordance with the Center of Disease Control criteria.[13] There were eight patients (4.8%) with superficial incisional SSI, and intra-abdominal infection/abscess was observed in five patients (3%). Percutaneous drainage was performed accompanied with ultrasonography in one patient due post-operative abscess. Four patients with localized intra-abdominal infection were treated by administering intravenous antibiotherapy. Although microperforation was suspected in 11 patients during laparoscopic exploration, these patients were included in the uncomplicated group on that

Table 3. The relationship between specimen retrieval bag and positive culture results, superficial incisional surgical site infection and postoperative intra-abdominal infection in patients according to complicated and uncomplicated subgroups

Variables		No specimen retrieval bag (n=88)	Specimen retrieval bag (n=77)	Total	p-value
		n (%)	n (%)		
Uncomplicated					
Positive culture results	No	58 (74.4)	49 (83.1)	107 (78.1)	0.223[a]
	Yes	20 (25.6)	10 (16.9)	30 (21.9)	
Superficial incisional surgical site infection	No	72 (92.3)	59 (100.0)	131 (95.6)	0.037[b]
	Yes	6 (7.7)	0 (0.0)	6 (4.4)	
Postoperative intra-abdominal infection	No	77 (98.7)	57 (96.6)	134 (97.8)	0.577[b]
	Yes	1 (1.3)	2 (3.4)	3 (2.2)	
Complicated					
Positive culture results	No	4 (40.0)	8 (44.4)	12 (42.9)	1.000[b]
	Yes	6 (60.0)	10 (55.6)	16 (57.1)	
Superficial incisional surgical site infection	No	9 (90.0)	17 (94.4)	26 (92.9)	1.000[b]
	Yes	1 (10.0)	1 (5.6)	2 (7.1)	
Postoperative intra-abdominal infection	No	10 (100.0)	16 (88.9)	26 (92.9)	0.524[b]
	Yes	0 (0.0)	2 (11.1)	2 (7.1)	

[a]Chi-Square Test, [b]Fisher's Exact Test.

Table 4. Univariate and multivariate logistic regression analysis to evaluate the effects of specimen retrieval bag usage and other parameters on superficial incisional surgical site infection and post-op intra-abdominal infection

Variables	Superficial incisional surgical site infection				Post-op intra-abdominal infection			
	Univariate		Multivariate		Univariate		Multivariate	
	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)
Peroperative perforation	0.044**	4.41 (1.04–18.69)	0.798	–	0.045**	6.5 (1.04–40.6)	0.053	–
Specimen retrieval bag use	0.082*	6.57 (0.79–54.64)	0.082	–	0.167	–	0.187	–
Positive culture results	0.039**	4.72 (1.08–20.61)	0.609	–	0.131	–	–	–
CRP	0.070*	1.01 (0.99–1.02)	0.786	–	0.759	–	–	–
Diameter	0.039**	1.39 (1.02–1.91)	0.348	–	0.275	–	–	–
Drain insertion	0.018**	7.24 (1.41–37.19)	0.082	–	0.188	–	–	–
Age	0.437	–	–	–	0.449	–	–	–
Sex	0.916	–	–	–	0.997	–	–	–
Leukocyte	0.731	–	–	–	0.819	–	–	–
Neutrophil	0.441	–	–	–	0.584	–	–	–
Neutrophil %	0.667	–	–	–	0.708	–	–	–
Diabetes mellitus	0.999	–	–	–	0.999	–	–	–
Aspiration-irrigation	0.182	–	–	–	0.681	–	–	–
Complicated	0.539	–	–	–	0.188	–	–	–

*Statistically significant at p<0.10. **Statistically significant at p<0.05. CRP: C-reactive protein; OR: Odds ratio; CI: Confidence interval.

no perforation was found in their pathology results. Bacterial growth was observed in culture results taken from the trochar site in 46 patients. *Escherichia coli* was detected in 31 (67%), *Pseudomonas aureginosa* in 4 (8%), *Enterococcus* in 3 (6%), and coagulase negative *Staphylococcus* in 2 (4%), while the growth of *Klebsiella*, *Staphylococcus haemolyticus*, *Staphylococcus aureus*, Staphylococcus spp., and *Streptococcus agalactiae* was observed in one patient (2%).

