Differential diagnostic criteria of normal and abnormal as a result of tubercoulous process intrathoracic lymph nodes

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ABSTRACT

Comparative analysis of radiological patterns of normal and abnormal, as a result of tubercoulous process, intrathoracic lymph nodes using the approach of computer tomography showed criteria used to diagnose primary tuberculosis in children and adolescent: quantity, groups and sizes of visualized intrathoracic lymph nodes. The results of study of tuberculous changes in lymph nodes due to age parameters are provided.

Keywords: computed tomography, intrathoracic lymph nodes, tuberculosis of intrathoracic lymph nodes, children and adolescents.

Nowadays, one of the main problems of phtisiopediatry is lack of consensus on CT visualization of normal lymph nodes and the criteria of norm that would help to determine pathological changes in the nodes. Some authors believe that in connection with incorrect interpretation of enlarged lymph nodes computed tomography (CT) often aids the hyper diagnosis of tuberculosis (Y.V. Mikhailova, I.M. Son, E.I. Skachkova, S.N. Sterlikov, 2009) [8]. Level of hyper diagnosis of child tuberculosis, in some cases, can reach 70% (F.E. Gegeyeva, 2006) [3]. When diagnosing primary tuberculosis in children subjective criteria are frequently implemented. For example, when CT scanning of a child infected with tuberculous microbacteria (TMB) shows intrapulmonar nodes it is considered to be an evidence of local form, regardless of their size or age of the child. Although is is known that use of CT helps to visualize minimal intrathoracic lymph nodes (IPLN), both connected with tuberculosis and not. Both Russian and foreign authors have not come to one conclusion on this matter. According to Y.V. Lazareva (2002), intrathoracic lymphoadenopathy in tuberculosis can be divided into: severe lymphoadenopathy with lymph nodes size over 10mm or mass of nodes; minor adenopathy with lymph node size ranging 5-10mm; micro adenopathy withlymph node size less than 5mm [6].

B.I. Ishenko (2001) and A.A. Starshinova (2013) take 0.5cm as a relative value unit for lymph nodes [4,11]. Authors Y.V.Vaganov, L.G.Zemko (2002) consider mediastinal lymph nodes to bepathologically changed if they are over 8mm or smaller but in groups [2].H. Geldmacher, C. Taube(2002) recommend to view all the detected lymph nodes over 1cm as querulous [13]. Y.V. Matushkina (2008), W.H.Boom (1996), N.W. Schluger (1998), R.F.Yen (2008) do not exclude the possibility of tuberculous lesion in non-enlarged lymph nodes not detected by CT {7,12,14,15].

The problem of determining the age morphology of lymphatic system still carries important theoretical and practical meaning. The research on this matter has been conducted by L.I.Rassokhina-Volkova (1958-64), G.T.Krasovskiy (1963), I.P Parfenova (1960) et al [10,5,9]. They have determined that lobed nodes appear significantly more often during childhood, they are also more florid. Slightlymoreofthemoccurinfetusesandinfants. Most nodes of larger size appear in children of 2-11 years of age. With aging, the quantity and size of lymph nodes lessen, and each of remaining nodes has larger territory of flow. AccordingtoA.A. Akhmedzyanov (1976), people of mature age the capsule of lymph nodes is more closely attached to surrounding tissue [1]. Thus, currently there is still no consensus on the "norm" and "pathology" on size criterion of the lymph node.

Goal of research. To study criteria of differential diagnostics of normal (non-changed with pathological process) and tuberculosis affected intrathoracic lymph nodes using computed tomography.

MATERIALS AND METHODS OF RESEARCH

In order to differentiate abnormal due to tuberculous process lymph nodes from normal lymph nodes, two study groups were created:

Group 1 - 99 children with tuberculosis of intrathoracic lymph nodes (TITLN) in active phase of tuberculous process;

Group 2 (control group) - 105 healthy children and adolescent, non-infected with micro bacteria of tuberculosis.

All children from Group 1 were infected with tuberculous micro bacteria: 10 children (10.1%) had weakly positive (5-9mm) TB skin test with 2TU, 28 (28.3%) showed reaction of mild intensity (10-14mm), 21 (21.2%) - intensified, and 40 (40.4%) showed hyperergic results. From this group only 34 children received DST, 10 children had doubtful and negative results (29.4), one had mild reaction (2.9%), 5 children (14.7%) had severe reaction, 18 (53.0%) were hyperergic. In total 70 (70.75) children had contact with tuberculous patient.

