



Research Article

DRAIN VS NO DRAIN, IN COMPLICATED APPENDICITIS

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ABSTRACT

Background: The most common complication after perforated appendicitis is intra abdominal abscess, ranging in incidence from 14 to 18%. Drainage following appendectomy is usually determined by whether the underlying appendicitis is simple or complicated and largely determined by the surgeons' belief, based on expertise or personal opinion. we discuss the results of patients of perforated appendicitis, treated with or without a abdominal drain. **Patients and methods:** A retrospective study of patients diagnosed with perforated appendicitis having surgery was performed. Patients diagnosed with perforated appendicitis treated with a abdominal drain and patients treated without a drain. Both groups were evaluated in terms of complications: intra-abdominal abscess, re-intervention, readmission and duration of hospital stay. **Results:** 200 patients diagnosed with perforated appendicitis underwent appendectomy. 120 patients were treated without drain and 80 patients with a abdominal drain. Thirty-one (26%) patients from the group without a drain had a re-intervention compared to 9 (11%) in the group with a drain (p = 0.013). Overall complications and readmission were also significantly lower in patients treated with a peritoneal drain. **Conclusion:** An abdominal drain seems to reduce overall complication rate, re-intervention rate and readmission rate in patients treated with perforated appendicitis.

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INTRODUCTION

Acute appendicitis remains the most common general surgical emergency seen in most hospitals and the most common cause of acute abdomen requiring surgical intervention. Peak incidence ranges between 15 and 30 years. In contrast to acute uncomplicated appendicitis, the perforated appendicitis is related to an increased risk of postoperative complications and to adverse outcome. Intra-abdominal abscesses are the most common complication after perforated appendicitis and remain a significant problem ranging in incidence from 14 to 18% (Fraser *et al.* 2010; St Peter *et al.* 2008a, b)^{1,2,3}. In contrast to patients with acute uncomplicated appendicitis, reporting incidence form 1–2% (St Peter *et al.* 2008b)³. Peritoneal tube drainage is widely used by surgeons in current clinical practice. Intra-abdominal abscess formation after appendectomy could potentially be prevented after tube drainage of peritoneal cavity (Curran and Muenchow 1993; Fishman *et al.* 2000; Lund and Murphy 1994)^{4,5,6}. Retention of possible contaminated intra-abdominal fluids could be drained timely. Nevertheless, routine peritoneal drainage after appendectomy in case of perforated appendicitis remains topic of debate (Narci *et al.* 2007)⁷. Many surgeons use peritoneal drains selectively now (Dandapat and Panda 1992; Schwartz *et al.* 1983; Yamini *et al.* 1998)^{8,9,10}, although others recommend routinely use of drains in case of perforated appendicitis (Curran and Muenchow 1993; Fishman *et al.* 2000; Lund and Murphy

1994)^{4, 5, 6}. In addition, the impact of an abscess on patient outcome is tremendous and directly increases hospital stay and hospital costs (Gasior *et al.* 2013)¹¹. Therefore, prevention of intra-abdominal abscesses after appendectomy is of major importance. Although many studies have reported outcomes after appendectomy concerning perforated appendicitis, there is still major controversy regarding the optimal management of perforated appendicitis. In this study we report results of patients operated for perforated appendicitis, treated with or without peritoneal drainage in current clinical practice.

MATERIALS AND METHODS

Patients

All patients treated in our hospital for acute appendicitis between January 2014 and December 2018 enrolled the study. Patients with uncomplicated appendicitis and patients with a malignancy (after pathological examination) were excluded. A total of 200 patients diagnosed with perforated appendicitis were included for further analysis.

Diagnosis

All patients were pre-operatively examined by the surgeon on call. The diagnosis of appendicitis was made by the attending surgeon according to the MANTRELS score and ultrasonography. Additionally computed tomography was performed to confirm diagnosis of acute appendicitis with

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borderline MANTRELS scores. Diagnosis of perforated appendicitis was made intra-operatively or occasionally on pre-op ultrasound.

