

MDCT Scan Evaluation of Abdominal Lymphoma

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A B S T R A C T

Introduction: Accuracy of CT in the staging of patients with lymphoma is widely recognized, and it is now the first investigation of choice in the initial staging and follow up of these patients. The current research aimed to study the role of CT scan of the abdomen in staging of the different types of the lymphoma, to study the differences of the involvement pattern and morphology among the different types of the lymphoma and to assess the role of the CT scan to characterize the morphology of primary lymphomas involving the hollow and solid abdominal viscera.

Material and methods: The study was a retrospective survey from 2014 to 2015. CT scan abdomen was performed in 80 patients of histological proved lymphoma; All the scans were performed using 128 slice CT scanner

Results: In this retrospective male preponderance study of 80 patients with proven lymphoma, positive findings were seen in 57 (71.2%) patients, with 46% of HD and 84% of NHL patients showed intraabdominal involvement CT accurately detected nodal and extranodal sites of involvement,

Conclusion: Lymphnode involvement was the most common manifestation of lymphoma and it was seen in 66% of all the patients. CT showed the exact sites, the pattern of involvement, the morphological features and associated complications like encasement of the vessels, hydronephrosis, biliary obstruction, bony erosion, extramedullary cord compression etc. in both HD and NHL. Extranodal involvement was detected in -- patients. The involvement of liver was seen in 28%, spleen in 26.3%, GIT in 14% and renal involvement was seen in 7% of the patients with positive findings. Other sites of involvement include pancreas, psoas muscle and vertebrae.

Key Words: MDCT Scan, Abdominal Lymphoma

INTRODUCTION

Lymphomas are malignant tumors of lymphoreticular origin i.e. from lymphocytes and histiocytes and their precursor cells. Clinically and pathologically, lymphomas are quite heterogeneous. However, two distinct clinic pathologic groups are routinely distinguished; Hodgkin's disease (HD)^{1,15} and Non Hodgkin's lymphoma (NHL).⁴

They are one of the common neoplasms of the patients in the young age group. Accurate staging of the patients is very important in planning appropriate therapy as advent of newer chemotherapeutic regimens and radiotherapy planning has improved the outcome with aim of achieving total cure rather than palliative cure. A series of examinations were performed for this purpose

In the past lymphography was performed as primary investigation to assess the retroperitoneal lymphadenopathy.^{11,14} It is highly accurate in the detection of macroscopic nodal abnormalities. The limitations are few, although the nodes above cisterna chyli in the root of mesentery and in the hepatic or splenic hila are not demonstrated Exploratory laparotomy⁶ was undertaken to further stage patients when bone marrow biopsy did not reveal any tumor. Ultrasound is a useful survey technique for bulky retroperitoneal

lymphadenopathy and can also detect isolated enlarged nodes or groups of nodes in the other areas. But main disadvantages are the operator dependency and sub optimal evaluation due to excessive bowel gases and obesity. Computed tomography (CT) is a more accurate method in this regard and in addition lymphomatous involvement of other abdominal viscera including liver, spleen, gastrointestinal tract, genitourinary system can be detected earlier.

It presents a cross-sectional picture of the abdomen which can be used in planning of radiation therapy ports.⁴ So CT forms an essential component of staging procedure. Administration of oral contrast prior to CT scan allows good visualization of the bowel loops and separates them from retro peritoneal and mesenteric nodes as well as vessels. Intravenous administration of water soluble non ionic contrast permits visualization of vascular structures which is essential to separate vessels from lymphnodes. Different patterns of enhancement helps in detection of lymphomatous deposits in the various abdominal organs.

CT is also the most acceptable and used modality for follow up of patients with Lymphoma.^{2,8}

The current research aimed to study the role of CT scan of the abdomen in staging of the different types of the lymphoma, to study the differences of the involvement pattern and

morphology among the different types of the lymphoma and to assess the role of the CT scan to characterize the morphology of primary lymphomas involving the hollow and solid abdominal viscera and the roles of CT scan in follow up of the patients.

MATERIAL AND METHODS

The study was a retrospective survey from 2014 to 2015. CT scan abdomen was performed in 80 patients of histological proved lymphoma. All the scans were performed in our institution after obtaining permission from hospital ethics committee.

Study population

A total of 80 subjects were included irrespective of their age and sex with following inclusion and exclusion criteria.

