Stump Appendicitis: A Rare Late Complication of Appendectomy, a Retrospective Analysis of 9082 Appendectomy Cases

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ABSTRACT

Objective: Appendectomy for appendicitis is one of the most common surgical procedures performed worldwide. The remnant of the appendix stump after the first appendectomy carries the risk of developing stump appendicitis. Stump appendicitis is a rare late complication of appendectomy; inflammation occurs in the remaining appendicular stump. Delayed diagnosis of this condition can cause serious complications. Stump appendicitis is indeed a recognized clinical picture, but is often overlooked when evaluating patients with right lower quadrant abdominal pain, especially those with a history of appendectomy. It remains a clinical challenge because of its often delayed diagnosis and effective treatment, and possible accompanying morbidity or mortality.

Material and Methods: Materials and Methods: We retrospectively screened the patients who were hospitalized in our general surgery clinic and diagnosed with stump appendicitis in the hospital for 12 years. There were 11 patients between January 2011 and 2023.

Results: The mean age of all 11 patients described was 55 years (range: 20 to 66). 72% of the patients were male (8/11 males and 3/11 females). 63% of the patients had their first operations open, and 36% of them were laparoscopic. The mean white blood cell count on presentation of all reported 11 cases was 11,996 cells/mm³ (range: 5930 to 18,740), the mean fever was 37.82°C (range: 36.8 to 38.6), and the mean CRP count on presentation of all cases was 36.7 (range: 0.4 to 142.91). The most commonly performed radiographic examination used to diagnose stump appendicitis is the abdominal computerized tomography (CT) scan. It was used in 100% (11 cases). Ultrasound was also used in 100% (11 cases).

Conclusion: The appendicular base must be accessed prior to undertaking an appendectomy, irrespective of the chosen strategy or technique. It is noteworthy that, apart from open or laparoscopic appendectomy, antibiotic therapy should also be considered as part of the treatment regimen, as documented in the literature series.

Keywords: appendectomy, complication, stump appendicitis

INTRODUCTION

Acute appendicitis is perhaps the most common cause of acute abdomen, responsible for more than 40000 hospitalizations per year in the UK and more than 2000000 surgeries per year in the USA¹-². The lifetime-long risk of appendicitis is 8,6% in the male gender and 6,7% in the female gender, and the life-long risk of appendectomy is 12% in the male gender and 23,1% in the female gender³. Many surgeons are generally prepared for common complications after appendectomy surgery, like wound infections or intra-abdominal abscesses⁴. The development of stump appendicitis after appendectomy surgery is an extremely rare condition with only 36 cases reported in the UK literature⁵-⁶. Stump appendicitis(SA) is an acute inflammation of residual appendicitis and is an under-reported complication that may occur after laparoscopic/open appendectomy⁷-⁸.
In the past 25 years, laparoscopic appendectomy has seen a notable increase, possibly an enlargement, although this assertion is not corroborated by Liang's findings (9). Short-term complications of appendectomy include; bleeding, pelvic abscess, and wound infection. Among the late complications are; small bowel obstruction, abdominal hernia, and more rarely; SA. Removing part of the appendix means leaving a stump that allows appendicitis to recur. Many clinicians still do not think that SA may be present in the differential diagnosis of patients presenting with right-lower-quadrant (RLQ) pain after previous appendicitis surgery (10). Consequently, the resulting diagnosis and, accordingly, delay in treatment cause an increment in mortality and morbidity (8). SA was first reported by Rose in 1945.; this condition is stated as re-inflammation of the remaining tissue after surgery (9-11). The true prevalence of SA, and the precise reason for this, is unknown, due to the underreporting of the condition as well as the lack of diagnosis (12). In this article, we have examined patients diagnosed with acute appendicitis who were treated at our clinic.

**MATERIAL and METHODS**

We retrospectively screened the patients who were hospitalized in our general surgery clinic and diagnosed with stump appendicitis in the hospital for 12 years. Appendectomy was performed in 9082 patients between January 2011-2023.

