

Ultrasound in Emergency Medicine



IS PELVIC ULTRASOUND ASSOCIATED WITH AN INCREASED TIME TO APPENDECTOMY IN PEDIATRIC APPENDICITIS?

Naveen Poonai, MD, FRCPC,* Jonathan Gregory, BASC,* Graham Thompson, MD,† Rod Lim, MD, FRCPC,*
Skylar Van Osch, BSC,* Tara Andrusiak, BSC,* Sandra Mekhaieel, BSC,* Gurinder Sangha, MD, FRCPC,*
Jamie Seabrook, PHD,* and Gary Joubert, MD, FRCPC*

*Western University, Children's Hospital, London Health Sciences Centre, London, Ontario, Canada and †University of Calgary, Alberta
Children's Hospital, Calgary, Alberta, Canada

Reprint Address: Naveen Poonai, MD, FRCPC, London Health Sciences Centre, Victoria Hospital, 800 Commissioners Road East, Room E1-105,
London, Ontario, N6A 2V5 Canada

Abstract—Background: Appendicitis is a common pediatric condition requiring urgent surgical intervention to prevent complications. Pelvic ultrasound (US) as a diagnostic aid has become increasingly common. Despite its advantages, evidence suggests US can lead to delayed definitive management. **Objective:** The objective was to test the hypothesis that US is associated with an increased time to appendectomy in children with acute appendicitis. **Methods:** A chart review was conducted of all children aged 0–17 years who presented to the pediatric emergency department (ED) with a discharge diagnosis of appendicitis. The primary outcome variable was the interval between initial evaluation to appendectomy between patients who received an US and those who did not. **Results:** Of 662 cases included, 424 patients (64%) underwent a pelvic US and 238 patients underwent an appendectomy without US. Median time interval from initial evaluation in the ED by a physician to appendectomy among patients who received an US was 9.7 h (interquartile range [IQR]: 6.8–15.0 h) compared with 5.5 h (IQR: 3.8–8.6 h) among patients who did not receive an US (Mann-Whitney, $p < 0.001$). The increased time to appendectomy in patients who received an US was dependent on the patient being female and presenting to the ED after hours (univariate analysis of variance test for interaction, $p < 0.05$). **Conclusions:** Female pediatric patients and those presenting after hours that undergo an US have a significantly increased time to appendectomy compared with those who do not undergo diagnostic imaging. © 2014 Elsevier Inc.

Keywords—appendicitis; ultrasound; delay; pediatrics

INTRODUCTION

Appendicitis is the most common pediatric condition requiring urgent surgical intervention and is diagnosed in up to 8% of children evaluated in urgent care settings for abdominal pain (1–3). The incidence increases from an annual rate of 1–2 per 10,000 children between birth and 4 years of age, peaking in adolescence to 19–28 per 10,000 children younger than 14 years (4). There is also evidence that in the last 20 years, the incidence of appendicitis has increased (5). Children commonly present with nausea, vomiting, anorexia, low-grade fever, right lower-quadrant pain, abdominal tenderness, and guarding (4,6). While the incidence of appendicitis is <5% among children younger than 6 years of age, this age group often poses a diagnostic challenge because they present with less specific signs and symptoms (7). Consequently, delayed diagnosis is common and has been reported in up to 57% of cases in children younger than 6 years of age. Consistent with this, young children have a high rate of bowel perforation (70%), which correlates strongly with a delayed diagnosis (7). Perforation is rare in the first 12 h, but is increasingly common

thereafter, consequentially, the rate of perforation is directly proportional to a delay in diagnosis (8). Therefore, early appendectomy is instrumental in avoiding the complications of appendicitis, which include perforation, peritonitis, abscess formation, and sepsis (7).