Inclusion criteria: Patients with histopathological diagnosed cases of lymphoma were included in the study

Exclusion criteria: Patients with contrast allergy and pregnancy.

Equipment used

CT Machine: 128 slice PHILIPS BRILLIANCE.

Method

Complete history was taken and histopathological report was noted. Other laboratory and haematological tests were observed.

Technical parameters are as follows

Field of view - 300 mm, Length- 240 mm.

Detector configuration (in mm) - 16 x 1.5 mm

Pitch factor - 0.938

Gantry rotation time - 0.5 sec

Reconstructed slice thickness - 1.0 mm

Increment- 1.0 mm

Tube current (in eff. mAs) - 200, kV- 120

Contrast material: Volume - 2 ml/kg

- Concentration- 300 mg/ml

- Injection rate - 2 ml/s

Technique

Prior to the procedure, all patients are instructed to be fasting for 4 hrs. 800 ml of oral contrast is given to the patient over 45 minutes before the scan, with another 200 ml just before taking the patient on for scanning. Contiguous 1 mm thick plain scans with an interval of 1 mm are performed for the liver, followed by post contrast scan of 1mm thickness at an interval of 1 mm, from the domes of the diaphragm to the pubic symphysis.

RESULTS

In the retrospective study of 80 patients with histological proven diagnosis of lymphoma were reviewed, and the following data was obtained.

- | | |
|------------------------------------|--------|
| 1. Total number of patients | 80 |
| 2. Total number of male patients | 53 |
| 3. Total number of female patients | 27 |
| Male: Female ratio | 1.96:1 |

Findings at initial CT scan

Out of 80 studied cases 23 were normal and 57 showed

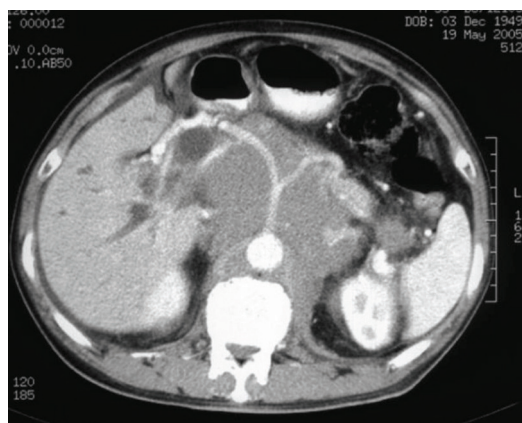


Figure-1: Large homogenous retroperitoneal lymph node mass encasing vessels



Figure-2: Involvement of liver and spleen in Hodgkin's disease



Figure-3: Involvement of caecum with circumferential wall thickening in NHL

abnormal finding in the abdomen. Amongst positive cases the 13 were of Hodgkin's disease and 44 were of Non Hodgkin's lymphoma. Positive findings are divided into two categories one with lymph node involvement and other category of extra nodal abdominal organs involvement.

Hodgkin's lymphoma

Lymph node involvement in Hodgkin's disease was observed in only 8 patients. It is classified in less than 2 cm, more than 4 cm and between 2 to 4 cm as mild, gross and intermediate enlargement. Location wise enlarged lymph nodes seen in retroperitoneum in six patients, mesentery in one and iliac

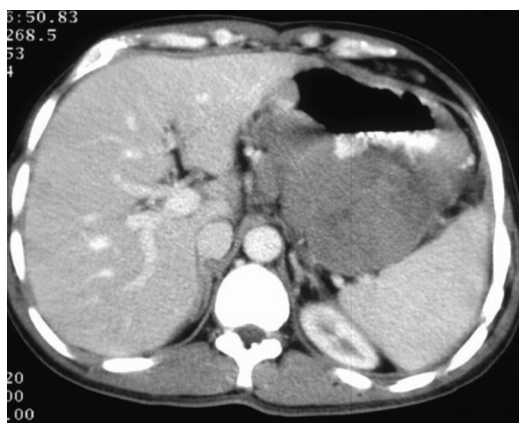


Figure-4: Primary stomach lymphoma with homogenous mass like involvement in NHL

region in one patient. Less than 2 cm size of lymphnode is observed in three cases, more than 4 cm was observed in two patients and three patients showed lymphnode enlargement between 2-4 cm. Most of the lymphnodes are homogenous, solid enhancement and only one showed areas of necrosis and heterogenous enhancement.

