

# Current management of appendicular mass - a narrative review

**Kumar Hari Rajah, Somanathan Menon and Ganesh Ramachandran**

Department of Surgery, School of Medicine, Faculty of Health and Medical Science, Taylor University, Subang Jaya, Malaysia

## ABSTRACT

Appendicular mass is considered as one of the complications of acute appendicitis but there is no consensus on the optimal management of this condition. The management of this condition has always been conservative management with interval appendectomy as popularized by Oschner and Sheerin. The need for interval appendectomy has now been questioned, and an emerging trend has been early appendectomy by laparoscopic method. There are no guidelines on the management of appendicular mass and treatment is decided by the surgeon. We have conducted a narrative review to investigate what is the current practice in the management of appendicular mass.

## KEYWORDS:

*Appendicular mass, appendicular phlegmon, appendicular lump, interval appendectomy*

## INTRODUCTION

Acute appendicitis is one of the most common acute abdominal conditions that is seen in surgical practice and appendicular mass accounts for up to 10% of cases. The pathological spectrum can range from Phlegmon to abscess formation. The appendicular mass is composed of the inflamed appendix, omentum and bowel loops, and it forms after about 24 to 48 hours after the initial symptoms. This is a protective mechanism to prevent the spread of infection. The treatment of appendicular mass has been debated over the past 80 years. The diagnosis of appendicular mass is made clinically, but ultrasonography is the most popular investigation of choice, although computerized tomography (CT), is more sensitive. The presentation is more acute in children, whereas in the adults the mass tends to take longer to form.<sup>1</sup>

The management of appendicular mass can be divided into three treatment approaches 1) Conservative management with broad spectrum antibiotics and intravenous fluids followed by interval appendectomy in 6 - 8 weeks. This was proposed by Oschner and Sheerin in 1901 and is the most popular treatment option for appendicular mass and is widely practiced worldwide. 2) Conservative management without interval appendectomy, as this option is proposed due to low infection rates and low recurrence rates and hence there is no need for interval appendectomy. For patients above the age of 40, follow up treatment with investigations like colonoscopy and computerized tomography (CT) is required. 3) Immediate appendectomy which is emerging as

an alternative treatment option, and this option eliminates the risk of recurrence and the need for interval appendectomy. The operative options are open appendectomy and laparoscopic appendectomy. Open appendectomy was the treatment of choice, but laparoscopic appendectomy is emerging as an alternative treatment option due to decreased post operative pain, early recovery, and earlier discharge to home. Currently conservative treatment of appendicular mass is the most favored by most surgeons. However, the pressing question is the need for interval appendectomy after conservative treatment, as there is a growing trend to opt against interval appendectomy. The argument for this is the low rate of recurrent infection and the early return to work.<sup>2,3</sup>

## MATERIALS AND METHODS

Currently there is no uniform consensus on the management of appendicular mass, and we have conducted this review article to investigate the various management options. We conducted a literature review using PUBMED, Cochrane database of clinical reviews and Google scholar looking for clinical trial, observational studies, cohort studies systemic reviews, and meta-analysis from 1990 to 2022. We used the following keywords, "Appendicular Mass", "Appendicular Phlegmon", "Appendicular Lump", "Interval Appendectomy" and, "Complicated Appendectomy". All articles were in English language only. Further articles were obtained by manual cross referencing of the literature. Case reports and studies with less than 10 patients and editorials were excluded.

## DISCUSSION

### Conservative management followed by interval appendectomy.

Oschner and Sherren proposed this management for appendicular mass in 1901, during the era of limited antibiotics and imaging technologies. This approach involved keeping the patient nil by mouth and starting intravenous antibiotics and measuring the size of the appendicular mass. This treatment is continued for 24 to 48 hours, and it involves monitoring of the vital signs.<sup>2</sup> This method removes the risk of complications that can occur during the acute phase of surgery and interval appendectomy eliminates the risk of recurrence.<sup>3</sup> Interval appendectomy will help to give a histological diagnosis and to prevent recurrence. The complication rates from interval appendectomy are low.<sup>4</sup>

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*Corresponding Author: Kumar Hari Rajah*

