SOME ASPECTS OF THYROID SYSTEM STATUS IN PERSONS EXPOSED TO THE CHERNOBYL ACCIDENT

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ABSTRACT

The thyroid system status estimation held in post-accidental period dynamics among 7868 children evacuated from the 30-km Chernobyl zone and resident now in Slavutich city (Cs-137 contaminated area), among contaminated regions permanent residents, among native kievites and evacuated from 30-km zone. The thyroid pathology incidence dependence on residence place during Chernobyl Accident and after that was revealed. The immune-inflammatory thyroid disorders are characteristic for 30-km zone migrants, goitre different forms - for the radionuclides contaminated territories residents. No thyroid function abnormalities frequency confidential increase was registered during the research activities run. The total serum cholesterol level application unavailability is revealed in Chernobyl accident survivors thyroid hormones metabolic effects estimation. Data concerning Chernobyl accident consequences cleaning up participants (CACCP) presented additionally.

INTRODUCTION

The thyroid gland and thyroid system in general posses the important place among nuclear facilities accidents. That is particular in case of Chernobyl nuclear power plant accident (CNPPA) [1].

Because of radiiodine high content in CNPPA fallout and iodine metabolism features the thyroid irradiation doses can exceed 10 - 20 Gy [2]. That unavoidably leads to thyroid pathology risk amplification [3]. Children are characteristic with higher thyroid irradiation doses compared to that in adults [4].

The radioecologic situation after the CNPPA in Ukraine is peculiar with extreme irregularity of present soil contamination level and radiiodine-produced thyroid irradiation doses in 1986. The differences in radionuclides spectrum content (including the variety of iodine radioactive isotopes) both with improper stable iodine profilaxys created the unpredictable situation concerning the possible pathology amount growth in survivors.

MATERIALS AND METHODS

The study of 9068 children and adolescents age 4 - 17 years old (0 - 10 years at the moment of accident) was held. 1st study group consisted from 1952 persons evacuated from town Pripyat in 1986, now resident in Slavutich city - Cs137 contaminated area); 2nd study group was presented with 2664 Chernigov province residents (mild radionuclide contamination with no iodine dietary abnormalities in pre-accidental
period). The IIIrd study group contained the 2440 Kiev province Ivankov region residents (moderate soil contamination with mild goitre endemy - environmental iodine insufficiency). The 812 children - Kiev city residents were involved (400 native kievites and 206 migrants from town Pripyat) as the IVth study group. The Vth study group was presented with Rivno province residents - 1200 persons (remote territories with the severe radioactive contamination). The 260 persons - CA CCP of 1986 - 1987 years period were examined as the comparison group with high absorbed thyroid and total irradiation doses.

The study program contained:
- complex clinical examination;
- thyroid ultrasonography (mobile echo camera "Aloka-260" during the field works or unit "Aloka SSD-500" in clinic;
- thyroid hormones assay with immunofluorescent method on DELFIA unit ("Wallac Co");
- radiation anamnesis reconstruction;
- total serum cholesterol and malonic dialdehyde assay [5] as the thyroid function metabolic marker (first one) and lipids peroxydation index (second one).

RESULTS AND DISCUSSION

The 1st study group was characteristic with only inhalation mode of radioiodine incorporation because of evacuation during few days after the accident and almost absence of local origin food products in diet. The further residence in contaminated location contributed the low radiation doses effection here.

The contaminated territories residents IIInd group was characteristic with long-term chronic radionuclides incorporation. The joint alimentary-inhalation mode of radionuclides incorporation was present.

The 1991 - 1995 years study results indicated that the amount of thyroid pathology increase with the age. The wave-like dynamics was surveyed from year-to-year. The average values consisted 1.6 - 5.0 %. The cases with goitre of IB degree were considered as the risk group. The mentioned quota consisted from 24.2 - 37.5 % during 1991 - 1995. At present no further thyroid pathology growth is registered. No clinical signes of thyroid function abnormalities were revealed. Some cases with neuro-emotional lability and termoregulatory abnormalitied were related to autonomous nervous system functional pathology.

The carried out hormonal studies revealed the hypothyroxinemia in 0.8 % of cases (1st study group) with TSH increase in 0.2 % of cases. On the background of clinical pattern absence that was qualified as the laboratory hypothyroidism.

The clinical cases of hypothyroidism absence is not corresponding to the expected [6].The present results may indicate the distinct peculiarities of exposed paediatric population in Ukraine (i.e. ethnic features, dietary peculiarities, unproper iodine prophylaxis etc.) with delayed onset of expected pathology in the future.

The thyroid ultrasonography revealed no confidential differences in thyroid volume and frequency of structural disorders between native kievites and persons evacuated from town Pripyat - present Kiev residents.

The thyroid gland status in both Kiev residents groups is presented in Table I. The study results among Rivno province residents indicated the high prevalence of thyroid cancer cases (both newly detected and already treated ones) - 0.7 % of cases, diffuse goitre - 0.4%, nodular goitre - 0.2 %, subacute thyroiditis - 0.4 %, chronic thyroiditis - 4.5 %, hypothyroidism - 0.5 %. The rather enough prevalence of
thyroid cancer and hypothyroidism prove the unfavourable significance of combination of radioiodine irradiation, contaminated zone residence and goitre endemy as the background.

In 86.2 % of Chernobyl 30-km zone residents the hypercholesterolemia was revealed. No correspondence to thyroid hormones serum content and clinical pattern was fixed. The sharp variability of parameter in native kievites is remarkable. The serum cholesterol level and malonic dialdehyde content directly correlated ($r=0.34$) in children age less than 7 years old at the moment of Chernobyl accident.

<table>
<thead>
<tr>
<th>Thyroid gland status</th>
<th>Chernobyl zone migrants</th>
<th>Native kievites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>No goitre</td>
<td>112</td>
<td>28</td>
</tr>
<tr>
<td>IA stage</td>
<td>102</td>
<td>25.5</td>
</tr>
<tr>
<td>IB stage</td>
<td>176</td>
<td>44.5</td>
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<tr>
<td>Diffuse goitre II stage</td>
<td>2</td>
<td>0.5</td>
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<tr>
<td>Nodular goitre</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>Chronic thyroiditis</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Subacute thyroiditis</td>
<td>10</td>
<td>2.5</td>
</tr>
</tbody>
</table>

In the comparison study group of CACCP of "iodine period" with the most complicated mode of thyroid and total body exposure to radiation during the all the survey period the progredient realization of the non-stochastic effects was registered. Those were presented with "euthyroid" hyperthyroxinemia, chronic thyroiditis with autoimmune component and hypothyroidism resulting outcome. The research data are proved with epidemiological statistics.

**CONCLUSIONS**

1. Thyroid pathology in children - Chernobyl accident survivors is registered with different frequency depending on place residence during accident and further period.

2. The thyroid cancer and hypothyroidism are more frequently present in persons with thyroid irradiation, resident on radioactively contaminated territories with environmental iodine deficiency.

3. The immune-inflammatory disorders are more characteristic for Chernobyl 30-km zone migrants; the certain forms of goitre are proprial to the contaminated territories residents.

4. No confidential difference revealed between native kievites and town Pripyat migrants resident now in Kiev (i.e. kievites are also affected after the CNPPPA and resident in unfavourable environment).

5. The revealed morphological changes in thyroid gland tissue in 34 % of all cases are to be considered as the premorbid status with high risk of pathology outcome.

6. The serum cholesterol level in case of ionising irradiation is not corresponding to thyroid status and not available for biochemical estimations application.
REFERENCES


