

Can the Negative Appendectomy Rate be Minimized?

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ABSTRACT

Background: Acute abdominal pain represents a vast inpatient burden of diverse diagnoses. Historically, the care of this group of patients has been overlooked and underfunded and there has been resultant variability in the quality of care provided.

Negative appendectomy exposes patients to avoidable anesthesia and surgical complications, and it can be due to improper clinical assessment, unavailability of diagnostic modalities.

Aim: To identify all patients presenting with suspected acute appendicitis and determine the negative appendectomy rate.

Methods: This was a retrospective study of patients who presented to the emergency department or referred by a GP, between May 2018 to April 2019. A surgical team on call established the clinical diagnosis. Management, including discharge home, laboratory tests, imaging, admission for observation, and operation was based on the surgeon's clinical assessment and decision.

Results: 273 patients underwent appendectomy; out of them 147 (53.84%) males and 126 (46.15%) females. Positive appendectomy (PA) was proven in 241 cases (88.27%), while 32 cases (11.72%) had negative appendectomy.

Conclusion: More conscientiousness is required in making clinical diagnosis of acute appendicitis; our negative appendectomy rate is comparable with that of literature

INTRODUCTION

Right iliac fossa pain is one of the most common presentations to the acute surgical take. The lifetime risk of having appendicitis is 7% - 8% with an overall incidence of 11 cases per 10,000 populations per year.^{1,2,3} This condition is most commonly seen in patients aged between early teens and late 40s; there is a slight male to female predominance. Classic presentations of appendicitis may only occur in 50% of people,^{4,5,6} and establishing the diagnosis of acute appendicitis remains challenging. Diagnosis is based on history, clinical examination and supported by radiology and laboratory tests such as white blood cell (WBC) count and C-reactive protein (CRP).^{7,8} The risk of complications with appendicitis rises with the duration of symptoms, and these can be life-threatening if they are not managed promptly. In some

patients, who present with a typical history and convincing examination signs, it is easy to determine what their management, but those with less specific signs can be more of a diagnostic challenge. It is these patients that require further time and investigations to determine the correct diagnosis and subsequent treatment. Appendicitis account for more than 40,000 hospital admissions in England each year. The rate of appendectomy is around 10 per 10,000 cases per year in the US.⁹ Negative appendectomy rates in the literature range from 2 - 41% and several authors consider higher negative appendectomy rates acceptable in order to minimize the incidence of perforation. UK National audit in 2012 found the negative appendectomy rate to be 20.6%.¹⁰ There is huge intra- and inter-hospital variability in the management of these patients¹¹

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AIM

To identifying all patients presenting with suspected acute appendicitis and determine the negative appendicectomy rate.

METHODS

This is a retrospective study of patients who presented to the emergency department or who were referred by General Practitioner (GP), between May 2018 and April 2019. Data were retrieved by detailed review of the hospital case notes, including blood tests, radiographic imaging and operative course. The following data fields were collected: Age, Gender, Presenting complaint, Comorbidities, Admission status, Date of admission, Date of operation, Date of discharge, Histology, overall care pathway and outcome.

Inclusion criteria: all patients referred to the on call surgical team with suspected appendicitis and who underwent appendicectomy.

Exclusion criteria Patients with concurrent Urological / Gynaecological problems or underwent diagnostic laparoscopy for investigative purposes were excluded from the study.

Laparoscopic Appendicectomy was undertaken via a standard 3-port method, achieving pneumoperitoneum using the Hasson / Veress technique. Open Appendicectomy was performed in conventional manner by Lanz incision.

STATISTICAL ANALYSIS

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 24). Multivariable logistic regression models were created to explore the factors associated with negative appendicectomy, readmission, surgical site infection, intra-abdominal abscess and reintervention. Mean values were compared using the Student t test. Univariate analysis of categorical variables was performed by the chi-

square test. Chi-square was estimated for the significance between negative appendicectomy and presenting complaint and clinical examination findings. The t-test was used to test the significance between negative appendicectomy and blood test results. For all tests the p value was considered Statistically significant if it was <0.05.

RESULTS

273 patients underwent appendicectomy; out of them 147 (53.8%) males and 126 (46.15%) females. Positive appendicectomy was proven in 241 cases (88.3%), while 32 cases (11.7%) underwent a negative appendicectomy (Table 1). In the negative appendicectomy sample, 19 cases (59.4%) were females and 13 cases (40.6%) were males. There was no significant relationship between negative appendicectomy and gender (Table 2). Most admissions were in the younger age group between 5 and 45 years (Fig: 1). There was a significant association between negative appendicectomy in males aged 16 - 35 years ($p < 0.05$) and females aged 11 - 45 years ($p < 0.05$).

