CASE REPORT

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# Irritant contact dermatitis due to accidental contact of formocresol used in endodontic treatment: a case report

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We present an unusual case of contact dermatitis of the face following the use of formocresol. A 23-year-old man presented to our hospital, 3 days after his dental appointment, with moderate pain and a burning sensation related to a patch of darkly discolored skin. Questioning his dentist revealed that he used formocresol as an intracanal medicament. The root canals had been extirpated and formocresol had been placed into tooth #26 as a medicament. The dentist admitted that he accidentally touched the patient's face with his formocresol-contaminated hands. Formocresol was removed from the canals and calcium hydroxide was placed. Then, a dermatology consultation was requested and it was diagnosed as irritant contact dermatitis. Complete healing was observed with appropriate drug therapy. The present case urges us to pay attention to preventive isolation methods and not to prefer formocresol, which can cause serious clinical manifestations, as an intracanal medicament.

**Keywords:** Formocresol, Iatrogenic, Irritant contact dermatitis, Root canal medicament.

## Introduction

The use of an intracanal medicament is based on the desirability of reducing or eliminating the microbial flora of the root canal system before obturation. The increased emphasis placed on chemomechanical preparation has resulted in relegating the role of intracanal medications to one of secondary importance in modern endodontic therapy. However, the potential value of the use of an antimicrobial agent between appointments should not be disregarded. Some of the previously used medications are known to possess a high potential for toxicity.

Formocresol was introduced by Buckley (1) in 1904 for the disinfection of irritated and inflamed pulps and root canals. It contains 19% formaldehyde, 35% cresol, and 15% glycerin in a water base. Formaldehyde produces fixation of tissues and has strong disinfecting properties. The tricresol is empirically included in the preparation to reduce the irritating properties of formaldehyde (2). It had been used both as an intracanal medicament and a pulpotomy agent (3,4). Despite the benefits of formocresol (3), there are toxic effects (5). Allergic reactions (6) and local soft and hard tissue necrosis (7) have been reported when such formaldehyde compounds were used clinically. However, the adverse effects of the clinical use of this compound are not widely reported. The purpose of this article is to report on an unusual case of irritant contact dermatitis on the face caused by the use of formocresol as an intracanal medicament.

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## Case Description and Results

A 23-year-old man presented to Istanbul Medipol University, Dentistry Faculty Hospital, 3 days after a dental appointment. Extraoral examination yielded that he had a patch of darkly discolored skin, covering almost the entire left upper facial region (Fig. 1). The patient said that he had suddenly felt a burning sensation during his dental treatment and a skin discoloration had occurred immediately after the treatment (Fig. 1a). He pointed out that the lesion got bigger on the 2nd day and he sent his photograph to the dentist (Fig. 1b). When the lesion got bigger and darker on the 3rd day (Fig. 1c), he got flurried and consulted the hospital. Medical history was noncontributory. The dentist in question revealed that he used formocresol as an intracanal medicament in the root canals of tooth #26. He admitted that he had soaked a cotton pellet in a bottle of formocresol and accidentally touched the patient's face with his formocresol-contaminated hands. The dentist only prescribed amoxicillin/clavulanic acid as an antibiotic.

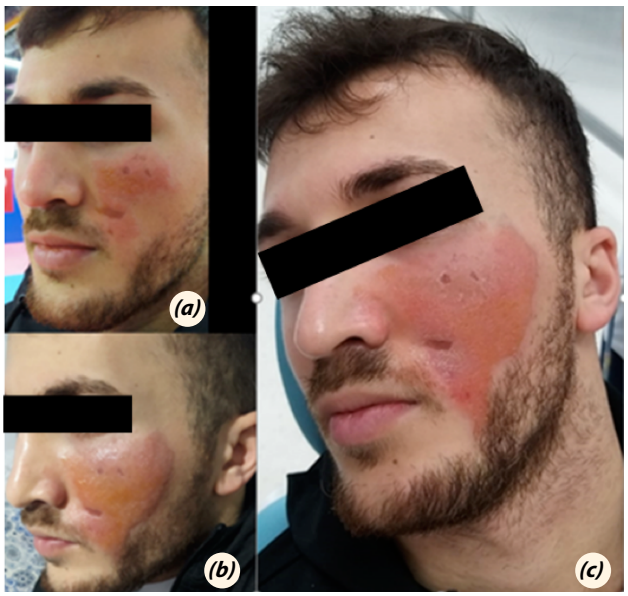


**Fig. 1** **(a)** Extraoral view on the same day with the use of formocresol; **(b)** Extraoral view after 2 days of treatment; **(c)** Extraoral view after 3 days of treatment

