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Interval appendectomy-Current perspectives-narrative review article

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Abstract:

The indication of interval appendectomy after the management of appendicular mass has been controversial. There has been no consensus on the indication of interval appendectomy. The indication is usually decided by the treating surgeon, with the current trend moving towards omission of interval appendectomy in favor of follow up of patients with computerized tomography and colonoscopy. With better investigative tools the relevance of interval appendectomy is being questioned. We have conducted this review article to look at the role and relevance of interval appendectomy in the management of appendicular mass.

Keywords-Interval appendectomy, delayed appendectomy, appendicular mass, complicated appendicitis

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1 | INTRODUCTION

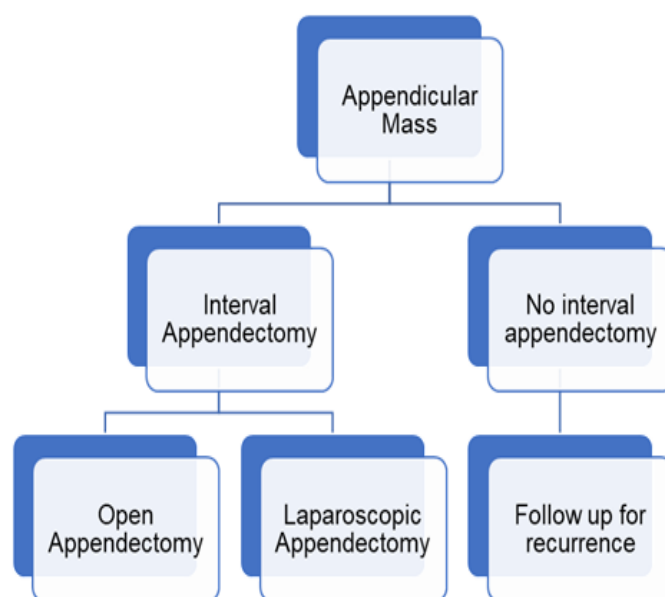
Appendicular mass is a complication of perforation of the appendix, and it consists of a localized walled off inflammatory mass that is formed of the inflamed appendix, the surrounding viscera and omentum. The management of appendicular mass has been controversial with three types of management which include, 1) Conservative management with interval appendectomy done six to eight weeks later 2) conservative management without interval appendectomy and 3) immediate appendectomy. (1) Conservative treatment involves keeping the patient nil by mouth, starting intravenous fluids and intravenous antibiotics, and performing an interval appendectomy in about 8 weeks' time. This has been the most common treatment method for appendicular mass. The reason for performing an interval appendectomy is to prevent recurrence and to rule out any malignancy that mimics an appendicular mass. The role of interval appendectomy has recently been questioned and there are some who advocate for the removal of interval appendectomy.(2)

The World Society of Emergency Surgeons (WSES) does not recommend interval appendectomy for young patients who have undergone conservative treatment for the management of appendicular mass, but interval appendectomy is recommended for patients who present with recurrent symptoms.(3)

The Eastern Association for the surgery of trauma in their guidelines in the management of acute appendicitis did not recommend interval appendectomy after completion of conservative treatment. Interval appendectomy is only recommended in patients who experience recurrent attacks after surveillance testing with computerized tomography or colonoscopy and evaluating the age of the patient and assessing their comorbidities.(4)

The European Association of Emergency Surgeons (EAES) did not come up with any guidelines on interval appendectomy, but they decided that the management of appendicular mass should be with non-surgical management but the need for interval appendectomy was still being debated due to lack of evidence of its benefit.(5)

Image 1



Flow chart for the management of appendicular mass and interval appendectomy

2 | METHOD

As there is no consensus on the indication for interval appendectomy after conservative management of appendicular mass, we conducted this review article to investigate the indications and contraindications for interval appendectomy. We conducted a literature review using PUBMED, Cochrane database of clinical reviews and Google scholar looking for clinical trials, observational studies, systemic reviews, and meta-analysis from 1990 to 2023. The following keywords were used, "interval appendectomy", "appendicular mass", "delayed appendectomy" and "appendicular phlegmon". All articles that were not in English and case reports, commentaries and letters to the editor were excluded. Studies with pregnant patients were excluded.

3 | DISCUSSION

Conservative treatment followed by interval appendectomy.

