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Chronic cadmium intoxication caused by a dental prosthesis

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Summary. We present a case of chronic cadmium intoxication caused by a gold dental prosthesis. The first symptoms of the disease appeared 2 years after insertion and gradually intensified over the next 3 years. Analysis of blood and urine samples, as well as parts of the prosthesis, revealed an excessive concentration of cadmium. The prosthesis was removed and the concentration of cadmium gradually returned to normal, with an amelioration of symptoms. This case illustrates the importance of investigating the possibility of intoxication with a heavy metal when symptoms of chronic illness accompany the presence of a prosthesis.

Key word: Cadmium intoxication, by a dental prosthesis

Zusammenfassung. In dieser Abhandlung wurde der Fall einer chronischen Kadmiumvergiftung dargeboten, wobei das Kadmium aus einer aus ungeeignetem Material hergestellten Zahnprothese entstammte. Die Krankheitserscheinungen wurden während des Prothesentragens erst nach ungefähr zwei Jahren sichtbar und verstärkten sich trotz des Behandlungsversuches. Die Analyse von Blut, Urin und Teile der Prothese zeigte eine sehr hohe Konzentration von Kadmium. Nach der Entfernung der Zahnprothese sind die Symptome zurückgegangen und die Kadmiumkonzentration im Blut hat sich im Zeitraum von zwölf Wochen normalisiert.

Schlüsselwort: Kadmium, Intoxication durch Zahnprothesen

Introduction

The recognition of metal intoxication is facilitated if the possible source is known; in this respect a scrupulous analysis of the case history is indispensable. We present a case that was difficult to diagnose due to the unusual source of intoxication, which proved to be a gold dental prosthesis.

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Case history

A female patient aged 52 years was admitted to our Department of Forensic Medicine for toxicologic examination. Her symptoms upon presentation are listed in Table 1. The illness had had a progressive course over the last 3 years in spite of her numerous attempts to obtain medical aid. She had also undergone lengthy courses of treatment at health spas, apparently for a disease of the digestive system. Routine laboratory examinations did not reveal any changes other than a moderate normochromic anemia. Investigations for a possible infectious agent were negative. No previous history of degenerative disease was found, nor were there any genetic disorders in her family. Her living and working conditions were good. The possibility of professional or environmental intoxication was excluded.

Upon questioning we learned that 5 years earlier a gold dental prosthesis had been inserted by a private dentist. Taking this as a possible clue, we decided to search for intoxication by a metal normally present in the material from which the prosthesis was made.

Methods

Blood and urine samples were collected from the patient and analysed by atomic absorption spectrometry using an instrument equipped with a graphite cuvette (Carl Zeiss, GDR). Samples were dissolved in concentrated nitric acid prior to the assay. Specimens from various parts of the prosthesis were obtained and similarly analysed. The potential generated by the prosthesis was also measured using a microvoltmeter with platinum electrodes. Measurements on blood and urine samples were repeated at regular intervals after removal of the prosthesis.

Results

Our analysis revealed a strikingly elevated concentration of cadmium in the blood and urine of the patient. The mean (from five measurements) concentration in the blood was 210 μg/l, which is approximately 20 times the normal upper limit of 10 μg/l [1]. The mean urine concentration was 125 μg/l, also substantially high. The cadmium content in the prosthesis was excessive (2.98% by weight in the bridge, 0.065% in the crown, compared with 0.018% for genuine dental

Table 1. Major symptoms appearing during the course of illness of the patient

1. Gastrointestinal disturbances with hemorrhagic diarrhea
2. Chronic inflammation of the anus
3. Recurrent nephritis
4. Chronic gingivitis with purulent changes
5. Chronic atrophic pharyngitis
6. Pruritus and pseudo-urticaria
7. Ostalgia
8. Dyspnea
9. Marked general weakness

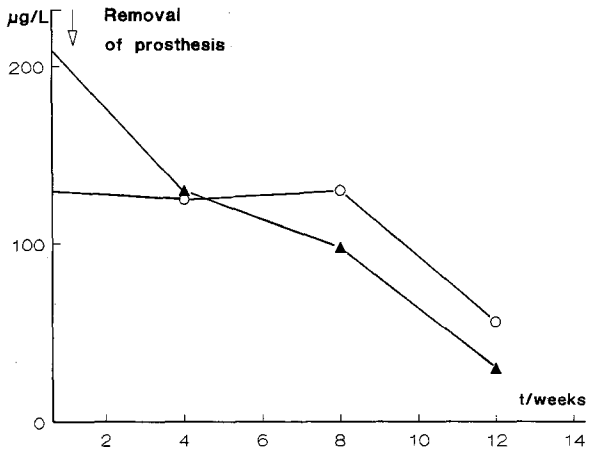

Fig. 1. Mean concentrations of cadmium in blood (▲—▲) and urine (○—○) in the course of observation of our patient

gold). The prosthesis generated a high potential of 320–350 mV, as against the normal value of less than 50 mV for dental gold. The levels of other metals analysed for comparative purposes (silver, copper, lead, tin, strontium and aluminium) were within normal limits.

When the prosthesis was removed the concentration of cadmium in the blood and urine returned to normal over the next 12 weeks (Fig. 1). This was accompanied by amelioration of the symptoms and restoration of normal health. The prolonged course of the normalization of cadmium concentration is consistent with the low elimination rate for this metal [2].

Discussion

The results obtained in this study allow us to conclude that the symptoms in our patient resulted from chronic cadmium intoxication, the source being a dental prosthesis made from an inappropriate material. This conclusion is supported by the restoration of health after removal of the prosthesis.

The amount of cadmium found in this patient is interesting for at least two reasons: firstly, the possibility of an implanted prosthesis being a source of intoxication is often overlooked. In this context one should also remember that the material used to manufacture the prosthesis might not be genuine. Secondly, the amount of cadmium released from the prosthesis is impressive and could have been fatal. That this was not so might be explained by a chronic course of intoxication, allowing the organism to adapt to a slowly rising concentration. The influence of spa treatment which favors heavy metal elimination should also be considered [3].

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