Intraoral examination showed that tooth #26 was sensitive on percussion. Palpation of the alveolar mucosa revealed sensitivity over the buccal surface of the mesial root. The tooth was stable and had minimal pocketing (3 mm or less) with no evidence of gingival pathology (Fig. 2a and b). Both radiographic (Fig. 2c and d) and CBCT (Fig. 3) examinations of tooth #26 yielded a radiolucency associated with the palatal root previously initiated treatment with symptomatic apical periodontitis. An informed consent was obtained from the patient. Following local anesthesia and rubber dam placement, the temporary restoration was removed along with the cotton pellet. Four canals were

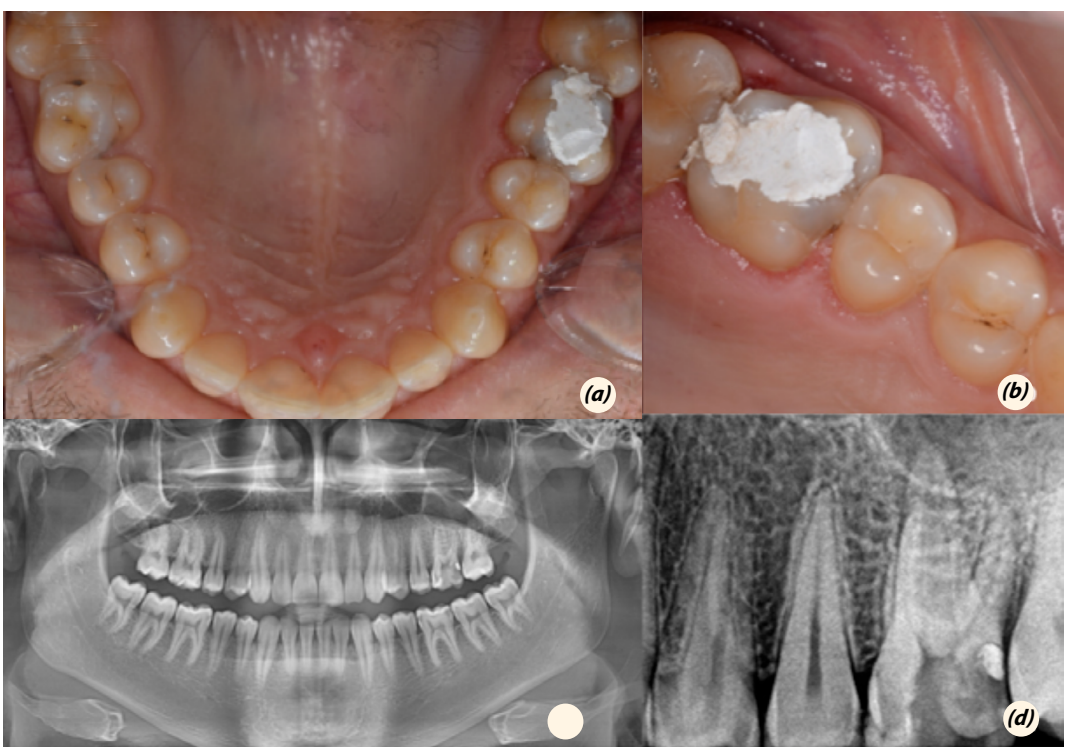


**Fig. 2.** (**a** and **b**) Intraoral view of the patient; (**c** and **d**) Panoramic and intraoral periapical radiographs of the patient