All patients were briefed about the study, and informed consent was obtained from each participant regarding the utilization of their data in this scientific study. Stump appendicitis was diagnosed in eleven patients.

For this, ethics committee approval was obtained from Medipol University, and the study was started with the decision numbered E-10840098-772.02-2993.

**Statistical Analysis**

The categorical variables were reported as percentages and also continuous variables as mean with standard deviation for descriptive statistics.

**RESULTs**

The mean age for all 11 patients described was 55 years (range; 20 to 66). Seventy-two percent of the patients were male (8 out of 11 males and 3 out of 11 females). Sixty-three percent of the patients underwent their initial operations through open procedures, while 36% underwent laparoscopic procedures.

The mean white blood cell count on presentation of all reported 11 cases was 11,996 cells/mm³ (range; 5,930 to 18,740), the mean fever was 37,82 °C (range; 36,8 to 38,6), and the mean CRP count on presentation of all cases was 36,7 (range; 0,4 to 142,91). The most frequently employed radiographic examination for diagnosing stump appendicitis is the abdominal computed tomography (CT) scan (Figure 1). It was utilized in 100% of the cases (11 cases), and ultrasound was also employed in 100% of the cases (11 cases).

In 45% (5 cases) an open approach for the definite treatment of stump appendicitis was chosen. The remaining 18% (2 cases) were performed laparoscopically, 27 % (3 cases) were treated with antibiotherapy, and 0.09 %, that is, one patient, had a right hemicolectomy. The average stump length for all cases was 3.3cm (range, 1.5 to 6). Perforation was found in 0,09% (1/11 cases), and that patient was chron. No postoperative complications such as wound infections, bleeding, abscess formation, or postoperative ileus were observed. The mean hospital stay was 2.2 days (range, 1 to 7) (Table 1).

**Table 1: Characteristics of Included Patients**

<table>
<thead>
<tr>
<th>Patients</th>
<th>n=11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Female /Male)</td>
<td>3/8</td>
</tr>
<tr>
<td>Mean Age</td>
<td>37,5 (20-66)</td>
</tr>
<tr>
<td>Mean fever (°C)</td>
<td>37,8 °C</td>
</tr>
<tr>
<td>Mean CRP (mg/dL)</td>
<td>36,6 mg/dl (0,4-142,9)</td>
</tr>
<tr>
<td>Mean WBC (cells/mm³)</td>
<td>11,9 cells/mm³</td>
</tr>
<tr>
<td>Mean stump (cm)</td>
<td>3,1 cm (1,2-6)</td>
</tr>
<tr>
<td>Ex operation type</td>
<td>Conventional: 7 Laparoscopic: 4</td>
</tr>
<tr>
<td>Lenght of stay in hospital</td>
<td>2,27 days (1-7)</td>
</tr>
</tbody>
</table>

**Figure 1: **CT scan view of stump appendicitis
DISCUSSION

C. Amyand conducted the initial appendicitis surgery in 1735. R. Fitz reported the clinical signs and pathological features of appendicular inflammation in 1886. Rose, on the other hand, narrated the inflammation of the residual tissue in a patient who had already experienced appendicitis surgery and first mentioned Stump appendicitis in 1945 (11). Four years after Rose, Baumgardner defined stump appendicitis and published a review of 36 cases of SA (13).

Some studies have proposed that there may be an increment effect of SA when laparoscopic appendectomy is crosschecked with conventional appendectomy. However, as Liang also mentioned in his study, the incidence of SA after conventional appendicitis surgery is twice that of laparoscopic surgery. While this rate was 66% in conventional surgery, it was 34% in laparoscopic surgery (9, 14). In our database, when treating our patients, we incorporated antibiotic therapy as a treatment method alongside open and laparoscopic surgery options (15). This approach was applied to 3 out of 11 patients. Interestingly, contrary to the findings in the literature, all three of these patients were successfully treated without the need for additional surgery. The distinguishing factor in these patients was the stump appendicitis length, which was less than 3 cm in all three cases. In addition to the literature information, it can be considered that this may be a treatment option in patients with a short stump length due to the small number of case series. However, the necessity of expanding the case series should be kept in mind. Antibiotherapy is considered the primary treatment option in the pediatric population, except for the presence of perforated appendicitis or peri-appendicular abscess. In the adult population, surgery is still the first choice in patients with primary appendicitis. However, it should be kept in mind that this treatment option can be considered in patients with stump appendicitis (16).

