

## A Clinicopathological Review of 655 Appendices Removed For Acute Appendicitis in a Tertiary Care Medical Center in Lebanon: A Retrospective Study

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### Abstract

**Context:** Acute appendicitis is the most commonly performed emergency abdominal surgery. A variety of conditions can mimic it.

**Aims:** This study aims to determine the pathological diagnosis in appendectomy specimens.

**Methods and Materials:** This is a retrospective analysis of 655 patients who underwent appendectomy in a tertiary care centre between January 2007 and February 2018. Demographic information was gathered. The results were analysed using SPSS statistics software.

**Results:** 655 patients were included (male to female ratio: 1.46/1). The mean age was 31.9 years. Histopathological findings were abnormal in 514 (78.4%) including uncomplicated appendicitis 442 (67.4%), perforated appendicitis 26 (3.97%), necrotic gangrenous appendicitis 7 (1.1%), accidental appendicitis 5 (0.76%), purulent appendicitis 4 (0.6%), congestion 11 (1.67%), fecaloma 8 (1.22%) and unusual findings in 13 patients.

The perforation rate was 7.6%. Patients with pathologically normal appendices were significantly older than those with abnormal appendices ( $P < 0.05$ ). Abnormal findings were more seen in males ( $p < 0.05$ ). The false appendectomy rate for appendicitis was 12.8% (75 cases), Gender was determined to have a significant effect on this rate ( $P < 0.05$ ) which was more seen in females (60%) while age had no effect on it.

**Conclusion:** The variety of pathological results post appendectomy verifies the continuous need for histopathological studies to confirm the diagnosis. False appendectomy rate is more common in females which suggest the need of laparoscopy in this group.

**Keywords:** Appendectomy, Acute appendicitis, Pathological examination, Negative appendectomy rate, Lebanon

### Introduction

Appendicitis is one of the most common causes of the acute abdomen and is a frequent indication for an emergent laparotomy worldwide [1]. It occurs most frequently between 10 and 19 year old, and has an incidence of 233 cases per 100,000. It is more frequent in men (M/F ratio of 1.4:1), with a lifetime incidence of 8.6% in men compared to 6.7% for women [2].

Appendicitis is believed to be secondary to appendiceal obstruction which may be caused by fecaliths (hard fecal masses), calculi, lymphoid hyperplasia, infectious processes, and benign or malignant tumours. However, the majority of patients with appendicitis do not have a fecalith and some patients with a fecalith have a histologically normal appendix [3].

Appendectomy is considered the gold standard treatment of acute appendicitis [4]. The best time for appendectomy is still debated but many studies succeeded to prove that it could be delayed for few hours if antibiotics were given properly [4].

Even though there is no doubt that histopathological studies are being omitted for multiple pathologies like hernia and tonsillectomy, it is still needed post appendectomy because of the variety of pathologies that can mimic appendicitis like tumours and inflammatory bowel diseases and their need of further medical management post operatively [5,6]. In one study conducted by Yilmez, et al. that included 1621 patients proved that histopathological studies allows the early detection of unusual findings in the appendix even if its macroscopic appearance is normal [7].

The data about appendectomy in Lebanon are limited. Our study evaluated pathological findings of appendectomies in a tertiary care centre. It also aimed to collect epidemiological data of pathological

results encountered post appendectomy in Lebanon.

### Subjects and Methods

This is a retrospective study that included Records of 655 patients who underwent appendectomy in a tertiary care center in Lebanon between January 2007 and March 2018 due to a presumptive diagnosis of acute appendicitis. All appendices had been removed by open or laparoscopic surgery and were routinely submitted for pathological studies.

Demographic information was gathered.

Microscopic reports of appendectomies were categorized into different subgroups and patients' characteristics were compared between these subgroups.

Characteristics of cases with and without perforated appendicitis were also compared.

The ethics committee of the hospital approved the study.

The results were analysed using SPSS, version 23. A P-value less than 0.05 were considered statistically significant. Results are expressed as mean (standard deviation).

### Results

655 patients were included (male/female ratio: 1.46:1). Age distribution is shown in the Table 1 below with a mean age of 31.9 years.

Histopathological findings were abnormal in 514 (78.4%) including uncomplicated appendicitis 442 (67.4%), perforated appendicitis 26 (3.97%), necrotic gangrenous appendicitis 7 (1.1%), accidental appendicitis 5 (0.76%), purulent appendicitis 4 (0.6%), congestion 11 (1.67%), fecaloma 8 (1.22%). Table 2 shows the detailed characteristics of the unusual pathological results which were found in 13 patients: oxyurosis 3 (0.4%), mucocele 3 (0.4%), carcinoid tumor 2 (0.3%), endometriosis 1 (0.15%), non-Hodgkin's lymphoma 1 (0.15%), adipose regression 1 (0.15%), 1 ceecal diverticulosis with remnant appendix (0.15%) and tuberculoid appendix 1 (0.15%).