All children from Group 2 also underwent TB skin test with 2TU. All 105 children had tuberculin-negative results from the day of birth up to the moment of CT scanning. 68 children (64.8%) underwent DST: results were also negative. 45 (42.9%) of children from this group frequently had catarrhal diseases of lungs: ARVI, catarrhal tonsillitis, acute bronchitis and pneumonia. On the moment of CT scanning there is no cases of acute or acute exacerbation of chronic inflammatory disease, all children were practically healthy.

All children were scanned with Siemens Somatom Emotion Duo CT scanner, with a slice of 3mm for children and 5mm for adolescent, and intervals of slices 2.5mm.

RESULTS

Given groups were comparatively evaluated on the localization, quantity and size of the intrathoracic lymph nodes.

Research showed that children with tuberculosis of intrathoracic lymph nodes (Group 1) had lesions of 1-6 anatomical groups of lymph nodes and more. Among 99 children with active form of tuberculosis of intrathoracic lymph nodes 40 (40.3%)had lesions of 1-2 groups of lymph nodes, i.e. there was occurrence of minor forms of tuberculosis of ITLN (fig.1).

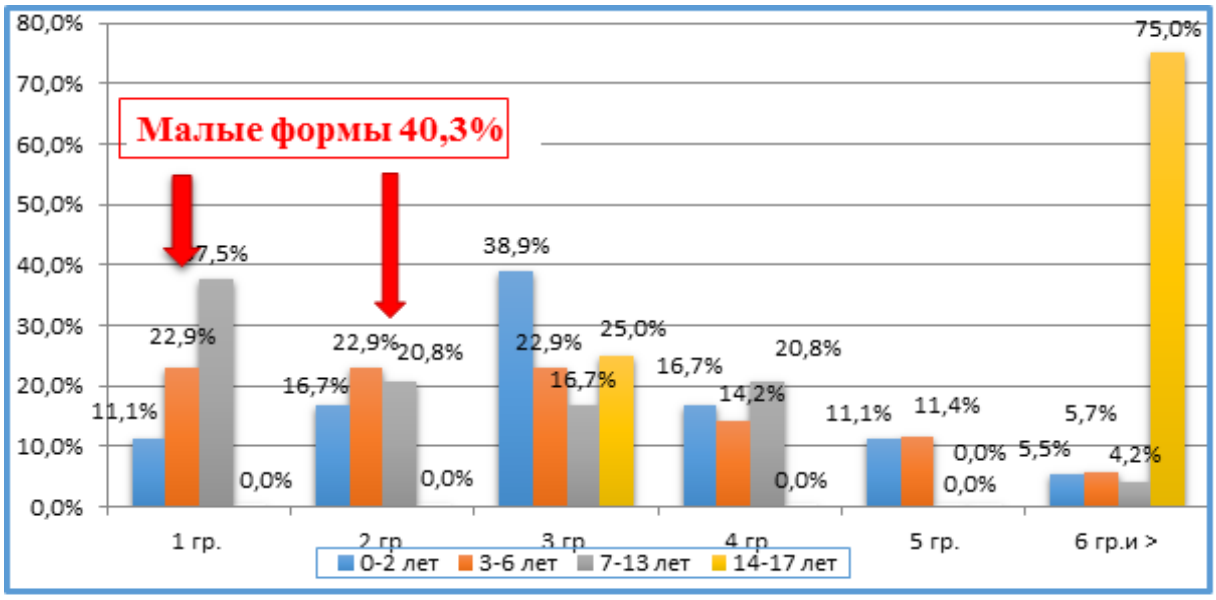

Figure 1. Prevalencerateoflesion of intrathoracic lymph nodes during TITLN.

In addition to the above, it was determined that prevalence of tuberculous lesion with a range of many groups of lymph nodes depends on age peculiarities (table 1).