*Email: kharirajah@yahoo.com.my*

**Table I: Table of contents of the retrospective studies**

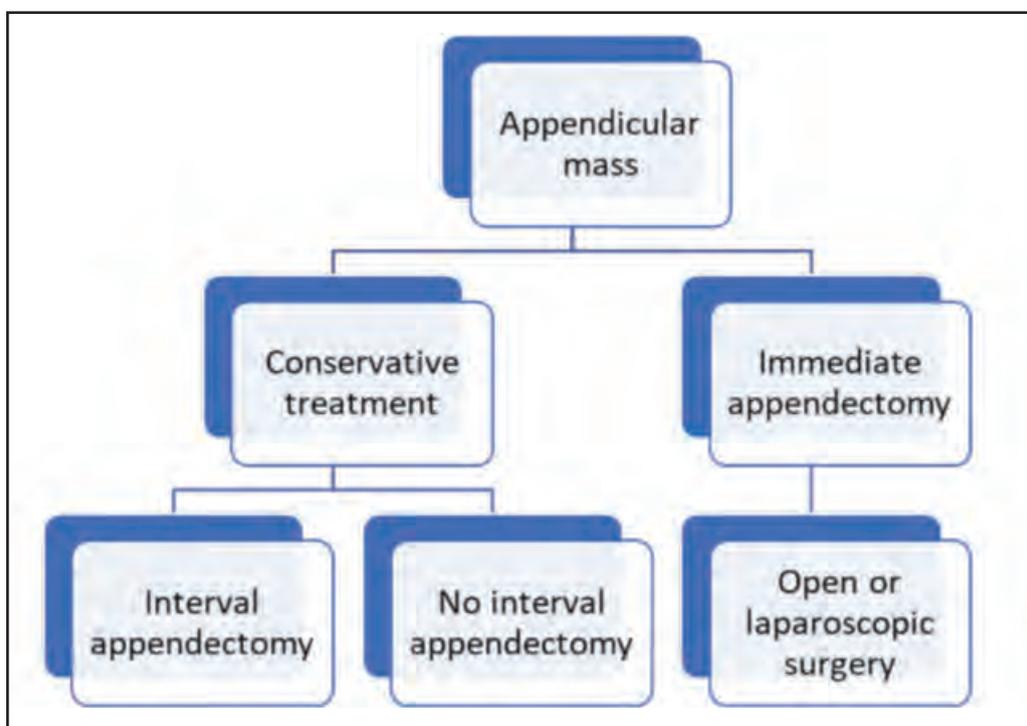
Olsen et al	Systematic review	3,772 patients	70 to 80% success rate	Most of the studies were retrospective in nature
Van Amstel et al	Meta-analysis	1,355 patients	12% complication in conservative group	Most of the studies were retrospective in nature
Gillick et al	Retrospective study	427 patients	85% success rate	Retrospective in nature
Ravichandran et al	Prospective study	116 patients	Decreased wound infection rates	Low patient load
Demetrashvilli et al	Retrospective study	48 patients	Complication rates were the same in both groups	Retrospective in nature
Kim et al	Retrospective study	76 patients	Outcomes and complications were the same in both groups	Retrospective in nature

**Table II: Table of contents of the studies for conservative treatment**

Fugazolla et al	Meta-analysis	1,288 patients	90% success rate for conservative treatment.15% recurrence rate	Most studies were retrospective in nature
Anderson et al	Meta-analysis	59,488 patients	93%success rate with 10%recurrence rate	Most of the studies were retrospective in nature
Demetashivilli et al	Prospective cohort study	74 patients	High success rate for conservative treatment	Low patient numbers
Yilmt et al	Retrospective study	126 patients	Lower morbidity and infection rate	Retrospective study in nature

**Table III: Table of contents for studies that favor early appendectomy**

Khan et al	Randomized control trials	300 patients	5-8% complication rate	Low patient numbers
Arshad et al	Comparative study	176 patients	Low wound infection rate	Low patient numbers
Das et al	Retrospective study	112 patients	Low wound infection rate	Retrospective in nature
Pathan et al	Prospective study	100 patients	Reduced infection rate	Low patient numbers
Ishar et al	Observational study	60 patients	Reduced mean hospital stay at 4 days	Low patient numbers
El-sood et al	Retrospective study	40 patients	Reduced mean hospital stay	Low patient numbers
Kumar et al	Prospective study	50 patients	Reduced mean hospital stay	Low patient numbers



