

## Original Article

### Evaluation of Diagnostic Accuracy of follow-up non-contrast abdominal CT scans in cancer patients: A Retrospective Analysis

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#### ABSTRACT

**Background:** The ability of CT to deliver higher spatial resolution and shorter scanning times over other modalities has been considered positive points. The CT is being used in clinical applications such as CT colonography, CT angiography, CT urography etc. The present study was conducted to assess diagnostic accuracy of follow-up non-contrast abdominal CT scans in cancer patients. **Materials & methods:** The present retrospective study comprised of 360 CTs of abdomen done with or without contrast medium of both genders. Before starting the study, a prior approval from institutional ethical committee was obtained. Three well experienced MD radiologists independently analyzed all scout and final images for interpretation of findings. The inter-observer bias was eliminated following comparison of all findings of all radiologists. Cancer related findings (CRFs) were classified based on location and type of findings. Lymph nodes with size above 1 cm were considered positive for the study. Lymph nodes <1cm were excluded. **Results:** Axillary lymphadenopathy was seen in 2 cases and inguinal lymphadenopathy in 1 case. Lung metastasis was observed in 8 cases and liver metastasis in 17 cases, colon wall thickening in 1 case, pleural effusion in 5 cases, pericardial effusion in 3 cases, pancreatic duct irregularities in 3 cases and lymphoma in 2 cases. All the radiologists had right findings in all cases. There was no inter-observer bias. **Conclusion:** The evaluation showed that follow-up NECT has a low non-detection rate for CRFs of the abdomen as compared to combined with and without contrast CT.

**Key words:** Abdominal, Computed tomography.

Received: 10 May 2018

Revised: 14 June 2018

Accepted: 18 June 2018

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**This article may be cited as:** Wadhvani ND, Patil NB. Evaluation of Diagnostic Accuracy of follow-up non-contrast abdominal CT scans in cancer patients: A Retrospective Analysis. Int J Res Health Allied Sci 2018; 4(4):97-100.

#### INTRODUCTION

The advent of computed tomography (CT) in year 1970's has revolutionized the field of Radiology and been proved beneficial in diagnosis. The usefulness of CT in the era of surgery, diagnosis and treatment planning of cancer patients, pre and post management of traumatized patients, evaluation of stroke cases and other cardiac ailments has been well accepted.<sup>1-3</sup> Amongst various advantages of CT which made this diagnostic aid a boon to Radiology, universal availability, short procedural time which can allow physicians to rapidly confirm or exclude a diagnosis with improved conviction are important one. When talking about surgery, it plays a vital role as it has

decreased the need for emergency surgery from 13% to 5% and has almost made many exploratory surgical procedures extinct. Moreover, there is considerable reduction in inpatient admission due to change in focus of diagnostic tool from other modalities towards CT. With subsequent advancement in CT, it has become an appealing imaging modality. The ability of CT to deliver higher spatial resolution and shorter scanning times over other modalities has been considered positive points. The CT is being used in clinical applications such as CT colonography, CT angiography, CT urography etc.<sup>4-6</sup> The usefulness of iodinated contrast has been evaluated within the context of many disease processes, patient

presentations and clinical settings such acute and non-acute/oncologic indications. The present study was conducted to assess diagnostic accuracy of follow-up non-contrast abdominal CT scans in cancer patients.

**MATERIALS & METHODS**

The present retrospective study was conducted in the department between 2012- 2016. It comprised of 360 CTs of abdomen done with or without contrast medium of both genders. Before starting the study, a prior approval from institutional ethical committee was obtained. Inclusion criteria were CTs of abdomen and pelvis of patients above 18 years of age. All cases were diagnosed with cancer. Only those cases which had confirmed clinical diagnosis of cancer of any stage were included. Poor quality non-diagnostic CTs were excluded. Patients not giving consent to CT scans were also excluded from the study. CT scans were obtained with 64-slice multi- detector CT scanner (Planmics). The field of view involved area from lungs to the pelvis. In all patients parameters of potential difference of 120 KVp and current of 500mAs was adjusted with 0.7 s rotation time and helical pitch 98. Intravenous administration of 80 ml omnipaque 300 mg/ml at a rate of 2.5 ml/s with 24-gauge antecubital vein plastic angiocatheter was performed. In contrast-enhanced cases, 225 ml of Redicat 2 was inserted 1 h and later on ½ hour following the non-contrast portion of the exam. Three well experienced MD radiologists independently analyzed all scout and final images for interpretation of findings. The inter-observer bias was eliminated following

comparison of all findings of all radiologists. Cancer related findings (CRFs) were classified based on location and type of findings. Lymph nodes with size above 1 cm were considered positive for the study. Lymph nodes <1cm were excluded. Results thus obtained were subjected to statistical analysis using chi- square test. P value less than 0.05 was considered significant.

