

Involvement of Abdominal and Pelvic Lymph Nodes in Non-Hodgkin Lymphoma: the Nodal Distribution in Chinese Patients

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OBJECTIVE To study the distribution of abdominal and pelvic lymphadenopathy in non-Hodgkin lymphoma (NHL) in Chinese patients.

METHODS CT images of 241 NHL patients with abdominal and/or pelvic lymphadenopathy were reviewed. Among them, clinical and image data from 96 patients fulfilled the requirements for the analysis: 1. Abdominal and/or pelvic lymphadenopathy detected by CT in untreated patients (n=74). 2. Recurrent patients: new lesions in abdominal or pelvic lymph nodes who never had any nodular lesion by previous abdominal and/or pelvic CT (n=14). 3. Treated patients who did not have abdominal and/or pelvic CT previously, showed regression of initial disease for at least 6 months after chemotherapy and subsequently showed abdominal and/or pelvic lymphadenopathy (n=8). According to the Clinical Schema for Lymphoid Tissue, these patients were divided into 3 histologic subtypes: indolent (IL; n=31), aggressive (AL; n=61) and very aggressive (VAL; n=2) lymphoma. The remaining 2 cases were unclassified lymphoma (UCL). Both abdominal and pelvic CT scans were undertaken in 46 patients, abdominal CT only in 47 patients and pelvic CT only in 3 patients. Enhanced CT was obtained in 80 patients. The anatomic sites involved were designated as retroperitoneal (ie. paraaortic), mesenteric, abdominal (ie. celiac, paracardiac, gastrohepatic and hepatic hilum, etc.), retrocrural, subdiaphragmatic, common iliac, internal iliac, external iliac and inguinal nodes respectively.

RESULTS The lesions located in the retroperitoneum were most common for IL and AL, the incidences being 83.3% (18/25) and 83.1% (49/59) respectively, results being similar. Among those, lymphadenopathy distributed mainly in the retroperitoneum, superior and inferior renal hila, with an incidence of 72.0% (18/25) in IL and 67.3% (33/49) in AL. Pelvic lymphadenopathy came next, with the overall incidence of 41.9% (126/301), 57.5% (50/87) in IL and 35.5% (76/214) in AL respectively. Mesenteric lymph nodes stood third with the overall incidence of 37.1% (33/89), 43.3% (13/30) in IL and 33.9% (20/59) in AL. Statistical analysis showed that external iliac lymph node involvement to be more common in IL than in AL ($P<0.05$), while comparisons of other groups showed no statistical significance.

CONCLUSION For Chinese NHL patients, retroperitoneal lymph nodes were mostly involved, followed by iliac and mesenteric lymphadenopathy, which was different from that of the Western countries. The involved retroperitoneal lymph nodes in NHL of Chinese patients were predominantly located in the superior and inferior renal hilum.

KEYWORDS: lymphoma, non-Hodgkin / radiography, lymphatic metastasis /

Received May 20, 2004; accepted August 19, 2004.

Chinese Journal of Clinical Oncology

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radiography, tomography, X-ray computed.

Non-Hodgkin lymphoma (NHL) is a group of complicated diseases. Of which, each of the pathological subtypes is an independent disease entity having its own histologic morphology, immunophenotype, genetic features, source of homologous normal tissue, clinical course and prognosis.^[1] Lymphoma in Chinese patients is different from that of Caucasians in view of the clinical course and pathological subtype. NHL is commonly seen, but follicular NHL is uncommon.^[2] In patients of Western countries, NHL commonly involves abdominal lymph nodes, the majority of which are mesenteric lymph nodes; the incidence of lymphadenopathy of the NHL follicular type located in mesentery, retroperitoneum, and splenic hilum are markedly higher than that of the diffuse type.^[3,4] However, to our knowledge, there are no published studies addressing this issue in Chinese patients. In order to learn the differences in the distribution of abdominal and pelvic lymphadenopathy in NHL between Chinese and Western patients, we retrospectively analyzed data from 96 Chinese patients at the Cancer Hospital, Chinese Academy of Medical Sciences, Beijing.

