

Appendicular Abscess: An Update on Current Management: Narrative Review Article

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Abstract: Appendicular abscess is a complication from perforation of the appendix, and it is seen in 10% of cases of acute appendicitis. It is diagnosed by clinical examination, the presence of leukocytosis and imaging modalities like ultrasound or computerized tomography. The treatment is usually conservative with intra-venous fluids, antibiotics and percutaneous drainage of the abscess. The introduction of laparoscopic surgery has seen a move towards immediate appendectomy. Interval appendectomy is no longer a routine and is only performed for patients who present with recurrent symptoms. We have conducted this narrative review article to look at the various management options for appendicular abscess.

Keywords: Complicated appendicitis, appendicular mass, appendicular abscess, appendectomy, laparoscopic appendectomy and percutaneous drainage.

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INTRODUCTION

An appendicular abscess often occurs because of perforation of the appendix. It is included under the term appendicular mass which is defined as a clinical spectrum that occurs from perforation of the appendix that involves the formation of a mass in the right iliac fossa. The mass includes the cecum, terminal ileum, omentum and perforated appendix. The appendicular mass can range from a phlegmon to an abscess (Garba & Ahmed, 2008). The diagnosis of an appendicular abscess or mass is made by performing a clinical examination of the abdomen which may reveal a mass in the right iliac fossa, obtaining blood investigations that may show leukocytosis or elevated C-reactive protein and imaging modalities like ultrasound or computerized tomography. The treatment of an appendicular abscess can be divided into conservative treatment with intravenous antibiotics and percutaneous drainage of the abscess in stable patients. For unstable patients an immediate appendectomy is performed followed by intra-venous antibiotics. For stable patients with an appendicular abscess, immediate appendectomy was not encouraged due to the high risk of complications like post operative abscess formation and enterocutaneous fistula formation

(Ahmed *et al.*, 2005; Becker *et al.*, 2018; Tannoury & Abboud, 2013).

Traditionally an Interval appendectomy was performed eight weeks after conservative treatment but it need not be performed as a routine due to the low recurrence rates and for older patients (above the age of 40), performing a computerized tomography or a colonoscopy can help to detect any other pathology in the colon to not miss lesions like malignancy (Demetrashvili *et al.*, 2019). Interval appendectomy can be performed as an open or laparoscopic procedure. Laparoscopic interval appendectomy is associated with better outcomes when compared to open interval appendectomy (Rashid *et al.*, 2013).

The World Society of Emergency Surgeons (WSES) in their guidelines for the management and treatment of acute appendicitis have recommended that patients with an appendicular mass or abscess can be managed with an immediate laparoscopic appendectomy and conservative treatment with intra-venous antibiotics and percutaneous drainage of abscess may be employed when laparoscopic surgical services are not available (Di Saverio *et al.*, 2020). The European Association of

Emergency Surgeons (EAES) in their guidelines in the diagnosis and management of acute appendicitis recommend conservative or non-operative treatment for patients who present with an appendicular mass or abscess (Gorter *et al.*, 2016).

The need of performing an interval appendectomy is also being questioned now as due to the low recurrence rates of right iliac fossa pain. For patients who are below the age of 40 years will not be required to undergo an elective interval appendectomy. Patients who are above the age of 40 can be investigated with imaging modalities like computerized tomography (CT) and colonoscopy (Koirala *et al.*, 2016; Panahi *et al.*, 2020).

As there is no current consensus in the management of an appendicular abscess, we have conducted this review article looking into the diagnosis,

and management of appendicular abscess. The role of percutaneous drainage of an appendicular abscess and immediate surgery is evaluated. We conducted a literature review using PUBMED, the Cochrane database of systemic reviews, Google scholar and semantic scholar looking for randomized control trials, non-randomized trials, observational and cohort studies, clinical reviews, systemic reviews, and meta-analysis from 1980 to 2024. The following keywords were used, “complicated appendicitis”, “appendicular mass”, “appendicular abscess”, “appendectomy”, “laparoscopic appendectomy” and “percutaneous drainage”. All articles were in English, and all articles were assessed by manual cross referencing of the literature. Commentaries, case reports and editorials were excluded from this review. Adult and pediatric patients were included in this study and pregnant patients with acute appendicitis were excluded.

