

Iatrogenic injury of oral mucosa due to Chemicals: A Case report of formocresol injury and review

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Abstract: *Formaldehyde and its products have been widely used in endodontic procedures as intracanal medicaments. Formocresol has gained popularity in pediatric dentistry as pulpotomy medicament. The very nature of formocresol is to fix the soft tissues when exposed. When using it as a pulpotomy medicament, care should be taken to expose only the pulp tissue for such medicaments. When proper isolation techniques are not employed, such injuries can occur as an extended action of the chemical nature of the substance on unintended parts of the oral mucosa. This article presents and discusses the case of coagulative necrosis of Labial mucosa and its subsequent healing, which compromised on the quality of life of the patient. As a pediatric dentist, the clinician should be aware of hazardous effects formocresol and necessary care and preventive measures like rubber dam isolation should be mandatorily employed while using formocresol.*

Key words: *Iatrogenic injuries, Formocresol and Oral Mucosa*

I. Introduction

Injuries to oral soft tissues can occur due to accidental, Iatrogenic and factitious trauma, which may present as burns, ulcerations and gingival recessions. Physical Chemical and thermal agents are the main causative agents for oral soft tissue burns¹.

Ulcerative lesions in the oral cavity have many potential causes ranging from trauma to cancerous conditions. Various chemical agents find place in the day to day dental practice ranging from cavity varnish to De-vitalizing pastes². These chemicals, when used injudiciously can harm the integrity of the soft tissues in the oral cavity. Formocresol has been widely used in pediatric dentistry since its introduction into dentistry by Buckley in 1904. Since then lot of concern has been expressed and discussed in the field of dentistry about the safety of formocresol use especially in pediatric dentistry. Improper use of formocresol can readily cause widespread necrosis of soft tissues in the oral cavity. This article presents and discusses the case of injury due to formocresol and its management.

Description of Case:

A 9yr old boy reported to Dept of Pedodontics, College of Dentistry, University of Basrah, Al-Basrah, Iraq. (The case was observed by the Author when he was on a faculty exchange programme with the said university – April 2013) with the chief complaint of pain in his primary mandibular right second molar. Based on the presenting signs, symptoms clinical examinations and radiological interpretations the case was diagnosed as chronic irreversible pulpitis. An undergraduate student was assigned to perform pulpectomy. The student performed access opening followed by biomechanical preparation. A dressing with formocresol soaked cotton pellet followed by access restoration with Zinc oxide Eugenol was done.

After 24 Hrs the patient reported with the complaint of pain and swelling on his right cheek and lips (Figure 1). Intraoral examination revealed an extensive ulcerative lesion measuring 1 X 5 Cm extending from the labial mucosa from commissure to midline of lower lip (Figure 1). The lesion appeared like coagulative necrosis covered by slough. Patient's mouth opening and food intake were reduced owing to the symptoms inside the oral cavity. Anamnesis from the patient and the parents about any application of topical agents post-operatively or any traumatic cheek bite due to local anesthesia during the pulpectomy procedure, was of no relevance. The differential diagnosis of Allergy due to contact, drug reaction, mechanical irritation and burns

due to chemicals were considered. Upon enquiry, the student explained the procedure was carried out the without the use of rubber dam. Also, the cotton pellet soaked with formocresol was not squeezed between the cotton gauze, which is the standard procedural protocol advocated in the use of formocresol in pediatric dentistry. This procedural error ended up in soaking the operator's glove with formocresol, which came in contact with the labial mucosa resulted in ulceration of this extent.

Treatment:

After the initiation of the pulpectomy, the patient was on a course of Amoxicillin which was asked to continue for the full course to reduce or prevent the infection of the ulcerated area. The patient was instructed to rinse regularly with Betadine gargle. Topical application of the Triamcinolone acetate (TESS) and Benzocaine (Mucopain) use was advocated. Nutritional supplements in the form of multivitamins that would improve the healing were also prescribed for ten days. Considering his clinical conditions she was advised to be on soft and cold diet without spice. After ten days recall, his condition was visibly improved with complete healing (Figure 2). On his third visit pulpectomy was completed.

Table 1: Chemical Substances which can cause injury to oral mucosa²

Chemical toxic substances	Purpose of use
DENTAL MATERIALS	
Cavity Varnish ⁵	Restorative dental material
Dentine bonding agent ⁶	Restorative dental material
Phosphoric etching solutions ⁷	Restorative dental material
Iodine ⁸	Antiseptic
Phenol (Carbolic Acid) ⁹	Antiseptic
Trichloroacetic acid ⁹	Astringent for gingival retraction
Ferric sulphate ¹⁰	Astringent for gingival retraction
Chromic acid ¹²	Antiseptic
Hydrofluoric acid ¹³	Porcelain and metal etching
Sodiumhypochlorite ¹⁵⁻¹⁹	Root canal irrigant
Calcium hydroxide ^{20,21}	Restorative material
Formocresol ^{21,11}	Endodontic treatments
Paraformaldehyde ⁹	Devitalizing agents
Arsenic ²²	Devitalizing agents
MEDICATIONS	
Chlorpromazine ¹⁴	Antipsychotic drug
Promazine ¹⁴	Antipsychotic drug
Aspirin ²³⁻³²	Non Opioid analgesics
Alendronate	Bisphosphonate
NON-PHARMACOLOGICAL SUBSTANCES	
Mouth washes	Antiseptic for intra oral use
Hydrogen peroxide	antiseptic
Gasoline	Petroleum derived mixture used as ad fuel
Rubbing alcohol	68.5-71.5% V/V of absolute alcohol
Battery acid	Sulfuric acid and water
Minard's liniment	Relief from pain
Arrack	Strong distilled spirit
Silver nitrate	Chemical cauterization
Denture cleansers	Agent used for cleaning dentures
Garlic	Culinary and medicinal uses
DRUGS	
Cocaine	Recreational drug
MDMA	Recreational drug

