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Review Article

DENTURE ADHESIVES: A REVIEW

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ABSTRACT

Denture adhesives also known as adherents or fixatives, entered dentistry at the end of the 18th century. The first patent associated with adhesives was announced in 1913, and succeeded in the 1920s and 1930s. Research found that by using denture adhesives, the retention of a full prosthesis is enhanced. Products of denture adhesives can increase the patient's satisfaction, comfort, fulfilment and function with dentures. The fact that poor fitting dentures are usually kept in place with a great amount of adhesive material has unfortunately driven many dentists to presume a relationship between denture adhesive and severe alveolar ridge resorption. Denture wearers who overuse denture adhesives may inadvertently expose themselves to high levels of zinc over time, zinc builds up in the body, leading to copper deficiency, nerve damage, and denture cream induced neuropathy. The purpose of this article is to review the recent literature that documents the serious adverse systemic effects of prolonged, excessive zinc ingestion from the overuse of denture adhesives.

INTRODUCTION

Denture adhesives have long been recognized by denture wearers as a useful adjunct to denture retention, stability and function. Early fixatives were formulated from vegetable gums such as acacia, tragacanth that adsorbs water to form a mucilaginous layer between the denture bearing tissue and denture base. The early adhesives were not very satisfactory because they were highly soluble in water and washed out readily from beneath the denture.[1]

The composition of denture adhesives continues to change as the manufacturers try to improve the efficacy of then-products. In 1970's calcium salts were added and In 1980's the effectiveness of denture adhesives was improved by adding zinc to the previous formulations.[2] Active ingredients in current formulations can include combined polymethyl vinyl ether-maleic anhydride (PVM-MA) zinc and calcium salts with carboxymethylcellulose.[3]

Some marketed denture adhesive creams, including certain Fixodent and Poll-Grip formulations, contain zinc at levels of about 17 to 34 mg/g.[4] The amount of zinc added to denture adhesives exposed habitual denture cream users to levels of zinc that were significantly higher than the -TJSDA recommended daily allowance. Chronic, excessive ingestion of zinc can result in copper deficiency, which is an established and increasingly recognized cause of neurologic disease.

The purpose of this article is to review the recent literature that documents the serious adverse systemic effects from the overuse of denture adhesives.

Review

The U.S. Food and Drug Administration (PDA) received reports of adverse systemic effects from the overuse of denture adhesives at least as early as 2005. In November 2005, two adverse event reports were filed regarding GlaxoSmithKline's Poligrip denture adhesive. One report described the case of an adult female patient who, according to her physician was suffering from "zinc poisoning secondary to Poligrip denture adhesive cream." The patient suffered significant neurological symptoms including intense headaches, difficulty breathing, difficulty walking and facial weakness. According to the FDA, GlaxoSmithKline viewed the incident as "medically serious.

The American Journal of Clinical Pathology published an article in 2005 which clearly established the link between excess zinc exposure and neurodegeneration. This study focuses on three patients suffering from high zinc levels, low copper levels, and myopathy. One of the patients was 47 years old and confined to a wheel chair; another patient was 42 years

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old and unable to walk with a steady gait or hold objects in his hands. The source of his excess zinc was determined to be denture cream

In November 2006, Health Canada received a report of a 52-year-old woman who had used Ultra Poli-Grip Denture Adhesive Cream over a period of years and was reported to have ingested large amounts of the product. The patient experienced numbness in both of her legs.[6]

In 2008 researchers at the University of Texas Southwestern Medical Center published research linking denture cream to zinc poisoning in The medical journal Neurology. These researchers found that the high levels of zinc contained in denture creams could cause a copper deficiency in denture cream wearers who habitually used substantial amounts of denture adhesive to fix their dentures in place.

S.P Nations article, has clearly identified Denture Cream as a source of excess zinc.'[1] This article directly linked the use of denture cream to copper deficiency and serious neurological disease in several patients. In 2009, medical research further confirmed that denture cream is a primary source of excessive zinc, which can cause both myelopathy and neuropathy.[7] In this study 100% of the patients examined had a history of wearing ill-fitting dentures which required large amounts of denture cream, ultimately resulting in significant exposure to zinc. Scientists who conducted this research said "we identified denture cream as a source of excessive zinc in 100% of patients."

In September 2009, Health Canada received a report of a 56-year-old woman who had used Fixodent Original Denture Adhesive for 7 to 8 years and then experienced unexplained pain, numbness and loss of sensitivity in her limbs.[6]

Similar cases of neurologic disease suspected of being associated with the overly liberal use (more than one 68 g tube per week) and chronic, excessive ingestion of denture adhesive creams containing zinc have been published/'[8].

