



Stump Appendicitis: An Update on Current Management: A Narrative Review Article

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Review Article

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ABSTRACT

Stump appendicitis is a rare complication that occurs after an appendectomy and the diagnosis of this condition is usually delayed. The diagnosis is confirmed by either an ultrasound or computerized tomography. The management of stump appendicitis is by performing a completion appendectomy, which can be done as an open or laparoscopic procedure. The delay in diagnosis can often lead to complications like perforation and abscess formation. We have conducted this review article to look at the diagnosis and management of stump appendicitis. The method of stump closure is also discussed by looking at the various methods that are employed.

Keywords: *Stump appendicitis; residual appendicitis; acute appendicitis; appendectomy; laparoscopic appendectomy.*

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1. INTRODUCTION

Acute appendicitis is a common gastrointestinal condition that presents with right sided lower abdominal pain, and it is seen in 90-100 cases per 100,000 population. Acute appendicitis is commonly seen in children and young adults. It is slightly more common in males than in females and is the most common admission to the surgical ward for acute abdominal pain [1-3]. Acute appendicitis is diagnosed with a combination of history taking, clinical examination and blood investigations. Imaging modalities like ultrasound and computerized tomography are utilized if there is difficulty in establishing the diagnosis. The treatment of acute appendicitis is by performing an appendectomy, and it can be performed by an open or laparoscopic method [4-7].

Stump appendicitis is defined as the interval re-inflammation of the residual appendicular tissue after an appendectomy. It is a rare complication after an appendectomy and has an incidence of 1 in 50,000 cases. It occurs when the appendicular stump is more than 0.5cm and inflammation occurs due to the compromised blood supply or impaction by fecalith. The surgical technique, complexity of the case, anatomical variation and operator experience are all factors that can lead to stump appendicitis. It can occur in both open appendectomy and laparoscopic appendectomy [8-13]. The clinical presentation is usually right sided lower abdominal pain, and the diagnosis is usually confirmed after imaging with an ultrasound or computerized tomography. Computerized tomography will show a distended appendicular stump, peri cecal inflammation, free fluid in the right iliac fossa and abscess formation. The treatment of stump appendicitis is by performing a completion appendectomy which can be performed by an open or laparoscopic method [14].

The diagnosis of stump appendicitis is usually delayed as the history of appendectomy makes clinical diagnosis difficult. Complicated appendicitis can often lead to stump appendicitis as they may be difficult in the dissection of the appendix and visualization of the base. The length of the appendicular stump that was left behind during the initial appendectomy is an important factor in the development of stump appendicitis with a stump size of more than 0.5cm can increase the incidence of stump appendicitis. Improper identification of the

surgical anatomy is also an important factor that leads to stump appendicitis, like not identifying the base of the appendix [15].

As there is no current consensus in the management of stump appendicitis, we have conducted this review article looking into the diagnosis, and management of stump appendicitis. 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, case-reports, systemic reviews, and meta-analysis from 1980 to 2023. The following keywords were used, "stump appendicitis", "residual appendicitis", "acute appendicitis", "appendectomy" and "laparoscopic appendectomy". All articles were in English, and all articles were assessed by manual cross referencing of the literature. Commentaries, letters to the editor and editorials were excluded from this review. Adult and pediatric patients who were presented with stump appendicitis were included in this study and pregnant patients with acute appendicitis were excluded due to the risk of anesthesia.

2. DISCUSSION

2.1 Diagnosis of Stump Appendicitis

As the clinical presentation of stump appendicitis is usually non-specific and most surgeons opt for imaging modalities like ultrasound and computerized tomography to confirm the diagnosis of stump appendicitis. Sonographic findings are usually non-specific and indicate free fluid in the right iliac fossa or inflammation at the caecum. Computerized tomography may show inflammation of the appendicular stump, thickening of the cecum with fat stranding and free fluid in the right paracolic gutter [16]. Computerized tomography is increasingly being used to diagnose stump appendicitis with the characteristic appearance of inflammation of the appendicular stump with the presence of an appendicolith or peri-cecal fluid collection. Stump appendicitis shares the conventional features of acute appendicitis, and this makes the diagnosis of stump appendicitis much easier [17,18]. The presence of leukocytosis is a common presentation for all patients who present with stump appendicitis, and it is used with clinical examination and imaging modalities like ultrasound and computerized tomography to establish the diagnosis of stump appendicitis

[19]. The following table shows the average appendicular stump length of the cases of stump appendicitis.