Several retrospective studies were done on patients who presented with symptoms of appendicular mass, who were treated with conservative treatment followed by interval appendectomy, and this was compared with those who underwent immediate appendectomy. The post operative complications and wound infection rates were lower in the interval appendectomy group than in the immediate appendectomy group, but the length of hospital stay, and cost were higher in the interval appendectomy group. This study concluded that interval appendectomy is still indicated in the management of appendicular mass.(6)

There were retrospective studies that analyzed the histology of the interval appendectomy specimens of patients of appendicular mass who underwent conservative treatment followed by interval appendectomy. The histological analysis of these appendectomy specimens showed acute inflammation accounted for most of the specimens, followed by chronic inflammation and appendicolith. These studies concluded that interval appendectomy provided a diagnostic option for patients who underwent conservative treatment for appendicular mass.(7,8)

Several retrospective studies were done on the management of appendicular mass in children. The patients were divided into those that underwent conservative treatment followed by interval appendectomy and those that underwent immediate appendectomy. The overall complication rates were not significant but wound infection rates were higher in the immediate appendectomy group. These studies concluded that conservative treatment followed by interval appendectomy is a viable option in the management of complicated appendicitis in children.(9,10)

Ahmed et al conducted a survey to look at how appendicular mass is managed in the mid-Trent region of England. The results showed that up to 75% of general surgeons offered interval appendectomy for patients who underwent successful conservative treatment of appendicular mass. Specialist registrars were however less likely to offer interval appendectomy after conservative treatment of appendicular mass.(11)

Laparoscopic interval appendectomy was also evaluated in the treatment of patients who were treated with conservative treatment. The results showed that there were fewer post operative complications and reduced hospital stay in the interval laparoscopic appendectomy group when compared to the immediate appendectomy group. The advantages of interval laparoscopic appendectomy were, that the disease can be evaluated more thoroughly, malignancy can be excluded, and morbidity was reduced when compared to immediate surgery.(12,13)

Kita et al performed a prospective study on the usefulness and cost-effectiveness of interval

appendectomy for complicated appendicitis. A total of 43 patients of complicated appendicitis were included in the study and 32 patients underwent interval appendectomy after conservative treatment and 11 underwent immediate appendectomy. The results showed that there were low post operative complication rates group and better cost-effectiveness in the interval appendectomy group when compared to the immediate appendectomy group. The conclusion of this study was that interval appendectomy was indicated after conservative treatment of complicated appendicitis.(14)

There were several retrospective studies that investigated the effectiveness of interval appendectomy after conservative treatment for complicated appendicitis in pediatric patients and this was compared with those patients who underwent immediate appendectomy. The intra-abdominal abscess and wound infection rate were higher in the immediate appendectomy group when compared to the interval appendectomy group. This showed that conservative treatment followed by interval appendectomy was effective in the management of appendicular mass in pediatric patients.(15-17)

There were several studies that looked at the symptoms of recurrence after conservative treatment of appendicular mass and the need of interval appendectomy. The results of these studies were that the readmission rate after conservative treatment was considerable and interval appendectomy was indicated. Although conservative treatment and interval appendectomy was successful in most of the cases but readmission due to recurrent attacks prior to interval appendectomy was a problem which was seen in up to one third of the cases. Hence interval appendectomy will need to be undertaken for patients who present with recurrent symptoms.(18-21)

The summary of all these studies is that conservative treatment of appendicular mass followed by interval appendectomy is indicated to prevent recurrence and not to miss any underlying pathology. The introduction of laparoscopic appendectomy has made interval appendectomy easier with decreased post operative complications and shorter hospital stay. The drawback of these studies was that most of them were retrospective in nature and the patient numbers were low.

Table I

Studies	N-numbers	Wound infection rate	Intraabdominal abscess	recurrence
Kim et al	1267	6.1%	1.1%	3.9%
Weiner et al	480	0%	0%	5.9%
Nazery et al	105	11%	27%	34%
Gillick et al	427	3%	2.3%	15.8%
Soo Jo et al	171	7.6%	4.1%	2.9%

Summary of the studies that support conservative treatment followed by interval appendectomy.