Historically, the diagnosis of appendicitis was largely based on the physician's history and physical examination findings. During the last decade, however, the use of diagnostic imaging, primarily pelvic ultrasound (US) and computed tomography (CT), has superseded the clinical examination in directing the course of surgical management. The use of US for the diagnosis of acute appendicitis in children was first described in 1981 and increased dramatically during the next 2 decades (1,7,9). In a pooled analysis, US has been reported as sensitive (85%) and specific (94%) for diagnosing appendicitis (6). Advantages include its noninvasive nature and zero risk of exposure to ionizing radiation (7,10,11). Proponents of its use as a diagnostic modality cite a decreased negative appendectomy rate, decreased perforation rate, and decreased cost (1,12–14).

Despite its reported advantages, evidence suggests that diagnostic imaging leads to significant delays in definitive management, resulting in increased expenses without clear improvements in diagnostic accuracy or health outcomes (15–17). In children, the use of US has been found to be associated with a delay in surgery and an increase in hospital charges, without a reduction in perforation or complication rates (18). Similarly, York et al. found that the median time from emergency department (ED) evaluation to the operating room was significantly longer among children who received an US or CT scan compared with those who did not receive imaging (15).

Although it has not yet been clearly demonstrated that US leads to increased complication rates in appendicitis, limited findings suggest that in children, time to appendectomy is greater when diagnostic imaging is performed. To date, there have been no large studies determining if routine use of US is associated with a delay to appendectomy or an increased rate of appendicitis-related complications. The objective of this study was to test the hypothesis that diagnostic pelvic US is associated with an increased time to appendectomy in children with acute appendicitis. The results could provide a rationale for more selective imaging and earlier surgical evaluation in specific situations.

METHODS

This study was conducted as a retrospective cross-sectional study using a chart review. The hypothesis was that a diagnostic pelvic US compared with no US is associated with greater time to appendectomy in chil-

dren presenting with acute appendicitis. The study included all children aged 0–17 years who presented to the pediatric ED at an academic tertiary care center from January 1990 to January 2012 with a discharge diagnosis of appendicitis based on *International Classification of Disease*, 10th revision diagnostic codes. The ED is part of an academic tertiary care pediatric trauma center and has approximately 40,000 annual visits, serving a catchment of > 1.8 million children.

Any patients who were transferred from another center were excluded because the logistics associated with the transfer could have contributed to delays. Hemodynamically unstable patients or those who presented with clear signs of peritonitis suggestive of appendiceal perforation were excluded because it was believed they will often undergo CT or urgent surgery to rule out the presence of a suppurative complication. Patient charts were obtained using the hospital's medical records service based on the discharge diagnosis of appendicitis. The chart review included physicians' clinical notes, nursing records, radiology, and operative reports.

The primary outcome variable was the total length of time from the patient's initial evaluation in the ED by a physician until the first incision of appendectomy. The time to appendectomy for patients who received an US to diagnose appendicitis was compared with that of those who received an appendectomy without a diagnostic US. Secondary outcomes included the incidence of complications related to perforation, including abscess, peritonitis, ileus, and sepsis.

Every US was performed by a technician using Puy-laert's graded compression technique and interpreted by one of two staff radiologists with subspecialty training in pediatric radiology (19). The final diagnosis of appendicitis was made by a staff pathologist based on histologic examination of the excised appendix at the time of surgery.

An a priori subgroup analysis using sex, age, and time of presentation as covariates was based on the rationale that male patients have fewer competing diagnoses so that the time to appendectomy was postulated to be shorter. Children younger than age 6 years are at higher risk for perforation due to nonspecific presentation and anatomical differences. Patients that present during night-time hours (5:00 PM to 8:00 AM) are more likely to undergo delays in diagnostic imaging and appendectomy due to limited availability of technical support during these hours.

From the hospital chart, the following data were extracted by trained research assistants: sex, age, highest preoperative temperature, white blood cell count, presence or absence of vomiting, appendectomy technique (open or laparoscopic), time and day of ED presentation, and time of surgery. Time of first assessment by an ED physician was determined from nursing records and

Download English Version:

<https://daneshyari.com/en/article/3246570>

Download Persian Version:

<https://daneshyari.com/article/3246570>

[Daneshyari.com](https://daneshyari.com)