MATERIALS AND METHODS

Clinical data

Criteria for analysis

During the period of May, 1990 to November, 2000, there were 241 patients with abdominal and/or pelvic lymphadenopathy diagnosed by CT scanning and proven by pathology at our hospital. Of these, 96 cases turned out to fulfill the following criteria of analysis: (1) Abdominal and/or pelvic lymphadenopathy in initial untreated patients examined by CT (n=74). (2) Newly found abdominal or pelvic lymphadenopathy whose previous abdominal and/or pelvic CT was normal (n=14). (3) Treated patients who did not have abdominal and/or pelvic CT previously and showed regression of initial disease for at least 6 months after chemotherapy, and subsequently have showed

abdominal and/or pelvic adenopathy (n=8).

General data

A total of 96 patients including 65 men and 31 women, whose ages ranged from 7 to 74 years (mean 47.4 ± 14.9). As for the subtypes of NHL, there were 31 cases with indolent lymphoma (IL) (men: 22, women: 9, 47.7 ± 13.9 years old), 61 cases with aggressive lymphoma (AL) (men: 40, women: 21, 48.0 ± 14.9 years old), 2 cases with very aggressive lymphoma (VAL) (1 man, 9 years old, 1 woman, 30 years old) and 2 unclassified cases. Since there were only 3 patients whose ages were 7 to 12 years (IL, AL and VAL for one patient each), this study reflected the basic characteristics of adult NHL.

Clinical stages

According to the Ann Arbor staging system, there were 5 cases in stage IA, 1 I EA, 11 II A, 6 II EA, 19 III A, 1 III EA, 9 III B, 4 III EB, 13 IV A, 5 IV EA, 17 IV B and 5 V EB.

Pathological classification and clinical grouping

The pathological classification of 96 NHL cases according to the WHO Classification of Neoplastic Diseases of Hematopoietic and Lymphoid Tissues (1997)^[5] is shown in Table 1. Their clinical grouping and corresponding clinical stages are shown in Table 2 according to the Criteria of Clinical Grouping.^[6]

Methods

In this retrospective study, the conventional CT examinations were performed with a GE 9800 Hilight in 74 cases, and with a spiral CT (SCT) (Picker, PQ 6000 si) in 22 cases. Scanning parameters were as follows: 10 mm collimation, pitch 1.0 or 1.5 in SCT, 120 mA, 240 kV. The gastrointestinal tract was opacified by oral contrast medium (1.5% iodine, 1500 ml), and iv contrast material (100 ml, 30 g I) was administered to 80 patients who did not have contraindications for an enhanced CT scan. For the abdominal and pelvic CT scans (46 cases), the range from the dome to the lower margin of the pubis was covered; and from the dome to the iliac crest for

Table 1. The pathological classification (WHO 1997) and clinical stages of 96 NHL

Pathological type	Clinical Staging												Total
	I A	I EA	II A	II EA	III A	III EA	III B	III EB	IV A	IV EA	IV B	IV EB	
Follicular Grade II	1	-	3	1	5	-	1	1	1	-	-	2	15
Follicular Grade III	1	-	2	3	3	-	-	-	1	1	4	-	15
Small lymphocytic	-	-	-	-	2	-	3	1	4	2	2	-	14
Mantle zone	1	-	1	-	2	-	1	-	1	1	-	-	7
MALT	-	-	-	1	-	-	-	-	-	1	-	-	2
Diffuse large B-cell	1	1	2	1	4	1	1	-	1	-	5	1	18
Peripheral T-lymphocyte	1	-	-	-	3	-	2	1	1	-	3	-	11
Peripheral T unspecified	-	-	-	-	-	-	1	-	1	-	-	1	3
Precursor T-lymphoblast	-	-	-	-	-	-	-	-	1	-	1	-	2
T/NK cell	-	-	-	-	-	-	-	-	-	-	1	-	1
T-cell originative, unclassifiable	-	-	1	-	-	-	-	-	-	-	-	-	1
Anaplastic large cell	-	-	1	-	-	-	-	1	1	-	-	-	3
Plasmacytoma	-	-	-	-	-	-	-	-	-	-	1	-	1
Mixed	-	-	1	-	-	-	-	-	-	-	-	-	1
Unclassifiable	-	-	-	-	-	-	-	-	1	-	-	1	2
Total	5	1	11	6	19	1	9	4	13	5	17	5	96

