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Oral chemical burn due to accidental ingestion of calcium oxide food desiccant in a patient with dementia

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Abstract

Oral chemical burns occur when a chemical accidentally enters the mouth, causing burns and ulcers in the oral mucosa, esophagus, stomach, and upper digestive tract if swallowed. Oral chemical burns primarily occur in children because of accidental ingestion. However, a few reports have described advanced-age patients with dementia who developed oral chemical burns. Patients with dementia often exhibit impaired judgment and irregular eating behaviors, at times leading them to ingest nonfood substances. We herein describe a case of an advanced-age patient with dementia who ingested a calcium oxide food desiccant at home and developed chemical burns that were exacerbated by an improperly placed implant-supported complete fixed prosthesis. This case report emphasizes the need for families and nurses who care for patients with dementia to renew their understanding of the danger of accidental ingestion of nonfood substances. Knowledge of the appropriate response to calcium oxide food desiccant ingestion is also important to prevent the occurrence of severe chemical burns.

Keywords

Dementia, oral chemical burn, accidental ingestion, calcium oxide food desiccant, dental implants, nonfood substances

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Background

Oral chemical burns occur when a chemical is ingested, causing burns and ulcers in the oral mucosa, esophagus, stomach, and upper digestive tract.[1,2] Many types of chemicals and drugs can cause chemical

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burns, the severity of which depends on the concentration and quantity of the chemical as well as the manner and duration of contact with the tissue. In particular, ingestion of corrosive chemicals can cause injuries ranging in severity from mucosal erythema to transmural necrosis of the esophagus and stomach with viscous perforation, which can be life-threatening.[2]

Chemical burns of the oral cavity and upper gastrointestinal tract secondary to corrosive chemical ingestion may be accidental (mostly in children or patients with dementia) or deliberate, as in suicide attempts.[2] Numerous case reports of toddlers have described placement of various items from the surrounding environment into the oral cavity.[3] However, only a few reports have described advanced-age patients with dementia who have developed oral chemical burns, and the cause of these burns is accidental ingestion of nonfood substances.[1,4,5] Patients with dementia often exhibit impaired judgment and irregular eating behaviors, leading them to ingest nonfood substances.[6]

This report describes an advanced-age patient with dementia who ingested a calcium oxide food desiccant at home and developed chemical burns. The affected areas were rinsed with physiological saline, and an antibiotic was administered to prevent secondary infection. One week later, the ulcers had nearly completely healed. This case report was written to promote awareness regarding accidental ingestion of chemicals that may occur in patients with dementia.

Case presentation

A 91-year-old Japanese woman presented with chemical burns of her oral mucosa. This patient had developed symptoms of Alzheimer's disease 5 years previously, and she had been under the care of her family since then. In addition to an acetylcholinesterase inhibitor to treat her dementia, the patient had been prescribed antihypertensive and antihyperuricemic drugs. She had a quiet, bright personality and was able to engage in simple everyday conversations. She had a complete denture in the maxilla and an implant-supported complete fixed prosthesis (ISCFP) in the mandible, and she exhibited no dysphagia. However, the ISCFP was shallowly located in the oral vestibule, and there were no keratinized tissues around the implants.

In June 2017, a family member found the patient covering her mouth, apparently in pain. The patient had been eating dried seaweed that was kept in a sealed container. The family member found a white powder and an open packet of calcium oxide food desiccant nearby, suggesting that the patient had accidentally ingested the food desiccant. The patient complained of severe pain in the oral cavity. Her family ensured that she expelled as much of the remaining calcium oxide as possible from her mouth. The patient was thereafter taken to the hospital by ambulance, and a physician observed the absence of calcium oxide-induced inflammation or ulcers in the esophagus and stomach.

After the medical diagnosis, the patient was examined at our dental hospital to ascertain the cause of her oral pain. During the oral examination, no symptoms of burns were observed on the palatal or buccal mucosae because these areas were protected by a complete denture in the maxilla. However, moderate erosion accompanied by ulceration and redness was present from the vestibular mucosa behind the lower lip and tip of the tongue to the left side and the sublingual mucosa; moreover, strong hyperpathia was observed (Figure 1). Close inspection of the lower lip and underneath the tongue confirmed the absence of residual calcium oxide, and the affected areas were rinsed well with physiological saline. Additionally, no

Figure 1. Chemical burn with ulcer of intraoral mucosa.