The study, conducted by Drs. Amar Patel and Nasir Bashirelahi, entitled "what each dentist must know about Zinc"[9] was published in the issue of April 2011 of General Dentistry. Patel and Bashirelahi, review of existing literature and case studies on the cream of the dental prosthesis based on zinc and found that some patients were exposed to 200 times as much as the daily allowance recommended zinc. They concluded that these health risks "should be a matter of concern for all dentists caring for denture patients. Dentists should admonish their patients to limit their use of denture adhesives in accordance with manufacturers' instructions."

In Feb.2011, Health Canada and GlaxoSmithKline (GSK) published an information document in, advising health professionals about potential health risks to patients from the long-term excessive use of denture adhesives that contain zinc. Patients who use more than the directed amounts of such denture creams over several years (e.g., applying the product more than once a day due to ill-fitting dentures) may be susceptible to developing myeloneuropathy and blood disorders.[10]

Zinc is an essential trace element and has indispensable role for human health.[11] Due to its nature as an essential trace element, oral uptake of small amounts of zinc is essential for survival. The recommended dietary allowance (RDA) for zinc is 11 mg/day for men and 8 mg/day for women. Lower zinc intake is recommended for infants (2-3 mg/day) and children (5-9 mg/day) because of their lower average body weights.[12]

Taking up large doses of supplemental zinc over extended periods of tune is frequently associated with copper deficiency.[13] This correlation seems to be caused by the competitive absorption relationship of zinc and copper within enterocytes, mediated by MT. The expression of MT is up-regulated by high dietary zinc content, and MT binds copper with a higher affinity than zinc. Consequently, available copper ions are bound by MT and the resulting complex is subsequently excreted[14]. So Copper absorption is depressed when zinc is given in high excess over copper.[1S]

The balance between zinc and copper in the body is essential for neurological health. Taking in too much of one of these trace metals can cause depletion of the other.

Frequent symptoms of copper deficiency include hypocupremia, impaired iron mobilization, anemia, leukopenia, neutropenia, decreased superoxide dismutase (SOD) (particularly erythrocyte SOD (ESOD)), ceruloplasmin as well as cytochrome-c oxidase, but increased plasma cholesterol and LDL: HDL cholesterol and abnormal cardiac function.[16]

Denture wearers who use denture cream may inadvertently expose themselves to these high levels of zinc. Because denture cream is swallowed in little quantities each time denture wearer take a consume, or is absorbed directly through the gums. As denture cream is inadvertently ingested by the wearer over tune, zinc builds up in the body, leading to copper deficiency, nerve damage, and denture creamtinduced neuropathy.

Neuropathy is a disorder caused by damage to the peripheral nervous system. Severe denture cream neuropathy can result in permanent disability, paralysis and even death. The symptoms of denture cream neuropathy can include:[17-18]

- Tingling, numbness, burning, or pain in the extremities
- Paralysis or loss of ability to move arms, hands, legs or feet
- Muscular weakness
- Poor balance and coordination
- Abnormal blood pressure and heart rate
- Constipation and bladder dysfunction
- Decrease in walking stride

One of the initial signs the adhesive that holds the dentures has turn out to be harmful is the sudden onset of tingling and numbness in feet and fingers, unexplained emotions of weakness, and poor balance. If left untreated Zinc Poisoning can be deadly. To make matters worse, these symptoms are found in many other disorders. Consequently, excessive levels of Zinc are often overlooked as a possible cause.

The U.S. Food and Drug Administration (PDA) classified Denture adhesives as Class I medical device. Class I medical device means having the slightest risk of potential injury and that safety testing or list product ingredients is no longer desired. Nevertheless, the said advantage was only given in the year 1990's when denture creams have no zinc ingredients for the past 30 years.

The U.S. Food and Drug Administration (PDA) received reports of potential zinc poisoning from denture adhesives at least as early as 2005. The FDA urged manufacturers to revise their labeling to identify products that contain zinc, or to replace the zinc with "an ingredient that presents less health risks in situations of overuse."

On February 23, 2011 The U.S. Food and Drug Administration (FDA) notified all manufacturers of denture adhesives regarding the adverse events related to the use of denture adhesives and asking for their assistance in dealing with this public health issue.

FDA strongly recommended manufacturers of dental adhesive to consider:

1. Performing a risk analysis of your labeling to assess how risks can be mitigated;
2. Conducting a human factors study to assess consumer understanding of labeling and the potential for misuse of your product;
3. Modifying your labeling to include a statement that the product contains zinc if appropriate and define maximum safe usage in easily understood terms, and
4. Replacing zinc with an ingredient that presents less health risks in situations of overuse.

CONCLUSION

It is obvious from this extensive body of medical literature that denture patients must be advised of the risks of prolonged overuse of denture adhesives and dentists should admonish their patients to limit their use of denture adhesives in accordance with manufacturers' instructions. Epidemiologic studies revealed the source of excessive zinc intake to be from overuse of denture adhesives. The simple act of trying to keep dentures in place can trigger crippling neurological diseases involving myelopathy and sometimes polyneuropathy. This syndrome is characterized by a loss of the ability to feel or use the arms and legs, and can even result in complete paralysis.

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