Table 2. The clinical grouping and stages of 96 NHL

Clinical grouping	Clinical staging												Total
	I A	I EA	II A	II EA	III A	III EA	III B	III EB	IV A	IV EA	IV B	IV EB	
IL	1	-	3	2	7	-	4	2	5	3	2	2	31
AL	4	1	8	4	12	1	5	2	6	2	14	2	61
VAL	-	-	-	-	-	-	-	-	1	-	1	-	2
Unclassifiable	-	-	-	-	-	-	-	-	1	-	-	1	2
Total	5	1	11	6	19	1	9	4	13	5	17	5	96

abdominal CT scans alone (47 cases); from the iliac crest to the lower margin of the pubis for pelvic CT scans (3 cases).

Anatomic locations of involvement

The anatomic locations were designated as retroperitoneal, abdominal, mesenteric, subdiaphragmatic, common iliac, internal iliac, external iliac and inguinal nodes, respectively. The range of the retroperitoneum was defined from the origin of the celiac artery to the bifurcation of the abdominal aorta, which was divided by the renal hila into superior / inferior renal hila, both of which were involved. Abdominal lymph nodes were also divided into the gastrohepatic ligament, hepatic

hilum, splenic hilum, cardiac and para-celiac artery lymph nodes.^[7,8]

Diagnostic standard of lymph nodes involved

If the shortest dimension of the lymph node in its maximal transverse section exceeded the diagnostic threshold it was defined as abnormal. The diagnostic threshold value varied according to different locations. For the paracardiac and gastrohepatic ligament region lymph nodes, the diagnostic threshold was 8 mm; hepatic hilar, 7 mm; retrocrural, 6 mm; upper retroperitoneal, 9 mm; lower retroperitoneal, 10 mm; mesenteric, 8 mm; common, internal, external iliac and inguinal nodes, 10mm. In addition, for some cases,

although the diameters measured were smaller than that of the above-mentioned thresholds, it was also regarded as abnormal if the lymph nodes gathered in a cluster, enlarged during follow up, and diminished after chemotherapy.

Follow-up

There were 67 patients (178 times) who had follow-up abdominal and/or pelvic CT scans. Among them, the patients had abdominal CT only 83 times, both abdominal and pelvic CT were administered 92 times, 3 had pelvic CT only. All patients were followed-up for a period of 1 to 66 months (mean: 6 months).

Statistical analysis

All data were entered into and analyzed by SPSS 10.0. χ^2 tests were used to compare the differences among various groups.

RESULTS

IL: (31 cases)

In this group, the retroperitoneal, abdominal,

mesenteric, retrocrural, subdiaphragmatic and common iliac lymph nodes were not included in a CT scan in 1 case, and the internal iliac, external iliac and inguinal nodes were not included in 12 cases. Therefore, the retroperitoneal, abdominal, mesenteric, retrocrural, subdiaphragmatic, and common iliac lymph nodes could only be evaluated in 30 cases; internal iliac, external iliac and inguinal lymph nodes could only be evaluated in 19 cases. The locations of lymph node involvement in IL cases are shown in Table 3. We found unilateral retrocrural node involvement (right) in 3 cases and bilateral in 10 cases; unilateral (right) and bilateral subdiaphragmatic nodes in 2 cases each; unilateral common iliac nodes in 4 cases (right: 2 cases, left: 2 cases) and bilateral in 13 cases. Unilateral internal iliac nodes (right) in 3 cases and bilateral in 6 cases; unilateral external iliac nodes in 6 cases (right: 5 cases, left: 1 case) and bilateral in 6 cases; unilateral inguinal nodes in 5 cases (right: 4 cases, left: 1 case) and bilateral in 7 cases.