II. Figures:



Figure 1: Ulceration of Labial mucosa due to Formocresol



Figure 2: Complete healing of ulcer after ten days.

III. Discussion:

Iatrogenic errors during clinical procedures are considered to be a problem of an epidemic nature. In US, the financial implications due to this is estimated to be around \$ 29 billion annually³. It should be kept in mind that the risk of harm in dentistry is considerably low when compared to invasive procedures performed by other health care professionals. But due to increased awareness about health care and medico-legal options, there is a growing concern among practicing clinicians as more dentists are being sued each year.

Apart from the known / established complications due to dental procedures, unexpected injuries due to high speed / sharp instruments or the chemical nature of medicaments and dental materials, can occur during / after the procedure. Damage resulting due to exposure of such substances that are toxic can be grouped as – (i) Unintentional general (ii) Environmental (iii) Occupational (iv) Therapeutic error (v) Unintentional misuse (vi) Bite/Sting (vii) Food poisoning (viii) Unintentional unknown (ix) Suspected suicidal (x) intentional misuse⁴.

Oral Mucosal damage due to chemicals can occur during the use of such materials due to procedural errors in dentistry. Such used in dentistry have been listed in table 1. Unintentional general, Unintentional Misuse, Therapeutic errors due to improper application or usage of medicine is common among patients²³⁻³². These kind of injuries can occur as a result of self-medication without seeking professionals advice. Hydrogen peroxide, Chlorhexidine, Listerine, are the commonly used dental medicaments by patients that can cause mucosal damage. Other substances known to have been associated are Phenol, Topical Anesthetic gel, Silver nitrate, Minard's Liniment. Easy Accessibility or availability of such medications over the counter has been attributed for such damages. At times, such damages can also happen due to high levels of alcohol as constituent, additive or preservative than the toxic nature of the main ingredient.

Formocresol since its introduction has been widely used in dentistry especially in pediatric dentistry despite concerns regarding its mutagenicity and carcinogenicity. Even though such concerns have not been established for the amount of formocresol used in pediatric endodontics, injudicious handling without proper preventive measures i.e. Rubber dam isolation, Excess Formocresol in cotton pellet (Failure to squeeze Cotton pellet between cotton gauze to remove excess formocresol) can damage the oral tissue which ends up as an

iatrogenic error. Unintentional misuse of materials can also be a harmful event for the user. One such accidental use of formocresol as eye drops has created irreversible damage to the conjunctiva³⁵.

Irrespective of the cause of the injury the clinical presentation depends on the nature, Duration of exposure and its chemical nature. Chemically induced oral ulcerations can affect any site inside the oral cavity, but most commonly affects the labial and buccal mucosa².

The typical clinical feature of such chemical injury usually manifests as, superficial white, wrinkled appearance. As the duration of exposure increases, the necrosis proceeds and the affected epithelium becomes separated from the underlying tissue and can be desquamated¹⁴. Removal of necrotic epithelium reveals red bleeding connective tissue that subsequently covered by yellowish fibrinopurelent membrane. Histopathological examination of such tissue shows features of coagulative necrosis¹⁴. If the chemical injury is involved with a salivary gland duct, it might end up with transient obstructive sialadinitis³⁶; the resulting scarring of ductal opening can end up with permanent obstruction, chronic sialadinitis and may require surgical excision of duct/gland³⁷.

The diagnosis of a chemical burn depends on the correlation of presenting clinical history, signs, the chronological events related to suspected agent and onset of ulceration aids in the diagnosis². Histopathological investigations of such ulcerations should be considered only if the need arises due to failure in establishing the cause.

Treatment of oral ulcerations due to chemical injury primarily requires identification and removal of the responsible agent. Since ulcers due to chemical injuries usually heals up within two weeks without scarring; only palliative and symptomatic treatment should be considered. Avoidance of plaque accumulation with gentle oral hygiene measures along with topical anesthetic agents should help². A bland diet which helps in maintaining the general wellness of the individual is strongly recommended. In severe tissue damage topical corticosteroid (Triamcinolone – TESSTM) applied along with carboxymethyl cellulose would be of help. Antibiotic therapy should be considered only in very extensive cases¹⁴. Hence, it is recommended that whenever a pediatric endodontic procedure is carried out necessary preventive isolation steps such as rubber dam application should be mandatorily followed by every clinician.

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