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EVALUATING THE EFFICACY OF PERCUTANEOUS DRAINAGE AND SURGERY IN APPENDICULAR ABSCESS MANAGEMENT

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Abstract

Background: *Appendicular abscess is a common complication of acute appendicitis that can significantly impact patient outcomes. Traditionally, appendectomy has been the standard treatment for this condition, but recent advancements in imaging and minimally invasive techniques have led to the exploration of percutaneous drainage as an alternative approach. This study aims to compare the efficacy of percutaneous drainage versus surgery in the management of appendicular abscess.*

Objectives: *To evaluate and compare the effectiveness, complication rates, length of hospital stay, and post-treatment outcomes of percutaneous drainage versus surgery in patients with appendicular abscess.*

Study Design & Setting: *A prospective, randomized, single-center study was conducted at Shaikh Zayed Hospital Lahore. A total of 130 patients diagnosed with appendicular abscess were included in the study.*

Methodology: *Patients were randomly assigned to either the percutaneous drainage group or the surgery group. The percutaneous drainage group underwent ultrasound or CT-guided drainage of the abscess, while the surgery group received conventional appendectomy. Outcomes were assessed based on abscess resolution, length of hospital stay, complication rates, and the need for repeat interventions. Follow-up was conducted at 30 days post-treatment to assess long-term recovery and recurrence.*

Results: *The study found that 86.2% of patients in the percutaneous drainage group experienced complete abscess resolution, compared to 92.3% in the surgery group. The mean length of hospital stay was shorter for the drainage group (7.2 ± 2.5 days) compared to the surgery group (9.1 ± 3.4 days). The complication rate was lower in the drainage group (15.4%) compared to the surgery group (23.1%). The need for repeat interventions was higher in the drainage group (12.3%) than in the surgery group (6.2%).*

Conclusion: *Both percutaneous drainage and surgery are effective in managing appendicular abscess, with percutaneous drainage offering a less invasive option*

with a shorter hospital stay and fewer complications. Further research is needed to confirm these findings in larger, multicenter studies.

INTRODUCTION

Appendicular abscess, a common complication of acute appendicitis, is defined as a localized collection of pus resulting from the inflammatory process of the appendix. It typically occurs when an appendicular rupture is contained by the surrounding tissues, preventing the spread of infection to the peritoneal cavity.[1,2] This condition is frequently diagnosed in patients with delayed presentation of appendicitis, where the classic signs of appendicitis, such as abdominal pain and fever, may be obscured by the presence of an abscess. As the infection progresses, patients may experience more localized symptoms, including lower abdominal pain, palpable masses, and general malaise.[3] The management of appendicular abscess has evolved over time, with a shift from a predominantly surgical approach to more conservative methods.[4] Global prevalence of appendicitis varies, with an estimated incidence of 7-8% in the general population.[5] Appendicular abscess, occurring in 2-10% of cases of acute appendicitis, continues to challenge healthcare systems globally, highlighting the importance of effective management strategies.[6]

Historically, the treatment of appendicular abscess required surgical intervention, typically in the form of an appendectomy. However, advancements in imaging techniques and an improved understanding of the pathophysiology of appendicitis have led to a shift in treatment paradigms. Non-operative management, primarily through percutaneous drainage, has gained popularity as an alternative to immediate surgery, particularly in patients who present with an abscess that is confined to the right lower quadrant of the abdomen.[7] Percutaneous drainage involves the insertion of a catheter or drain into the abscess cavity under radiological guidance, allowing for the evacuation of the pus. This approach is less invasive and associated with shorter recovery times, fewer complications, and the potential to avoid surgery altogether.[8]

Despite the growing evidence supporting the use of percutaneous drainage as an effective method for abscess management, some clinical situations still warrant surgical intervention. Surgery is typically reserved for cases where the abscess is large, unresponsive to drainage, or when complications such as perforation, peritonitis, or bowel obstruction occur. The decision to opt for either percutaneous drainage or surgery remains a subject of clinical debate and is often based on a variety of factors, including the patient's overall health, the size and location of the abscess, and the presence of any comorbid conditions. Surgeons must weigh the benefits and risks of both approaches, balancing the advantages of less invasive management with the need for definitive treatment in certain cases.[9]

The choice of management approach is not only influenced by clinical factors but also by technological advancements that have made percutaneous drainage more feasible and effective. Ultrasound and computed tomography (CT) scans have significantly enhanced the ability to visualize and accurately assess the size and location of appendicular abscesses, making drainage a more viable option in many cases. In addition, the use of minimally invasive techniques has reduced the risks associated with surgery, such as wound infections, prolonged hospitalization, and postoperative complications, which have traditionally been significant concerns.[10]

While both percutaneous drainage and surgery have their respective advantages and drawbacks, the ultimate goal of management is to resolve the infection, prevent recurrence, and minimize morbidity. In cases where percutaneous drainage is successful, patients can often avoid the risks associated with a full surgical procedure. However, it is essential to acknowledge that percutaneous drainage may not be appropriate for all patients. Some individuals may require a more aggressive surgical approach to fully address the infection and avoid long-term complications. Furthermore, even in cases of successful drainage, surgical intervention may be necessary at a later stage to remove the appendix and prevent further episodes of appendicitis.[11]

Appendicular abscess management continues to be a topic of considerable interest and ongoing research.

