

To Determine the Use of Follow-Up CT among patients with Persistent Non-Traumatic Abdominal Pain Presented in Emergency Department

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ABSTRACT

Aim: To determine the value of a short-term follow-up abdominopelvic computed tomography (APCT) examination in emergency department pts with persistent abdominal pain & an initially negative CT.

Place & duration of study: Radiology Department of three tertiary care teaching hospital from January 2010 to December 2013.

Methods: Approximately 10,000 APCTs examinations in there ED. Nine hundred fifty-seven patients received two APCTs within 1 week for non-traumatic abdominal pain in the ED.

Results: Sixty-four patients with initially negative APCTs presented to the ED within 1 week with persistent abdominal pain and received follow-up APCT imaging. The mean follow-up period was 2.6 days. The mean interval period in which the second APCT yielded a positive result was 2.0 days. Seventy-five percent of follow up examinations were performed with intravenous contrast .Twenty-three percent of patients had positive findings on the follow-up examination. Seventy-three percent of the follow up positive findings were referable to bowel pathology. The cause of abdominal pain remained elusive at 1 week in 23% of patients.

Conclusion: Short-term follow-up APCT examinations in patients with persistent, unexplained abdominal pain may be of benefit if the second APCT is performed with intravenous contrast in patients suspected of having bowel pathology.

Keywords: Computed tomography, abdominal pain, and Emergency department

INTRODUCTION

Abdominal pain is one of the most common presenting symptoms among patients in the emergency department (ED). The diagnostic possibilities are considerable given the overlapping presentations of findings on physical examination. Several investigations have demonstrated the utility of computed tomography (CT) in evaluating these patients. Over the past two decades, CT has become the first-line imaging modality of choice. Its use is associated with improved diagnostic accuracy, morbidity and mortality reduction, and decreased length of hospital stay^{1,2,3,4,5}. CT is highly specific and sensitive for detecting many of the commonly encountered entities among emergency department patients. However, there is a subset of patients who have normal CTs that do not explain the origin of presenting pain and symptomology⁷. Among adult patients presenting to the ED with non-traumatic abdominal pain and an initially negative abdominopelvic CT (APCT), a short-term follow-up APCT may be performed if the presenting pain

persists. The frequency and clinical significance of this practice is uncertain. The purpose of this investigation is to determine the benefit of a short-term follow-up APCT examination among adult ED patients with persistent abdominal pain and an initial negative APCT.

MATERIALS AND METHODS

This retrospective research investigation was conducted at different teaching hospitals. This investigation received approval from the hospital medical ethics review board. Using the hospital radiology order entry and information systems, we queried and identified patients who received two APCT examinations within a 1-week interval in the emergency department of the hospital. Over the 3-year period between January 2011 and December 2013, 957 patients received two APCTs within 1 week for non-traumatic abdominal pain in the ED. We reviewed the clinical records and imaging reports of these patients. We selected patients for this investigation if they: (a) had an initially negative APCT examination which did not explain the patient's abdominal pain and/or symptoms; (b) did not undergo a surgical intervention before the follow-up APCT; and (c) had at least 1 week of clinical follow-up available. Eight hundred eighty-three of 957(92.3%)

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patients had either a positive finding on the initial APCT examination, underwent surgery, or were lost to clinical follow-up. We excluded these subjects from our investigation. Seventy four of 957(7.7%) patients had a negative initial APCT examination. Ten patients were excluded from the investigation due to insufficient clinical follow-up (lack of clinical documentation). Sixty-four of 957(6.7%) patients met the selection criteria.

Statistical analysis: We recorded the change in the type of CT examination performed with respect to intravenous contrast administration as: non-contrast to non-contrast, non-contrast to contrast-enhanced, contrast-enhanced to contrast enhanced, and contrast-enhanced to non-contrast. We compared the frequencies of change among the four groups using a chi-square test. We organized the positive and negative findings among the non-contrast and contrast-enhanced examinations into a 2x2 table and applied a McNemar's test to this data to determine if one particular type of CT was ordered more than the other on the second examination.

RESULTS

During a 3-year period from January 2011 to December 2013, approximately 10,000APCTs in the ED; an estimated 66% of these examinations were performed for non-traumatic indications. Nine hundred fifty-seven patients received two APCTs within 1 week for non-traumatic abdominal pain in the ED. Sixty-four patients with initially negative APCTs presented to the ED within 1 week with persistent abdominal pain and received follow-up APCT imaging. Of the 64 patients in the final cohort, 33 were male and 31 were female. Their ages ranged from 23 to 90 years with a mean age of 56.4 years. The mean follow-up period in which the second APCT was obtained was 2.6 days. The mean interval period in which the second APCT was positive was 2.0 days. The mean interval period in which the second APCT was negative was 2.87 days. Fifteen of the 64 patients (23%) had a positive finding on the follow up APCT. Of the 15 patients with a positive second APCT, four had small bowel obstruction, two had large bowel obstruction, three had colitis, and six had various other findings (Table 1). Eleven of the 15(73%) patients with positive second APCTs had findings referable to bowel pathology (Table 1). Forty-nine of 64(77%) patients had a negative second APCT. Fifteen of 64(23%) patients had no diagnosed cause of abdominal pain at 1 week. In the remaining 34 of 64(53%) patients, a variety of clinical diagnoses were assigned. These clinical diagnoses included: urinary tract infections, diverticulitis, cholecystitis, pancreatitis, renal stones, gastroenteritis, gastritis, chronic colonic ischemia, irritable bowel, constipation,

musculoskeletal causes, and other causes—not otherwise specified (Table 2).