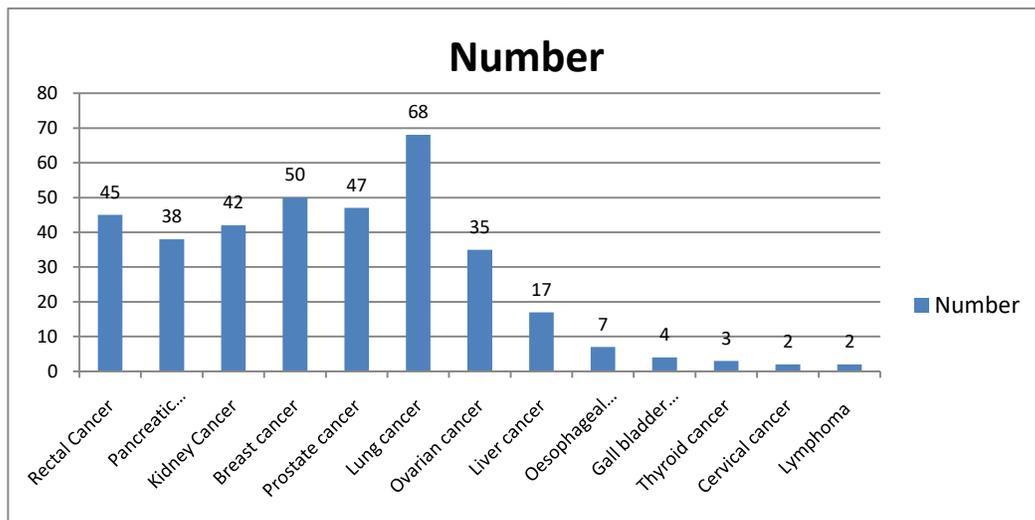
**RESULTS**

Table I shows that out of 360 cases, males were 210 and females were 150. The difference was non- significant (P-0.5). Graph I shows that commonly observed cancers were lung cancer (68), breast cancer (50), prostate cancer (47), rectal cancer (45), kidney cancer (42), pancreatic cancer (38), ovarian cancer (35), liver cancer (17), oesophageal cancer (7), gall bladder cancer (4), thyroid cancer (3), cervical cancer (2) and lymphoma (2). The difference was significant (P< 0.05). Table II shows that renal mass was correctly detected by all readers in 42 cases, pancreatic mass in 35 cases, esophageal mass in 7 cases, lung masses in 52 cases, cervical mass in 2 cases, colonic mass in 1 case, rectal masses in 43 cases, ovarian in 35 cases and thyroid masses in 3 cases. Axillary lymphadenopathy was seen in 2 cases and inguinal lymphadenopathy in 1 case. Lung metastasis was observed in 8 cases and liver metastasis in 17 cases, colon wall thickening in 1 case, pleural effusion in 5 cases, pericardial effusion in 3 cases, pancreatic duct irregularities in 3 cases and lymphoma in 2 cases. All the radiologists had right findings in all cases. There was no inter- observer bias.

**Table I Distribution of cases**

Total- 360	
Males	Females
210	150

**Graph I Distribution of cancers based on involvement of organs**



**Table II Number of cases according to category & inter reliability**

Category	NECT & CECT	Reader 1	Reader 2	Reader 3	Match
<b>Mass</b>					
Renal mass	42	42	42	42	1
Pancreatic mass	35	35	35	35	1
Oesophageal mass	7	7	7	7	1
Lung mass	52	52	52	52	1
Cervical mass	2	2	2	2	1
Colonic mass	1	1	1	1	1
Rectal mass	43	43	43	43	1
Ovarian mass	35	35	35	35	1
Thyroid mass	3	3	3	3	1
<b>Lymphadenopathy</b>					
Axillary	2	2	2	2	1
Inguinal	1	1	1	1	1
<b>Metastatic disease</b>					
Lung metastasis	8	8	8	8	1
Liver metastasis	17	17	17	17	1
<b>Organ wall thickening</b>					
Colon wall thickening	1	1	1	1	1
<b>Effusion</b>					
Pleural effusion	5	5	5	5	1
Pericardial effusion	3	3	3	3	
<b>Miscellaneous</b>					
Pancreatic duct irregularities	3	3	3	3	1
Lymphoma	2	2	2	2	1

## DISCUSSION

In patients with acute abdominal pain, abdominal CT is a well-established technique which provides a highly sensitive and reliable tool for the differential diagnosis. The various pathological conditions showing acute abdominal pain may include acute appendicitis, colitis, diverticulitis, inflammatory bowel disease, bowel obstruction, adnexal cyst, acute cholecystitis, acute pancreatitis and urethral obstruction. With the advent of CT, the rate of accurate diagnosis for acute appendicitis is significantly increased and the sensitivity of 91–100% and specificity of 91–99% has been reported.<sup>7-12</sup>

