

Fluorosis: An Uncommon Cause of Quadriparesis

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Abstract

Fluorine is a double edged sword as its higher levels are linked with dental/skeletal fluorosis while its deficiency is associated with dental caries.¹ Skeletal fluorosis may remain asymptomatic or may present with myeloradiculopathy secondary to cord compression and nerve root involvement.

Neurological complication including quadriparesis is a rare complication of endemic fluorosis. Since the changes of dental and skeletal fluorosis are irreversible, prevention is the mainstay of controlling the disease.

Key Words: Fluorosis, skeletal fluorosis, quadriparesis

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INTRODUCTION

Fluorine, classified as one of the micro-nutrients for the human being, is beneficial for the growth of enamel. It is a double edged sword as its higher levels are linked with dental/skeletal fluorosis while its deficiency is associated with dental caries.¹

Skeletal fluorosis may manifest as osteosclerosis/ossification of ligaments detected incidentally and sometimes in advance stages myeloradiculopathy secondary to cord compression, and nerve root involvement may occur leading to severe crippling deformities.²

A case of quadriparesis due to fluorosis related compressive myelopathy is being described here.

CASE REPORT

A 65 years old male, a resident of a village in the eastern part of Rajasthan came to medical OPD complaining of pain in the neck as well as the lower back region, weakness in all four limbs leading to

inability to stand up with the loss of grip of both hands for the last three months. He also had decreased sensations in the area below his neck with increasing severity towards lower limbs with numbness below the umbilicus and urinary retention for last five days.

The patient was apparently asymptomatic six months back, then while doing his routine household activities, he developed weakness in left lower limb which he perceived as difficulty in getting up from sitting position and this progressed to involve right lower limb, right upper limb and left upper limb over the period of 5-6 months. Symptoms were insidious in onset and gradually progressed over six months. The patient also mentioned about the frequent urge for micturition over this period. Two days before admission, while walking patient had a trivial fall and following that there was an increase in the weakness of all four limbs such that patient became confined to bed. Over a period of 4 hours, he realized that he was unable to pass urine although he could feel the sensation. He also had back pain for last 4-5 months. There was no history of loss of consciousness, seizure, visual defects, double vision, difficulty in swallowing, facial deviation, difficulty in hearing and speech, weight loss, decreased appetite, recent vaccination, animal bite and any radiation therapy in the past. There was no history

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suggestive of diabetes mellitus, hypertension, and anti-tubercular treatment.

His vitals were-pulse 108/minute, regular, blood pressure 114/76 mm of Hg, temperature 102F, respiratory rate 22/minute with thoracoabdominal respiration and oxygen saturation was 98% at room air. There was no pallor, jaundice, cyanosis, clubbing, lymphadenopathy, pedal oedema. The systemic examination of his cardiovascular, respiratory, and gastrointestinal system was normal. On oral examination, teeth had white chalky deposits with brownish discoloration. Mottling of enamel and irregular surface of teeth were present (Figure 1).



Figure 1. Teeth with white chalky deposits, brownish discoloration, mottling of enamel and irregular surface

On central nervous system examination; he was conscious, oriented, had normal higher mental functions and cranial nerves. Generalized wasting of muscles of limbs with marked wasting and atrophy of hands muscles was found. He had the power of 3/5 in upper limbs and 2/5 in lower limbs. DTRs were also brisk in all four limbs. Plantar response was extensor bilaterally, and both abdominal and cremasteric reflexes were absent. The sensory examination revealed complete loss of pain and temperature with absent touch, pressure, fine touch, vibration till T10 spinal segment and after that graded sensory loss up to C5 dermatome bilateral symmetrically. The joint position was impaired in all four limbs. Gait and cerebellar signs could not be assessed. Restricted movement of the neck in all directions due to limited movement of the cervical spine was found. Meningeal signs were absent. No para vertebral swelling or bed sores were present.

He was also unable to perform forward flexion of the spine (coin test), chin to chest test, hand on the occiput test (UNICEF clinical tests).

Blood investigations including complete blood count, renal function tests, liver function tests, fasting and post-prandial blood sugar, erythrocyte sedimentation rate, C-reactive protein, serum calcium, serum magnesium, serum phosphorus

levels were within normal limit. Antinuclear antibodies and rheumatoid factor were also negative.

