

The Impact of Routine CT Scan for Acute Appendicitis on the Negative Appendectomy Rate: Clinical Audit of a Single Center

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Abstract

Background: Acute appendicitis remains the most common surgical emergency worldwide. Patient usually presents with abdominal pain mainly right lower, which gives tenderness on examination. This may or may not be associated with raised inflammatory markers. CT scan is nowadays routinely done in accident and emergency room, which leads to the confirmation of symptoms presented as acute appendicitis. Appendectomy is done at earliest and the specimen sent for histopathology. Some appendixes are obviously inflamed, but some are found borderline which only confirms after the histopathology report. Removing a normal appendix means negative appendectomy will be determined on final histopathology report.

Aim: The aim of this study is to determine the negative appendectomy rate in Mediclinic City Hospital Dubai, where CT scan is routinely done for all patients with clinical suspicion of acute appendicitis.

Patients and Methods: Data from 2010 till 2018 of patients who underwent emergency appendectomy was collected. Total of 407 patients were included in the study, age ranges between 14 - 70 years and the average was 36.76 (SD). Children and pregnant were excluded from the study.

Result: Negative appendectomy rate in our hospital was found to be (no) 6.1%, 25 patients out of 407 were not found as acute appendicitis on histology. Of the 25 patients, 9 (2.2%) were found to have other diagnoses. The mean age was 36.76 (10.97). To that concern the gender, 225 (55.3%) were males and 182 (44.7%) were females. Out of the total only 30 (7.4%) patients did not undergo CT scan due to unknown reasons.

Conclusion: Negative appendectomy rate has declined globally over the period of time due to increased use of imaging modalities, mainly CT scan, but still some cases are picked up which does not confirm on histology. Our hospital has a low rate of negative appendectomy due to the routine use of CT scan in the diagnosis of acute appendicitis. Hence we decided to share our experience.

Keywords: Routine CT; Appendectomy Rate; Mediclinic; Dubai

Introduction

Appendicitis, an inflammation of the vestigial vermiform appendix, is one of the most common causes of acute abdomen and one of the most frequent indications of emergent abdominal surgical procedure worldwide [1,2]. Appendicitis occurs more frequently in the second and third decades of life. The incidence is approximately 233/100,000 population and is highest in the 10 - 19 years-old age groups [3].

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There is male to female ratio of 1.4:1 and lifetime incidence of 8.6% in men and 6.7% in women [3]. The pathogenesis involves inflammation of the appendiceal wall followed by ischemia, perforation and formation of localized or generalized peritonitis. Obstruction of the lumen of appendix being the most common cause, that can happen with fecaliths (hard stool), calculi, lymphoid hyperplasia, infectious process and rarely benign or malignant tumors. Clinical manifestations include abdominal pain, which classically starts in periumbilical region that later shift to right lower abdomen. It is associated with anorexia, nausea and vomiting. There can be low-grade fever as well. On examination they have classical tenderness at the McBurney's point. Laboratory investigations may show an increase in the total white cell count and a left shift in neutrophils, which increase the likelihood of appendicitis [4]. These parameters were in olden times considered to be diagnostic but nowadays imaging has taken over. In past ultrasound was the only radiological investigation to consider in diagnosing appendicitis, but now time has changed. These days it has been routine to perform a CT scan for suspected cases of appendicitis, which has led to decrease rates of negative appendectomies [5]. CT scan being the gold standard for diagnosing acute appendicitis [6], it is performed for almost every patient in our institute presenting to accident and emergency with signs and symptoms of acute appendicitis.

Objective of the Study

The objective of this study is to audit clinical records and to evaluate Mediclinic's negative appendectomy rate.

Methods

The study was performed in Mediclinic City hospital, which is located in Dubai. It is a tertiary care hospital, with a very busy emergency and surgical department. City Hospital serves a large number of mixed nationality populations. The institute provides a 24/7 service with full-time faculty of general surgeons. The histopathology records were searched for all emergency appendectomies carried in hospital during the 8-year period from 2010 to 2018. Incidental appendectomies were excluded, leaving 407 patients with acute appendicitis. Mediclinic intended to audit negative appendectomy rates. Using a cross-sectional study in institute. The results are solely single institute based. The data collected for patients who underwent emergency appendectomy, diagnosed predominantly on CT scan, a few patients were found who did not undergo CT scan and were diagnosed on ultrasound, majority were young males, the reason for not doing CT scan was not mentioned. Data was collected from the medical records; minimum 14 and maximum 70-years of age were included in the study. Each patient's electronic medical record was reviewed who underwent emergency appendectomy, the radiology and histology reports were collected. Some patients were found to have CT scan done outside Mediclinic facility; those were excluded from the study. Interval appendectomies were also excluded from the study. CT scans reported as appendicular wall thickness > 2 mm, lumen dilatation > 6 mm, peri-appendiceal fat stranding, wall enhancement and appendicolith were taken as signs of acute appendicitis. Presence of inflammation on histology was taken as acute appendicitis and no signs of inflammation contributed towards negative appendectomy rate. There were no reported post-operative complications in the cases studied, the procedure was also uneventful in all of them.