Conservative treatment without interval appendectomy

Darwazeh et al conducted a systemic review of the management of appendicular mass comparing interval appendectomy to conservative treatment alone. 21 studies

with 1943 patients were included in the systemic review of which 1400 underwent conservative treatment alone and 543 underwent interval appendectomy. The conservative group showed a recurrence rate of 12.4% and a morbidity rate of 13.3% and the morbidity rate for

the interval appendectomy was 10.4%. This study concluded that interval appendectomy can be omitted after conservative treatment as the risk of recurrence is low and the chances of missing other conditions like inflammatory bowel disease and malignancy are low. Performing an interval appendectomy also increases the cost and post operative morbidity. (22)

Sakorafas reviewed the need for interval appendectomy after conservative treatment and concluded that interval appendectomy is not needed after successful conservative treatment due to the low recurrence rate. Interval appendectomy is only indicated for patients with complicated appendicitis who present with recurrent attacks of abdominal pain. As there are no standard guidelines for the management of appendicular mass, the management of this condition is usually decided by the treating surgeon and hence this is the reason why interval appendectomies are being performed. (23)

Anderson et al conducted a meta-analysis on the nonsurgical treatment of appendicular abscess or phlegmon, which included 61 studies. The results of this meta-analysis % showed that conservative treatment is associated with a 93% success rate and the risk of recurrence rate is 7.4% and the rate of detection of malignancy is 1.2%. This study concluded that after conservative treatment of appendicular mass, interval appendectomy should be omitted and but for patients above the age of 40 years should be investigated with computed tomography and colonoscopy for patients with recurrent episodes of abdominal pain.(24)

There were several studies that looked at the recurrence rate of patients who underwent conservative treatment for appendicular mass. This was then compared with patients who underwent immediate appendectomy. The post operative infection rates were higher in the immediate appendectomy group and interval appendectomy was not done in the conservative group as the recurrence rates from these studies were from 7% to 20% and hence this study concluded that routine interval appendectomy is not required after conservative treatment.(25–27)

Kristensen E et al studied the effects of conservative management on appendicular mass, where by 202 patients with appendicular mass were included in the study.193 patients underwent conservative treatment with a success rate of 88% and recurrence rate of 7.1%. The value of doing an interval appendectomy was questioned as the rate of recurrent attacks were low when compared to the complications of performing an

appendectomy. This study concluded that conservative management of an appendicular mass is highly successful and the need for interval appendectomy is questioned.(28)

Mohamad et al, reviewed the management of acute appendicitis, and the need for interval appendectomy after conservative management of an appendicular mass. As the rate of recurrence after successful management of appendicular mass was low and usually occurs during the first year. The symptoms are usually milder and hence interval appendectomy can be omitted after conservative treatment of an appendicular mass.(29)

Chowdhary et al performed a prospective study on the relevance of interval appendectomy after conservative treatment of appendicular mass.165 patients of appendicular mass were divided into 3 groups, the first group included 55 patients who underwent immediate appendectomy,49 patients in the second group underwent conservative treatment alone and 53 underwent interval appendectomy. The conservative group was followed up and the recurrence rate was 8.16%and the interval appendectomy group showed a post operative complication rate of 17% and a longer hospital stay. This study concluded that interval appendectomy can be excluded after conservative management.(30)

Meeks et al also reviewed the need for interval appendectomy after completion of conservative treatment for appendicular mass and concluded that interval appendectomy is not required after conservative treatment as the recurrence rate is low and the risk of missing any neoplastic lesion can be assessed by computerized tomography and colonoscopy.(31)

Lietzen et al conducted a population-based study on the appendiceal neoplasm risk associated with complicated appendicitis. A total of 472 patients reports were reviewed and the tumor risk was higher in the complicated appendicitis group when compared to the uncomplicated appendicitis group. The overall tumor prevalence rate among acute appendicitis patients was 1.24% and the most common tumor was neuroendocrine tumors.(32)

Most of these studies concluded that conservative treatment alone without interval appendectomy was sufficient in the management of appendicular mass, and most patients can be followed up with computerized tomography and colonoscopy, but the major drawback was the predominant retrospective nature of these studies.

Table II

Studies	N-number	Recurrence rate	Study type
Darwazeh et al	1943	12.4%	Systemic review
Anderson et al	59,448	7.4%	Meta-analysis
Tingstedt et al	93	8%	Retrospective case study
Kristensen E et al	202	7.1%	Retrospective study
Habeab et al	316	56.3	Prospective study
Murugan et al	150	17.3%	Prospective comparative study

Summary of the studies that support conservative treatment without interval appendectomy

4 | CONCLUSION

Based on the all the available evidence that we have reviewed, interval appendectomy can be safely omitted after successful conservative treatment for an appendicular mass. As the recurrence rate is low, most patients can be followed up and investigations like computed tomography and colonoscopy can be done for patients above the age of 40.

