

The comparison of effectiveness, safety, and clinical outcome of one step-percutaneous abscess aspiration versus drainage by insertion of a drainage catheter in children with post-appendectomy abscess

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Abstract

Introduction: Although radiologic guided abscess drainage with a drainage catheter has been a successful method for treatment of appendicular abscess after surgery, single stage aspiration technique could also be used as a good option in children with intra-abdominal abscess. The aim of this study was to compare efficacy, safety and clinical outcome of percutaneous abscess drainage versus aspiration in pediatric patients with post-appendectomy abscess formation.

Materials and Methods: This randomized control trial was conducted under the supervision of Mashhad University of medical sciences. Children were enrolled in the study with suspicion of post-appendectomy abscess formation. Patients were divided into two groups (drainage or aspiration) with simple sampling method. Demographic characteristics and clinical outcome were compared between the two groups. Data analysis was done using SPSS version 16.

Results: Fifty children with post-appendectomy abscess were enrolled in this study. Their mean age was 10.4 ± 4.1 year (range from 5 to 19

Keywords

- child
- abscess
- drainage
- aspiration
- appendectomy

yrs). Drainage was successful in 88% of patients and the succeed rate in aspiration group was 96% and this difference was not significant statistically ($p=0.609$). Duration of hospital stay was longer in the drainage group in comparison with aspiration (2.8 ± 0.55 vs. 2.1 ± 0.47 , p -value < 0.001).

Conclusion: Efficacy, safety and other clinical outcomes of percutaneous abscess drainage and aspiration were the same in pediatric patients with smaller than 5 cm post-appendectomy abscess. Due to lower cost and parental satisfaction, aspiration would be a good choice in children with small post-appendectomy abscess.

Introduction

One of the most common causes of abdominal infections is appendicitis and consequently it is the most common cause of intra-abdominal abscess formation in children ¹⁻⁶. Most cases of appendicitis occur in school-aged children, and it is less common in neonates ^{4,5}. Studies have shown that 23-73% of cases of perforated appendicitis occur in children and up to 10% of cases lead to abscess formation which will occur before or after surgery ^{7,8}. There are three basic strategies for abscess management after appendectomy. The first is emergency surgery that can lead to prolonged drainage, and increased risk of recurrence of abscess. The second option is radiologic guided interventions such as drainage catheter insertion and the last one is using broad spectrum antibiotics and one stage aspiration in abscesses with diameters smaller than 2 centimeters ⁷⁻⁹.

In recent years, most cases of abscess after appendectomy are managed with successful drainage using catheters. Drainage complications occur in up to 11% of these cases including catheter migration, pus and blood discharge from

the catheter site, hemorrhage and vascular injuries; particularly when a trans-gluteal approach is used ⁷. Other risks associated with the treatment include bowel perforation, damage to other abdominal organs and female genital tract ¹¹⁻¹³.

However, the use of imaging guided drainage has greatly reduced the risk of these complications, especially ultrasound guided approach ^{14, 15}. Nowadays, Image guided drainage has been a successful method for treatment of appendicular abscess after surgery, with a technical succeed rate of estimated 85-90% and clinical succeed rate of between 81 and 100% ^{16, 17, 18}. Drainage can reduce hospital stay duration and health costs in comparison with open surgery ¹⁸.

There are some studies in literature about efficacy of aspiration treatment in abdominal abscess ^{19, 20}. Also aspiration has been used for liver abscess in children, without serious complications ^{21, 18}. The aim of this study was to compare efficacy, safety and other clinical outcome of percutaneous abscess drainage in comparison with aspiration in pediatric patients with post-appendectomy abscess formation.

Materials and Methods

This controlled trial was conducted under the supervision of Mashhad University of medical sciences from 2013-2017. It was conducted based on Helsinki declaration and written consent was obtained from patients and their parents.

Children were enrolled in the study with suspicion of post-appendectomy abscess formation. Inclusion criteria were clinical diagnosis of appendicular abscess (pain in surgery site and fever), fluid collection presence on ultrasound investigation, abscess diameter smaller than 5 cm, interval between appendectomy and abscess formation less than 3 weeks. Patients with abscess larger than 5 cm were excluded from the study due to the opinion of our universities ethic committee.

Demographic characteristics (age, sex, etc) of all children were recorded at the start point. Patients were divided into two groups (drainage or aspiration) with simple sampling method.

All radiologic evaluations were performed by an experienced pediatric radiologist. All patients were evaluated by ultrasonography (Siemens sonoline Adara). Number of abscess, the phlegmon that exists in the cellular tissue around appendix, extra luminal gas or any type of fluid collections were recorded carefully. All procedures were performed under general

anesthesia in the operation room. Aspiration procedures were done by a 20 cc syringe attached to a gray angio-catheter for superficial collections and by a co-axial needle for deep collections. One to three time needling was done for each patient until the complete collection collapse.