AL: (61 cases)

Common iliac lymph nodes were included in all 61

Table 3. The lymph node distribution and clinical grouping of 96 NHL

Lymph nodes involved	Clinical grouping				Total
	IL	AL	VAL	Unclassifiable	
Retroperitoneum	25	49	2	2	78
Superior renal hila	2	4	-	1	7
Inferior renal hila	5	12	-	-	17
Superior and inferior renal hila	18	33	2	1	54
Abdomen	31	61	5	3	100
Paracardia	-	2	-	-	2
Hepatogastric ligament	9	13	-	-	22
Hepatic hilum	10	17	2	1	30
Splenic hilum	2	11	1	1	15
Paraceliac artery	10	18	2	1	31
Mesentery	13	20	1	1	35
Retrocrura	13	16	2	1	32
Subdiaphragm	4	4	-	-	8
Common iliac	17	25	2	-	44
Internal iliac	9	14	1	-	24
External iliac	12	17	1	-	30
Inguinal	12	20	1	-	33
Total	136	226	15	7	384

cases; the retroperitoneal, abdominal, mesenteric, retrocrural, and subdiaphragmatic lymph nodes were not included in 2 cases; the internal iliac, external iliac, inguinal nodes were not included in 10 cases. Thus, the retroperitoneal, abdominal, mesenteric, retrocrural, and subdiaphragmatic nodes were included in only 51 cases, and the internal iliac, external iliac, inguinal nodes were included in only 59 cases. Table 3 shows the sites of involved lymph nodes. There were 5 cases with unilateral retrocrural adenopathy (right: 3, left: 2) and 11 cases with bilateral involvement; 2 cases with unilateral subdiaphragmatic adenopathy (left) and 2 cases with bilateral involvement.; 4 cases with unilateral common iliac adenopathy (right: 2, left: 2) and 21 cases with bilateral involvement; 5 cases with internal iliac adenopathy (right: 3, left: 2) and 9 cases with bilateral involvement; 8 cases with unilateral external iliac adenopathy (right: 6, left: 2) and 9 cases with bilateral involvement ; 8 cases with unilateral inguinal adenopathy (right: 5, left: 3) and 12 cases with bilateral involvement(Fig.1-6).

VAL: (2 cases)

In this group, the internal iliac, external iliac and inguinal lymph nodes were not included in 1 case. Involvement of the retrocrural lymph nodes was seen in 2 cases; the common iliac, internal iliac, external iliac and inguinal lymph nodes were all bilaterally involved in 1 case.

For IL and AL cases, the statistically significant difference in distribution only was shown in the external iliac lymph node involvement ($\chi^2=5.074, P=0.024$), and no significant differences were noted at the other sites. The *P* values for the retroperitoneal, abdominal, mesenteric, retrocrural, subdiaphragmatic, common iliac, internal iliac and inguinal nodes between the 2 types of lymphoma were 0.973, 0.807, 0.384, 0.123, 0.307, 0.158, 0.115, and 0.101, respectively.

DISCUSSION

In our study, the retroperitoneal lymph nodes were involved most commonly in IL and AL cases. Both superior and inferior renal hila involvement was greater than a single site (either superior renal hilum or inferior renal hilum) involvement. Our results were different

