CASE REPORT

Gingival and localized alveolar bone necrosis related to the use of arsenic trioxide paste—Two case reports

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Introduction

The use of arsenic trioxide in dental treatment was first advocated by Haly Abbas in the year of 1492. It was used to...
devitalize inflamed pulps, a procedure claimed to be painless, and was widespread during the years before unreliable anesthetization.\(^2,3\) The utilization of arsenic trioxide (arsenic anhydride) paste during root canal treatment gives immediate pain relief, that led to its imprudent use not only for pulp devitalization, but also for the management of some uncertain discomfort such as dentin hypersensitivity, or pulpotomy of the deciduous tooth.\(^1\) In cases of acute symptomatic pulpitis, particularly in the mandibular molar, where profound anesthesia was previously difficult to achieve because of technical or anatomical problems, some dental clinicians used toxic preparations such as paraformaldehyde, cresol or arsenic paste to devitalize the inflamed painful pulp.\(^4\) Although effective, the potential for leakage of those preparations is unsafe in the palliative treatment of dental pain. The continuous application of “devitalizing pastes” gradually declined because of improvements in local anesthesia techniques.\(^5\)–\(^9\)

This report describes two cases in whom arsenical pulp devitalization was associated with significant gingival injury, and adjacent alveolar bone necrosis. The leakage of arsenic trioxide paste from an ill-fitting temporary restoration needs to be highlighted and emphasized.

**Case reports**

**Case 1**

A 54-year-old female visited the dental department asking for advice and complained about a painful white patch that was gradually getting larger on her lower left back gum. Her personal history confirmed that she accepted dental treatment in a local dental clinic on her lower left second molar because of deep decay. The dental practitioner had applied a "topical medication" and dressed tooth #37 with an unknown paste during root canal treatment, because of unsuccessful local anesthesia. Approximately 3 days later, a white patch developed and continued to increase in size whilst the gum began to feel tender. She called the private dentist, but was told to take some analgesic with anti-inflammatory drugs. However, the patient’s complaints did not resolve. The patient came to our dental department asking for further evaluation and management. Clinical examination revealed a white, crater-like lesion about 1.0 \(\times\) 1.5 cm\(^2\) in size, located on the interdental gingiva between the mandibular left first and second molars (tooth #36 and #37) (Fig. 1). The underlying alveolar bone was exposed and the gingival tissue was grayish-white in color and surrounded with reddish, rolled-liked soft tissue. The patient suffered severe pain during chewing and palpation. Furthermore, no probing bleeding from the exposed bone was noted. Marginal gingival recession of tooth #36 and tooth #35 was also found. The mesio-occlusal cavity of tooth #37 was filled with white color temporary filling material, but was not intact. After removal of the temporary filling, a piece of cotton pellet saturated with black arsenic-like paste was packed inside and the mesio-gingival floor of the cavity was exposed. A periapical radiograph revealed incomplete root canal treatment of tooth #37, whilst subgingival root decay beneath the distal crown margin of tooth #36 was also noted. A periradicular lesion was also suspected. Previous root canal treatment with chronic apical periodontitis of tooth #37 was diagnosed. Medical and family history did not contribute. Further management included the debridement of all necrotic soft tissue and copious irrigation with physical saline after 2.0% xylocaine local anesthesia. Oral amoxicillin (500 mg) and 200 mg metronidazole were given every 8 hours for 7 days. Additionally, the patient was prescribed 50 mg Voren as an analgesic and 0.12% chlorhexidine gluconate as a mouthwash twice a day for 7 days. The patient was recalled after 1 week to evaluate tissue healing. Two weeks later, secondary tissue healing of the interdental region was observed and the superficial necrotic bone was gradually replaced with vascular tissue. The gingiva tissue was completely healed after 7 weeks (Fig. 2). During this period, root canal treatment of the C-shaped tooth #37 was completed under rubber dam protection.