One of the challenges of identifying SA is that doctors in the emergency ward need to be mindful of the possibility that SA exists as a clinical diagnosis. It should be included in the differential diagnosis in the presence of RLQ pain in patients with appendectomy surgery. The symptoms that occur in the presence of stump appendicitis are the same as in a patient with appendicitis who has not undergone surgery. These are pain starting around the navel and spreading to the right lower quadrant, loss of appetite, nausea, and vomiting.

The maturation of stump appendicitis (SA) is influenced by various factors, with a key challenge being the accurate identification of the appendix base at the cecum junction. Incorrect determination of this junction may occur more frequently in the presence of widespread inflammation. An appendix with retrocecal extension may have a retrocecal base. In such cases, the segment of the appendix lost in the retrocecal area can be misjudged, potentially resulting in the creation of a stump by leaving the base on the wrong ground. In both conventional and laparoscopic appendicitis surgery, it is crucial to expose the base of the appendix after visualizing its junction with the cecum (17). An approach guided by observing the tenia coli footsteps may enhance the chances of success. The complete resection of the appendix from its base is necessary, and if this is not achievable, the stump length should be kept below 3 mm. A CT scan can assist in determining the size of the appendix. Additionally, if an incidental finding in a CT scan resembles coincidental appendix patients, observation should be considered instead of surgery, similar to uncomplicated appendicitis.

Attention should be paid to the size of the amputated appendix. In Liang’s series, 7 out of 48 patients had an average length of 4.4 cm, ranging from 3 cm to 6.5 cm (9). In our series, the mean extent of the resected appendix was 3.3 cm. Consequently, while the length of the resected tissue may vary, the residual tissue left behind should not exceed 3 mm, and this should be confirmed by the surgical team (18). Nevertheless, appendectomy surgery remains the established complementary treatment for SA.

Excepting the diagnosis of SA, there is one more realizable clarification for a patient who has had surgery for appendicitis to be diagnosed with appendicitis again: a duplicated appendix. This is an evolutionary anomaly and is very infrequently; 0.004 % of patients have undergone an appendectomy. Wallbridge and Cave have delineated three types of duplication (19-20). The first group is described as Type A and dual appendicitis has a single basis. The second group was named type B, where primary appendicitis was in the expected site, while secondary appendicitis originated from anywhere in the colon. As the last group, type C is the case of secondary appendicitis with replicating of the cecum (21).

CONCLUSION

The literature does not comprehensively address the possibility of stump appendicitis in gastrointestinal tract surgery. This somewhat uncommon complication can occur following an appendectomy procedure, including both laparoscopic and traditional appendectomies. While there was initial speculation that the incidence of stump appendicitis increased with laparoscopic appendectomy, current findings do not support this notion. Diagnosing stump appendicitis poses a particular challenge, and proper imaging techniques are crucial in the differential diagnosis.

When individuals who have undergone an appendectomy present with acute right lower abdominal discomfort, stump appendicitis should be considered among the potential differential diagnoses. However, it is essential to initially rule out more prevalent reasons. Accessing the appendicular base before performing an appendectomy is imperative, irrespective of the chosen strategy or technique. It’s worth noting that, in addition to open or laparoscopic appendectomy, antibiotic medication can also be considered as part of the treatment regimen, as indicated in literature series.

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Ethical approval: The present study was conducted in strict accordance with the principles outlined in the Declaration of Helsinki. Ethical approval for the study was obtained from the appropriate ethics committee, and all participants provided informed consent before participating in the study. For this, ethics committee approval was obtained from Medipol University, and the study was started with the decision numbered E-10840098-772.02-2993.

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