SPECIFIC FEATURES OF OCCUPATIONAL FLUOROSIS

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SUMMARY: Analysis of X-ray images of 397 patients suffering from fluorosis showed that 94.0% of cases exhibit degenerative-dystrophic impairments of the lumbar spine; 65.0% of cases – calcification of the anterior longitudinal ligament; and 91.0% of cases – impairments in the form of epicondylitis, periarthritis, and deforming arthrosis. Impairment of the musculoskeletal system exhibited systemic, multiple, and symmetrical nature.

Keywords: fluorosis, fluorine compounds, X-ray examination.

The issue of the prevalence of chronic fluorine intoxication (CFI) arose most acutely in the period from 1968 to 1969 when 581 cases of this disease were registered in the course of a medical examination of 8,085 workers at seven aluminum manufacturing plants [2]. From 40 to 100 cases of occupational fluorosis are registered in Russia each year. Currently, CFI is still associated only with fluorosis of teeth and bones, always exhibited as osteosclerosis and, to a lesser extent, as calcification of connection sites of ligaments and tendons to bones, periosteal reactions, and metabolic-dystrophic impairment of large joints. Under this interpretation, CFI pathogenicity of fluorine compounds is reduced to their osteopathogenicity, specific mechanisms of which are described in detail in literature reviews [1, 3-5, 10]. Production modernization as well as technological and hygienic measures have led to the improvement of working conditions at plants which use fluorine compounds (facilities involved in the production of cryolite, marble, superphosphate, and aluminum), resulting in lower concentrations of fluorine in workplace air. As a result, occurrence of severe cases of fluorosis has decreased significantly. However, there has been a significant increase in the prevalence of an involutional process occurring within the osseous tissue in the form of calcification of ligaments and tendons and deformation of the joints and spine [7].

Materials and methods. In order to identify the specific features of the CFI course, we analyzed case histories of 397 patients suffering from fluorosis who have been under dynamic observation by specialists at the clinic for occupational diseases for more than 20 years. 63.6% of the patients had the first stage of the disease, 17.8% the second stage, and 3.7% the third stage. To identify the characteristic features of the X-ray patterns caused by various impact intensity levels of fluorine compounds on the body, the investigation was conducted by the case-control method. The study subjects were in two groups of workers, 15 people each, employed in the production of aluminum at two different plants using the same technology; the average age was 44.3 years and the average length of service was 18.8 years. The mean fluorine level in the urine of workers at the first plant was significantly higher ($p < 0.05$) ($2.3 ± 0.430$ mg/L) compared to the fluorine level in the urine of the tested individuals in the control group ($1.2 ± 0.308$ mg/L).

Results. Analysis of the X-ray patterns of the clinic patients showed that in the 1st stage of the disease the lumbar spine is affected in 94.0% of cases. The X-ray images showed an increase in density with coarsening of the osseous tissue structure of the vertebrae. Calcification of the anterior longitudinal ligament was seen in 65.0% of cases. 33.3 % of patients exhibited characteristic changes of the
The share of unilateral and bilateral impairments of joints in workers with different fluorine exposure levels, %

<table>
<thead>
<tr>
<th>Nosological form</th>
<th>Workers with high exposure to fluorine</th>
<th>Operating control group</th>
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<tbody>
<tr>
<td></td>
<td>Unilateral impairment</td>
<td>Bilateral impairment</td>
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<tr>
<td>Osteoarthritis of the wrist</td>
<td>33.3</td>
<td>66.7</td>
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<tr>
<td>Epicondylitis of the humerus</td>
<td>25.0</td>
<td>75.0</td>
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<td>Humeroscapular periarthrosis</td>
<td>42.9</td>
<td>57.1</td>
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<tr>
<td>Myofasciitis of the forearms</td>
<td>14.3</td>
<td>85.7</td>
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<tr>
<td>Arthrosis of the knee</td>
<td>25.0</td>
<td>75.0</td>
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Conclusions. 1. The principal radiographic morphology symptoms of developing fluorosis include: changes in the bone structure and induration of the osseous tissue, moderate hyperostosis, narrowing of the medullary space, and calcification of the ligamentous apparatus. 2. The earliest changes associated with occupational fluorosis are structural changes in the spongy tissue that occur due to thickening and induration of bone trabeculae. 3. Pathology of the musculoskeletal system in the form of articular and para-articular impairments is the result of the impact of fluorine compounds on the periosteum and articular cartilage. 4. Long after termination of exposure to fluorine, radiographic symptoms of osteosclerosis of the vertebral bodies of the lumbar spine and of the cylindrical bones may in some cases be reduced, although complete restoration of normal bone structure was not found in any patients.

REFERENCES


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