**Fig. 1:** Flow chart for the management of appendicular mass.

A retrospective study by Koirala et al evaluated conservative therapy for appendicular mass where 173 patients were treated. Of this number, 10 patients developed complications that required emergency appendectomy, but the rest were managed conservatively. Only 35 patients returned for interval appendectomy. Bhandari et al in their study of 75 patients with appendicular mass were managed conservatively and only five patients developed appendicular abscess, but only 13 patients came back for interval appendectomy. Although these were retrospective studies, it showed the success of conservative treatment but highlighted the problem of patient's attendance for interval appendectomy. Further retrospective studies by Gillick and demetrashvili also showed the benefit of conservative treatment in the management of appendicular.<sup>5-7</sup>

In a prospective study by Elsaady, a total of 169 cases of appendicular mass 121 patients were treated conservatively. Of this total 106 were successfully treated and treatment failure was seen in 15 cases. This showed that the conservative method with interval appendectomy was an effective and safe treatment method. This was also confirmed by a prospective study by Ravichandran et al and ahmed et al which showed the success of conservative treatment followed by interval appendectomy.<sup>8-10</sup>

A systemic review by Olsen et al reviewed the literature in 48 studies and a total of 3,772 patients and they concluded that conservative management of appendicular mass was safe and associated with a Success rate of 80%-90% and there were no major complications. Another systemic review by Teixeira et al also concluded that conservative management of appendicular mass was safe and the risk of detecting neoplasms of the appendix was low.<sup>11,12</sup>

A meta-analysis by van Amstel, which included 14 studies and 1355 patients, for which 1022 were treated with conservative therapy and 333 underwent emergency appendectomy, complications were seen in 12.2% of the conservative therapy group and 25.5% in the emergency appendectomy group. The most common complication was wound infection. This showed that conservative therapy followed by interval appendectomy should be the treatment of choice for appendicular mass but the drawback from this meta-analysis was that the majority of the studies were small retrospective studies.<sup>13</sup>

An audit by Ahmed et al in the mid trent region in the United Kingdom, concluded that 75% of surgeons there conducted conservative therapy with interval appendectomy on patients with appendicular mass and that there was no present protocol for the treatment of appendicular mass.<sup>14</sup>

Another survey of hospitals in the south coast of the United Kingdom showed the diverse practice in the management of appendicular mass, where senior surgeons would manage these patients conservatively, but surgical registrars were more inclined to perform interval appendectomy.<sup>15</sup>

Kim et al did a retrospective analysis on 76 patients who were diagnosed with appendicular mass, 48 underwent conservative therapy followed by interval appendectomy and

28 underwent emergency appendectomy, the recurrence rate was low and the outcomes after surgery were the same in all the groups hence conservative therapy followed by interval appendectomy is still the primary choice of therapy for appendicular mass, but the choice of therapy will usually be decided by the surgeon.<sup>16</sup>

Garba et al., conducted a review on the treatment approaches for the management of appendicular mass and concluded that conservative management followed by interval appendectomy is still the primary treatment of choice for the management of appendicular mass and follow-up of patients are essential while waiting for interval appendectomy.<sup>17</sup> Simillis et al conducted a meta-analysis comparing conservative therapy versus immediate appendectomy on the treatment of appendicular mass,<sup>21</sup> studies were included, and the conclusion was that conservative therapy followed by interval appendectomy was associated with decreased wound complication ,abscess formation and intestinal obstruction. The duration of hospital stay was also the same between the groups.<sup>18</sup>

The European Association of Emergency Surgeons consensus development conference 2015 still recommends conservative management followed by interval appendectomy in the management of appendicular mass. Interval appendectomy is done to reduce the chance of recurrence and to not miss any under lying malignancy.<sup>19</sup> The World Society of Emergency Surgeons Jerusalem guidelines also recommends conservative treatment as the initially therapy of appendicular mass in the event of non-availability of laparoscopic surgery.<sup>20</sup>

Most of the studies that were done on conservative management of appendicular mass with interval appendectomy were retrospective in nature and this influenced the outcomes of wound infection and recurrence rate. An area of issue is the number of patients who are lost to follow- up and hence did not come for interval appendectomy. The number of patients in most of the studies was rather low in number. For future research it is hoped that randomized control trials can be used to investigate the conservative management of appendicular mass, but sample size may be a problem.