Appendicectomy rates were highest in the month of August 2018 (12.1%) and lowest in April 2019 (4.4 %). The negative appendicectomy rate was greatest in November 2018 (21.9%) and but lowest, at zero, during September 2018 and April 2019 (Fig: 2a, 2b). Histopathological examination showed 32 cases (11.72 %) without acute inflammation, 13 cases (4.76%) with mild inflammation, faecolith in 12 cases (4.39%), parasites in 2 cases (0.73%), fibrous obliteration in 2 cases (0.73%), and tumor in 1 case (0.36%) (Fig: 3). Operative findings were reported as 'normal appendix' in 12 cases (4.39%), gross inflammation in 18 cases (6.59%), and mild inflammation in 17 (6.22%) cases. Average length of stay in hospital was 3.44 days (range 1 - 23) (Fig: 4).

	Male	Female	Marginal Row Totals
Inflamed Appendix	133 (129.77) [0.08]	108 (111.23) [0.09]	241
Histology Normal	14 (17.23) [0.61]	18 (14.77) [0.71]	32
Marginal Column Totals	147	126	273 (Grand Total)

Chi-square = 1.49, $p = 0.22$.

Chi-square statistic with Yates correction = 1.0622, p -value = 0.30

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Table1.

Age in Years	Gender		Operative Findings			Histological Findings					
	Male	Female	Normal	Inflamed	Mild infl	Normal	Mild infl.	Cancer	Parasite	Faecolith	Obliteration
5 - 10	15	9	0	0	2	0	2	0	0	0	0
11 - 15	20	14	2	1	2	2	3	0	0	0	0
16 - 20	17	10	2	4	4	5	5	0	1	4	0
21 - 25	13	15	1	2	3	4	1	0	0	2	1
26 - 30	14	13	3	1	3	6	1	0	0	2	0
31 - 35	17	10	2	3	3	8	0	0	1	2	1
36 - 40	8	12	1	1	0	2	0	0	0	1	0
41 - 45	14	8	0	2	0	1	1	0	0	0	0
46 - 50	9	5	0	2	0	2	0	0	0	1	0
51 - 55	4	11	1	0	0	1	0	0	0	0	0
56 - 60	6	6	0	2	0	1	0	1	0	0	0
61 - 65	2	4	0	0	0	0	0	0	0	0	0
66 - 70	3	3	0	0	0	0	0	0	0	0	0
71 - 75	2	1	0	0	0	0	0	0	0	0	0
76 - 80	2	1	0	0	0	0	0	0	0	0	0
81 - 85	1	2	0	0	0	0	0	0	0	0	0
86 - 90	0	2	0	0	0	0	0	0	0	0	0
Total	147	126	12	18	17	32	13	1	2	12	2

Table2.

Month	Gender		Operative Findings			Histological Findings	
	Male	Female	Normal	Inflamed	Mild inflammation	Normal	Mild infl
May18	0	1	0	0	1	1	0
Jun-18	2	1	0	2	1	3	0
Jul-18	1	1	0	0	2	2	0
Aug18	0	3	1	1	1	3	0
Sep-18	0	0	0	0	0	0	0
Oct-18	1	1	0	2	0	2	0
Nov18	3	4	2	3	2	7	0
Dec18	0	3	2	0	1	3	0
Jan-19	3	3	2	2	2	6	0
Feb-19	1	1	1	0	1	2	0
Mar19	2	1	0	1	2	3	0
Apr-19	0	0	0	0	0	0	0
Total	13	19	8	11	13	32	0