Drainage procedure was performed by hydrophilic one step percutaneous drainage set (Bio Tec – 8-12 French, Taiwan) that was ultimately attached to a vacuum bag for two or three days. Lavage was not used in any patient.

Complications during procedure, hospital stay and total time were also recorded. Parents and children satisfaction and clinical outcome were compared between the two groups.

Descriptive data is reported as mean or frequency and qualitative variables were compared by the Mann-Whitney method. Chi square test was used to compare qualitative variables. A P-value less than 0.05 was considered to be statistically significant.

Results

Fifty children with post-appendectomy abscess were enrolled in this study. Their mean age was 10.4 ± 4.1 years (range from 5 to 19 yrs). Thirty children (60%) were male and the other 20 were female. Various variables are compared between the drainage and aspiration groups; which is shown in the **Table 1**.

Table 1: comparison of variables between two groups.

	Drainage	Aspiration	P-value
Age (years)	11.5 4.4 ±	9.3 3.7±	0.067
Number of abscess	1.3 0.7 ±	1.4 ± 0.7	0.690
Mean abscess size (mm)	39.9 * 21.2	37.4 * 19.1	0.357
Discharged fluid volume (cc)	24.6 ± 9.7	22.3 ± 10.4	0.420
Hospital stay (day)	2.8 ± 0.55	2.1 ± 0.47	<0.001

Duration of hospital stay was longer in the drainage group in comparison with the aspiration group (2.8 ± 0.55 vs. 2.1 ± 0.47, p-value < 0.001).

Drainage was successful in 88% of patients and the succeed rate in aspiration group was 96% and this difference was not statistically significant (p=0.609). Satisfaction rate were 92% and 96% in drainage or aspiration group, respectively (p=0.073). No complication found in both groups.

Discussion

Appendicitis is the most common cause of acute abdomen in children and adults and it's the cause of hospitalization in almost a third of children who are treated for abdominal pain. Abdominal abscess occurs in cases of perforated appendicitis and nowadays radiologic guided percutaneous drainage is a standard therapeutic option ¹⁹.

Use of single stage aspiration instead of drainage catheters especially in children is an option with few studies addressing it in the literature ^{20, 19}.

In a study by Abusedera et al, clinical success rate for aspiration was 94% in adult patients ¹⁹ and in a research by Wroblicka et al, 90% abdominal and pelvic abscesses in children and adult patients were successfully treated with a one-step needle aspiration and lavage. All patients in our study were children with a mean age of 10.4 ± 4.1 year (range from 5 to 19 years). The success rate in the

drainage group was 88% and in the aspiration group was 96% and this difference was not statistically significant (p=0.609).

A study conducted in 2015 in Egypt claimed that appendicular abscess drainage has no complications ²⁰. Our study confirmed his findings and none of our patients experienced complications after both methods of interventions. In addition to similar success rates with aspiration in comparison with drainage; antibiotic administration and duration of hospital stay was longer in the drainage group in comparison with the aspiration group (p-value < 0.001).

Also there are some papers in the literature regarding the usage of aspiration in the treatment of liver and breast abscess with high success rates. Few studies showed that management of a large pyogenic liver abscess with needle aspiration had 60% - 94% success ^{16, 21, 22}. These studies revealed that aspiration is a feasible and cost effective treatment option for breast abscess ^{23, 24}.

Moreover, there are some studies regarding conservative management of appendicular abscess which claim that conservative management seems to be more effective than early surgical intervention in the pediatric population, but they need to be

hospitalized at least 2-6 days^{15,25,18}. A Gasior study in 2013 showed a comparison of complications between drainage and conservative treatment for appendicular abscess and resulted in no difference between the 2 groups¹⁸.

However, long durations of hospital admission are a disadvantage of conservative management in comparison with aspiration or drainage treatment. Mean duration of hospital stay in our patients in the aspiration group was 2 days and in the drainage group was 3 days.

A high cure rate, no complications, shorter hospitalization, its usage in multiple collections, lesser cost and facility of procedure in comparison with drainage or surgery intervention or conservative management are the most important advantage of abscess aspiration. Appendicular abscesses smaller than 5 cm in children can be safely treated by aspiration with better technical and clinical success rates in comparison with drainage.

Our study had some limitation; exclusion of abscesses with a mean size of more than 5 cm and inability to differentiate between the effect of aspiration and the effect of the antibiotic

therapy which was prescribed simultaneously in these patients especially in small collections. The main factor which influences the success rate of conservative or interventional treatment of appendicular abscess is its size.

Conclusion

Efficacy, safety and clinical results of percutaneous abscess drainage and aspiration were the same in pediatric patients with smaller than 5 cm post-appendectomy abscess. Due to lower cost and parental satisfaction, aspiration would be a good choice in children with small post-appendectomy abscess.