Treatment

All patients received preoperative antimicrobial prophylaxis consisting of intravenous Ceftriaxone and Metronidazole. General/spinal anesthesia was performed in all patients.. Peritoneal lavage with warmed isotonic saline was performed after appendectomy. Leaving an intra-abdominal drain (Silicone) after appendectomy was decided by the performing surgeon based on the intraoperative findings. . Postoperatively intravenous antibiotics were prescribed in all included patients for at least 3 days following our hospital protocols. Drains were removed after at least 36 h based on the production and aspect of the drained fluid.

Outcome

Patients were classified into two groups. The first group consisted of patients diagnosed with perforated appendicitis treated with peritoneal drainage. The second group consisted of patients diagnosed with perforated appendicitis treated without peritoneal drainage. Complications were identified and categorized in the following groups: overall complications, re-interventions, duration of hospital stay and readmissions. The duration of a readmission was included in the hospital stay calculation. Overall complications were defined as wound infection, intra-abdominal abscess formation, post-operative abdominal pain and stump leakage. Post-operative abdominal pain was defined as abdominal complains after surgery requiring prolonged clinical observation or additional biochemistry or radiological tests. Re-interventions were defined as percutaneous drainage, re-laparoscopy/laparotomy, and prolonged use of intravenous antibiotics (>3–5 days). Statistical analyses were performed using SPSS, version 21.0 (SPSS, Inc., Chicago, USA). P values of ≤0.05 were considered significant.

RESULTS

Between January 2014 and December 2018 a total of 200 patients were diagnosed with perforated appendicitis and underwent appendectomy. A total of 80 (40%) patients were included in the group with a peritoneal drain and 120 (60%) patients in the group without a peritoneal drain. Between the groups no significant difference in age, gender and type of operation was observed (Table 1). There were 11 different operating surgeons and 2 of them never left an intra-peritoneal drain after appendectomy.

Table 1 Baseline characteristics of patients with perforated appendicitis

	drain n = 80	No drain n = 120 (%)	P value
Gender (%)	44 (56)	63 (53)	0.658
Age (range)	37 (14–83)	33 (13–82)	0.226

Overall complications

Overall, 55 patients developed a complication after surgery, 15 (19%) in the group with a peritoneal drain and 40 (33%) in the group without a peritoneal drain ($p = 0.027$). In the group without a peritoneal drain, post-operative abdominal pain was less frequently observed (0%) compared to the group with a peritoneal drain (15%; $p = 0.004$). No differences were observed between both groups in stump leak, wound

infections or other complications (e.g. ileus, respiratory insufficiency, myocardial infarction or hospital acquired pneumonia). Data concerning complications are shown in Table 2.

Table 2 Complications of patients with perforated appendicitis With and without peritoneal drainage

	drain n = 80	No drain n = 120 (%)	P value
Wound infection (%)	2 (3)	4 (3)	1.000
Intra-abdominal abscess (%)	5 (6)	18 (15)	0.061
Stump leakage (%)	1 (1)	0	0.397
Post-operative abdominal pain (%)	6 (7)	12 (15)	0.004
Other complications (%)	7 (9)	6 (5)	0.380
Overall complications	15 (19)	40 (33)	0.027

Intra-abdominal abscess

In the group with a peritoneal drain 5 patients (6%) developed an intra-abdominal abscess post operatively. In the group treated without a peritoneal drain 18 patients (15%) developed an intra-abdominal abscess after appendectomy. No statistical difference was observed between both groups ($p = 0.061$). Data are shown in Table 3.