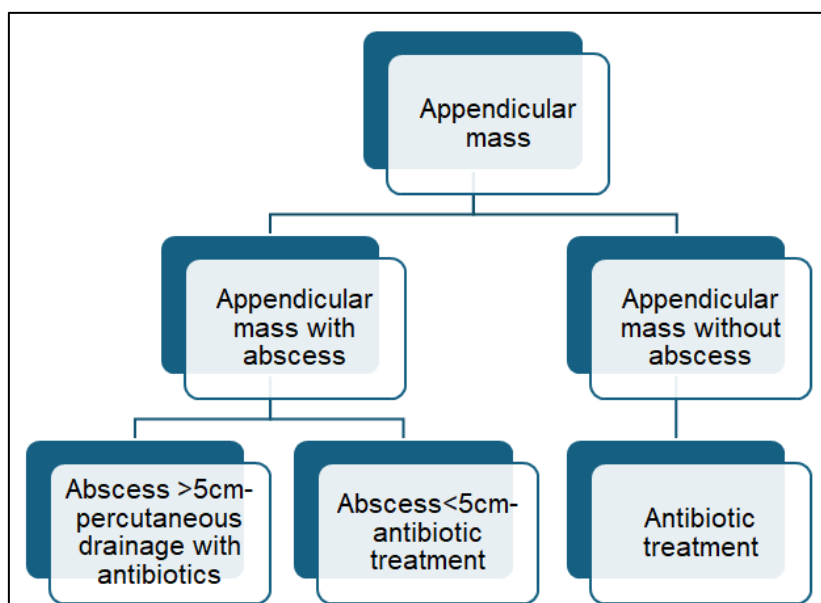


Image I: Flowchart showing the management of appendicular mass and abscess

DISCUSSION

Conservative treatment of appendicular abscess

Conservative treatment of an appendicular abscess involves starting the patient on intravenous antibiotics, analgesics, monitoring the vital signs and keeping the patient fasted. This method of management was popularized by Ochsner and Sheeren and it was associated with an 80% to 90% success rate, and it had low complications. An interval appendectomy was than performed after eight weeks to prevent recurrence (Coccolini *et al.*, 2018; Elsaady, 2019; Tingstedt *et al.*, 2002).

A systemic review and meta-analysis on the nonsurgical treatment of appendiceal abscess or phlegmon was conducted by Andersson *et al.*, 20 studies with 59,448 patients were included in this study and conservative treatment was associated with a success rate of 92.8% and a recurrence rate of 7.4%. The need for

percutaneous drainage of abscess was seen in 19.7% of the cases that underwent conservative treatment. Due to the low recurrence rates, interval appendectomy was not performed as a routine and high-risk patients could be followed up with computerized tomography and colonoscopy (Andersson & Petzold, 2007).

A meta-analysis comparing conservative treatment versus appendectomy for complicated appendicitis was conducted by Simillis *et al.*, 17 studies with 1572 patients were included in this study, of which 847 patients underwent conservative treatment and 725 underwent appendectomy. This study concluded that conservative treatment was associated with reduced wound infection rate, reduced intra-abdominal abscess rate and intestinal obstruction when compared to patients who underwent immediate appendectomy (Simillis *et al.*, 2010). Another meta-analysis was conducted by Fugazzola *et al.*, comparing early appendectomy versus

conservative management in complicated acute appendicitis in children. 1288 patients were included in this study, and the success rate of conservative treatment was 90% and the recurrence rate was 15.4% but the length of hospital stay was favorable to those patients who underwent immediate appendectomy (Fugazzola *et al.*, 2019).

Percutaneous drainage of appendicular abscess

Percutaneous drainage is a well-established technique that can be used to treat patients with complicated appendicitis with abscess formation. The drainage can be performed with the Seldinger technique under ultrasound or computerized tomography. When percutaneous drainage is combined with conservative treatment, it is associated with a better outcome and a lower risk of recurrence. The length of stay in the hospital is also reduced (Roach *et al.*, 2007; Shinde *et al.*, 2020; Zavras & Vaos, 2020). Percutaneous drainage of an appendicular abscess is associated with a reduced incidence of an interval appendectomy and a better outcome in children above the age of 13 years. The addition of intra-venous antibiotics also reduces the recurrence rate (Luo *et al.*, 2016). A prospective study comparing the therapeutic effectiveness of percutaneous drainage with antibiotics versus antibiotics alone was conducted by Zerem *et al.*, 50 patients were included in

the study and this study concluded that percutaneous drainage with intravenous antibiotics was safe, effective and associated with low recurrence rates (Zerem *et al.*, 2007).

The size of the appendicular abscess will affect its outcome, with abscesses less than 5cm are associated with better outcomes and reduced complications and abscesses larger than 5cm will require continuous drainage for a few days (Ke Lasson *et al.*, 2002). Image guided percutaneous drainage of an appendicular abscess with computerized tomography is associated with a better success rate and outcome, but ill-defined abscesses are usually associated with poor outcomes (Marin *et al.*, 2010). Among the factors that can influence the success of percutaneous drainage of an appendicular abscess include low grade abscess with no multi loculation, the use of computerized tomography guided drainage and the trans gluteal approach (Fagenholz *et al.*, 2016). A systemic review on the treatment of appendicular mass was conducted by Olsen *et al.*, 48 studies with 3772 patients were included in the study, and they concluded that percutaneous drainage of an appendicular abscess in adults and children may lower the risk of treatment failure, but it was associated with a moderate risk of complications (Olsen, 2014).

Table I:

Study	Study type	Year	N=numbers	Recurrence rate - percutaneous drainage	Recurrence rate- conservative treatment and no percutaneous drainage
Zerem <i>et al.</i> ,	Prospective study	2006	50	4%	32%
Marin <i>et al.</i> ,	Retrospective study	2010	41	10%	15%
Cheng Lou <i>et al.</i> ,	Retrospective study	2016	1255	3.33%	6.79%

Table showing the recurrence rate after percutaneous drainage of appendicular abscess.

