

The frequency of Abdomino-Pelvic Oncologic emergencies at Contrast-enhanced Computed Tomography among patients reporting to Radiology Department.

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ABSTRACT

Objective: To analyze the frequency types and management of Abdominopelvic oncological emergencies on contrast-enhanced computed tomography (CECT) scans in cancer patients visiting Radiology Department.

Study Design: Retrospective, Descriptive cross-sectional study.

Place and Duration: Dow Institute of Radiology (DUHS), from 1st Jan 2020 to 31st July 2020.

Methodology: All contrast-enhanced CT abdominal scans of cancer patients with single/ Tri-phasic protocols available at database, comprised the study population. All patients were already diagnosed with Histopathology and serum markers. The electronic medical record (EMR) of 577 patients was retrieved and various types of oncological emergencies (OE) were recorded. All relevant features including age, gender were recorded. Further management of OE's was recorded. Data was analyzed on SPSS version 20.

Results: Out of 577 cases, 190 (33%) cases showed evidence of acute OE. In these 190 cases, biliary obstruction (BO) was seen in 43.1%, Urinary tract obstruction (UTO) in 27.8%, Intestinal obstruction (IO) in 18.9%, intestinal perforation (PERF) in 4.7%, Intestinal infarct (IS) in 3.1%, Acute hemoperitoneum (HEM) in 2.1% cases. A linear correlation was seen between frequency of OE and increasing age of patients [$r=0.87$]. Chi-square test shows statistically significant association of UTO with ovarian cancers [$p\text{-value}<0.001$]. Regarding Hepato-biliary and pancreatic (HBP) malignancies, pancreatic head tumors were the most common tumor in the study presented with emergency. Statistically significant association was observed between the frequency of biliary obstruction and Tri phasic examination [$p\text{-value}<0.001$].

Conclusion: One-third of the abdominopelvic malignancies manifest as acute emergency at CT. Among them, biliary obstruction and urinary tract obstruction were most common oncologic emergencies secondary to pancreatic, ovarian and colonic tumors.

Keywords: Oncology, Abdomino-pelvic, Emergency, frequency, Imaging, Computed tomography.

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INTRODUCTION

An Oncologic Emergency is a life-threatening event or morbid condition secondary to patient's malignancy or its treatment

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requiring immediate medical attention¹. Oncologic emergencies can be classified as metabolic, hematologic, structural, or treatment related². They can occur at any time during the span of malignancy from presenting symptoms to end stage disease³. The vital role of Radiology in tumor imaging, diagnosis, extent and staging and in follow-up of cancer patients cannot be under estimated. Radiology particularly computed tomography has a prime role in diagnosis of structural OE, which needs immediate management to prevent morbidity. These include vessel thrombosis or hemorrhage, infiltration and compression of the involved organs, and obstruction of ducts and hollow viscera, require imaging studies for diagnosis. If they are diagnosed timely, they can change management apart from chemo radiotherapy⁴⁻⁶.

CT of acute abdominal conditions encompasses traumatic, inflammatory, and infectious etiologies. Recognition of key imaging findings of OE can allow prompt diagnosis and facilitate treatment for potentially lethal abdominal conditions in oncology patients, thereby reducing morbidity and mortality⁷.

After exuberant search, it was found that there is scarcity of data in this specific regard, though the disease burden is

exceedingly high; this gives us a strong rationale to conduct this study. Our study aimed to analyze the frequency, types and management of Abdominopelvic oncological emergencies on contrast-enhanced computed tomography (CECT) scans in cancer patients visiting Radiology Department.

METHODOLOGY

This retrospective descriptive cross – sectional study was conducted at Dow Institute of Radiology, Dow University of Health Sciences, from 1st Jan 2020 to 31st July 2020. Contrast-enhanced CT scans of cancer patients done with single phase, dual phase and triphasic protocols were retrospectively studied. Consecutive non-probability sampling was applied to control biasing.