The false appendectomy rate for appendicitis was 12.8% (75 cases). The perforation rate was 7.6%. Age and gender had no effect on perforation rate ( $p > 0.05$ ). Patients with pathologically normal appendices were significantly older than those with abnormal appendices with an age of 35.6 and 30.8 years respectively ( $P < 0.05$ ).

As shown in Table 3, abnormal findings were more seen in males ( $p < 0.05$ ). Gender was also determined to have a significant effect on false appendectomy rate ( $P < 0.05$ ) which was more seen in females (60%) while age had no effect on it ( $p = 0.451$ ). Age had a significant effect on pathological findings ( $P < 0.05$ ) with most of abnormal pathologies found in the age group of 19-40 years old ( $p < 0.05$ ), this effect was also significant for the patient who had acute appendicitis who also belonged to this same age group.

**Table 1: Age distribution of patients**

Age group ( years )	Abnormal pathology	Normal
0-13	55	14
13-19	76	12
19-40	196	54
40-65	116	34
Above 65 years old	24	15

**Table 2: Detailed characteristics of the 13 patients with unusual pathological results**

Patient	Age	Gender	Pathology	Surgical Approach
1	41	Female	Mucocele	Appendectomy
2	23	Female	Adipose regression	Appendectomy
3	37	Female	Carcinoid	appendectomy+ right hemicolectomy
4	15	Male	Tuberculosis	Appendectomy
5	30	Female	Appendicular endometriosis	Appendectomy
6	17	Male	Carcinoid	Appendectomy+ right hemicolectomy
7	60	Female	non-Hodgkin's lymphoma	Appendectomy
8	21	Female	Oxyurosis	Appendectomy
9	26	Male	Mucocele	Appendectomy
10	10	Female	Oxyurosis	Appendectomy
11	43	Female	Oxyurosis	Appendectomy
12	60	Male	Mucocele	Appendectomy
13	32	Male	Caecal diverticulitis + remnant appendix	Appendectomy

**Table 3: Effect of demographic features on pathological results**

Chi Square test for different variables	
Variables	P
Gender vs pathology	0.001
Gender vs perforation	0.763
Age group vs pathology	0.04
Age group vs perforation	0.172
Age group vs appendicitis	0.017

### Discussion

Acute appendicitis is one of the most common abdominal emergencies [1]. The goal of therapy of acute appendicitis is early diagnosis and prompt operative intervention with many surgeons resorting to the use of an aggressive approach with an accepted number of negative appendectomies of 15%, although the use of imaging studies have reduced this rate to less than 10% [8].

Appendicitis is believed to be secondary to luminal obstruction which may be caused by fecaliths (hard fecal masses), calculi, lymphoid hyperplasia, infectious processes, and benign or malignant tumours; in our study 8 patients (1.22%) were found to have fecalith with normal pathology of the appendix which is consistent with previous literature [3].

Data of previous studies regarding perforation of appendix are mixed with a perforation rate of 9% in patients who underwent routine CT imaging [9]. In our study, about 75% of the patients underwent imagery investigation (whether CT scans or ultrasound), the perforation rate was 7.8% which is slightly lower in comparison to the literature.

The negative appendectomy rate (NAR) is quality metric in the management of appendicitis, with many studies reporting an increase

in length of stay, infectious complication rate, case fatality rate and expenses in these patients, the NAR of patients who underwent non-incidental appendectomies in our study was about 12.5% which is slightly less frequent compared to the results of the retrospective analysis done by Flum and Koepsell (12.5% vs. 15.3%) [10].

Incidental appendectomy is defined as the removal of clinically normal appendix during non appendiceal surgery, and is considered as controversial in many cases while many studies recommend it specially in gynaecological procedures [11]. Wolf, et al. conducted a review of literature that included 250000 appendectomy done in the United States and found that incidental appendectomy was more common in female patients and that 1000 incidental appendectomies are expected to be done in order to prevent 52 cases of appendicitis [12]. Song, et al. reported rate of 3.3% of positive appendicitis after incidental appendectomy [11]. In our study, 70 patients underwent appendectomy for non appendiceal surgery; among these patients 5 patients (7.14%) were found to have appendicitis on pathology despite the fact that all these patients had a confirmed pathological and radiological diagnosis of the primary suspected disease. This rate of accidental appendicitis is very high compared to the literature and shows the importance of incidental appendectomy in preventing appendicitis.

13 of our patients had unusual findings on pathology which were less frequent than that found in some studies done in neighbouring countries such as Turkey (1.98% vs. 3.88%) [13].

Many previous studies showed the importance of the effect of age and gender on the rate of false negative appendectomy. A 10 years review of 475,651 cases of appendectomy in the United States done by Seetahal, et al. found that false negative appendectomy is more associated with female gender with 71.6% of cases of NAR belonged to female patients [14]. Agafonoff, et al. reported significantly that children had higher rate of false negative appendectomies than adults [15]. Noudeh, et al. also reported that children younger than 9 years old had the highest false positive appendectomy rate [16]. In neighbouring countries such as Iran, study done by Monajemzadeh, et al. which included 947 appendices taken from children showed that children with false negative appendectomy were significantly younger [17]. In our study, abnormal findings were more seen in males ( $p < 0.05$ ). Gender was also determined to have a significant effect on false appendectomy rate ( $P < 0.05$ ) which was more seen in females (60%) which is consistent with results of the study by Seetahal, et al [14]. In our study, age had no effect on NAR ( $p = 0.451$ ).