Table 3 Outcomes of all operated patients who had a drain vs no drain

	drain n = 80	No drain n = 120 (%)	P value
Reintervention	9 (11)	31 (26)	0.013
Percutaneous drainage	1 (1)	10 (8)	0.033
Transrectal drainage	1 (1)	2 (2)	1.000
Prolonged intravenous antibiotics	3 (4)	11 (9)	0.147
Readmissions	4 (5)	19 (16)	0.020
Median duration of hospitalization (IQR)	5 (3)	5 (3)	0.643

Re-interventions

Re-interventions were more observed in the patients treated without a peritoneal drain (26%) compared to patients with a peritoneal drain (11%; $p = 0.013$). Percutaneous drainage was more performed in patients treated without a peritoneal drain (8%) vs. patients with a peritoneal drain (1%; $p = 0.033$). No significant differences were observed between both groups in performed relaparoscopy/ laparotomies, transrectal drainage or prolonged use of intravenous antibiotics. Data concerning re-interventions are shown in Table 3. Readmissions and hospital stay: Readmissions were more frequent observed in the patients treated without a peritoneal drain (16%) vs. The patients treated with a peritoneal drain (5%; $p = 0.020$). No significant difference was found concerning duration of hospital stay between both groups. Data are presented in Table 3.

DISCUSSION

Although there is consensus about the aetiology of appendicitis, diagnosis and optimal treatment of this disorder are still under debate. In current literature, there is controversy concerning the use of a peritoneal drain in patients after treatment of perforated appendicitis (Narci *et al.* 2007) ⁷. Drainage following appendectomy is usually determined by whether the underlying appendicitis is simple or complicated and largely determined by the surgeons' belief, based on expertise or personal opinion (Dandapat and Panda 1992; Schwartz *et al.* 1983; Yamini *et al.* 1998) ^{8,9,10}. However, some investigators recommend routine use of drains in case of perforated appendicitis (Curran and

Muenchow 1993; Fishman *et al.* 2000; Lund and Murphy 1994)^{4, 5, 6}. Evidence to guide this clinical decision is scarce, often outdated and based on small numbers (Dandapat and Panda 1992; Magarey *et al.* 1971; Haller *et al.* 1973; Greenall *et al.* 1978; Stone *et al.* 1978)^{8, 12, 13, 14}. Some authors suggest that the use of peritoneal drains increases work load for nursing staff and doctors (Tander *et al.* 2003)¹⁵. In this study, re-interventions and readmission is significantly higher in patients treated without a peritoneal drain. In our study, 15% of the treated patients without a peritoneal drain developed an intra-abdominal abscess after appendectomy. If a peritoneal drain was used, abscess formation was reduced to 5 of 80 patients (6%; $p = 0.061$). Our reported data are comparable with previous studies (Dandapat and Panda 1992)⁸. Based on these data, additional studies need to include 140 subjects in the group without a peritoneal drain and 140 subjects in the group with a peritoneal drain to be able to reject the null hypothesis that the failure rates for experimental and control subjects are equal with a probability (power) of 0.8. The Type I error probability associated with this test of the null hypothesis is 0.05. Despite the absence of statistical significance in this study, re-interventions and readmissions were lower in the patients treated with a peritoneal drain after appendectomy in case of perforated appendicitis. This could be explained by the fact that numbers were relatively small in our selected patient population. However, the observed adverse outcomes in patients treated without a peritoneal drain highlights clinical importance. As prolonged hospital stay and re-interventions could be averted, possible preventive actions should be considered, including routine peritoneal drainage. Therefore, additional studies will have to answer the question whether routine peritoneal drainage may improve the outcome in patients in the context of perforated appendicitis.

In summary, our findings suggest that the use of a peritoneal drain reduces complications and readmission rate in patients with perforated appendicitis. Due to the shortcomings of the retrospective design of this study, recommendations cannot be made. Ideally, treatment with or without peritoneal drainage should be investigated in a randomized trial including a multivariate analysis.