**Case 2**

A 30-year-old woman first visited our dental department complaining of severe pain and continuous gingival bleeding from her right maxillary first bicuspid (tooth #14) following root canal treatment by a private dentist 2 weeks earlier. Clinical examination revealed a subgingival cavity and a marked area of necrosis of the interdental papilla at the mesial surface of tooth #14. The palatal mucosa was also...
involved, with exposure of alveolar bone which was white in color (Fig. 3). The tooth had a large mesio-occlusal cavity sealed with white color temporary restoration. Periodontal probing showed a 5.0 mm pocket mesially, with ease of bleeding on probing. The periapical radiographic examination indicated a 0.8 mm crater with horizontal bone loss located between the right maxillary canine and the first bicuspid. Previous dental history revealed the patient initially felt continuous pain on chewing of tooth #14 with mild mobility. There was a deep carious lesion with pulpal involvement detected. A diagnosis of irreversible pulpitis with acute apical periodontitis was made. Medical and family history did not contribute. The private dentist performed root canal therapy. Due to extreme pain during access preparation caused by ineffective anesthesia, the patient was told to apply the pulp devitalizing paste at that time. It was later confirmed (by phone) that it was an arsenic trioxide paste. A few days later, she subsequently suffered severe pain and swelling which gradually extended to the gingival region. She returned to her private dentist, but only oral antibiotics were prescribed. However, she did not feel any improvement in her symptoms. She decided to visit our dental department asking for emergency management and further evaluation of the problem, as she could not tolerate the severe continuous pain and gingival bleeding. After 2.0% xylocaine local anesthesia was administered, the temporary filling of tooth #14 and the arsenic paste was completely removed with copious irrigation using physiological saline. The sequestrum and the necrotic alveolar bone between tooth #13 and tooth #14 were removed using a long shank surgical number 4 carbide round bur with decortication to induce active bleeding. The wound was irrigated with copious betadine and physiological saline, and finally dressed with Coe-Pak (GC America INC, Alsip, IL, USA). The access cavity was filled with Intermediate Restorative Material (IRM) (Dentsply, Romulus, MI, USA). The patient was prescribed with 500 mg oral amoxicillin and 200 mg metronidazole for 7 days, together with 50 mg Voren as an analgesic and 0.12% chlorhexidine mouth rinsing solution twice a day for 7 days. One week later, a partial thickness gingival flap from the adjacent tooth was made and rotated to cover the wound defect without tension, after the necrotic bone had been thoroughly debrided and cleansed. The patient was recalled after 1 week and thereafter at 3-weekly intervals after the supporting tissues had completely healed. Root canal treatment was completed 1 month later (Fig. 4). The cavity was then filled with IRM temporary cement. The patient was advised to have a gingival graft before crown restoration, but was denied because of financial problems. The tooth was finally restored with composite resin material.

**Discussion**

In the past, effective anesthesia was unavailable and less reliable for patients with extremely painful teeth or uncooperative patients. The use of arsenical based preparations as devitalizing agents prior to pulp extirpation during dental treatment, became an important practice. Nevertheless, cases of arsenic-related tissue necrosis are occasionally reported, especially in some developing countries.8,10,11,13

Arsenic trioxide is a protoplasmic poison and the resulting tissue necrosis should be due to direct chemical irritation.8,12 Tissue damage has been reported in many articles and the adverse effects of most of these reports concern the incorrect use of the arsenical paste.3,5–8 The two cases in our report emphasize the leakage of the toxic agents into the periodontal supporting tissue, due to deep subgingival decay and inadequate temporary restoration. The second case in our report required surgical treatment to remove the necrotic alveolar bone and sequestrum in order to maintain the circulation of the supporting tooth structure.

Some reports pointed out that arsenic trioxide could induce allergic reactions. Patients who were already sensitized might experience anaphylactic episodes from a tooth filling, a major complication during dental treatment. It has been highlighted that arsenic trioxide might have carcinogenic or mutagenic properties.1,5,8

This toxic and carcinogenic agent should be applied in close contact with the exposed pulp tissue of a tooth for a maximum period of 2 weeks.12 To prevent harmful irritation and severe damage to the supporting tissue during

**Figure 2** (A) Secondary healing with vascular soft tissue; and (B) X-ray reveals angular bone healed.

**Figure 3** (A) Gingival and adjacent alveolar bone necrosis between teeth #13 and #14; and (B) X-ray reveals a 5-mm-deep pocket of mesial bone loss.
dental treatment, temporary restoration should be intact. Therefore, the treated tooth should be covered with a cotton pellet and meticulously sealed with zinc-oxide eugenol temporary restoration to prevent leakage and soft tissue irritation. Scientific research has proven that there are many safe and effective intracanal medications and root canal filling materials. It is our suggestion that in order to maintain the highest quality of care in a dental practice, clinicians should actively support the use of safe and effective materials in dental treatment.

In all cases of arsenic-induced tissue necrosis, tissue debridement and sequestrectomy with decortication is the only treatment option. Although attached gingiva and alveolar bone loss cannot be avoided, further dental treatment should be considered and advised.\(^5,6,8,10,13\)

In conclusion, arsenic trioxide may cause harmful adverse effects on adjacent periodontium and supporting hard tissue if leakage occurs or is used carelessly. As well as the systemic repercussions discussed above, it is suggested that there are no longer indications to use arsenic trioxide in contemporary dental practice. Their continued and unjustified use must be condemned.

References