Skiagram chest showed a generalized increase in bone density and skiagram both bone forearm revealed interosseous membrane calcification (Figure 2).



Figure 2. Skiagram both bone forearm showing interosseous membrane calcification (arrow)

MRI spine showed generalized reduced, altered signal intensity in all sequences (due to osteoblastic activity), diffuse vertebral sclerosis with ossified posterior longitudinal ligament resulting in cervical canal stenosis with cord compression over C4-5, C5-6 and D5-6 and exiting nerve root compression opposite C4-5, C5-6, C7-D1, D5-6, D6-7 (Figure 3).



Figure 3. MRI Spine showing diffuse vertebral sclerosis with ossified posterior longitudinal ligament

Figure 3. MRI Spine showing diffuse vertebral sclerosis with ossified posterior longitudinal ligament.

From the clinical examination, MRI, and X-ray findings, characteristic dental mottling and residence in endemic fluorosis region, a diagnosis of endemic skeletal fluorosis causing compressive cervical myelopathy leading to quadriparesis. The patient was shifted to Department of Neurosurgery and underwent surgery and he improved symptomatically.

DISCUSSION

Fluorine is one of the micronutrients for human being which is beneficial for the growth of enamel. It is a double edged sword as its higher levels are linked with toxicity while its deficiency is associated with dental caries.¹

Ground water is the main source of fluoride. The permissible upper limit of fluoride concentration in drinking water is 1.5 mg/L according to World Health Organization.³ In India, the upper limit has been laid down to 1.0 mg/L.⁴ In regions where the water content of fluoride is above the permissible level, chronic fluoride intoxication leads to endemic fluorosis. In India, endemic fluorosis affected states include Rajasthan, Gujarat, UP, Bihar, Maharashtra, Haryana, AP, Punjab, Tamil Nadu, and Kerala.²

Endemic fluorosis has many adverse effects on teeth, bone and organs which range from mild dental fluorosis to crippling skeletal fluorosis and severity depend up on duration and amount of fluoride exposure.¹⁻²

Dental fluorosis most commonly manifests as mottling of the enamel. Initially, white chalky patches appear on teeth, later on, brownish discoloration of teeth occurs which progress to pitting of enamel surface and chipping off the edges.⁵

Bones are largely composed of calcium compounds mainly calcium hydroxyapatite. The reaction of calcium and fluoride ions forms an insoluble salt, calcium fluoride (CaF₂) which is deposited in bone matrix leading to increased density but decreased strength in bones. The resulting fragile bones have low tensile strength, and the skeletal changes are termed 'Skeletal fluorosis'.⁶

The duration of development of skeletal fluorosis ranges from 6 months to 5 years which depends up on level of fluoride exposure.⁷⁻⁸

Skeletal fluorosis may remain asymptomatic as osteosclerosis/ossification of ligaments detected incidentally or may manifest as increased frequency of fractures, impaired joint mobility, sometimes in advance stages (3-10% of cases) myeloradiculopathy

secondary to cord compression and nerve root involvement may occur leading to severe crippling deformities. Quadriparesis is relatively uncommon.^{2,9}

In our case, the patient was residing in endemic fluorosis area and had features of dental and skeletal fluorosis. The treatment of dental fluorosis includes bleaching technique and abrasion procedures (i.e. laser assisted bleaching, abrasive pastes) and dental restorations. Though there are no established treatments for skeletal fluorosis, surgery should be aimed at restoration of function as much as possible.

Since the changes of dental and skeletal fluorosis are irreversible, prevention is the mainstay of controlling the disease. The preventive measures include alternative water sources, removal of excess fluoride from water via using Lime and Alum, improving the nutritional status of the population with higher calcium intake which reduces the ill effects of Fluoride salts.

CONCLUSION

Fluorosis is an endemic disease in India including Rajasthan which commonly manifests as dental fluorosis. Neurological complication including quadriparesis is a rare complication of endemic fluorosis. Since the changes of dental and skeletal fluorosis are irreversible, prevention is the mainstay of controlling the disease.

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