Table1

Distribution of quantities of lymph nodes during TITLN depending on age of patients

Quantity of lymph node groups	0-2 y.o.(n=36)		3-6 y.o. (n=35)		7-13 y.o. (n=24)		14-17 y.o. (n=4)		Total	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%	Abs.	%
0	-	-	-	-	-	-	-	-	-	-
1	4	11,1	8	22,9	9	37,5	-	-	21	21,2
2	6	16,7	8	22,9	5	20,8	-	-	19	19,1
3	14*	38,9	8**	22,9	4***	16,7	1****	25	27	27,3
4	6*	16,7	5**	14,2	5***	20,8	-	-	16	16,2
5	4*	11,1	4**	11,4	-	-	-	-	8	8,1
6	2*	5,5	2**	5,7	1***	4,2	3****	75	8	8,1
Total	36	100	35	100	24	100	4	100	99	100

Note: lesion of 3 and more lymph node groups": * and *** p=0,036,** and **** p =0,022, *** and **** p=0,007.

lesion up to 2 lymph node groups: * and *** p=0,008, **** and ** p=0,022, **** and *** p=0,007.

Involvement in the specific tuberculous process of 3 and more groups of lymph nodes with their increased enlargement was more frequently indicated in young children (26 children among 36, 72.2%). Children of older age (pres-school and school age) showed lesion of up to 2 groups of lymph nodes (16 children among 35 - 45.8% and 14 of 24 children - 58.3% accordingly), i.e. more frequently there was indicated a minor form of bronchadenitis (45.8% and 27.8%, p=0,008; 45,8% и 58,3%, p = 0,000; 58,3% и 45,8%, p=0,05; 58,3% и 0%, p=0,022; 27,8% и 0%,

p=0,007). 100% of adolescents showed wide-spread primary tuberculous process with lesion of 3-6 and more groups of lymph nodes.

Most frequently tuberculosis affected bronchopulmonary (23.2% and 22.2%), bifurcational (14.7%) and retrocaval (14.7%) groups of lymph nodes (table 2).

Table2

Groups of affected lymph nodes during tuberculosis of intrathoracic lymph nodes in different age groups of children and adolescents

Groups of lymph nodes	0-2 y.o.		3-6 y.o.		7-13 y.o.		14-17 y.o.		Total	
	Абс	%	Абс	%	Абс	%	Абс	%	Абс.	%
Bronchopulmonaryright .	28	26,7	24	24,0	13	18,3	3	17,6	68*	23,2
Bronchopulmonary left	24	22,9	24	24,0	14	19,7	3	17,6	65*	22,2
Bifucational	17	16,2	11	11,0	13	18,3	2	11,8	43*	14,7
Retrocaval	15	14,3	14	14,0	10	14,1	4	23,6	43	14,7
Paravasal	6	5,7	13	13,0	6	8,4	3	17,6	28	9,6
Paratracheal	7	6,7	7	7,0	4	5,7	1	5,9	19	6,5
Para-aortic	5	4,7	3	3,0	5	7,1	1	5,9	14	4,8
Subcarinal.	2	1,9	3	3,0	3	4,2	-	-	8	2,7
Aortic window	-	-	-	-	3	4,2	-	-	3**	1,0
Perioesophageal	1	0,9	1	1,0	-	-	-	-	2**	0,6
Total:	105	100	100	100	71	100	17	100	293	100

Note: in comparison * and ** p<0,01

Enlargement of lymph nodes rarely was seen in perioesophageal group (0.6%) and aortal window (1.0%).

In current conditions infiltrative bronchadenitis was detected in majority of cases (79.7%) and tumor-like was seen less frequently (20.3%, p=0.000). Enlagement of lymph nodes of the hilu, led to its widening. The hilum's structure was disrupted, its contours became uneven, wavy, and there was indication of intensification and deformation of periapical picture due to thickening of interlobular interstitium in adjacent lung tissue.

In TITLN sizes of visible nodes varied from 0.5 to 1.6cm and more (M±m = 0,93±0,24). The analysis of correlation between size of tuberculous lymph nodes and age of the patient

showed lack of statistically significant differences of average cross size of lymph nodes in studies age groups.

Isolated tuberculous lesion of lymph nodes of the hilum without involvement into pathological process of mediastinal nodes was rarely detected (23.6%). Use of CT angiography allowed to clearly distinguish enlarged lymph nodes from large mediastinal and hilum vessels. At that, the radiopaque was accumulated in the capsule of infected lymph node, limiting thyroid necrotic masses inside the capsule.

