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# SQUAMOUS CELL CARCINOMA OF THE BUCCAL MUCOSA ASSOCIATED WITH CHRONIC ORAL POLYVINYL CHLORIDE EXPOSURE

## Report of a Case

CHARLOTTE L. CASTERLINE, MD,\* PETER F. CASTERLINE, MD<sup>†</sup> AND  
DARRELL A. JAKUES, MD, FACS<sup>‡</sup>

The following case report describes a 22-year-old healthy man, non-smoker, non-drinker, who developed a squamous cell carcinoma of the buccal mucosa. The appearance of this unusual tumor in an unexpected clinical setting was unexplained until it was discovered that the patient had a lifetime habit of chewing plastic materials containing polyvinyl chloride (PVC). The extent and chronicity of his intense oral exposure to PVC is believed to be related to his subsequent development of an oral neoplasm. Attention is again focused on PVC as an important environmental toxin and carcinogenic agent. Clarification of the content of PVC in consumer products is urged. Physicians must remain aware of possible environmental carcinogens in patients presenting with unexpected or rare malignancies. Detection of such exposure may well prevent subsequent development of additional unexplained neoplasms.

*Cancer* 39:1686-1688, 1977.

THE DEVELOPMENT OF A SQUAMOUS CELL CARCINOMA of the buccal mucosa in a young adult male, non-drinker, non-smoker, is an extremely rare event. The following case report describes a young man who developed such a cancer in association with a unique lifelong habit of chewing plastic materials. The materials he chronically chewed contained polyvinyl chloride. The extent and chronicity (greater than 14 years) of his intense oral exposure to PVC is felt to be related to his subsequent development of an oral cancer.

## CASE REPORT

M.B., a 22-year-old white man, was in good health until early September of 1975, at which time he devel-

oped acute aphthous stomatitis with painful ulcers on the tongue, interdental papillae, buccal mucosa, and soft palate. The lesions resolved within one week, with the exception of a pinhead-sized papule in the right anterior labial buccal sulcus. This papule grew progressively until early December 1975, when it had reached the size of approximately 1 cm and was excised by a dentist. The pathology was interpreted as an invasive squamous cell carcinoma. He was referred to the Head and Neck Surgery Service at Walter Reed Army Medical Center, where a wide local resection was performed. Tissue margins were reportedly free of tumor. Since then he has been followed monthly by the Head and Neck Surgery Service. No recurrent tumor has been noted.

The patient denies the use of cigarettes, a pipe, cigars, chewing tobacco, alcoholic beverages or illegal drugs. He had no prior history of mouth or lip lesions. He currently is a vocalist and audio technician in the Armed Forces Bicentennial Band.

Since the age of eight the patient has been working with electronics equipment, both as a hobby and as a vocation. His jobs have included the rewiring of buildings, organs, and audio systems. He has developed the habit of chewing plastic-coated wire insulation as well as other types of plastic materials. He often stores the plastic material in his mouth for as long as six to eight hours. He frequently stores the plastic in either anterior buccal sulcus.

Past medical history: He had infectious mononucleosis in May of 1974 confirmed by a positive heterophile titer.

Family history: His maternal grandmother had cancer of the breast. There was no other family history of cancer.

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Appreciation is expressed to Dr. Mary Wolff, Environmental Science Laboratory, Mt. Sinai School of Medicine, New York City, NY, for performing the vinyl chloride assay.

Received for publication July 7, 1976.

Physical examination showed a well developed and well nourished male. Scar tissue was present at the site of the prior lesion resection in the right anterior mandibular buccal sulcus. Oral hygiene appeared excellent, with no evidence of faulty dentition. His teeth were noted to be grooved secondary to his chronic habit of stripping wire with his teeth. No scleroderma-like skin changes were noted. His fingers and toes appeared normal. No hepatomegaly, splenomegaly or abdominal masses were noted. Neurologic examination was normal.