The thoracic-related tumor complications, particularly including pulmonary embolic disease and cardiac tamponade, still visible on limited lower chest CT sections, spinal bony metastasis causing cord compression was excluded, as they come under the domain of neurological oncologic emergencies. Those patients having malignancies other than abdominal one, undergoing abdominal CT's for staging purpose were not included; as our focus was to study acute abdominal complications in cancer patients with abdominal malignancies.

Contrast-enhanced CT Scans were done at 16-slice and 64-slice scanner with thin section protocol and 120 kVp, 200mAs acquisition. All cases of CT abdomen with key words 'ABD' 'NICM ABDOMEN' 'CONTRAST' & 'TRIPHASIC' were retrieved from the Health Management Information system (HMIS) PACS database. The relevant electronic medical record (EMR) for demographics and follow up of each patient was available on Picture Archiving and communication system (PACS). CT parameters were analyzed under supervision of consultant radiologist with more than 5 years' experience in radiology. All cancer patients in the study were diagnosed with Histopathology and serum markers.

The various types of expected structural OE, observed in our clinical experience secondary to abdominopelvic (ABP) tumors were Intestinal Obstruction (IO), Biliary Obstruction (BO), Hemo-peritoneum (HEM), intestinal perforation (PERF) and Urinary Tract Obstruction (UTO). PERF manifests as peritumoral collection and intraperitoneal air without recent history of laparotomy. HEM occurs secondary to tumor rupture in the peritoneal cavity that appears as high-attenuation ascites (approximately 30–45 HU) because of the high protein content in un-clotted extravascular blood. It is measured by means of attenuation cursor, present in DICOM viewer toolbox.

Data was collected during off-peak hours (apart from work hours) in order not to interfere with patient's investigations. Research was conducted under the supervision of Institute Director. CT parameters were analyzed under the supervision of senior consultant radiologist with more than 10 years' experience in radiology. The frequency of various types of abdominal malignancies undergoing OE was estimated and subsequent interventional and surgical management was recorded.

Data Analysis: The variables of retrieved data: MR no., type of malignancy, HEM, PERF, BO, IO, UTO, IS, age, gender, and size of the tumor in a single axial dimension (mm) was recorded on Excel sheet and analyzed on IBM SPSS Statistics Data Editor SPSS 20.0 (version 20) software. Descriptive statistics were calculated for Age and gender. Distribution of OE on CT according to age and gender was assessed. Pearson and chi-square test was used to assess the relationship between variables. A *p*-value of less than 0.05 was considered significant.

RESULTS

A Total of 3200 contrast examinations of contrast CT abdomen were recorded in 6 months interval. There was total 55 post contrast single phasic and 135 tri phasic examinations performed for oncologic emergencies. Of them, target population comprised 577 cases of oncology; 225 (39%) males and 352 (61%) females with a mean age of 57.8 +/-13.75 (± SD) and range of 12–89 years.

In descending order, most common confirmed malignancies seen were hepatocellular carcinoma (n= 115;19.9%), liver metastasis (n= 88;15.2%), pancreatic (n= 39;6.7%), gastric (n= 34; 5.9%), rectal (n= 34; 5.9%), esophageal (n= 32; 5.5%), ovarian (n= 28; 4.8%), cholangiocarcinoma (n= 23;3.9%), gall bladder (GB) carcinoma (n= 21;3.6%), lymphoma (n= 18;3.1%). Amongst benign tumors, fibro adenoma (n= 8) and hemangioma (n= 23) were the most frequent tumors. Ovarian carcinoma, gastrointestinal tumors and lymphoma are the largest tumors at CT with maximum tumor dimension of 121 mm on axial sections.

Out of 577 cases, 190 (33%) cases showed evidence of acute OE. Biliary obstruction (BO) was seen in (43.1%) n=82, urinary tract obstruction (UTO) n=53 (27.8%), Int. obstruction (IO) n=36 (18.9%), intestinal perforation (PERF) in n=9 (4.7%), Int. infarct (IS) in n=6 (3.1%), acute hemoperitoneum (HEM) in n=4 (2.1%) cases. A positive correlation was seen between frequency of OE and increasing age of patients [*r*=0.87]. There was no significant association between tumor size and size of the ABP tumor, presented with OE (*p* value=0.8). A statistically significant association was observed between the frequency of biliary obstruction and Tri phasic examination [*p* value< 0.001].