Analysis of CT presentation of Group 2 showed that among 82.8% children and adolescents quantity of visible lymph nodes varied from 0 to 2, with no difference in age parameters (χ^2=13,045, p=0,788). At that, 22.9% children showed no lymph nodes. 17.2% of healthy children in CT scanning showed 3-6 groups of lymph nodes, and majority of lymph nodes was detected in adolescents (13.9%)

Frequency analysis of different localizations of lymph nodes in non-infected children showed that no matter the age, the most frequently detected groups are: retrocaval (27.6%), para-aortic (22.7%), paravasal (20.0%) (χ^2=7,041, p=0,989) (table 3).

Table3

Groups of lymph nodes in infected and non-infected children

Groups of lymph nodes	0-2 y.o.		3-6 y.o.		7-13 y.o.		14-17 y.o.		Total	
	Abs.	%	Abs	%	Abs	%	Abs	%	Abs.	%
Bronchopulmonaryright.	-	-	-	-	-	-	-	-	-	-
Bronchopulmonary left	-	-	-	-	-	-	-	-	-	-
Bifucational	3	10,0	7	14,3	3	10,7	6	15,7	19	13,1
Subcarinal.	3	10,0	2	4,1	1	3,6	4	10,5	10	6,9
Paravasal	6	20,0	9	18,3	5	17,9	9	23,8	29	20,0*
Paratracheal	1	3,3	4	8,2	3	10,7	3	7,9	11	7,6
Para-aortic	7	23,3	12	24,5	8	28,6	6	15,7	33	22,7*
Retrocaval	9	30,1	14	28,6	7	25,0	10	26,4	40	27,6*
Aortic window	1	3,3	1	2,0	1	3,5	0	0,0	3	2,1
Total:	30	100	49	100	28	100	38	100	145	100

Note:* χ^2=7,041, p=0,989

Lymph nodes in children and adolescents started showing from 0.3cm and their sizes were no more that 0.8cm. In one group no more than 2-3 lymph nodes were determined; they were not in conglomerates, homogenous structure, clear contours, smooth, perilymphatic fatty tissue unchanged.

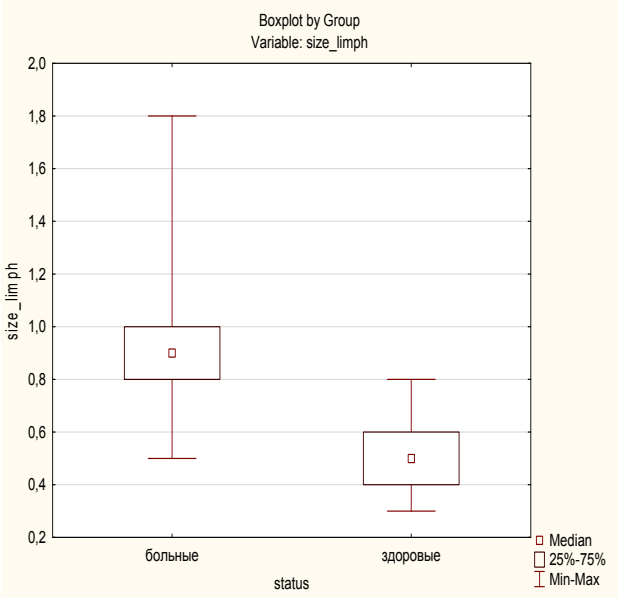

Figure 2. Comparative analysis of sizes of lymph nodes in infected and non-infected children

Thus, infected and non-infected children have significant differences in size of visible lymph nodes (p=0,000) (fig.2).

RESULTS

Comparative analysis of CT picture of normal (in non-infected with TMB) and abnormal, changed with tuberculous process lymph nodes showed existence of specific criteria, distinguishing given conditions in differential diagnostics. Quantity of visible groups of lymph nodes in non-infected children usually stays under 2, when during TITLN 3 or more groups are affected. Average cross size of lymph nodes in TITLN usually exceeds 0.90cm (M±m = 0,93±0,24), and non-infected children have lymph nodes with size of 0.50cm (M±m = 0,51±0,13). At that, upper line of norm of ITLN is 0.8cm. Frequency of occurrence of different groups of lymph nodes also varies: normally retrocaval, para-aortal and paravasal groups prevail, in TITLN bronchopulmonary, bifucational and retrocaval groups occur more frequently. Sizes of lymph nodes depend on age peculiarities.

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