Interval appendectomy after percutaneous drainage of abscess

Interval appendectomy was traditionally performed after conservative treatment of an appendicular abscess to prevent recurrence. As the recurrence rate for appendicitis is from 5%-25%, and the complication rate of 23% from the procedure, the need for performing an interval appendectomy has been questioned. Several studies have shown that due to the low recurrence rate, there is no justification for performing an interval appendectomy (Corfield, 2007; Tekin *et al.*, 2008; Willemsen *et al.*, 2002).

A systemic review was conducted by Darwazeh *et al.*, on whether an interval appendectomy should be performed after conservative management of perforated appendicitis and phlegmon. 21 studies with 1943 patients were included of which 1400 underwent conservative

treatment and 543 underwent an interval appendectomy. The morbidity from conservative treatment was 13.3% and the recurrence rate was 12.4%. The morbidity from interval appendectomy was 10.4%. This study concluded that interval appendectomy was associated with minimal benefit, and it leads to increased cost and morbidity (Darwazeh *et al.*, 2016).

An open label randomized control trial on active observation versus interval appendectomy after successful non-operative treatment of an appendicular mass in children (CHINA study) was conducted by Hall *et al.*, 106 patients were included in this study, of which 52 underwent interval appendectomy and 54 underwent conservative treatment, the recurrence rate from the patients who underwent conservative treatment was 12% and the complication rate from those patients who underwent interval appendectomy was 6%. This study concluded that interval appendectomy need not be performed as a routine and a wait and see approach might be better to treat those patients with recurrent symptoms

(Hall *et al.*, 2017). A systemic review was conducted by Hall *et al.*, looking at the justification of performing an interval appendectomy after successful conservative treatment in appendicular mass in children. 3 studies including 127 cases were included in this study, and the recurrence rate after conservative treatment was 20% and the complication rate after interval appendectomy was 3.4%. This study concluded that interval appendectomy may not be needed after completion of conservative treatment (Hall *et al.*, 2011).

Early laparoscopic appendectomy for appendicular abscess

Early or immediate appendectomy was not popular in the management of appendicular abscess due to the increased risk of wound infection, intra-abdominal abscess formation and intestinal obstruction. The introduction of laparoscopic appendectomy has seen a trend towards performing an immediate appendectomy due to the reduced post operative infections, early ambulation and reduced post operative nausea and vomiting (Cueto *et al.*, 2006; Forsyth *et al.*, 2017). Several studies have shown that laparoscopic appendectomy for appendicular abscess is associated with reduced symptoms of pain, vomiting and shorter length of stay in the hospital. The risk of intra-abdominal abscess formation was higher when compared to open appendectomy, but it has been decreasing over the past few years as the experience and technique of performing a laparoscopic appendectomy improves (Ball *et al.*, 2004; Khiria *et al.*, 2011; Kirshtein *et al.*, 2007; Yau *et al.*, 2007).

A systemic review and meta-analysis comparing laparoscopic appendectomy versus open appendectomy in adults with complicated appendicitis was conducted by Athanasiou *et al.*, 26 studies with 2188 underwent laparoscopic appendectomy and 2551 underwent open appendectomy. Laparoscopic appendectomy was associated with reduced wound infection rate, early recovery and reduced length of hospital stay. There intra-abdominal abscess rate was similar between both the groups. This study showed that laparoscopic appendectomy was associated with better outcomes when compared to open appendectomy (Athanasiou *et al.*, 2017). Another systemic review and meta-analysis comparing laparoscopic versus open appendectomy in adults with complicated appendicitis was conducted by Markides *et al.*, and they concluded that laparoscopic appendectomy was associated with reduced wound infection rates and the intra-abdominal abscess rate was comparable with open appendectomy (Markides *et al.*, 2010).

A meta-analysis was performed by Low *et al.*, comparing laparoscopic appendectomy versus open appendectomy in pediatric patients with complicated appendicitis. 39 studies with 3402 patients underwent laparoscopic appendectomy and 4522 patients underwent open appendectomy. The patients who

underwent laparoscopic appendectomy were associated with a shorter hospital stay, and lower surgical site infection. The intra-abdominal abscess rate was similar between both the groups, but this study concluded that laparoscopic appendectomy should be the procedure of choice in pediatric patients with appendicular abscess (Low *et al.*, 2019).

CONCLUSION

As there is no consensus on what is the best management for a patient who presents with an appendicular abscess, its management is decided by the clinical presentation of the patient and the experience of the surgeon who is treating the patient. Conservative treatment is a safe and effective form of treatment with percutaneous drainage of the abscess which in combination is associated with a better outcome. The size of the appendicular abscess is an important factor when determining the success of percutaneous drainage of abscess. If expertise for laparoscopic surgery is available, then an immediate appendectomy should be performed as this will eliminate the problem and reduce the risk of recurrence. Performing an immediate appendectomy is cost effective. Interval appendectomy need not be performed as a routine, as patients can be investigated with imaging modalities like computerized tomography or by performing a colonoscopy.

Conflict of Interest: There is no conflict of interest.

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