#### **Conservative management without interval appendectomy**

There are some in the surgical fraternity who oppose interval appendectomy as they point out that the rate of recurrence attacks is low and the complication rates from interval appendectomy are not low. A study by Noori et al, on 65 patients with appendicular mass who underwent conservative management with no interval appendectomy, the rate of recurrence was 10% and wound infection was seen in 4% of the cases. Hence upon completion of conservative management, interval appendectomy is not necessary as the recurrence rate is low.<sup>21</sup>

Demetrashvili et al also had conducted a cohort study on 74 patients with appendicular mass, where 47 had undergone conservative therapy and 27 underwent immediate appendectomy, and there were no significant differences in

the treatment for both groups, hence conservative treatment without interval appendectomy was still the preferred treatment of choice. Patients who present with recurrence can be operated and Computerised Tomography and colonoscopy can be done to investigate patients who present with recurrence.<sup>22</sup>

Yilmaz et al in his retrospective study on 126 patients with appendicular mass were divided into two groups one was managed with appendectomy and another group with conservative therapy alone. 43 underwent appendectomy and 72 underwent conservative therapy, the morbidity and infection rate was higher in the appendectomy group. Based on this study conservative appendectomy without interval appendectomy should be the treatment of choice and patients with recurrence can be followed up by investigations like colonoscopy and computed tomography. The drawback of this study was the fact that it was retrospective in nature.<sup>23</sup> Panahi et al in his study did a literature search on the best management option of appendicular mass, and after filtration a total of 5 papers were identified to provide the best evidence. Based on this, conservative management without interval appendectomy was considered the best treatment option for appendicular mass and to prevent recurrence, patients should be followed up with investigations like colonoscopy and imaging like ultrasound or computed tomography. Meshikhes also looked in the literature and concluded that interval appendectomy can be safely excluded, and that recurrence can be managed by laparoscopic appendectomy. Quartey investigated the need for interval appendectomy and concluded that it was not necessary and that recurrence can be investigated by colonoscopy or computerized tomography.<sup>24-26</sup>

Malik et al conducted a retrospective study on 220 patients with conservative management and 213 patients were treated successfully, the recurrence rate was 13% with a median follow up of 6 months. He concluded that interval appendectomy was not necessarily due to the low recurrence rates. Another retrospective study by Tingstedt also confirmed this.<sup>27,28</sup>

In a meta-analysis done by Anderson et al, which investigated the conservative management of appendicular lump and upon successful treatment interval appendectomy was not indicated. There was a success rate of 93% but percutaneous drainage of abscess was seen in 20% of cases. The risk of recurrence was seen in less than 10% of cases and was also associated with a risk of missing other diagnosis like malignancy or Crohn's disease in about 2% of cases. Follow-up of patients above the age of 40 was suggested with colonoscopy and Computed Tomography to not miss other diagnosis.<sup>29</sup>

A meta-analysis by Fugazolla et al on 14 studies with 1288 patients, where 622 were treated with conservative management and 666 with appendectomy, the success rate was 90% and the recurrence rate was 15.4%. This showed that conservative therapy should be the treatment of choice for patients with appendicular mass.<sup>30</sup>

The drawback from these studies was that most of them were retrospective in nature and due to the low recurrence rate and post operative infection rates the need of interval appendectomy was questioned. With better investigations like computerized tomography and colonoscopy, the need for interval appendectomy is being questioned. For future research, more randomized control trials should be conducted in the conservative management of appendicular mass and more prospective studies should be done, with better sample size.