As there is no consensus on the indication of interval appendectomy, the treating surgeon will be the one who decides if interval appendectomy needs to be performed on the patient.

The role of interval appendectomy in our region should not be completely omitted as patients who present with appendicular mass can be managed conservatively and subjecting these patients to immediate appendectomy has its problems as this operation is usually done as an emergency and by the surgical registrars or junior specialist. Performing an appendectomy in a patient with an appendicular mass carries a higher risk of bowel injury and abscess formation hence it is wiser to manage them conservatively and subjecting these patients to interval appendectomy only if they present with symptoms of recurrence.

Further randomized prospective studies may be needed to assess the role of interval appendectomy in the management of appendicular mass.

Conflict of interest

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

5 | REFERENCES

[1]. Garba ES, Ahmed A. Management of appendiceal mass. *Ann Afr Med.* 2008;7(4):200–4.

[2]. Quartey B. Interval appendectomy in adults: A necessary evil. Vol. 5, *Journal of Emergencies, Trauma and Shock.* 2012. p. 213–6.

[3]. Di Saverio S, Podda M, De Simone B, Ceresoli M, Augustin G, Gori A, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. Vol. 15, *World Journal of Emergency Surgery.* BioMed Central Ltd.; 2020.

[4]. Rushing A, Bugaev N, Jones C, Como JJ, Fox N, Cripps M, et al. Management of acute appendicitis in adults: A practice management guideline from the Eastern Association for the Surgery of Trauma. *Journal of Trauma and Acute Care Surgery.* 2019 Jul 1;87(1):214–24.

[5]. Gorter RR, Eker HH, Gorter-Stam MAW, Abis GSA, Acharya A, Ankersmit M, et al. Diagnosis and management of acute appendicitis. EAES consensus development conference 2015. *Surg Endosc.* 2016 Nov 1;30(11):4668–90.

[6]. Kim JY, Kim JW, Park JH, Kim BC, Yoon SN. Early versus late surgical management for complicated appendicitis in adults: A multicenter propensity score matching study. *Ann Surg Treat Res.* 2019;97(2):103–11.

[7]. Lugo JZ, Avgerinos D V., Lefkowitz AJ, Seigerman ME, Zahir IS, Lo AY, et al. Can interval appendectomy be justified following conservative treatment of perforated acute appendicitis? *Journal of Surgical Research.* 2010 Nov;164(1):91–4.

[8]. Fouad D, Kauffman JD, Chandler NM. Pathology findings following interval appendectomy: Should it stay or go? *J Pediatr Surg.* 2020 Apr 1;55(4):737–41.

[9]. Weiner DJ, Katz A, Hirschl RB, Drongowski R, Coran AG, Weiner DJ, et al. Interval appendectomy in perforated appendicitis.

[10]. Roach JP, Partrick DA, Bruny JL, Allshouse MJ, Karrer FM, Ziegler MM. Complicated appendicitis in children: a clear role for drainage and delayed appendectomy. *Am J Surg.* 2007 Dec;194(6):769–73.

[11]. Ahmed I, Deakin D, Parsons SL. Appendix mass: Do we know how to treat it? Vol. 87, *Annals of the Royal College of Surgeons of England.* 2005. p. 191–5.

[12]. Kim GYJ, You SH, Kye BH, Kwon TS, Lee YS, Oh ST, et al. Advantages of Interval Laparoscopic Appendectomy for Periappendiceal Abscess. *The Journal of Minimally Invasive Surgery.* 2014 Sep 15;17(3):37–43.

[13]. Jo YS, Yang SS, Im YC, Park DJ, Kim GY. Therapeutic Consideration of Periappendiceal Abscess: an Evaluation of Non-surgical Treatment Followed by Minimally Invasive Interval Appendectomy. *The Journal of Minimally Invasive Surgery.* 2017 Dec 15;20(4):129–36.

[14]. Kita R, Hashida H, Yamashita D, Kinoshita H, Kondo M, Kaihara S. Usefulness and Cost-effectiveness of Interval Appendectomy for Complicated Appendicitis. *Journal of Surgery.* 2021;9(3):109.