Extra nodal involvement observed in five patients. The involvement of the liver, spleen and kidney was observed in these patients in the form of organ enlargement and focal disease in the form of hypodense enhancing /non enhancing lesions. Two patients showed involvement of liver, two showed spleen involvement and one shows kidney involvement. Out of these one patient showed involvement of liver, spleen and kidney and not as isolated involvement

Non Hodgkin's lymphoma

Out of total 44 patients with NHL, 30 patients showed enlargement of lymphnodes. 24 patients showed retroperitoneal lymphnode enlargement, 9 showed mesenteric lymphnode enlargement, 16 patients had iliac lymphadenopathy, 2 showed enlarged obturator and 4 showed retrocrural enlarged lymph nodes

10 patients showed lymphnode enlargement less than 2 cm, 13 patients showed lymphnode size between 2-4 cm and 7 patients showed lymphnode size more than 4 cm. Most of the lymphnodes are homogenous, solid enhancement and few showed areas of necrosis and heterogenous enhancement. Most of the lymphnodes are conglomerated and only 4 cases showed discrete lymphnode enlargement

Extranodal involvement observed in 14 patients. The involvement of the liver, spleen, gastrointestinal tract, kidneys and other organ involvement was observed in these patients in the form of organ enlargement and focal disease in the form of hypodense enhancing / non enhancing lesions. These extranodal site involvements was observed in associated with other organ involvement rather than isolated finding in almost all the cases. Ten patients showed involvement of liver, ten showed spleen involvement, 8 showed GIT involvement and six showed kidney involvement. Six patients showed involvement of other organs. In two cases there is involvement of the pancreas, in one peritoneal involvement was observed and three cases showed involvement of the bones and muscles

DISCUSSION

In this study of 80 patients, the age group ranged from 3 years to 78 years. The peak incidence of HD was in second decade, with 10 patients (35.7%). There is second small peak observed in the fourth decade with 4 patients (14.2%) So there is bimodal peak observed in the second and fourth decade. The peak incidence of NHL, in the series was in fifth decade, with 14 patients in this age group (29.6%) This corroborates with the age related incidence of lymphoma in the literature. There was male predominance in the study (male to female ratio was 1.96:1).

23 cases of HD and 57 cases of NHL were studied in the study. The commonest histological subtype of HD was Nodular sclerosis accounting for 46.4% of the cases.

In 57 (71.2%) of the 80 patients, the initial CT scan of abdomen showed evidence of involvement by lymphoma at one or more sites. In 23 patients CT scan showed normal findings (28.7%). The CT scan was normal in 15 out of 28 patients of HD (53.5%) and it was normal in only 8 patients of NHL (15.3%) The commonest abnormality found was enlarged lymph nodes. (66.6%)fig 1. These findings are consistent with the previous literature studies showing that the abdominal involvement is more common in Non Hodgkin's lymphoma than HD.

Lymph nodes

Abdominal lymph node enlargement (>10 mm in diameter, >6mm retrocrural and >15mm pelvic) was initially present in 38 (66.6%) of the 57 patients with evidence of positive findings. Enlarged nodes were seen in the upper abdomen only from diaphragm to aortic bifurcation) in 14 patients, in the abdomen and pelvis in 24 patients, and in the pelvis in 6 patients. Enlarged nodes in the abdomen and pelvis are seen in 22 out of 30 patients of NHL and in only 2 out of 8 cases of HD. This is consistent with the literature studies that NHL^{11,15} shows wide spread involvement as compared to HD which presents as localized disease. 8 out of 28 patients of HD (28.5%) as compared to 30 patients out of 52(57.7%) of NHL. These findings are consistent with Castellino R A⁶ who showed 24% of HD and 48% of NHL showed retro peritoneal lymph node involvement. The mesenteric involvement was seen in only 1 out of 28(3.5%) cases of HD as compared to 9 out of 52 (17.3%) cases of NHL. These findings were similar to Blackledge and Castellino et al⁶ who showed that mesenteric lymph node involvement was more common, in NHL than HD. Also the involvement of the different nodal sites like portal, peripancreatic, celiac, which seen predominantly in NHL. The retrocrural, splenic, renal hilar enlargement was seen only in NHL cases (fig 1).