Figure 2. One week after the burn injury, the ulcers had mostly healed. A slight amount of remaining necrotic tissue was observed around the lower embrasures of the implant-supported complete fixed prosthesis.

abnormalities were present in the parts of the oral cavity involved in swallowing.

Redness, blistering, pain, and ulceration or necrosis of the mucosa are common symptoms of both chemical and thermal burns in the oral cavity. However, chemical burn symptoms vary based on the specific chemical exposure. Moreover, chemical burns proceed until the penetrating chemicals are inactivated, regardless of removal of the causative substance. In this case, most of the calcium oxide had been quickly removed by the patient's family; thus, the burn did not spread to the deep layer of the mucosa. However, the patient's oral pain was suspected to be due to the increased area of chemical burn caused by residual calcium oxide in the shallow vestibule and in narrow embrasures because of the inappropriate shape of the ISCFP.

Cefuroxime axetil (750 mg/day) was administered to prevent secondary infection. The patient's family was informed that the ulcers would heal within 1 to 2 weeks, and they were instructed to ensure that the patient ate a soft, room-temperature diet. One week after the incident, the ulcers on the side and bottom of the tongue had nearly completely healed. However, some necrotic tissue resulting from the healing process was observed around the lower embrasures of the ISCFP (Figure 2). The patient complained of slight pain when stretching her lower lip, but her family indicated that she had been able to eat and that her appetite had returned to normal 4 days after the incident.

Statement of ethics

The patient's family provided informed consent for publication of this case report. The requirement for ethics approval of this case report was waived by the university's ethics committee.

Discussion

The chemical burns in the oral cavity of the patient with dementia in this report were caused by the ingestion of calcium oxide food desiccant, which produced heat that caused thermal burns in addition to corrosive chemical burns because of its high alkalinity upon reaction with water (saliva). The triggers and factors that exacerbated the chemical burns were accidental ingestion by the patient, the desiccant itself, and the structure of the denture implants, which were difficult to clean.

Accidental ingestion of a foreign body or caustic substance often occurs in children

and patients with dementia. Intentional ingestion of corrosive chemicals to attempt suicide has also been reported. Children most commonly ingest foreign bodies from their surrounding environment. In patients with dementia, accidental ingestion of nonfood substances is a symptom of a reduction or loss of judgment or as a behavioral and physiological symptom of dementia.[6,7] Notably, the patient in the present case had previously attempted to ingest soil from a potted plant. Household products that patients with dementia may accidentally ingest include household cleaners, shampoo/bath gel, and food desiccants. Risks include potentially life-threatening choking, chemical burns, or poisoning, depending on the type of nonfood substance that has been ingested. The appropriate response depends on the ingested substance; thus, a sample (ideally, the actual object) of the substance that has been ingested should be brought to the medical institution to allow the doctor to identify the product and its contents to ensure appropriate treatment.

Two desiccants are commonly accidentally ingested: silica gel and calcium oxide. Silica gel is nontoxic and is not absorbed in the digestive tract. Conversely, calcium oxide, which was ingested by the patient in the present case, reacts when it contacts saliva (water), reaching a temperature of 100°C within 1 minute. Additionally, calcium hydroxide, which is the product of this chemical reaction, is strongly basic (pH of 12.6) and can cause chemical burns of the mucous membranes over an extended period of time. Calcium oxide that has been ingested should be expelled from the oral cavity immediately, and the mouth should be rinsed with a large volume of water. If calcium oxide may have been swallowed, the patient should drink a large volume of milk or water. Vomiting should be avoided because it will bring the calcium oxide into repeated contact with the digestive tract, causing further damage. In the present case, the family quickly discovered the patient's ingestion of calcium oxide and performed the appropriate procedures; thus, the burns in the oral cavity were relatively mild. Furthermore, the patient had not swallowed the desiccant, and there was no damage to the esophagus or stomach.

Patients with dementia are unable to manage their own oral hygiene, resulting in worsening of existing tooth caries and periodontitis. Furthermore, the reduced masticatory function that occurs with progression of movement impairment can negatively impact the patient's nutrient intake.[8,9] The patient in the present case did not exhibit any severe oral function disorders. However, she had experienced difficulty controlling her appetite, which may have led to accidental ingestion of the desiccant.

Conclusion

This case report highlights the need for caretakers of patients with dementia to ensure an understanding of the danger of accidental ingestion of nonfood substances to implement appropriate prevention. Moreover, it indicates that knowledge of appropriate responses to desiccant ingestion is needed.

Declaration of conflicting interest

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