The present study showed that CRFs are common in the follow-up CT scans of previously diagnosed cancer patients. We reviewed 360 abdominal CT scan images performed following the initial diagnosis of cancer in 360 patients and found a 52% prevalence of CRFs. In 149 cases, metastatic disease was the most common finding. In 98 cases, lymphadenopathy was the second most common finding. The present study revealed that follow-up NECT has a low non-detection rate for CRFs of the abdomen as compared to combined with and without contrast CT. The average non-detection rate for all CRFs was 3.0%. Excluding venous thrombosis the non-detection rate was only 0.9%.

Agarwal et al in their study observed that patients with flank pain often undergo non-enhanced computed tomography (NECT) for nephroureteral (NU) stone in

emergency department. After immediate image review, choice is made regarding need for subsequent contrast-enhanced CT (CECT) to help in evaluating for other causes of pain. This study assessed the experience of a single institution with this protocol and to determine the utility of CECT. Over a 6 month period, we performed a retrospective analysis on ED patients presenting with flank pain undergoing CT for a clinical diagnosis of nephroureterolithiasis. Patients initially underwent abdominopelvic NECT. The interpreting radiologist immediately decided whether to obtain a CECT to evaluate for another reason of pain. Medical records, CT reports, images and 7-day ED return were reviewed. NECT and CECT were compared for diagnosis. Additional information from CECT and changes in management as recognized in the patient's medical record were noted. 322 patients underwent NECT for obstructing NU stones during the study period. Renal or ureteral calculi were detected in 44.4 % (143/322). One hundred fifty-four patients (47.8 %) underwent CECT. CECT added information in 5.3 % (17/322) cases but only changed management in 6/322 patients (1.9 %). In 4 (1.2 %) patients with final diagnosis of renal infarct, splenic infarct, pyelonephritis and early acute appendicitis, there was no abnormality on the NECT (4/322). In the remaining 2 patients, an abnormality was visible on the NECT. In patients presenting with flank pain with a clinical suspicion of nephroureterolithiasis, CECT may not be indicated. In 5.3 % of cases, CECT provided

better delineation of an abnormality, changes in management after CECT occurred only in 2 % of cases. This comprised 1 % of patients in whom a diagnosis of organ infarct, pyelonephritis or acute appendicitis in a thin patient could only be made on CECT.<sup>13</sup>

Pfluger T et al utilized F-fluorodeoxyglucose (FDG) positron emission tomography (PET)/CT for the determination of the diagnostic value of contrast-enhanced CT (CECT) versus non-enhanced low-dose CT (NECT) in the staging of advanced malignant melanoma. F-FDG PET/CT examinations were performed in 50 patients with metastasized melanoma. For attenuation correction, whole-body NECT was performed followed by diagnostic CECT with contrast agent. For the whole-body PET, (18) F-FDG was applied. Extent of lesions, contrast enhancement, maximum standardized uptake value >2.5 were criteria for evaluation. Findings suspicious for melanoma were considered. NECT, CECT and (18) F-FDG PET were evaluated separately, followed by combined analysis of PET/NECT and PET/CECT and findings were confirmed histologically and by >6 months follow-up. 151 lesions out of 232 lesions found to be metastases. The sensitivity of NECT was 62%, CECT was 85%, PET was 90%, PET/NECT was 97% and PET/CECT was 100% and specificity of NECT was 52%, CECT was 63%, PET was 88%, PET/NECT was 93% and PET/CECT was 93% respectively. False-positive findings were observed in 17 cases. 6 false-positive findings were seen which consisted of 2 cases of other tumours, 6 cases of inflammatory lymph nodes, 1 case of inflammatory lung lesion, 1 case of blood vessel and 5 false-negative findings in liver (3), spleen (1), lymph node metastases (1). On PET/CECT, 6 false-positive findings were observed such as 3 cases of inflammatory lymph nodes 2 cases of other tumors and 1 case of inflammatory lung lesion and no false-negative findings occurred. 6 of 232 additional false findings on PET/NECT did not change staging compared to PET/CECT. Their results demonstrated that it is warranted to perform PET/NECT as an alternative of PET/CECT for melanoma staging.<sup>14</sup>

## CONCLUSION

The evaluation showed that follow-up NECT has a low non-detection rate for CRFs of the abdomen as compared to combined with and without contrast CT. The average non-detection rate for all CRFs was 3.0%. Excluding venous thrombosis the non-detection rate was only 0.9%. Hence, there is a high degree of accuracy for detecting CRFs by using NECT as the primary diagnostic tool.

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Source of support: Nil

Conflict of interest: None declared

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