In 20 of the 38 patients with nodal enlargement, CT scan showed evidence of lymphomatous involvement of one or more of the following sites, GI tract (4 patients), liver (10), spleen (10), and omentum (1). In one patient, the only extra nodal site of involvement was the epidural space. 5 out of 8 patients of HD and 15 out of 30 patients of NHL with lymph node involvement show extra nodal involvement.

The involvement of the retro peritoneal lymph nodes in Para aortic region was most common; it was seen in 30 patients out of 38 who showed lymph node involvement (78.9%)

It was seen equally common in both HD (75%) and NHL (80%). In 13 patients with enlarged abdominal lymph nodes, the diameter of the largest node was upto 2 cm, (34.2%), 2-4 cm in 18 patients (47.3%), and 4-10 cm or more in 7 patients (18.4%) (fig 1).

In 24 (63.1%) of the 38 patients, all nodes were homogenous, usually more dense than the muscle. In 13 patients (34.2%) the nodes had central low density, The nodes with central necrosis ranged in diameter from 4 to 10 In one patient there was evidence of calcification. Evidence of necrosis is seen in 11 out of 30 cases (36.6%) of NHL showing lymph node involvement as compared to only 2 out of 8 in patients of HD (25%). This showed that the evidence of necrosis is more common in bulky nodes and so in NHL cases than HD who showed smaller and homogenous nodes.

Calcification in patients with lymphoma occurring before therapy is rare as opposed to that in lymphoma after therapy. It occurred in our patients more often in the mediastinum, in patients with non-Hodgkin's lymphoma rather than in patients with Hodgkin's lymphoma, and only in patients with the aggressive type of disease.

Liver

In this study, the involvement of liver by lymphoma was seen in 16 cases (20.0%) out of 80 in the form of diffuse enlargement and or focal lesions, these results were comparable to the study of Zoranza et al¹⁶ who have found hepatic involvement in 11.5% of cases. Diffuse enlargement with or without focal lesions is seen in 16 patients with positive findings (28.0%). Diffuse enlargement without focal lesions is seen in 9 patients (15.7%) Focal lesions, varying in size from solitary to multiple were seen in 9 out of 57 patients with positive findings (15.7%). In all cases the focal lesions were less dense than the liver parenchyma (fig 2). Only 5 patients show focal lesions without evidence of enlargement (8.7%). In the absence of focal lesions the enlargement of the liver was mild (liver span less than 18 cm). In 4 of 80 patients with focal lesions showed marked hepatomegaly (more than 18 cm) 6 out of 28 cases of HD showed hepatic involvement (21.4%) as compared to 10 out of 52 patients with NHL (19.2%) Diffuse enlargement without focal lesions is seen in 4 (50%) patients of HD with hepatic involvement as compared to 3 (33.3%) of NHL cases

Out of 16 cases with hepatic involvement by lymphoma also showed splenic involvement in 12 cases, (75%) this correlates with the study of Strijk et al²⁰, where the involvement of the was always accompanied by splenic disease. In 11 out of 16 (68.7) patients with liver involvement showed evidence of lymphadenopathy. In one patient there is associated IHBR dilatation due to portal adenopathy.

Spleen

Splenic involvement was seen in 15 (18.75%) out of 80 and 26.3% of all the patients with positive abdominal findings. with 9 patients showing enlargement only without evidence of any focal lesions, 2 patients showed focal lesions with splenomegaly (fig. 2). Focal splenic lesions were seen in patients that varied from solitary to multiple in numbers These results were comparable to the study of Castellino et al⁷, that showed splenic abnormalities with CT in 14% of cases

and Pond et al 35 detected splenic abnormalities in 15.1% of the cases. Previous studies have shown that the detection of splenic disease by CT is difficult due to the miliary pattern of involvement.

Splenic involvement was seen in 5 (17.8%) out of 28 cases of HD and 4 out of 5 patients showed diffuse enlargement without any focal lesion. 10 patients of NHL showed splenic involvement (19.2%) and only 3 patients showed diffuse enlargement and focal lesions are seen in 5 patients. (fig 2)) The degree of splenic enlargement was mild (12-15 cm) in 5 patients and moderate in 4 patients (15-20cm). In all the 4 patients with moderate splenomegaly there is associated hepatomegaly

In 12 patients (80%) with splenic involvement there is associated lymphnode involvement.