There was no significant difference in terms of the positive culture results and incidence of post-operative intra-abdominal infection between the patients in Group 1 and Group 2 in both the complicated and uncomplicated appendicitis groups (p>0.05, Tables 2 and 3). The difference between the patients in Group 1 and Group 2 regarding the incidence of superficial incisional SSI was significant in the uncomplicated appendicitis group (p=0.037), whereas not significant in the complicated appendicitis group (p=1.000, Table 3).

The results of the univariate and multivariate binary logistic regression analyses performed to determine the effective parameters in the development of superficial incisional SSI and post-operative intra-abdominal infection, and the odds ratio and 95% CIs for each parameter that was found to be statistically significant are presented in Table 4.

It was determined in the univariate model that the effective parameters on superficial incisional SSI were perioperative perforation, positive culture results, appendix diameter, and drain insertion at the p<0.05 level (p=0.044, p=0.039, p=0.039, p=0.018, respectively), and SRB use and CRP at the p<0.10 level (p=0.082, p=0.070, respectively). Age, sex, leukocyte, neutrophil, neutrophil %, DM, aspiration-irrigation, and complication did not have a statistically significant effect on superficial incisional SSI. In the multivariate model, the effect of perioperative perforation, positive culture results, appendix diameter, drain insertion, SRB use, and CRP on superficial incisional SSI was found to be statistically insignificant (Table 4).

In the univariate model, only perioperative perforation was observed to be the effective parameter on post-operative intra-abdominal infection at the p<0.05 level (p=0.045) (Table 4). The effect of SRB use, positive culture results, CRP, appendix diameter, drain insertion, age, sex, leukocytes, neutrophils, neutrophil %, DM, aspiration-irrigation, and complication was detected to be statistically insignificant on the occurrence of postoperative intra-abdominal infection (p>0.05, Table 4). The perioperative perforation variable, which was found significant in the univariate model, was included in the multivariate model together with SRB use (Table 4). In the multivariate model, no statistically significant effect of SRB use together with perioperative perforation on the occurrence of postoperative intra-abdominal infection was determined (p>0.05).

DISCUSSION

In the USA, laparoscopic surgery constitutes 75% of appendectomy surgeries performed in 2011.[14] However, as laparoscopic

surgery increases the operation time and cost, its utilization is a subject of debate in many developing countries. SRBs used to safely extract the specimen in laparoscopic surgery play a role in the cost. For this reason, many researchers have sought to resolve this issue using their own handmade bags, and many studies have been carried out on this matter.[15,16] In this respect, we aimed to compare the method of direct pulling the specimen into the trochar in its extraction to reduce the cost of laparoscopic appendectomy with the use of SRB.

Laparoscopic appendectomy provides safer exploration of the entire abdomen than open appendectomy.[17,18] Although the infection rate reduces in appendectomies after laparoscopic surgery, intra-abdominal abscess formation is at higher rates compared to open appendectomy.[19] We observed that in the studies conducted in the literature, the presence of SSI has been compared between laparoscopic and open appendectomies, and SRBs have been routinely used during laparoscopic appendectomy in these studies.[20–22]

In the consensus published by the European Association of Endoscopic Surgery (EAES) in 2016, it was stated that there is insufficient evidence regarding the use of SRB, and it was recommended to avoid direct contact of the appendix with the abdominal wall during the extraction of the appendix.[23] However, a recently published evidence-based review recommends the use of SRBs to prevent SSI on the basis of the retrospective study.[24] Similarly, in a retrospective study conducted in the USA reviewing a very large series, the use of SRBs has been shown to reduce the infection rate by 40%.[11] Nevertheless, in all such studies, why SRB has been used in some patients and why it was not used in others is unknown due to the retrospective nature of these studies. In addition, it has been noted in the limitation section of these studies that there may be differences in antibiotic protocols used. However, we did not come across a previous randomized study in the literature that compares the use of SRBs with direct extraction of the specimen from the trochar in terms of the development of SSI. In our randomized study, even if we did not observe a statistical difference between the two groups in terms of SSI, there was a proportional difference between the groups. This proportional difference can be found statistically significant in future multicenter studies to be conducted with larger series.