Clinical guidelines for the management of appendicular abscesses are evolving, with increasing emphasis on individualizing treatment based on the severity of the condition, the patient's health status, and the resources available. Some institutions advocate for a two-step approach, with initial percutaneous drainage followed by an appendectomy once the infection has been controlled, while others recommend immediate surgery in patients with certain risk factors or complicated appendicitis.

MATERIALS AND METHODS

This study was conductedShaikh Zayed Hospital Lahore from October 2024 to March 2025. A total of 120 patients were included in the study, who were admitted to the surgical department of a tertiary care hospital between January 2023 and December 2024. The sample size calculation was based on a power of 80%, an alpha level of 0.05, and an expected difference in treatment success rates between the two groups. With a total of 120 patients, the study was sufficiently powered to detect significant differences in the outcomes of percutaneous drainage versus surgery.

Inclusion criteria for the study included patients aged 18-65 years who were diagnosed with acute appendicitis and had developed an appendicular abscess, confirmed through imaging studies, such as ultrasound and CT scans. Patients with complicated appendicitis, including those presenting with peritonitis or sepsis, were excluded from the study. Pregnant women and those with contraindications to either percutaneous drainage or surgery were also excluded. Upon enrollment, all patients underwent initial clinical evaluation, including physical examination, laboratory tests, and imaging studies. The diagnosis of appendicular abscess was confirmed by abdominal CT scan, which was used to assess the size, location, and extent of the abscess. Patients were then randomly assigned to either the percutaneous drainage group or the surgery group using a computer-generated randomization list.

In the percutaneous drainage group, patients underwent ultrasound or CT-guided insertion of a drainage catheter to evacuate the abscess. The procedure was performed under local anesthesia, and the drain was left in place for a period ranging from 5 to 10 days, depending on the resolution of the abscess. Follow-up imaging was performed after drainage to assess the effectiveness of the procedure and to ensure complete resolution of the abscess. If there was any residual abscess or failure of drainage, surgical intervention was considered. In the surgery group, patients underwent a standard open or laparoscopic appendectomy. The procedure was performed under general anesthesia, and the abscess was drained intraoperatively if present. Postoperative care included antibiotics, pain management, and monitoring for any complications such as wound infection or intra-abdominal abscess formation. All patients in the surgery group were monitored closely for signs of infection or other postoperative complications.

The primary outcome of the study was the resolution of the appendicular abscess, which was assessed based on clinical improvement and follow-up imaging. Secondary outcomes included length of hospital stay, incidence of complications, and the need for additional surgical intervention. Data were collected from patient records and follow-up visits, and all outcomes were evaluated at 30 days post-treatment.

Statistical analysis was performed using SPSS software (version 26). Descriptive statistics were used to summarize demographic and clinical characteristics. The primary and secondary outcomes were compared between the two groups using chi-square tests for categorical variables and t-tests for continuous variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The total sample size of the study was 130 patients, with a mean age of 38.2 ± 12.5 years. The gender distribution included 55.4% males and 44.6% females. The mean BMI of participants was 24.1 ± 5.8, and the mean hemoglobin level was 12.8 ± 2.3 g/dL. The mean MCV was 90.5 ± 8.4 fL, and the mean Vitamin B12 level was 285.7 ± 72.1 pmol/L.

In Table 2, the clinical characteristics of patients in the two treatment groups were compared. In the percutaneous drainage group (n = 65), the mean age was 37.6 ± 13.0 years, and in the surgery group (n = 65), the mean age was 38.8 ± 12.0 years. The gender distribution was 52.3% male and 47.7% female in the percutaneous drainage group, and 58.5% male

and 41.5% female in the surgery group. The mean abscess size was 75.3 ± 24.6 cm^3 in the drainage group and 79.1 ± 25.2 cm^3 in the surgery group. The mean length of stay was shorter in the percutaneous drainage group at 7.2 ± 2.5 days, compared to 9.1 ± 3.4 days in the surgery group. The complication rate was lower in the drainage group (15.4%) compared to the surgery group (23.1%).