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References

1. Curran TJ MS: The treatment of complicated appendicitis in children using peritoneal drainage: results from a public hospital. *J Pediatr Surg* 1993;28(2):204-208.
2. Fishman SJ PL, Klavon SL, O'Rourke EJ: Perforated appendicitis: prospective outcome analysis for 150 children. *J Pediatr Surg* 2000;35(6):923-926..
3. Lasson A LJ, Loren I, Nilsson PE: Appendiceal abscesses: primary percutaneous drainage and selective

interval appendectomy. *Eur J Surg* 2002;168(5):264-269.

4. Newman K PT, Kittle K: Appendicitis 2000: variability in practice, outcomes, and resource utilization at thirty pediatric hospitals. *J Pediatr Surg* 2003;38(3):372-379.

5. Samelson SL RH: Management of perforated appendicitis in children—revisited. *Arch Surg* 1987;122:691-696.

6. Walser E RS, Hernandex A, Ozkan O, et al: Sonographically guided transgluteal drainage of pelvic abscesses. *AJR Am J Roentgenol* 2003;181:498-500.

7. Hogan MJ: Appendiceal Abscess Drainage. *Techniques in Vascular and Interventional Radiology* 2003;6(4):205-14.

8. Price MR HG, Sartorelli KH, Meagher Jr DP: Recurrent appendicitis after initial conservative management of appendiceal abscess. *J Pediatr Surg* 1996;31(2):291-294.

9. Schmit PJ HD, Swisher SG: Analysis of risk factors of postappendectomy intra-abdominal abscess. *J Am Coll Surg* 1994;179(6):721-726.

10. Sivit CJ AK: Imaging of acute appendicitis in children. *Semin Ultrasound CT MR* 2003;24(2):74-82.

11. Stephen AE SD, Ryan DP: The diagnosis of acute appendicitis in a pediatric population: to CT or not to CT. *J Pediatr Surg* 2003;38(3):367-371.

12. Weyant MJ ES, Maluccio MA: The use of computed tomography for the diagnosis of acute appendicitis in children does not influence the overall rate of negative appendectomy or perforation. *Surg Infect* 2001;2(1):19-23.

13. Harisinghani MG GD, Hahn PF: CT-guided transgluteal drainage of deep pelvic abscesses: indications, technique, procedure-related complications, and clinical outcome. *Radiographics* 2002;22(6):1353-1367.

14. Brown C, Kang L, T S: Percutaneous Drainage of Abdominal and Pelvic Abscesses in Children. *Semin Intervent Radiol* 2012;29(1):286–94.

15. Wersäll J, Stenström P, Arnbjörnsson E, et al: Evaluation of Different Treatments for Appendiceal Abscess in Children. A Case for Surgical Approach. *MOJ Surg* 2015; 2(1): 00009.

16. Jha AK, Das G, Maitra S, et al: Management of large amoebic liver abscess--a comparative study of needle aspiration and catheter drainage. *J Indian Med Assoc* 2012;110(1):13-5.

17. Chandika AB, Gakwaya AM, Kiguli-Malwadde E, et al: Ultrasound Guided Needle Aspiration versus Surgical Drainage in the management of breast abscesses: a Ugandan experience.

BMC Res Notes 2012 ;(6)5:12.

18. Gasior AC, Marty Knott E, Ostlie DJ, et al: To drain or not to drain: an analysis of abscess drains in the treatment of appendicitis with abscess. *Pediatr Surg Int* 2013;29(5):455-8.

19. Abusedera M A, Khalil M, Ali A M A, et al: Percutaneous image-guided aspiration versus catheter drainage of abdominal and pelvic collections. *The Egyptian Journal of Radiology and Nuclear Medicine* 2013; 44: 223–230

20. Wroblecka JT, Kuligowska E: One-step needle aspiration and lavage for the treatment of abdominal and pelvic abscesses. *AJR Am J Roentgenol* 1998; 170(5):1197-203.

21. Rajak CL, Gupta S, Jain S, et al: Percutaneous treatment of liver abscesses: needle aspiration versus catheter drainage. *AJR Am J Roentgenol* 1998; 170(4):1035-9.

22. Ch Yu S, Hg Lo R, Kan PS, et al: Pyogenic liver abscess: treatment with needle aspiration. *Clin Radiol* 1997; 52(12):912-6.

23. Schwarz RJ1, Shrestha R: Needle aspiration of breast abscesses. *Am J Surg* 2001; 182(2):117-9.

24. Chandika AB, Gakwaya AM, Kiguli-Malwadde E, et al: Ultrasound Guided Needle Aspiration versus Surgical Drainage in the management of breast abscesses: a Ugandan experience. *BMC Res Notes* 2012;5:12.

25. Zerem E1, Salkic N, Imamovic G, et al: Comparison of therapeutic effectiveness of percutaneous drainage with antibiotics versus antibiotics alone in the treatment of periappendiceal abscess: is appendectomy always necessary after perforation of appendix? *Surg Endosc* 2007; 21(3):461-6.