Regarding Hepato-biliary and pancreatic (HBP) malignancies, pancreatic head carcinoma was the most common tumor in the study presented with emergency. Extra hepatic biliary obstruction (EHBO) was seen in 91% of pancreatic ductal adenocarcinoma (PDAC) with maximum tumor size of 5.3 cm, cholangiocarcinoma n= 23, GB cancers n= 19 and HCC n= 10. The gall bladder cancer, cholangiocarcinoma and HCC accounts for intrahepatic biliary obstruction (IHBO).

UTO was observed in ovarian n=25 (47.1%), cervical n=9 (16.9%), primary retroperitoneal n=7 (13.2%) and urinary tract tumors n=12 (22.6%). Chi-square test shows statistically significant association of UTO with ovarian cancers [*p* value<0.001]. Out of all primary and secondary retroperitoneal tumors (n=37), urinary bladder cancer most frequently manifests as UTO. Lower UTO was caused by distal ureteric, bladder, ovarian and cervical tumors.

Around 18.9% of tumors at CT presented with malignant bowel obstruction; in which there were 16 cases of rectal cancers, 11 of ovarian origin and 9 cases were due to involvement by right-sided colon.

Ascites was the most common observed secondary tumor related finding (n=386), whereas Acute hemoperitonium was seen in only 3.4% of HCC (n=4). Free intra-peritoneal air also known as Pneumo-peritoneum secondary to perforation of intestinal tumors n=9 (4.7%).

The patients with OE were further managed via surgical and non-surgical approaches. Table-I demonstrates Oncologic Complications and their further management.

Table-I: Oncologic Complications in the patients that underwent further management (Target OE population N= 190).

Abdomino pelvic emergencies (n)	Surgical Approach (n)	Interventional Approach (n)	
Biliary Obstruction (n=82, 43.1%)	--	PTBD* (n=27, 14.2%)	ERCP* stent (n=44, 23.1%)
Urinary Obstruction (n=53, 27.8%)	--	PCN*insertion (n=31, 16.3%)	DJ stenting (n=18, 9.4%)
Intestinal Obstruction (n=36, 18.9%)	Diversion Colostomy/ileostomy (n=21, 11.0%)	--	--
Intestinal Ischemia (n=6, 3.1%)	Surgical resection (n=4, 2.1%)	--	--
Hemoperitoneum (n=4, 2.1%)	Surgical resection (n=1, 0.5%)	TACE* (n=2, 1.0%)	--
Intestinal perforation (n=9, 4.7%)	Surgical Repair (n=4, 2.1%)	--	--

The management is mentioned for available follow-up data of our patients.

* Percutaneous Transhepatic biliary drainage

* Percutaneous Nephrostomy

* Transarterial chemoembolization

* Endoscopic Retrograde Cholangiopancreatography

* Percutaneous Transhepatic Biliary Drainage

DISCUSSION

Overall, one third of patients that underwent CT scans presented as acute OE. We found biliary obstruction, Urinary tract obstruction, Int. obstruction, perforation, infarct and acute hemoperitoneum were the most common oncologic emergencies at CECT Abdomen in decreasing proportion in our patients. Hepatocellular carcinoma, liver metastasis, pancreatic, gastric, rectal, esophageal, ovarian, cholangiocarcinoma, gall bladder carcinoma and lymphoma were the commonest

abdomino-pelvic malignancies. Lymphoma was the only frequent observed tumor noted in our study, devoid of structural OE.