2.2 Treatment of Stump Appendicitis

Once a diagnosis of stump appendicitis is made a completion appendectomy should be done, and it can be done by either an open or laparoscopic procedure. A delay in performing an appendectomy will increase the morbidity for the patient [19-21]. A systemic review by Casas et al looked at the management of stump appendicitis and 55 studies with a total of 76 patients with stump appendicitis were included in the study. 52 patients underwent a laparoscopic completion appendectomy with 94.4% underwent successful completion appendectomy and 5.6% required an ileocecal resection. The mean appendicular stump length was 2.5cm in this study and the method of stump closure was with an Endo loop or by stapler. This study concluded that stump appendectomy can be safely performed in patients with stump appendicitis [22]. A systemic review from Leff et al also looked at stump appendicitis and 60 cases were included. This study also concluded that completion appendectomy can be successfully performed either by an open or laparoscopic approach [23].

As laparoscopic appendectomy becomes more popular in the management of acute appendicitis some studies have suggested that the use of laparoscopic completion appendectomy to be performed for all cases after the diagnosis is established by computerized tomography [24]. A case series on the laparoscopic management of stump appendicitis by Choi et al concluded that laparoscopic stump appendectomy can be safely

performed with minimal morbidity and with reduced risk of infection [25]. A retrospective study by Khan et al on the management of stump appendicitis also concluded that laparoscopic stump appendectomy can be safely performed in the surgical management of stump appendicitis as it was associated with minimal complications [26].

Conservative treatment has been proposed in the management of stump appendicitis, where the patient is started on intra-venous antibiotics and intra-venous fluids and an elective interval stump appendectomy is then performed in eight weeks' time. Some studies have shown good outcomes in this form of management, but it is currently not recommended for the management of stump appendicitis [27,28]. For cases of stump appendicitis where the base is compromised and the surrounding cecum is inflamed, that an ileocecal resection or a right hemicolectomy may need to be performed to decrease the risk of fecal peritonitis and subsequent septicemia [29].

2.3 The Method of Stump Closure

The method of closure of the stump is important and with most of the stump appendectomy being performed laparoscopically. The most common method of closure is with an endo loop suture followed by Hemo lock polymer clip application and closure with an Endo stapler. Metallic clips can also be used but they are not as popular as polymer clips [30,31]. A comparison of the polymer clips, knot-tying and loop ligature was done by Ozdemir et al and they concluded that all three methods were safe for use in the closure of the appendix stump, but polymer clip application was associated with a reduced operative time [32].

Table 1. The appendicular stump length for patients who underwent stump appendectomy

Study	Study type	Year	Surgery	Appendicular stump length
Liang et al	Case series	2006	Laparoscopic appendectomy	4cm
Gifford et al	Case series	2006	Laparoscopic appendectomy	3.5cm
Hendahewa et al	Case series	2015	Laparoscopic appendectomy	2.5cm
Choi et al	Case series	2019	Laparoscopic appendectomy	2cm
Khan et al	Retrospective study	2020	Laparoscopic appendectomy	2cm
Soh et al	Case series	2024	Laparoscopic appendectomy	3cm

A systemic review was conducted by Makaram et al on the closure of the appendiceal stump, 19 studies with 5846 patients were included in this study. There were no differences with regards to post operative complications and length of hospital stay between the patients who received, Endo loop, clips, Endo stapler and suture closure. The use of clips was however associated with reduced operative time. This study concluded that there was no significance difference with regards to method of appendicular stump closure [33].

A systemic review and meta-analysis was conducted by Shaikh et al on the management of the appendicular stump using either clips or sutures. 7 studies with 517 patients were included in this study and there were no differences with regards to the post operative complication and length of hospital stay but endo clips were associated with a shorter operative time, were easy to use and were more cost effective [34]. A similar systemic review and meta-analysis by Poon et al comparing endo loop and endo clips for the management of the appendicular stump and they concluded that Endo clips are a viable alternative for the management of the appendicular stump [35].

3. CONCLUSION

Stump appendicitis is a rare complication of an appendectomy, and the diagnosis is usually delayed due to the history of performing an appendectomy. The diagnosis is usually confirmed by either an ultrasound or a computerized tomography. Once the diagnosis has been established a completion appendectomy should be performed with the laparoscopic method being the operation of choice. Completion appendectomy is usually performed by surgeons as adhesions from the previous surgery will make dissection of the stump difficult and closure of the stump is equally important. Both Endo clips and Endo sutures are equally effective in the surgical management of the appendicular stump with ileocecal resection being rarely performed.

The delay in the diagnosis of stump appendicitis is associated with a higher risk of complication like appendicular mass and abscess formation, hence early diagnosis and treatment is essential to prevent this from occurring. Completion appendectomy should be performed by an experienced surgeon as adhesions may make the surgery difficult.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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