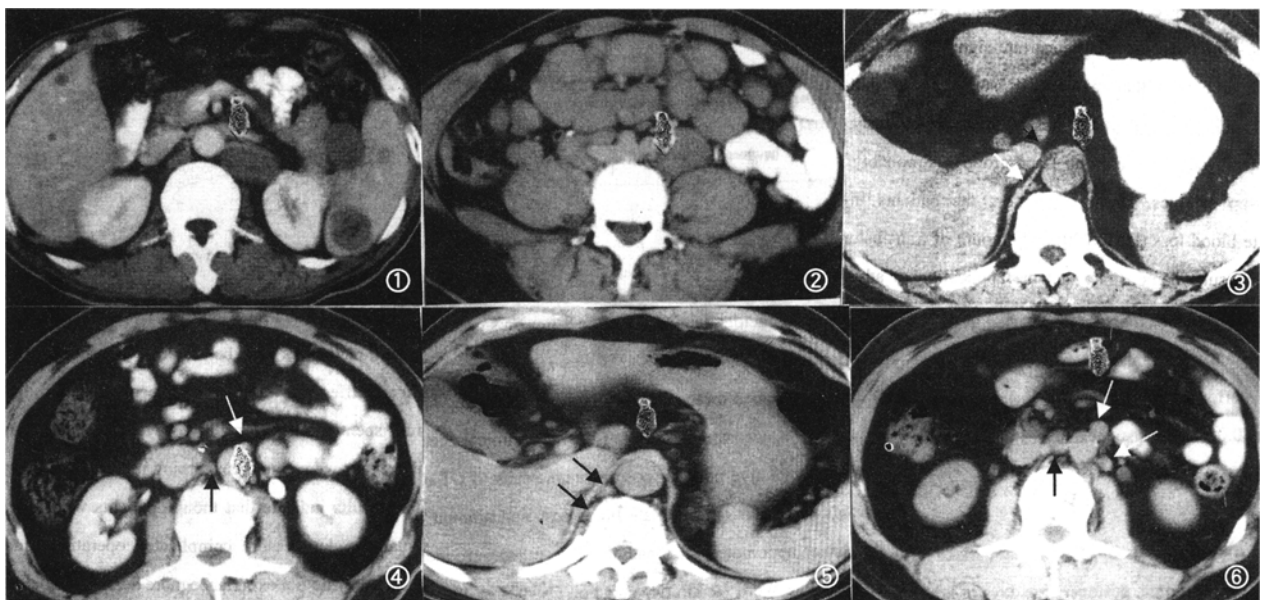


Fig.1. Aggressive NHL (mantle zone lymphoma). Previously untreated patients. Enhanced CT scan showed solitary lymph adenopathy in splenic hilum and retroperitoneum with homogeneous density, which is similar to that of muscle. CT value after enhancement increased by 20~31HU. Liver and spleen were simultaneously involved.

Fig.2. Indolent NHL (small lymphocytic type). Previously untreated patients. Enhanced CT scan showed that there were multiple solitary lymph nodes in the mesentery and retroperitoneum with homogeneous density similar to that of muscle.

Fig.3-6. Indolent NHL (small lymphocytic type). Lymph adenopathy (arrows) with the dimension less than 1 cm in right retrocrura and retroperitoneum (Fig.3,4). Twenty-one months later (5 months after chemotherapy), enlargement and increasing in number of the nodes in the same sites (Fig.5,6).

from that of Goffinet's study.^[9] Their prospective study for 197 cases of untreated NHL with laparotomy demonstrated that the para-aortic lymph nodes were involved in 48.9% (88/180 cases), which was remarkably lower than that of our study. Neumann^[10] reported that the para-aortic lymph nodes were most commonly invaded in NHL, which was different from the predominantly involved sites of both superior and inferior renal hila in our series.

The incidence of mesenteric lymph node involvement in IL and AL cases in our series was 37.1% (33/89), which was a little higher than that of Yang 's report (30%),^[11] and was obviously lower than that of Goffinet 's (51%).^[9] In NHL patients Jing^[12] reported that, lymph adenopathy merely involved the mesentery without accompanied retroperitoneal lymphadenopathy. In our series, only 3 follicular type cases (grade II, 1 case; grade III, 2 cases) had the involvement of only mesenteric lymph nodes, their incidence was much lower than that of the involvement of retroperitoneum without invading the mesentery (30/89).

Involvement of the splenic hilum nodes in cases of IL and AL was 14.6% (13/89), much lower than that reported by Goffinet et al.^[9] Nonetheless , their results were obtained through laparotomy and most of the lymph nodes involving the splenic hilum were small; there might be some false negative cases based on our study done only by CT scans.

The incidence of involvement of para-iliac nodes placed second (41.9% , 126/301 cases) , which was similar to that reported by Goffinet et al.^[9] (41%). The incidence of retrocrual node involvement was 32.6% , and to our knowledge, there have been no prior relevant reports.

The incidence of mesenteric, retrocrual, subdiaphragmatic, common iliac, internal iliac, and inguinal lymph node involvement in IL was higher than that in AL cases, while there was no statistically significant difference between the 2 group. Involvement of the external iliac nodes in IL were much more than that in AL (63.3% vs 42.7% , $P < 0.05$). This might be due to the long course of disease as well as more extensive involvement occurring in IL cases.

In conclusion, for Chinese NHL patients, retroperitoneal, iliac and mesenteric lymph nodes are

the 3 sites most commonly involved, and the retroperitoneal lymphadenopathy are predominantly located in the regions of both superior and inferior renal hila. These findings differ from that of Western countries, in which the mesentery was the area most commonly involved.

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