Case Report

Successful treatment of arsenic-induced lung malignancy: a case report

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Abstract

Environmental arsenicosis is a serious public health problem in parts of Eastern India. Chronic arsenicosis is known to cause malignancy of various organs. We here report a case of simultaneous lung and skin squamous cell cancer in a 49-year-old male subject. His regular tube well drinking water was found to contain high levels of arsenic (0.125 mg/L), and his hair and nail samples also tested positive for arsenic. He was treated with chemotherapy (gemcitabine/carboplatin), followed by radiotherapy. He responded to the treatment with complete radiological remission. This case highlights a serious public health concern for arsenic affected parts of India.

KEY WORDS: Arsenic, lung cancer, squamous cell cancer, gemcitabine

Introduction

Arsenic contamination of ground water is a major public health problem in eastern part of India, especially West Bengal.[1] Numerous people, predominantly in rural areas, are affected by this environmental poison. Although initially detected as a disease of the skin, chronic arsenicosis affects almost all systems of the body.[2] A potentially fatal complication of chronic arsenicosis is malignancy. The organ highest affected by arsenic-induced malignancy is the skin.[3] But, other organs such as lung, liver, or urinary bladder are also affected by malignancy. Sometimes, more than one organ may be simultaneously affected. We here report a case of squamous cell carcinoma of both lung and skin in environmental arsenicosis. This was successfully treated with chemoradiotherapy.

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Case Report

A 49-year-old male from an arsenic affected district of West Bengal presented to the medicine clinic with progressive dyspnea for 6 months and cough, hemoptysis, and hoarseness of voice for 4 months. Further examination also revealed pain and heaviness on the left side of the chest. He worked as a farmer and had no tobacco addiction. He had never been tested for chronic arsenicosis. General examination revealed absent breath sounds over the left thorax along with left-shifted trachea. Incidentally, an ulceroproliferative growth was also found over his right sole [Figure 1].

Initial imaging of the thorax revealed a huge mass in the left side with complete collapse of the left lung [Figure 2]. There was mediastinal lymphadenopathy and erosion of three ribs on that side. Bronchoscopic biopsy proved the mass to be a squamous cell carcinoma. A biopsy from the right sole lesion was also found to be squamous cell carcinoma. Among other investigations, hemoglobin concentration was 8 g/dL (N: 11–14); arsenic level in his hair was 1.48 μg/g (N: 0.2–0.5), and nail 1.81 μg/g (N < 0.5). A sample of the tube well drinking water from his village was also tested in the reference laboratory of Kolkata. Arsenic level in the water came as 0.125 mg/L (safe limit: 0.01 mg/L).

After discussion of the case in a multidisciplinary meeting, the patient was planned for chemotherapy initially. His regimen

Figure 1: Right heel of the patient showing the ulceroproliferative growth.

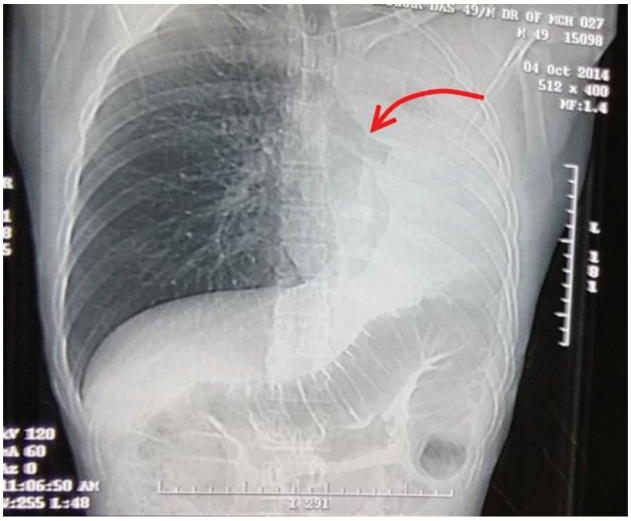

Figure 2: Initial chest X-ray of the patient showing the mass in left thorax with collapse of left lung and grossly shifted trachea (red arrow).