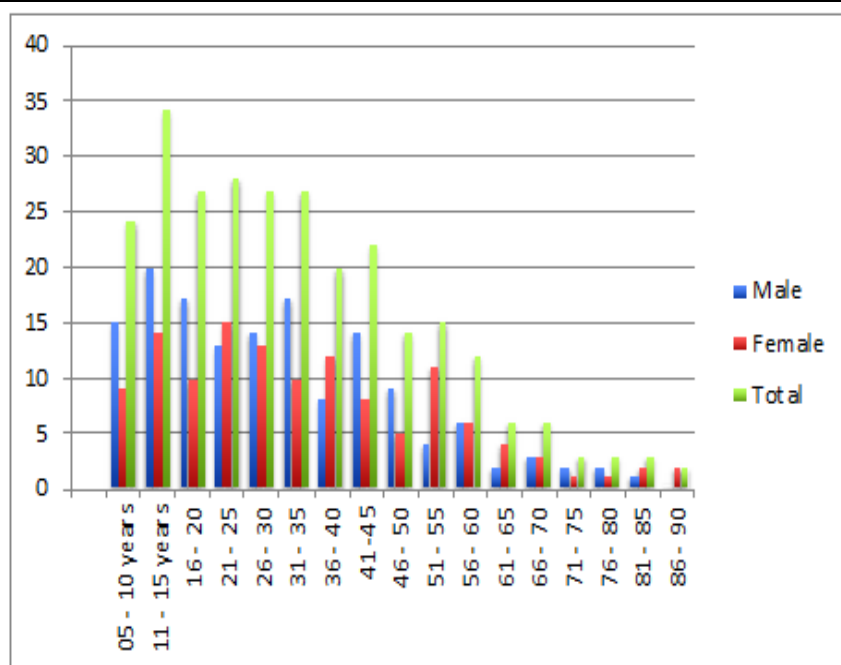


Fig1.

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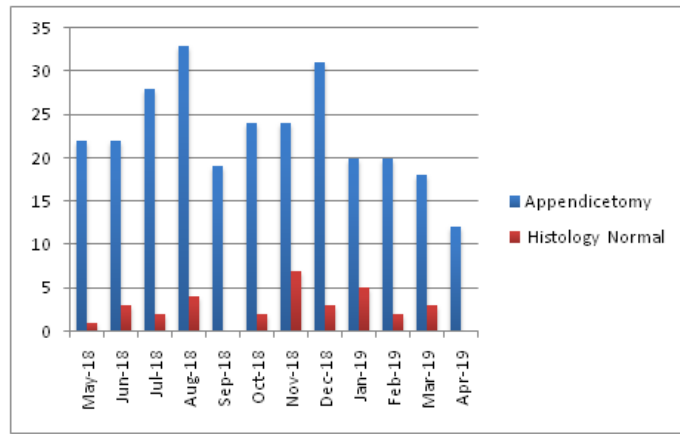


Fig2A.

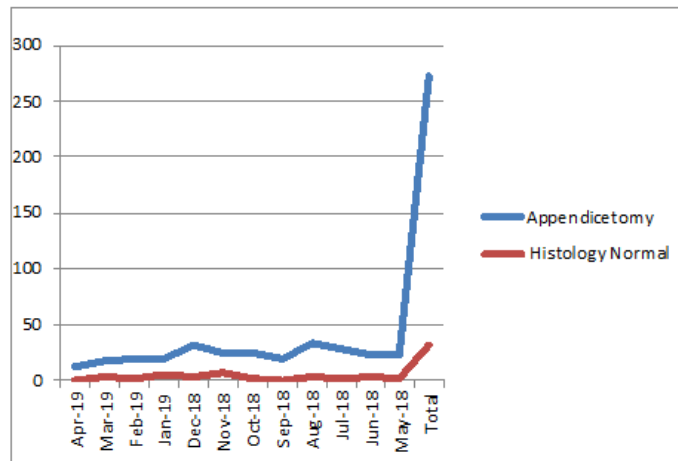


Fig2B.

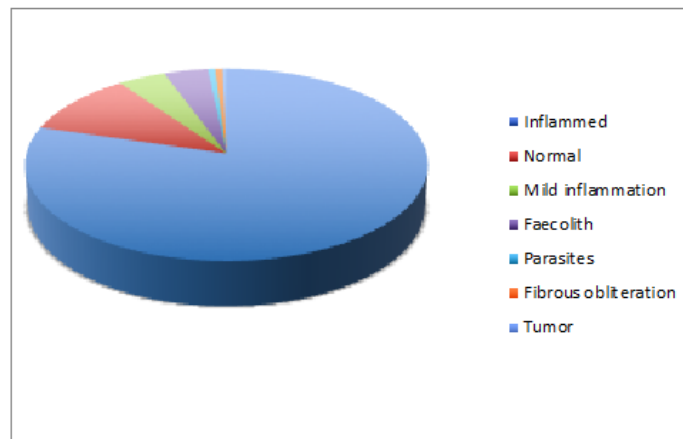


Fig3.