Routine laboratory tests including hematology and chemistry profiles were within normal limits. Gamma glutamyl transferase was normal. Antinuclear antibody, hepatitis-associated antigen, VDRL, and carcino-embryonic antigen assays were all negative. Immunoglobulin levels (G, A, M, D) and serum complement determinations (C<sub>3</sub> and C<sub>4</sub>) were normal. Radiographs of the chest, abdomen, hands, feet, and upper gastrointestinal tract were normal. Liver-spleen scan showed no organomegaly. Urinalysis and urine cytology were negative. Delayed skin tests to streptokinase-streptodornase and monilia were reactive. Pulmonary function tests showed no obstructive or restrictive changes. A fat biopsy was done and assayed for vinyl chloride, the results of which were negative.

#### DISCUSSION

The incidence of squamous cell carcinoma of the head and neck in the United States is reported as approximately 5% of all cancers. Squamous cell carcinoma of the buccal mucosa represents only 1% of the squamous cell carcinomas of the head and neck.<sup>7</sup> In a recent review of carcinoma of the oral cavity, 478 cases were analyzed. Of these cases, only 14 carcinomas of the buccal mucosa were reported, representing an incidence of 3% of the oral cavity cancers. Ninety-six percent of these oral cancers were associated with heavy smoking and alcohol consumption. Of the other 4%, nearly all were associated with irritation from faulty dentition. Thus, most cases had some possibly associated carcinogenic influence.<sup>2</sup>

The case described above is unique not only in the rarity of the cancer described, but in its unexpected appearance in a young healthy man who denied the use of cigarettes, cigar, pipe, chewing tobacco or alcoholic beverages. Furthermore, his oral hygiene appeared exceptionally good. Prolonged and detailed queries as to possible exposure to other oral carcinogens led to the discovery of his unique habit of chewing plastic materials. When the extent and duration (greater than 14 years) of his oral exposure to plastics was elucidated, it began to appear more than coincidental that his neoplasm had arisen in an area of buccal mu-

cosa in which he frequently stored plastic material for prolonged periods. The known carcinogen polyvinyl chloride is a major constituent of the tubing, wire insulation materials, and cables<sup>8</sup> with which this patient had chronic intense oral exposure.

Polyvinyl chloride and its monomer, vinyl chloride, emerged as new occupational carcinogens in January 1974. This followed the investigation of several deaths due to angiosarcoma of the liver in industrial workers exposed to vinyl chloride. These tumors occurred in workers who had been exposed to vinyl chloride for roughly 20 years.<sup>1</sup> Systemic toxicity syndromes related to vinyl chloride exposure in workers have also been described. Included among these are acroosteolysis, hepatosplenomegaly, pneumoconiosis, Raynaud's phenomenon, scleroderma-like skin changes, and contact dermatitis. The manifestations of systemic toxicity vary according to the mode, extent, and duration of exposure.<sup>9</sup>

In a recent mortality study of workers in the manufacture of vinyl chloride and its polymers, Tabershaw and Gaffey found that in humans vinyl chloride may be associated with neoplasia of organ systems other than liver. Interestingly, they found an excess of buccal cavity and pharynx cancers, apparently inversely related to estimated exposure. This finding was possibly a chance occurrence, or related to exposures to other substances. However, the authors postulated that the mouth and pharynx might be peculiarly susceptible due to the gaseous nature of the chemical.<sup>6</sup>

This case report again focuses attention on PVC and VC, linking chronic and intense exposure to these materials to neoplastic changes in human tissue. Although the occurrence of buccal cancer in the patient described above could have been a chance occurrence, we consider this unlikely in view of what is known about PVC and its carcinogenic effects.<sup>3-6</sup> Clarification of the content of this material in wire coverings, insulation, and other consumer products is needed. Certainly other workers in the electronics field should be made aware of the possible danger associated with chronically placing plastic-coated materials in the oral cavity. Finally, physicians must remain alert to the detection of patient exposure to occupational carcinogens. Specific interrogation of patients with oral carcinomas as to PVC exposure may reveal similar cases. Detection and prevention of such exposure may well prevent the subsequent development of additional unexpected neoplasms.

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1. Braun, P., and Druckman, E.: Vinyl chloride: Can the worker be protected? *N. Engl. J. Med.* 294:653-657, 1976.
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A M mo From



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cc

Clark Cooper MD  
Curiously related to  
four buccal cancers  
in our MCA study -  
I like the quickly estab-  
lished association.  
T.R.T.  
Aug 24, 1977

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