Data analysis

Data was entered in computer using IBM-SPSS version 25 (SPSS Inc., Chicago, IL) for windows licensors 1989, 2019. Frequency tables and measure of percentage and measure of tendency and dispersion were performed as descriptive statistics. Categorical variables were cross-tabulated to examine the independency between variables, for such variables the χ^2 -square test or Fisher's exact test as appropriate. A P-value of less than 0.05 will be considered significant in all statistical analysis.

Ethical consent

This study was conducted in full conformance with principles of the "Declaration of Helsinki", Good Clinical Practice (GCP) and within the laws and regulations of the UAE/DHCC. The ethical approval was obtained from the Medical Director in Mediclinic City.

Results

Four hundred and seven patients who underwent emergency appendectomy during the period of 2010 to 2018 after fulfilling our inclusion criteria were studied. Out of them 225 (55.3%) were male and 182 (44.7%) were female. The age ranges between 14 and 70-years, with mean age of 36.76 and standard deviation of 10.967. Out of 407 appendectomies 382 (93.9%) were found positive at histology, means consistent with the diagnosis. 25 cases (6.1%) were found negative, which decides the negative appendectomy rate. Other diagnoses in our study were found in 9 (2.2%) patients. One case each of adenoma and Crohn’s were notified. Two cases of granulomatous inflammation and five cases of tumor (carcinoid) were reported. 376 (92.4%) patients were reported as acute appendicitis, one patient’s CT scan stated that appendix is secondarily inflamed as part of generalized inflammation. Among 407 patients, in 30 patients CT scan was not done, these were usually young males and were diagnosed on ultrasound. Among 376 patients 356 (94.7%) were positive on histology and 20 (5.3%) were the negative appendectomies (Table 1). This negative appendectomy rate is lower than our overall negative appendectomy rate; the reason for this increased rate was those 30 patients who were diagnosed on ultrasound. The 30 patients who were diagnosed on the basis of ultrasound had a negative appendectomy rate of 13.3% (Table 2). These patients never had a CT scan, which could have saved them from an unnecessary operation. The positive predictivity of the CT scan is 94.7% in our study, when compared to the positive predictivity of ultrasound which was 86.7% only. Hence it was obvious from our study that if we exclude those cases, which were diagnosed on ultrasound, our negative rate was dropped to 5.3%.

		CT Scan Findings		Total
		Acute appendicitis	Secondary inflamed	
Histology	No	20	1	21
	Yes	356	0	356
Total		376	1	377

Table 1: The positive predictivity of the CT Scan is 94.7%.

		Ultrasound		Total
		No	Acute Appendicitis	
Histology	No	21	4	25
	Yes	356	26	382
Total		377	30	407

Table 2: The positive predictivity of the Ultrasound is 86.7% and the negative predictivity is 5.6%.

Discussion

This study reviews the negative appendectomy rate in Mediclinic City Hospital, Dubai. Negative appendectomy exposes a patient to unnecessary general anesthesia, surgical complications and hospital stay. There are a number of diseases, which can present as acute appendicitis; a proper pre-operative diagnosis could save a patient from an avoidable surgery and unnecessary cost. In Mediclinic City Hospital, we have the facility to do CT scan 24 hours; we have 24/7 on-call radiologists who gave us the report immediately. It is the routine of our emergency physicians that whenever they suspect a patient with appendicitis, they call our on-call surgical registrars, who then

decide to do a CT scan. Our study results show a very low negative appendectomy rate (6.1%) compared to literature in which the rate varies between 4 and 40% [7]. However, in the era of CT scan the acceptable rate has decreased to 6 - 8.4% [9,10]. CT scan has a sensitivity of 90 - 100%, specificity of 91 - 99% and positive predictive value of 95 - 97%. CT has also proven to be superior to ultrasound in the diagnosis of acute appendicitis [11] and this observation is consistent with the results of our study. Abdominopelvic CT with low radiation dose image acquisition protocols should be used, as they do not compromise diagnostic accuracy [12]. Histological examination of the resected appendix reveals the presence or absence of inflammation, also the incidence of other pathology will be revealed which may alter the plan of management in the patient. The incidence of other pathology was low (2.2%) in our study, which is consistent with the literature [13]. The main disadvantages of CT are the cost, delay in time to surgery and radiation exposure. In our Hospital delay is not an issue. Cost is generally offset by shorter hospital stay and low negative appendectomy rate. Radiation exposure has been minimized with the new sophisticated scanners [12]. Our experience with CT scan has been very important in reducing our negative appendectomy rate. However, this does not nullify the importance of history taking and physical examination, which still remain the initial diagnostic tool.

Conclusion

This is an individual Hospital based study, in which concluded that Mediclinic's NAR is low (6.1%) due to routine use of CT scan in diagnosing acute appendicitis.

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