was gemcitabine (1.4 g) and carboplatin (450 mg) on day 1, followed by only gemcitabine on day 8. Six such 21-day cycles were given. After 6 months, repeat imaging of thorax showed [Figure 3] marked improvement in the lung mass with only a small residual mass in left lung apex. For this, local external beam radiation therapy was given using a Theratron 780-C Cobalt-60 machine after CT-based planning at 60Gray in

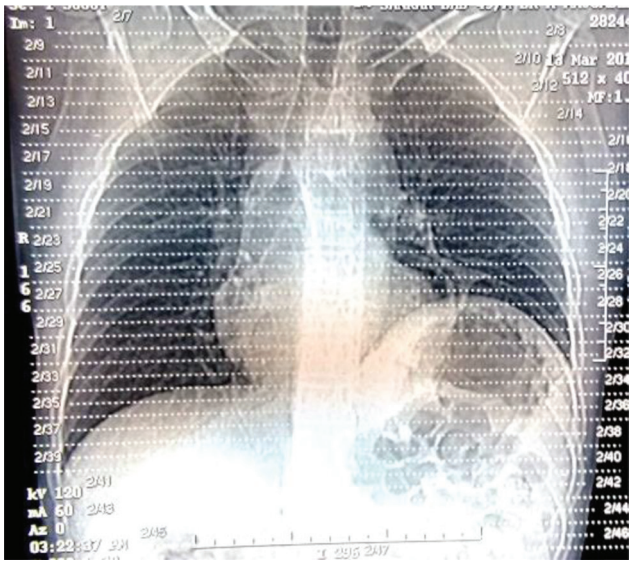

Figure 3: Posttreatment chest X-ray of the patient showing disappearance of the mass and reexpansion of the left lung.

30 fractions. Except for significant anemia requiring blood transfusion, there was no other remarkable adverse effect during the entire treatment. At 1 year following start of therapy, the patient revealed marked improvement in symptoms. He could resume his farming activity. The skin lesion in the right sole had also disappeared following the chemotherapy.

The patient is now under regular follow-up in the oncology clinic. He had not had any new lesions anywhere in the body. He had changed his residence to a safer low-arsenic zone.

Discussion

Arsenic toxicity is known to cause malignancies in different organs.[4] Skin cancer is the commonest cancer in chronic arsenicosis, but as far as mortality is concerned, lung cancer is the most important.[4] Lung cancer is associated with arsenic concentration in drinking water>100 μg/L.[4] In our patient, the sample of drinking water had 125 μg/L of arsenic. Cancer after arsenic exposure occurs after a long latent period.[5] In one landmark study from Chile, the risks for lung cancer after documented arsenic exposure increased significantly after 20–30 years.[5] However, in cases such as ours, where the exact duration and level of environmental arsenic exposure is not known, it is difficult to establish the duration of latent period.

Lung malignancy owing to arsenic exposure is predominantly of squamous cell variety, as in our case.[6] The exact pathway of carcinogenesis after arsenic exposure is still only partly known. It is hypothesized that methylation of inorganic arsenic leads to activation of the carcinogenic potential by affecting gene transcription and other epigenetic mechanisms.[7] Arsenic also leads to formation of reactive oxygen species. Recently, arsenic compounds have also been found to modulate histone proteins in the body and alter microRNA expression.[7]

Arsenic-induced malignancy may involve multiple sites such as lungs, skin, and bladder.[8] Thus, if a patient is diagnosed to exhibit arsenic-induced lung cancer, then other potential sites should still be searched. In our patient, besides the lung malignancy, dermatological cancer was also present.

The treatment of cancers after arsenic exposure is similar to general malignancy treatment protocol. In our patient, we used chemotherapy, followed by radiotherapy for the lung malignancy, which led to complete remission. In a case report from China, arsenic-induced lung malignancy was also reported to respond to chemotherapy with cisplatin and irinotecan.[9] Another case report from India documented a patient with chronic arsenic exposure who presented with both squamous cell carcinoma and adenocarcinoma simultaneously in the lungs. The patient also responded to cisplatin and etoposide therapy.[10] Treatment of the lung cancer should be based on the staging and grading of the tumor as in other cases.

Conclusion

Malignancy is a potentially fatal complication of chronic arsenic exposure. Treatment of the malignancy is done according to standard guidelines, and early aggressive therapy is often rewarding. However, removal of the source of chronic arsenic exposure is also an important part of overall treatment.

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