In the literature, while the incidence of SSI is about 7%, the incidence of SSI after laparoscopic appendectomy is reported as varying between 3.4% and 5.9%.[25] In accordance with these results, in our study, the superficial superficial incisional SSI rate was 4.8% and the intra-abdominal infection rate was 3%, as expected.

Among all appendicitis, the incidence of complicated appendicitis is between 5% and 28%, and the perforation frequency reaches up to 20%.[26] In line with the literature, 17% of our patients had complicated appendicitis. In the patients with complicated appendicitis, no statistically significant difference was observed between the Group 1 and Group 2 in terms of superficial incisional SSI, intra-abdominal infection and the results of the swab culture taken from the wound site. In the patients with uncomplicated appendicitis, we are of the opinion that the use of SRB has no effect on the development of SSI, since the results of intra-abdominal infection and positive culture results were statistically similar in the groups in which SRB was or was not used. Only in the patients with uncomplicated appendicitis, the frequency of superficial incisional SSI was statistically significantly higher in the group who underwent surgery without the use of SRB. When we performed a statistical analysis by considering both complicated and uncomplicated appendicitis groups, we observed that the use of SRB did not have a protective effect against the development of SSI and positive culture results. However, considering the facts that SRB was used to prevent microbial seeding and that positive culture results were found to be statistically similar in our study, we think that this situation may be due to patient-related factors.

Many previous studies have shown that DM, men sex, preoperative sepsis, and complicated appendicitis increase the risk of intra-abdominal infection after laparoscopic surgery.[27,28] In our study, we compared the groups in terms of predisposing factors that may cause infection. In the statistical analysis conducted to compare the results of the two groups, it was observed that the two groups were similar regarding diabetes and men sex. A significant difference was observed between two groups in terms of preoperative sepsis and preoperative complicated appendicitis. We are of the opinion that the groups were not homogeneously distributed in the randomization because of the fact that our series was small, and that in case of conducting studies with larger series, homogeneous groups could be attained with regard to these parameters. In addition, it was determined that the perioperative perforation status between the two groups and the extraction of the specimen using a SRB were not effective independent factors for the development of post-operative infection.

The lack of randomized controlled studies on the use of SRBs, the fact that randomized controlled studies mostly focus on the comparison of laparoscopic and open appendectomies, and routine use of SRBs in these studies is the aspects that strengthen our study. Besides, due to its randomized nature, unlike other retrospective studies, analyzing the causal factors that may predispose to infection in both groups increases the strength of our study.

Some of the limitations of our study were that the study was conducted in a single center, that the groups were not large enough, and that there was no homogeneity between the groups in terms of some parameters that would create a predisposition to infection. In addition, the routine use of post-operative antibiotics was another limitation in our study. However, we consider that our results were not affected from the routine use of antibiotics, since they were administered to the patients in both groups to standardize the study.

Conclusion

In our study, we revealed that the use of SRBs did not prevent microbial seeding, and therefore using SRB increases the cost of surgery. However, we believe that in order for the surgeon to feel safe in terms of the development of SSI, especially in complicated cases, lower-cost methods such as using surgical glove fingers can be used. In conclusion, although our study data show that the use of SRBs in laparoscopic appendectomy was not more effective than the method of removing the specimen directly from the trochar in preventing SSI, we are of the opinion that this result should be supported by multicenter studies to be conducted with larger series.