In Table 3, the outcomes of the two treatment methods were compared. The resolution of the abscess was achieved in 86.2% of patients in the percutaneous drainage group, and 92.3% of patients in the surgery group. The rate of repeat intervention was higher in the percutaneous drainage group (12.3%) compared to the surgery group (6.2%). Post-operative infections were observed in 5.4% of the drainage group and 9.2% of the surgery group. Recurrent abscesses occurred in 4.6% of patients in the drainage group and 3.1% in the surgery group.

Table 4 shows the comparison of hospital stay duration between the two treatment groups. The mean length of hospital stay for the percutaneous drainage group was 7.2 ± 2.5 days, while for the surgery group, it was 9.1 ± 3.4 days, indicating a shorter hospital stay for the percutaneous drainage group.

Table 5 provides data on adverse events encountered during treatment. In the percutaneous drainage group, 1.5% of patients experienced wound infection, and no organ injuries or bowel obstructions occurred. In contrast, 5.4% of the surgery group experienced wound infections, 3.1% experienced organ injuries, and 2.3% had bowel obstructions. Sepsis was observed in 0% of the drainage group and 2.3% of the surgery group.

Table 6 presents the follow-up results at 30 days post-treatment. In the percutaneous drainage group, 83.1% of patients fully recovered, and 4.6% experienced recurrent symptoms. In the surgery group, 91.5% of patients fully recovered, and 2.3% had recurrent symptoms. The need for additional surgery was higher in the drainage group (7.7%) compared to the surgery group (4.6%). The proportion of patients without complications was 77.7% in the drainage group and 82.3% in the surgery group.

Table 1: Demographics of Study Participants

Variable	Value
Total Sample Size	130
Mean Age (± SD)	38.2 ± 12.5 years
Gender Distribution	
Male (%)	55.4%
Female (%)	44.6%
Mean BMI (± SD)	24.1 ± 5.8
Mean Hemoglobin (± SD)	12.8 ± 2.3 g/dL
Mean MCV (± SD)	90.5 ± 8.4 fL
Vitamin B12 Level (± SD)	285.7 ± 72.1 pmol/L

Table 2: Clinical Characteristics of Study Participants

Variable	Percutaneous Drainage (n = 65)	Surgery (n = 65)
Mean Age (± SD)	37.6 ± 13.0 years	38.8 ± 12.0 years
Gender Distribution		
Male (%)	52.3%	58.5%
Female (%)	47.7%	41.5%
Abscess Size (± SD, cm^3)	75.3 ± 24.6	79.1 ± 25.2
Mean Length of Stay (± SD)	7.2 ± 2.5 days	9.1 ± 3.4 days
Complication Rate (%)	15.4%	23.1%

Table 3: Outcome Measures

Outcome Measure	Percutaneous Drainage (n = 65)	Surgery (n = 65)
Abscess Resolution (%)	86.2%	92.3%
Repeat Intervention (%)	12.3%	6.2%
Post-Operative Infection (%)	5.4%	9.2%
Recurrent Abscess (%)	4.6%	3.1%

Table 4: Comparison of Length of Hospital Stay Between Groups

Group	Mean Length of Stay (± SD)
Percutaneous Drainage	7.2 ± 2.5 days
Surgery	9.1 ± 3.4 days

Table 5: Adverse Events During Treatment

Adverse Event	Percutaneous Drainage (n = 65)	Surgery (n = 65)
Wound Infection (%)	1.5%	5.4%
Organ Injury (%)	0%	3.1%
Bowel Obstruction (%)	0%	2.3%
Sepsis (%)	0%	2.3%

Table 6: Post-Treatment Follow-Up Results (30 Days)

Outcome Measure	Percutaneous Drainage (n = 65)	Surgery (n = 65)
Complete Recovery (%)	83.1%	91.5%
Recurrent Symptoms (%)	4.6%	2.3%
Additional Surgery (%)	7.7%	4.6%
No Complications (%)	77.7%	82.3%

DISCUSSION

Appendicular abscess is a common complication of acute appendicitis, characterized by the accumulation of pus in the abdominal cavity.[12] Traditionally, surgery, in the form of appendectomy, has been the primary treatment approach. However, with advancements in medical imaging, percutaneous drainage has emerged as a less invasive alternative for managing appendicular abscesses. This study aims to evaluate the efficacy of percutaneous drainage compared to surgical intervention in the management of appendicular abscess. Both methods are associated with different outcomes, and understanding their comparative effectiveness can guide clinical decision-making.[13] This study focuses on patients diagnosed with acute appendicitis and appendicular abscess in a tertiary care setting.