[15]. Furuya T, Inoue M, Sugito K, Goto S, Kawashima H, Kaneda H, et al. Effectiveness of Interval

- Appendectomy After Conservative Treatment of Pediatric Ruptured Appendicitis with Abscess. *Indian Journal of Surgery*. 2015 Dec 1;77:1041–4.
- [16]. Gillick J, Velayudham M, Puri P. Conservative management of appendix mass in children [Internet]. Vol. 88, *British Journal of Surgery*. 2001. Available from: www.bjs.co.uk
- [17]. González MC, Rodríguez JCB, Moore EH, Atanay DA. Predictors of recurrent appendicitis after non-operative management of children with perforated appendicitis presenting with an appendicular inflammatory mass. *Arch Dis Child*. 2014 Feb;99(2):154–7.
- [18]. Nazarey PP, Stylianos S, Velis E, Triana J, Diana-Zerpa J, Pasaron R, et al. Treatment of suspected acute perforated appendicitis with antibiotics and interval appendectomy. *J Pediatr Surg*. 2014;49(3):447–50.
- [19]. Abouhamda A, Jan Y, Alturkstani M. Interval Appendectomy Operative vs. Non-Operative Management of Appendicitis in Saudi Arabia. *Egypt J Hosp Med*. 2017 Jan;66:221–6.
- [20]. Al-Qahtani H, Alam MK, Al-Akeely MH, Al-Salamah SM. Routine or selective interval appendectomy for non-surgically treated appendiceal mass. *J Taibah Univ Med Sci*. 2010;5(2):101–5.
- [21]. Habeeb TAAM, Hussain A, Schlottmann F, Kermansaravi M, Aiolfi A, Matic I, et al. Recurrent appendicitis following successful drainage of appendicular abscess in adult without interval appendectomy during COVID-19. Prospective cohort study. *International Journal of Surgery*. 2022 Jan 1;97.
- [22]. Darwazeh G, Cunningham SC, Kowdley GC. A Systematic Review of Perforated Appendicitis and Phlegmon: Interval Appendectomy or Wait-and-See?
- [23]. Sakorafas GH. Interval routine appendectomy following conservative treatment of acute appendicitis: Is it really needed. *World J Gastrointest Surg*. 2012;4(4):83.
- [24]. Andersson RE, Petzold MG. Nonsurgical treatment of appendiceal abscess or phlegmon: A systematic review and meta-analysis. *Ann Surg*. 2007 Nov;246(5):741–8.
- [25]. Tingstedt B, Bexe-Lindskog E, Anderson R. WlorldrFrancis Management of Appendiceal Masses [Internet]. Available from: <https://academic.oup.com/ejs/article/168/11/579/6039797>
- [26]. Allan Z, Al-Habbal Y. Non-Operative Management of Acute Appendicitis-Evidence versus Practice in Eastern Health. *J Surg Oper Care* [Internet]. 2018;3(2):205. Available from: www.annepublishers.com
- [27]. Murugan R, Padma S, Senthilkumaran M. Interval Appendectomy vs Conservative Management Alone-A Therapeutic Dilemma-A Retrospective Comparative study at Chennai Medical College Hospital & Research Centre-Irungalur, a Rural Tertiary Care Centre in South India. *Int J Curr Res Rev*. 2018;10.
- [28]. Skoubo-Kristensen E, Hvid I, Skoubo-Kristensen E. The Appendiceal Mass Results of Conservative Management.
- [29]. Mohamed A, Bhat N. Acute Appendicitis Dilemma of Diagnosis and Management. Vol. 23, *The Internet Journal of Surgery*. 2009.
- [30]. Chowdhary SK, Talukdar R, Singh NK. Assessment of the Relevance of Interval Appendectomy in Treatment of Appendicular Lump: A Prospective Study. *Int J Sci Study* [Internet]. 2016;|. Available from: www.ijss-sn.com
- [31]. Meeks DW, Kao LS. Controversies in appendicitis. In: *Surgical Infections*. 2008. p. 553–8.
- [32]. Lietzén E, Grönroos JM, Mecklin JP, Leppäniemi A, Nordström P, Rautio T, et al. Appendiceal neoplasm risk associated with complicated acute appendicitis—a population based study. *Int J Colorectal Dis*. 2019 Jan 31;34(1):39–46.