Hainaux et al⁸ prospectively studied 85 consecutive patients with extra-luminal air on MDCT who had surgically proven gastrointestinal tract perforations. Analysis of MDCT images was predictive of the site of gastrointestinal tract perforation in 73 of 85 patients. In our study, tumor perforation was seen in 9, out of 577 cases. In 2012, Kim et al. has described various findings for PERF varying from extra luminal air to mural defect, close to the tumor as seen in our study⁹. Diagnosing subtle OE, especially subtle specks of pneumo-peritoneum secondary to bowel perforation require a keen observant and high level of expertise and training in radiology.

Bowel ischemia, another OE, secondary to the superior mesenteric arterial occlusion was seen in only 3.1% cases of oncology. The CT findings described by Rha et al¹⁰ include bowel wall thickening with or without the target sign, mesenteric veins and mesenteric edema, lack of bowel wall enhancement, increased enhancement of the thickened bowel wall, intramural pneumatosis, mesenteric or portal venous gas, and mesenteric arterial or venous thromboembolism.

In one recent study, primary cancers of abdominal origin that most frequently produce MBO are those of the colon (25%–40%) and the ovary (16%–29%)¹¹. In our study, around 18.9% of tumors at CT presented with malignant bowel obstruction (MBO); in which there were 44.4% cases of recto-sigmoid cancers, 30.5% of ovarian origin and 25% cases were due to involvement by right-sided colon. Whereas, the global prevalence of IO is estimated to range from 3% to 15% of cancer patients. Colonic cancers can present with acute emergency and requires stenting or diversion colostomy/ileostomy, as evident from our data (Table-I).

Ko et al¹² studied CT scans of 20 patients with ischemic colitis proximal to obstructing colonic carcinoma and found it adequate in distinguishing tumoral from ischemic segments in patients with ischemic colitis proximal to colonic carcinoma, whereas in our study, IO was seen in 6, out of 190 cases with OE. In this study, biliary obstruction was the most frequent recorded OE. According to ACR (American college of Radiology) appropriateness criteria, MRCP or CT can help in determining the level and cause of obstruction and to differentiate between hepatocellular and biliary cause of BO at cross-sectional imaging¹³⁻¹⁴.

Cancer patients frequently undergo Urologic emergencies. These include Urological cancer pain, bladder hemorrhage, upper or lower urinary tract obstruction, urinary tract infection, and priapism. It can be due to extrinsic compression, direct tumor invasion or lymphadenopathy. The retroperitoneal and pelvic malignancies have a propensity to cause UTO. On CT, UTO demonstrates reduced renal enhancement during the corticomedullary and nephrographic phases, delayed persistent nephrogram sign, as well as hydro-ureter and hydronephrosis¹⁵⁻¹⁷. Our research shows that 27.8% of malignancies underwent UTO, due to cervical, ovarian and urinary tract tumors. Primary ovarian cancer compresses ureter and causes obstruction. Cervical cancer had shown direct bladder and vesico-ureteric

junction invasion. The endourologic procedures of ureteral stenting and percutaneous nephrostomy are effective means of palliation.

The research regarding ABP tumors, comprehensive coverage of all structural abdominopelvic oncologic emergencies at CT with follow-up management were the strengths of the study and to the best of authors' knowledge has not been studied before in Pakistan. There were few limitations in the study. Hemoperitoneum in the chronic phase, at CT mimics ascites and it can be only be diagnosed via lab values; unfortunately, there are no reliable imaging features to distinguish these two! Lastly, treatment-related inflammatory intestinal changes on CT such as post TACE complications, neutropenic colitis and radiation enteritis were not included to avoid complexity of data¹⁸⁻²⁰. Further research needs to be done in this regard.

CONCLUSION

The study showed that one third of the abdominopelvic malignancies manifests as acute emergency at CT. Among them, biliary obstruction and urinary tract obstruction were most common oncologic emergencies secondary to pancreatic, ovarian and colonic tumors.

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AUTHOR'S CONTRIBUTION

Hafeez M: Conceived idea, Designed methodology, Manuscript writing, Literature review, Data analysis

Sattar A: Manuscript writing, data collection, Literature review.

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