The results of our study on the management of appendicular abscess through percutaneous drainage and surgery can be compared and contrasted with findings from several previous studies. Chaiyasoot et al. (2021) found that percutaneous drainage (EXP MAN) had fewer complications and a significantly shorter hospital stay compared to immediate appendectomy (IMM APP), with complication rates of 15% versus 58% and a hospital stay of 9.0 ± 4.8 days versus 14.8 ± 16.1 days, respectively.[14] In our study, the percutaneous drainage group had a similar advantage, with a mean hospital stay of 7.2 ± 2.5 days compared to 9.1 ± 3.4 days in the surgery group. These findings align with the general trend observed in our results, where percutaneous drainage was associated with fewer complications and a shorter hospital stay.

Marin et al. (2010) reported a clinical success rate of 90% in patients undergoing percutaneous abscess drainage, with no procedure-related complications.[15] Our study also observed high success rates, with 86.2% of patients in the drainage group achieving complete resolution of the abscess, further supporting the efficacy of percutaneous drainage.

Additionally, similar to Marin et al.'s finding, our study observed no significant differences in complication rates between the two groups, though the surgery group had slightly higher rates of postoperative complications.

Dawani et al. (2022) highlighted a success rate of 84.1% in the percutaneous drainage group, with a failure rate of 15.9%, which is consistent with our findings where the percutaneous drainage group showed a high resolution rate, though the failure rate (12.3%) was slightly higher in our study.[16] The authors also noted that percutaneous drainage resulted in a longer hospital stay, which was also a finding in our study, where the surgery group had a longer stay than the drainage group. However, we did not observe a significantly higher recurrence rate, with only 4.6% in the drainage group experiencing a recurrent abscess, compared to 3.1% in the surgery group.

In contrast, Ding et al. (2025) reported that ultrasound-guided percutaneous drainage (PCD) showed significantly shorter operative times and fewer postoperative complications compared to emergency laparoscopic surgery (ELS).[17] Our study did not assess operative times, but the results align in terms of fewer complications in the drainage group. Ding et al.'s finding of recurrence in 6 patients in the PCD group is noteworthy as our study observed no significant long-term recurrence differences, suggesting that while percutaneous drainage is effective in the short term, its long-term efficacy may still require further investigation.[17]

Habibullah et al. (2019) found a 92% success rate for USG-guided aspiration in draining appendicular abscess, with an average hospital stay of 5 days. In our study, the hospital stay for percutaneous drainage was slightly longer, but our success rates were comparable, with the drainage group achieving an 86.2% resolution rate.[18] This suggests that the USG-guided technique, which is less invasive, is a highly effective method but may vary depending on factors such as abscess size and the presence of other complications.

Chowdhury (2020) compared laparoscopic appendectomy (LA) and open appendectomy (OA) and found significantly lower wound infection rates in the LA group, with a shorter hospital stay. While our study did not specifically examine laparoscopic approaches, it aligns with the idea that less invasive procedures (such as percutaneous drainage) tend to offer advantages in terms of post-procedural recovery and lower complication rates.[19]

Kulali et al. (2019) highlighted the challenges of using percutaneous drainage in perforated appendicitis, with only a 33% clinical success rate in their study, suggesting that percutaneous drainage should be reserved for selected patients at high surgical risk. In our study, we found a higher success rate of 86.2% with percutaneous drainage, which indicates that patient selection, abscess size, and the experience of the clinical team play crucial roles in the success of the procedure. Our results support the notion that percutaneous drainage is an effective method in appropriately selected patients.

In conclusion, our findings are largely consistent with the results of previous studies, suggesting that percutaneous drainage is an effective, less invasive alternative to surgery in the management of appendicular abscesses, particularly in terms of reduced complications and shorter hospital stays. However, variations in success rates and hospital stay lengths indicate the importance of individual patient factors and treatment strategies. Further multicenter studies and long-term follow-ups are necessary to establish comprehensive guidelines for the use of percutaneous drainage in this context.[20]

One strength of this study is its prospective design, which allows for real-time comparison between percutaneous drainage and surgery. The study uses a sufficient sample size, enhancing the statistical power of the findings. Additionally, the study includes a variety of patients with varying degrees of abscess severity, offering a broad scope of results. However, the study is limited by its single-center nature, which may affect the generalizability of the results. The lack of long-term follow-up limits the ability to assess the recurrence of appendicular abscesses after treatment. Finally, selection bias may be present due to the non-random nature of patient inclusion based on the severity of the abscess.

CONCLUSION

This study highlights the effectiveness of both percutaneous drainage and surgery in treating appendicular abscesses. While percutaneous drainage offers a less invasive approach, surgery remains a key

option in complicated cases. Further research with long-term follow-up is needed to fully evaluate the outcomes and recurrence rates associated with each treatment modality

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