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Skeletal Fluorosis due to Inhalant Abuse

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Introduction: Skeletal fluorosis (SF) is a rare toxic osteopathy characterized by massive bone fixation of fluoride. It is prevalent in India, China, and Africa due to fluoride water contamination, high consumption of brick tea, or even fluoride air pollution in industrialized areas.

In the United States, it does not constitute a public health issue; however, it has been found recently in individuals who inhale high amounts of recreational fluoride. The mechanism of fluoride toxicity on the bone is attributed to its anabolic effect, and patients usually present with diffuse and chronic bone pain, non-vertebral fractures, and hyperparathyroidism.

Case: We present the case of a 39-year-old woman, who presented with bone pain and joint stiffness leading to impaired gait. She was previously seen by neurology, rheumatology, and oncology due to concern for neuropathy, rheumatoid arthritis, or possible occult malignancy but was referred after an inconclusive workup.

Her past medical history was significant for a motor vehicle accident resulting in chronic back pain. She began using painkillers, but eventually, she turned to inhalants to help with pain management and depressive symptoms. Her inhalant of choice was keyboard cleaner. Slowly, she began noticing diffuse bone pain, muscle weakness, and difficulty walking that required her to use crutches. She continued to abuse inhalants 2-4 cans per day for about 5 years until March 2021. Physical exam was relevant formultiple bony prominences bilaterally on the elbows and thoracic spine. She also had a diminished range of motion of her 4 limbs, being unable to fully extend arms or legs. Lab evaluation showed elevated alkaline phosphatase 971, normal AST/ALT, vitamin-D 52, normal serum calcium and PTH, elevated random urine fluoride 23 mg/L (<3.2), elevated osteocalcin 292ng/ml (<32), and elevated N-telopeptide 2283 BCE/mmol cr (<64). Upper extremity x-rays showed evidence of diffuse mature periosteal reaction involving the proximal humerus, radius, ulna, and metacarpals and prominent medial and lateral epicondylar enthesopathy consistent with fluorosis.

Discussion: Skeletal fluorosis should be suspected in patients at risk for fluoride inhalation. Occupational exposure including huffing was key in this case. Diagnosis was confirmed by the detection of excess fluoride in the blood and urine.

Currently, the only accepted treatment is to stop further ingestion or inhalation of fluoride. The half-life of retained fluoride in the bone is about 7 years. Unfortunately, there is no antidote for SF. One theoretical therapy is teriparatide, which might accelerate bone turnover and release skeletal fluoride.

Further research is needed to identify more treatment options for patients diagnosed with this condition as the substance abuse crisis worsens in many developed countries. This case also emphasizes the importance of a thorough history prior to undertaking costly, time-consuming medical workups.

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