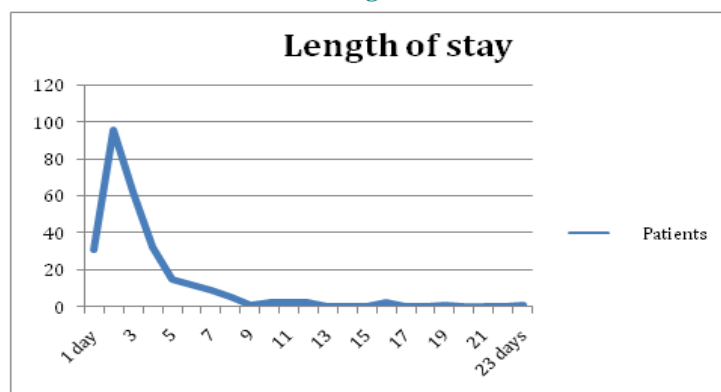


Fig4.

DISCUSSION

Acute appendicitis is conventionally a clinical diagnosis; though, not all patients present with the 'typical' symptoms and signs of acute appendicitis. The clinical presentation can vary from mild symptoms to signs of generalized peritonitis and sepsis. The diagnosis of appendicitis can be challenging even in the most experienced of clinical hands, hence, the significance of individual clinical variables to establish the likelihood of acute appendicitis in a patient is low.^{12,13} Biochemical testing is performed routinely in most patients, but its significance in confirming acute appendicitis is debatable. Systematic review showed that elevated CRP levels render the highest diagnostic accuracy followed by increased numbers of leucocytes¹³. Complicated appendicitis (perforation or intra-abdominal abscess) is more likely the greater the duration of symptoms¹⁴ and in older patients (>50 years),¹⁵ if clinical findings suggest acute appendicitis, further investigations should not delay proceeding to surgical management.¹⁶ Appendectomy is still considered to be the gold standard; initial non-operative management of appendicitis has been investigated in the adult population. Randomized controlled trials reported an effectiveness of 41–85 % at 1-year follow-up¹⁷⁻²¹. Meta-analyses of these studies revealed that non-operative treatment of acute appendicitis is less effective but could avoid surgery in 60–85 % of patients²²⁻²⁷. This approach may raise concerns of recurrent symptoms, missed malignancy, and the progression of uncomplicated into complicated appendicitis. Due to the possible avoidance of surgery with an initial non-operative treatment strategy, morbidity may be diminished.^{24, 26, 28} In this study most appendectomies were in the young age group between 5 and 45 years, and a significant relationship was reported between negative appendectomy and males of 16 - 35 years and females of 11 - 45 years. These findings are comparable to studies by Primates²⁹ and Bhopal et al.³⁰ The lifetime chance of appendectomy can be as high as 20%.^{31,32} The negative appendectomy rate is a well-known in the treatment of patients with suspected appendicitis.³³ In previous decades, a negative appendectomy rate of between 15% and 25% has been accepted as reasonable.³⁴

The contemporary negative appendectomy rate varies from 6 % in the United States (routine use of preoperative imaging) and Switzerland

(routine use of laparoscopy) to 21 % in the United Kingdom (selective use of imaging and laparoscopy).³⁵⁻³⁷ The negative appendectomy rate found in this study was 11.72% and this is within the traditional measures of acceptance and consistent with literature. There is inconsistency regarding the management of an unexpected "normal appendix" during diagnostic laparoscopy.^{38, 39} If no other pathology is identified. The decision to remove the appendix should be considered but based on the individual clinical scenario. Macroscopically normal appendices may have abnormal histopathology. Several studies have shown a 19% - 40% rate of pathologically abnormal appendix in the setting of no macroscopic abnormalities.⁴⁰ Therefore, the risk of leaving a potentially abnormal appendix must be weighed against the risk of appendectomy in each individual scenario. Cases of postoperative symptoms requiring reoperation for appendectomy have been described in patients whose normal appendix was left in place at the time of the original procedure. Patients are usually discharged from hospital one day after the operation for uncomplicated appendicitis. Our average length of stay was 3.44 days (range 1 - 23 days) and this is in consistent with the study of Bhopal et al.³⁰ and Baigrje et al.⁴¹ who reported postoperative a length of stay of 4.1 days. The longer period of hospital stay in our study was due to complicated appendicitis, or perforated or gangrenous appendix.

The limitations of this study were that only patients who had an appendectomy were studied, while patients who had suspected appendicitis and managed conservatively were not included. The use of the negative appendectomy rate as a quality indicator is debatable – primarily that it does not specify resolution of clinical symptoms. It is likely that patients with negative appendectomy had an improvement in their symptoms following appendectomy. Many diseases resemble the presentation of acute appendicitis. Subsequently, more effort would be directed toward reducing negative appendectomy rates and its complications.

CONCLUSION

More conscientiousness is required in making a clinical diagnosis of acute appendicitis; our negative appendectomy rate is comparable with that of literature.

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