Carcinoid tumour is rare and is usually found in less than 0.3% to 2.27% of appendectomies [18]. It usually occurs at the seventh decade with an age adjusted incidence of 4.1 per 100000. It is more found in African Americans than in Caucasian (6.46 versus 4.60/100,000) and is slightly more associated with male gender (4.97 versus 4.49/100,000) [19]. In our study, two patients were found to have carcinoid tumours and therefore the prevalence was 0.3% which is similar to that of the literature, both were middle eastern Caucasian patients, and both tumours were suspected during the operation, one of them was a 17 years old male and the other was a 37 years old female, and therefore they were too young compared to the median age of 63 years found in the literature [19].

Mucinous neoplasm of the appendix also known as mucocele consist of a cystic mass filled with mucin and is caused by the luminal

obstruction of the appendix secondary to benign conditions such as hyperplastic growth or to malignant process [20]. It is more frequent in women and usually occurs in middle aged patients [21]. It can cause appendicitis or acute abdomen and usually diagnosed intraoperatively or by histopathological study. Mucocele is found in 0.3% of all appendectomy specimens [20]. In our study, 3 patients (0.45%) were diagnosed of having mucocele, all of them were middle aged patient (between 40 and 60 years old) which is consistent with literature but unlike other studies it was less associated with female gender (1/3).

Appendiceal endometriosis is defined as the presence of endometrial tissue in the appendix and is found in 2 to 4% of cases of endometriosis [22]. It is usually asymptomatic, but it occasionally causes appendicitis, perforation, and intussusceptions [22]. We found endometriosis in a 32 years old female patients (0.15%) with an incidence of 0.15% which is more frequent than in the study done by Yabanoglu, et al. in Turkey [13].

Enterobius vermicularis (pinworm) or oxyuriasis is one of the most common nematode infections worldwide; it has a simple life cycle with the adult worms establishing themselves in the gastrointestinal tract, mainly in the cecum and appendix. The pinworm can be found in normal and inflamed appendices following appendectomy, but whether or not they cause appendicitis is still debated. In the literature, the incidence of pinworm in the appendix ranges from 0.2% to 41.8%. In our study 3 patients (0.4%) had an appendix infested by the pinworm; none of them had associated inflammation which doesn't correlate with the literature which reports an incidence of 13% to 37% of inflammation in appendices infested by this germ.

Tuberculosis may affect all tissues and organs in the body, but it most frequently involves the lungs. The gastrointestinal system is the sixth most common location of extra-pulmonary tuberculosis. TB may affect all of the segments of the GI system, from the mouth to anus with ileo-cecal involvement of 40% of cases of intra-abdominal tuberculosis [23]. Tubercular appendicitis was first recognized by Corbin in 1873 and seen in about 1% of cases of intra-abdominal appendicitis [23,24]. Histopathological examination is usually needed for accurate diagnosis of this condition and usually reveals the presence of caseating granulomas and Langhans giant cells. There is a debate regarding the use of anti-tuberculosis drugs with some studies reporting that appendectomy alone is sufficient but no consensus has been reached [25]. In our study, one patient (0.15%) had tuberculosis, he was a 15 years old male with history of recent travel, there was no pulmonary involvement and during his surgery the disease was limited to the appendix, a non caseating granuloma was seen on pathology, anti-tuberculosis drugs were given after surgery without complications.

The gastrointestinal tract is the most common site for extra nodal lymphoma. The stomach is the most common, followed by the small intestine, pharynx, colon, and oesophagus. Lymphoma of the appendix is estimated to be found in 0.015% of appendectomies and is almost exclusively non-Hodgkin's B-cell lymphoma, more specifically, Burkitt's lymphoma [26]. Its clinical presentation is very similar to that of appendectomy with most patient presenting for insidious onset of right quadrant pain and usually it is more associated with male gender with a median age onset of 18 years [27]. We had one case of non-Hodgkin lymphoma and unlike the data of the literature; it was a case of 60 years old woman.



One of the most important limitations of our study is that it is a retrospective study done only in one medical centre.

## Conclusion

Although of the pathological studies post appendectomy revealed acute appendicitis in 78.4%, the rest of our patients had either normal pathology or unusual disease of the appendix. The negative appendectomy rate was 12.8% and it was more associated with the female gender. The most common unusual findings were infections (*Enterobius vermicularis*, TB) and benign or malignant tumors and most of these patients either had further surgery (right colectomy) or needed further medical treatment (antibiotics, antiparasitic and chemotherapy). 70 patients underwent appendectomy incidentally for non-suspected appendicitis and 5 of them were found to have the disease. Therefore we suggest histopathological studies for appendectomy specimens even in the case of incidental appendectomy or normal macroscopic appearance.

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