References

1. Fraser JD, Aguayo P, Leys CM, Keckler SJ, Newland JG, Sharp SW, *et al.* A complete course of intravenous antibiotics vs a combination of intravenous and oral antibiotics for perforated appendicitis in children: a prospective, randomized trial. *J Pediatr Surg.* 2010;45(6):1198–1202. doi: 10.1016/j.jpedsurg.2010.02.090. [PubMed] [CrossRef] [Google Scholar]
2. St Peter SD, Sharp SW, Holcomb GW, 3rd, Ostlie DJ. An evidence-based definition for perforated appendicitis derived from a prospective randomized trial. *J Pediatr Surg.* 2008;43(12):2242–2245. doi: 10.1016/j.jpedsurg.2008.08.051. [PubMed] [CrossRef] [Google Scholar]
3. St Peter SD, Tsao K, Spilde TL, Holcomb GW, 3rd, Sharp SW, Murphy JP, *et al.* Single daily dosing ceftriaxone and metronidazole vs standard triple antibiotic regimen for perforated appendicitis in children: a prospective randomized trial. *J Pediatr Surg.* 2008;43(6):981–985.

- doi: 10.1016/j.jpedsurg.2008.02.018. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
4. Curran TJ, Muenchow SK. The treatment of complicated appendicitis in children using peritoneal drainage: results from a public hospital. *J Pediatr Surg.* 1993;28(2):204–208. doi: 10.1016/S0022-3468(05)80276-3. [PubMed] [CrossRef] [Google Scholar]
5. Fishman SJ, Pelosi L, Klavon SL, O'Rourke EJ. Perforated appendicitis: prospective outcome analysis for 150 children. *J Pediatr Surg.* 2000;35(6):923–926. doi: 10.1053/jpsu.2000.6924. [PubMed] [CrossRef] [Google Scholar]
6. Lund DP, Murphy EU. Management of perforated appendicitis in children: a decade of aggressive treatment. *J Pediatr Surg.* 1994;29(8):1130–1133. doi: 10.1016/0022-3468(94)90294-1. [PubMed] [CrossRef] [Google Scholar]
7. Narci A, Karaman I, Karaman A, Erdogan D, Cavusoglu YH, Aslan MK, *et al.* Is peritoneal drainage necessary in childhood perforated appendicitis?—a comparative study. *J Pediatr Surg.* 2007;42(11):1864–1868.
8. Dandapat MC, Panda C. A perforated appendix: should we drain? *J Indian Med Assoc.* 1992;90(6):147–148. [PubMed] [Google Scholar]
9. Schwartz MZ, Tapper D, Solenberger RI. Management of perforated appendicitis in children. The controversy continues. *Ann Surg.* 1983;197(4):407–411. doi: 10.1097/0000658-198304000-00005. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
10. Yamini D, Vargas H, Bongard F, Klein S, Stamos MJ. Perforated appendicitis: is it truly a surgical urgency? *Am Surg.* 1998;64(10):970–975. [PubMed] [Google Scholar]
11. Gasior AC, Marty Knott E, Ostlie DJ, St Peter SD. To drain or not to drain: an analysis of abscess drains in the treatment of appendicitis with abscess. *Pediatr Surg Int.* 2013;29(5):455–458. doi: 10.1007/s00383-013-3262-3. [PubMed] [CrossRef] [Google Scholar]
12. Magarey CJ, Chant AD, Rickford CR, Margarey JR. Peritoneal drainage and systemic antibiotics after appendectomy. A prospective trial. *Lancet.* 1971;2(7717):179–182. doi: 10.1016/S0140-6736(71)90894-4. [PubMed] [CrossRef] [Google Scholar]
13. Haller JA, Jr, Shaker IJ, Donahoo JS, Schnauffer L, White JJ. Peritoneal drainage versus non-drainage for generalized peritonitis from ruptured appendicitis in children: a prospective study. *Ann Surg.* 1973;177(5):595–600. [PMC free article] [PubMed] [Google Scholar]
14. Greenall MJ, Evans M, Pollock AV. Should you drain a perforated appendix? *Br J Surg.* 1978;65(12):880–882. doi: 10.1002/bjbs.1800651215. [PubMed] [CrossRef] [Google Scholar]
15. Tander B, Pektas O, Bulut M. The utility of peritoneal drains in children with uncomplicated perforated appendicitis. *Pediatr Surg Int.* 2003;19(7):548–550. doi: 10.1007/s00383-003-1029-y. [PubMed] [CrossRef] [Google Scholar]