Table 1: Final CT diagnosis after follow-up APCT within 1 week in 64 patients (positive second APCT)

Final diagnosis	Number=15 of 64
Small bowel obstruction	4 (6.25%)
Large bowel obstruction	2 (3.13%)
Colitis	3 (4.69%)
Appendicitis	1 (1.56%)
Pyelonephritis	1 (1.56%)
Renal infarct	1 (1.56%)
Clot in ureter	1 (1.56%)
Cholecystitis	1 (1.56%)
Epiplioicappendagitis	1 (1.56%)

Table 2: Final clinical diagnosis after follow-up APCT within 1 week in 64 patients (Negative second APCT)

Final clinical diagnosis (DX)	Number=49 of 64
No final clinical DX	15(23.44%)
Clinical DX: urinary infection	8(12.50%)
Clinical DX: diverticulitis	2(3.13%)
Clinical DX: musculoskeletal	3(4.69%)
Clinical DX: other—not specified	9(14.06%)
Clinical DX: renal stones	2(3.13%)
Clinical DX: cholecystitis	2(3.13%)
Clinical DX: pancreatitis	1(1.56%)
Clinical DX: gastroenteritis	3(4.69%)
Clinical DX: gastritis	1(1.56%)
Clinical DX: ischemic colon	1(1.56%)
Clinical DX: irritable bowel	1(1.56%)
Clinical DX: constipation	1(1.56%)

Over the investigation period, 68% of all APCT examinations in ED were performed with intravenous contrast. Thirty-two percent of all APCT examinations were non-contrast during the same period. In our investigation cohort 19 of 64(30%) initially negative APCT examinations used intravenous contrast. Forty-five of the 64(70%) initially negative APCT examinations were non-contrast. Forty-eight of 64(75%) second APCTs were performed with intravenous contrast. Sixteen of 64 (25%) of these examinations were performed without intravenous contrast. The McNemar's test revealed that significantly more contrast-enhanced APCTs were performed the second time after the first APCT was negative (p<0.001). Thirty two of 64(50%) initially non-contrast-enhanced negative APCTs were performed with intravenous contrast the second time. Eight (13%) of these examinations revealed positive findings. Sixteen of 64(25%) of the initially negative APCTs performed with intravenous contrast were repeated with intravenous contrast the second time. Five (8%) follow up examinations demonstrated positive findings. Fourteen of 64 (22%) patients with initially negative non-contrast enhanced APCT examinations received a second noncontrast-enhanced APCT. Two (3%) of these examinations showed a positive finding. Two of the 64(3%) patients with an initially negative contrast-enhanced APCT

received a second non-contrast APCT. Neither revealed any positive findings. The chi-square test examining the change in frequencies between contrast-enhanced and non-contrast examinations did not reveal a statistically significant difference among the four groups (Table 3).

Table 3: Analysis of the four different examination groups based on the type of second APCT performed with respect to the first. There is no statistical difference between the four groups (Chisquare test—p value=0.73)

Change in type of CT	No	Change in result	No change in result
Non-contrast to non-contrast	14(22%)	2(3%)	12
Non-contrast to contrast	32(50%)	8(13%)	24
Contrast to contrast	16(25%)	5(8%)	11
Contrast to non-contrast	2(3%)	0(0%)	2

DISCUSSION

Abdominal pain can represent a spectrum of conditions from surgical emergencies to self-limited and benign entities. Several prior investigations examined how CT performed as an initial imaging tool; CT is beneficial in diagnosing adult patients with abdominal pain^{1,2,3,4,5,6}. Other investigators have reviewed CT as an adjuvant examination⁷. With the exception of patients demonstrating symptoms clearly indicating biliary pathology, CT is the first-line imaging modality among this adult patient population⁸. Although most diagnoses are made initially or are self limiting and do not represent to clinical providers, there are a subset of patients who have normal initial CTs and persistent non-traumatic abdominal pain which prompts a return visit to the ED. The frequency and clinical significance of this occurrence is uncertain. Nine hundred fifty seven of approximately received two APCTs within 1 week in our ED. Sixty four of 957(6.7%) of ED patients presented with acute, non-traumatic abdominal pain, had negative initial APCT, returned within 1-week with unexplained, persistent abdominal pain, and had repeat, short-term follow up APCT examination. The data in this investigation showed that it was common clinical practice to perform a contrast-enhanced APCT 75% of the time after an initial negative APCT. While this practice increased the yield of positive findings on the second APCT 50% of the time, a statistically significant difference in the results, was not found. A short-term follow-up APCT was able to explain the patient's symptoms in 23% of cases with persistent abdominal pain and an initial negative APCT (Table 1). The most common positive finding on the follow up APCT to explain the patient's symptoms was small or large bowel obstruction. Obstruction was identified 40% of the time. The

second most common condition demonstrated on the positive follow-up APCT was colitis (20%). Overall, bowel pathology comprised 73% of the positive findings on follow-up examination. The mean interval period in which the second examination was positive was 2.0 days. This data may suggest a lag between the onset of symptoms and the demonstration of findings on CT in cases that prove to have bowel pathology. The final diagnoses listed in Tables 1 and 2 were based on final coded patient diagnoses used for billing. When no imaging diagnosis was available, the final diagnosis (Table 2) rested more heavily on clinical, laboratory, pathology, or surgical findings. For example, the eight cases of urinary infection, two cases of obstructive uropathy, and one case of pancreatitis were made on laboratory findings. The cases of diverticulitis, ischemic colon, constipation, and irritable bowel were made clinically.

CONCLUSION

This data suggests that a short-term follow-up APCT examination in adult patients with persistent, unexplained abdominal pain may be beneficial if the second examination is performed with intravenous contrast, especially in patients who may prove to have bowel pathology. Seventy five percent of follow-up APCT examinations were performed using intravenous contrast. Seventy-three percent of APCTs with positive findings had pathology referable to bowel pathology.

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