Kidney

The CT scan showed evidence of renal involvement by lymphoma in 4 (5%) of all the patients and. In 3 case there was evidence of diffuse renal lymphoma seen. In one patient there are focal lesions. The results are comparable to Cohan et al¹⁴ who found 7% incidence of renal involvement in malignant lymphoma. The renal nodules were less dense than the adjacent renal parenchyma on post contrast scans. 3 out of 4 patients (75%) were of NHL and one patient of HD showed diffuse enlargement of both kidneys. In all the patients with renal lesions CT scan showed other sites of extra nodal involvement. Perirenal lymphomatous involvement was seen in one patient of NHL.

Gastrointestinal tract

GIT involvement was seen in 8 (10%) of the CT scans. Sites of involvement included the stomach 3 (fig 4) (37.5%) patients, followed by small intestine (ileo-cecal region) fig.4 in 3 cases (37.5%) and the large bowel in 2 patients (25%). The results were similar to the study of Lewin K J et al²⁶ who showed the stomach as the commonest site of GIT followed by small and large intestine. and appendix. All the patients were of diffuse Non Hodgkin's lymphoma and the age group ranged from 35 to 75 years.

The CT findings showed circumferential wall thickening as commonest pattern in 6 cases. Focal eccentric wall thickening and a mass in 2 patients (ileo-cecal region) (fig 4) This morphological pattern was similar to that described by Dodd et al²⁷, who found circumferential wall thickening more than 1.5 cm in most of the patients (fig 4)⁷

In 5 of the 8 cases CT also showed evidence of lymphnode involvement (62.5%) associated in 2 cases focal lesions in the solid viscera. The results are comparable to the study of Buy et al² who found associated lymphadenopathy in 92.5% of the patients.

Pancreas

Pancreatic involvement was seen in 2 patients (2.5%) all of NHL type (3.5% of NHL) All the cases showed extensive retro peritoneal and mesenteric lymphadenopathy.

The pattern of pancreatic involvement in the form of infiltration from adjacent lymphnodes in all the cases correlates with the study of Glazer et al⁵

Peritoneum

Ascites was seen in only one patient of the abdominal

lymphoma cases. Omental and peritoneal infiltration was seen in the 2 patients. All these patients were of NHL, high grade type and there was associated extensive retroperitoneal lymph node enlargement.

Musculoskeletal involvement

CT showed lymphomatous involvement of the muscle in 2 patients (2.5%). Marked enlargement of the psoas muscle with heterogenous density was seen. In one patient eccentric soft tissue infiltration of the epidural space of the lumbar spine was observed. All the patients were of NHL high grade (3.4%) and associated with extensive retroperitoneal lymphadenopathy and focal lesions were present in liver. (table 3) The findings in our study correlate with that of Glazer et al 22, where the incidence of muscle involvement was 4%, all the patients having associated retro peritoneal lymphadenopathy.

Follow up CT scan were available in 20 patients with 15 patients showing regression of the disease (75%), 4 patients showed progression of the disease (20%) and one patient showed no change in the disease status since the previous scan. (5%). The CT findings corroborated with clinical features in all the patients (100%) These findings correlate with the study of Oliver et al³¹ with CT scan showing an excellent correlation with clinical status of the patient.

Out of 4 patients with disease progression two patient showed enlargement of the lymph node size and involvement of the other sites that were initially not involved and 2 patients showed deposits in the liver and spleen with enlargement of their size which was not seen initially.

All the patients with regression of the disease showed reduction of the lymphnode size or disappearance of the lymphnode mass and decrease in the attenuation of the lymphnode and evidence of the calcification. Calcification after treatment was seen in 4.

The patient with no change in the disease status was a case of HD and showed small lymphnodes in the upper retroperitoneum as were seen in the initial scan.

CONCLUSION

The accuracy of CT in the staging of patients with lymphoma is widely recognized, and it is now the first investigation of choice in the initial staging and follow up of these patients. Staging laparotomy involving splenectomy and biopsy of all lymphnode sites was formerly gold standard for staging of intraabdominal lymphoma, but is now rarely performed. Most centers now rely on biopsy of one group of nodes for diagnosis and stage the patient based on imaging with CT and hematological assessment including bone marrow biopsy. In this retrospective male preponderance study of 80 patients with proven lymphoma, positive findings were seen in 57 (71.2%) patients, with 46% of HD and 84% of NHL patients showed intraabdominal involvement. CT accurately detected nodal and extra nodal sites of involvement. So CT scan is the essential investigation modality in all patients with lymphoma as it can detect the intra abdominal disease.

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