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Original Contributions

INCIDENTAL FINDINGS ON PEDIATRIC ABDOMINAL COMPUTED TOMOGRAPHY AT A PEDIATRIC TRAUMA CENTER

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Abstract—Background: The increasing availability and use of computed tomography (CT) in pediatric abdominal trauma has increased the detection of incidental findings. While some of these findings are benign, others may require further evaluation for possible clinical importance. **Objectives:** This study aimed to identify the frequency and type of incidental findings and their need for follow-up on abdominal CT in patients at a pediatric trauma center. **Methods:** This was a retrospective, observational study on trauma patients ≤ 21 years of age who presented to the emergency department between January 1, 2004 and July 31, 2016 and underwent CT scans of the abdomen and pelvis. **Findings** were classified as benign anatomic variants, benign pathologic lesions, and pathologic lesions requiring additional work-up. **Results:** There were 1073 patients included in the study population, with a mean age of 15.5 years; 707 (66%) were males. A total of 418 incidental findings were identified in 345 patients. Of these, 290 (69%) were benign and 60 (14%) were likely benign pathologic that required possible outpatient monitoring. Of those requiring additional evaluation, 5 (1%) patients warranted further evaluation before discharge. **Conclusions:** Nearly one-third of patients had at least one radiographic finding unrelated to their injury. Of these, more than two-thirds did not require additional evaluation, but nearly one-third of

patients required some form of further work-up. © 2017 Elsevier Inc. All rights reserved.

Keywords—CT scan; incidental findings; trauma

INTRODUCTION

Pediatric trauma cases have increased over the past several years, becoming one of the leading causes of morbidity and mortality in the pediatric population (1). Approximately 80% of pediatric trauma cases are related to blunt abdominal trauma (2). In such pediatric abdominal trauma cases, there had been an increasing use and availability of computed tomography (CT), which is both sensitive and accurate in determining the exact location and extent of an injury. Although current literature suggests a decreased utilization of CT in hemodynamically stable patients, until recently, according to the Eastern Association for the Surgery of Trauma, despite the risk of radiation, CT remains the imaging modality of choice in hemodynamically stable patients whose initial physical examination is suggestive of abdominal injury (3–5).

The increased use of imaging in the medical field has led to increased detection of incidental findings, which can be benign without health risks. However, some may require follow-up and others may require urgent

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evaluation. Several studies have looked into the identification of incidental CT findings in adult patients and in certain subsets of pediatric patients (6–9). Drawing from a review of medical literature on adults, the American College of Radiology has published a comprehensive report that provided clinicians with suggested algorithms to guide the approach to evaluation of incidental findings (10). However, this cannot be applied to children and further highlights the need for pediatric data to guide management in this low-risk population. Recommendations for pursuing the investigation of incidental but specific radiographic findings in pediatric patients are currently lacking. In addition, few studies have explored the type and frequency of incidental specific findings on abdominal and pelvic CT scans in pediatric trauma patients. Identification of the type and frequency of incidental findings is the first step toward a clearer understanding of the issue and scope of the problem. This may, in turn, prevent children from undergoing unwarranted medical testing, allow appropriate resource utilization, and ensure that more serious findings are not overlooked. The goal of this study was to identify the frequency and type of incidental findings and their need for follow-up on abdominal CT in pediatric trauma patients seen at a level II pediatric trauma center.

MATERIALS AND METHODS

This was a retrospective, observational study on all pediatric patients ≤ 21 years of age who consulted between January 1, 2004 and July 31, 2016 to the emergency department (ED) of Staten Island University Hospital, a 700-bed, tertiary care teaching hospital in Staten Island, New York. The pediatric ED is a level II trauma center with a census of 25,000 patient visits per year. We conducted a retrospective review of electronic medical records. This start date was used because a computerized medical charting system was initiated in 2004. The study was approved by the institutional review board.

At this institution, emergency physicians and the trauma team decided whether there was a need to perform a CT scan. Patients who underwent a CT scan of the abdomen and pelvis for an indication listed as trauma were included. For patients who had multiple CT scans, we included only the most recent CT scan. Exclusion criteria were any CT scan not read and interpreted by a board-certified radiologist and subjects with incomplete charts.

Two physicians trained in the study protocol and data abstraction reviewed each record to ensure consistency and accuracy. We used a predesigned, standardized case report form to record the data from the CT reports and obtained radiographic diagnoses from computerized reports. All reports were dictated by a board-certified attending radiologist.

Study staff reviewed and categorized all findings into 3 main classes, with subgroups for groups 2 and 3. These included (1) benign anatomic variants that require no form of intervention; (2a) benign pathologic findings not requiring further investigation based on their known natural history, and (2b) likely benign pathologic, may require outpatient monitoring; and (3) pathologic findings requiring further work-up (3a) before discharge and (3b) as outpatient. This was similar to the system described by Paluska et al. in a study that reviewed incidental findings in trauma patients who underwent multiple CT scans (6). A modified list of clinically significant incidental findings that were devised in the same study was used in this study (4). Recommendations for investigating incidental but specific radiographic findings are lacking, and therefore we established an institutional panel consisting of board-certified emergency, pediatric, and radiology physicians. A consensus on the appropriate classification of incidental findings was reached based on existing literature and local practice patterns. When no uniform consensus was possible (e.g., lymphadenopathy), 2 physicians reviewed the entire chart and each finding was categorized according to the best judgment of the reviewing physicians. Demographic and clinical characteristics were also recorded.

Data Collection and Processing

The data were collected and managed using Research Electronic Data Capture, a secure, web-based application designed to support data capture for research studies at Staten Island University Hospital.

No sample size was calculated because the entire eligible population in the database was included. The data were analyzed using descriptive statistical methods and were expressed as frequency counts and percentages for categorical variables or as mean and standard deviation or median and interquartile range, as appropriate, for continuous variables. Results were presented as proportions or mean difference, with 95% confidence intervals. Data analysis was conducted using SAS software (version 9.3; SAS Institute Inc., Cary, NC).

RESULTS

During the study period, 9325 CT scans of the abdomen and pelvis were performed. Of these, 1079 were for the indication of trauma. We excluded an additional 6 subjects because of incomplete data. Therefore, 1073 subjects were included in the final analysis. The median age was 18 years (interquartile range, 15–19 years) and 707 (66%) were male. There were 695 subjects admitted, 377 discharged, and 1 death. The type of trauma was blunt in 1012 of the cases, penetrating in 32 cases, and

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