Ethics Committee Approval: This study was approved by the Tokat Gaziosmanpaşa University Clinical Research Ethics Committee (Date: 27.09.2021, Decision No: 2021/15).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: M.S.B.; Design: M.S.B.; Supervision: M.S.B.; Materials: M.S.B., C.U.; Data: M.S.B., C.U.; Analysis: M.S.B., C.U.; Literature search: M.S.B.; Writing: M.S.B., C.U.; Critical revision: M.S.B., C.U.

Conflict of Interest: None declared.

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

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ORİJİNAL ÇALIŞMA - *ÖZ*

Laparoskopik apendektomide cerrahi alan enfeksiyonunu azaltmak için spesimen torbası kullanmak gerekli mi?: Randomize kontrollü bir çalışma

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AMAÇ: Laparoskopik apendektomi yapılan hastalarda spesimen torbası kullanılarak veya doğrudan trokar yoluyla spesimen çıkarılmasının cerrahi alan enfeksiyonu açısından etkilerinin karşılaştırılmasını araştırmak.

GEREÇ VE YÖNTEM: Toplam 165 hasta rastgele iki gruba ayrıldı. Yetmiş yedi hastada (grup 1, %46.7) spesimen torbası kullanılırken 88 hastada (grup 2, %53.3) kullanılmadı. Hastaların demografik özellikleri, eşlik eden hastalıkları, laboratuvar sonuçları, ameliyat öncesi apendiks çapı, ameliyat sırasındaki bulgular, ameliyat sırasında yapılan işlemler, hastanede kalış süreleri, cerrahi alan enfeksiyonları, patoloji sonuçları, kültür sonuçları, komplikasyon gelişen hastaların bulguları ve ameliyat sonrasında gelişen komplikasyonlar nedeniyle hastalara verilen tedaviler kaydedildi.

BULGULAR: Hastaların yaş ortalaması 33.95 SD 13.25 (min-maks: 18–78) idi. Demografik özellikler, hastanede yatış süreleri, DM insidans oranlarının dağılımı, peroperatif perforasyon, peroperatif sıvı/apse, dren konulması, aspirasyon-irrigasyon, yüzeyel kesi yeri enfeksiyonu, drenaj gereksinimi, güdük kaçağı, pozitif kültür sonuçları, ameliyat sonrası karın içi enfeksiyon ($p>0.05$) açısından gruplar arasında anlamlı farklılık izlenmedi. Nötrofil ve lökosit değerleri gruplar arasında istatistiksel olarak anlamlı farklılık gösterdi (sırasıyla, $p=0.044$, $p=0.012$). Komplike apandisit açısından iki grup arasında anlamlı fark vardı ($p=0.040$). Hem komplike hem de komplike olmayan apandisit gruplarında grup 1 ve grup 2'deki hastalar arasında pozitif kültür sonuçları ve postoperatif karın içi enfeksiyon insidansı açısından anlamlı fark yoktu ($p>0.05$). Yüzeyel insizyonel SSI açısından grup 1 ve grup 2'deki hastalar arasındaki fark komplike olmayan apandisit grubunda anlamlı iken ($p=0.037$), komplike apandisit grubunda anlamlı değildi ($p=1.000$). Çok değişkenli modelde, $p<0.05$ düzeyinde postoperatif karın içi enfeksiyon üzerinde sadece peroperatif perforasyonun etkili parametre olduğu gözlendi ($p=0.045$).

TARTIŞMA: Bu çalışmanın sonuçları, laparoskopik apendektomi yapılan hastalarda spesimen torbası kullanımının mikrobiyal ekimi engellemediğini ortaya koydu, bu nedenle laparoskopik apendektomide spesimen torbası kullanımının cerrahi alan enfeksiyonu ile ilişkili olmadığı sonucuna varıldı.

Anahtar sözcükler: Apse; intraabdominal infeksiyon; laparoskopik apendektomi; spesimen torbası; yüzeyel cerrahi alan infeksiyonu.

Ulus Travma Acil Cerrahi Derg 2023;29(2):203-211 doi: 10.14744/tjtes.2023.97828