#### **Immediate appendectomy either by open or laparoscopic method**

There are surgeons who advocate for immediate appendectomy for patients who present with an appendicular mass, as this approach excludes the need for readmission, cures the condition and reaches a definitive diagnosis. A prospective study by Bahram on 46 patients with appendicular mass who were subjected to immediate appendectomy. The infection rates were 8% and the mean hospital stay was 3 days. This showed that immediate appendectomy was feasible and safe in the management of appendicular mass.<sup>31</sup>

Ali et al in his literature review, stated that emergency appendectomy in the management of appendicular mass is emerging as an alternative treatment than conservative management. It is safe and cost-effective and reduces hospital stay.<sup>32</sup>

Khan et al conducted randomized control trials on 300 patients with appendicular mass, 150 had undergone immediate appendectomy and 150 conservative treatments. The wound infection rates among the groups were 5% and 8% respectively and the frequency of intra-abdominal abscess was less than 2%. This study concluded that immediate appendectomy was more effective option in the management of appendicular mass.<sup>33</sup>

Arshad et al in his comparative study on 176 patients of appendicular mass, 88 patients underwent immediate appendectomy and 88 underwent conservative treatment. The wound infection rate was higher in the immediate appendectomy group but the stay in hospital was less than in the conservative treatment group, but the rate was not high to exclude immediate appendectomy. Immediate appendectomy in the treatment of appendicular mass is a safe and effective treatment option.<sup>34</sup>

Das et al conducted a retrospective analysis on 112 patients of appendicular mass who were divided into 56 patients who underwent immediate appendectomy and 56 underwent conservative treatment. The length of hospital stay was less in the appendectomy group. They were discharged home sooner than the group that underwent conservative treatment. Early appendectomy is curative, cost-effective and reduces hospital stay in the management of appendicular mass. This was also confirmed by obaidi et al who came with the same conclusions in his study.<sup>35,36</sup>

Tiwary et al in their study of 54 patients with appendicular mass were divided into 2 groups of 27 patients each who

underwent immediate appendectomy and conservative treatment. The infection rates were the same in both groups but the stay in hospital was shorter in the appendectomy group. Early appendectomy is better in the treatment of appendicular mass as it is associated with shorter stay and reduced cost and eliminates the need for a second admission.<sup>37</sup>

Pathan et al in his prospective observational study of 100 patients of appendicular mass also noted that the length of hospital stay was reduced in the immediate appendectomy group. It was also associated with faster return to work and low economic burden. This conclusion was also observed by Israr in his observational study that immediate appendectomy was safe and effective.<sup>38,39</sup>

Laparoscopic appendectomy has been emerging as an alternative to the management of appendicular mass. Several retrospective studies were done on the role of laparoscopic appendectomy in the management of appendicular mass. The mean operation time was longer but the use of postoperative analgesia and the stay in the hospital was reduced. The advantage of laparoscopic appendectomy was adequate access and visualisation of the peritoneum, lower risk of adhesion and faster mobility. Hence laparoscopic appendectomy is a feasible option in the management of appendicular mass.<sup>40-44</sup>

The World Society of Emergency Surgeons Jerusalem guidelines of 2020 recommended that in the management of appendicular mass, laparoscopic surgery is a safe and feasible treatment option if it is done in experienced hands. It is associated with fewer admissions and fewer additional interventions.<sup>21</sup>

The drawback of most of these studies is that they are retrospective in nature with small sample sizes. There were also concerns that acute appendicitis is an emergency procedure and most of the appendectomies were performed by junior specialists and registrars which could account for the higher post operative wound infection rates. Most of the studies that used laparoscopic appendectomy in the management of appendicular used senior surgeons who had experience in laparoscopic surgery, and this could account for the better outcomes. It is hoped that future randomized control trials can be conducted in terms of the use of laparoscopic appendectomy in the management of appendicular mass.

## CONCLUSION

Based on the available evidence, the management of appendicular mass should be done with immediate appendectomy and laparoscopic appendectomy should be the surgery of choice. If facilities for laparoscopic appendectomy are not available then conservative treatment should be done for the patient and for patients above the age of 40 years, they can be followed by computerised tomography and colonoscopy. Interval appendectomy is not required, and it is only indicated for patients who present with recurrent symptoms.

## CONFLICT OF INTEREST

There is no conflict of interest related to this review article.

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