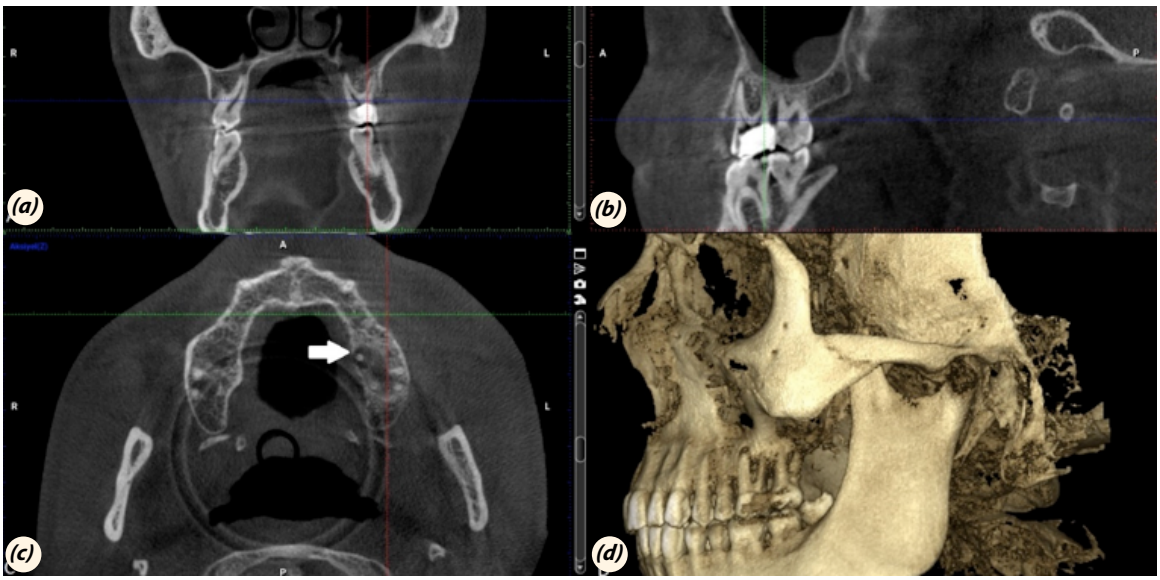


**Fig. 3.** The CBCT image of the same patient, **(a)** Coronal image, **(b)** Sagittal image, **(c)** Axial image, periapical abscess at the root of tooth #26 (white arrow), **(d)** 3D reconstructed image.

located, and the working length was established with an apex locator (Raypex6; VDW GmbH, Munich, Germany). The root canals were prepared using the VDW rotate files and irrigated with 5% NaOCl. The canals were apically enlarged until 35/.04 taper to the working length. Between each instrument, the root canal was irrigated with 5 mL of 5% NaOCl solution. Hence, a total of 40 mL of the irrigating solution was used. The root canal was dried with sterile paper points and medicated with calcium hydroxide powder (Calxyl; OCO Products, Dirmstein, Germany) which was mixed with saline with a ratio of 1:1. The paste was inserted into the canal using lentulo spirals (Maillefer–Dentsply, Baillagues, Switzerland). The root canals were sealed with a 1-mm cotton pellet and a 3-mm layer of temporary filling material (Cavit G; 3M ESPE AG, Seefeld, Germany). The patient was then referred to a dermatologist on the same day as his endodontic treatment. The dermatologist made a diagnosis of irritant contact dermatitis and prescribed fusidic acid with betamethasone 17-valerate (Fucicort cream; LEO Pharma, Ballerup, Denmark), 15% Triticum vulgare L. aqueous extract (Fito cream; Tripharma Drug, Istanbul, Turkey), and cetirizine HCl tablets (Zyrtec tablet 10 mg; UCB Pharma, Istanbul, Turkey). For 1 week. His blood sample showed that his C-reactive protein was <0.6 mg/L (normal range 0–5 mg/L). Laboratory tests showed a normal serum IG level 0.01 103/uL (normal range: 0.01–0.03 103/uL) and normal % IG level 0.2% (normal range: 0.1–0.61%). In the complete blood count test, monocyte (%) and eosinophil (%) values were found to be slightly high as 8.4% (normal 2–8%) and 4.1% (normal 2–4%), respectively.

Five days after the formocresol accident (2 days following complete instrumentation), the patient reported that his previous symptoms had abated. Extraoral examination revealed that the lesion was still present, and all his clinical signs and symptoms were similar to those at the initial examination. The patient was rescheduled for evaluation after 1 week. 7 days later this accident, he sent us his photograph and it was seen that his condition was found to have visibly improved (Fig. 4a).

By his third visit on the 10th day, the condition had completely resolved and the root canal treatment was subsequently completed (Fig. 4b). The tooth was isolated, the temporary restoration was removed and the medication was washed out by irrigating with 5 mL of saline solution and by carefully filing the canal with the master apical file.

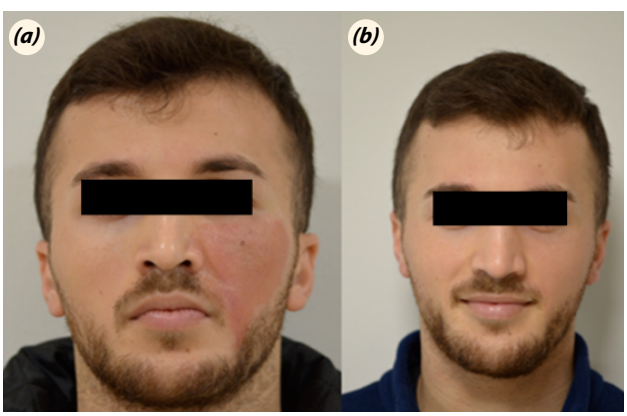


**Fig. 4.** **(a)** Extraoral view after 7 days of treatment, **(b)** Extraoral view after 10 days of treatment

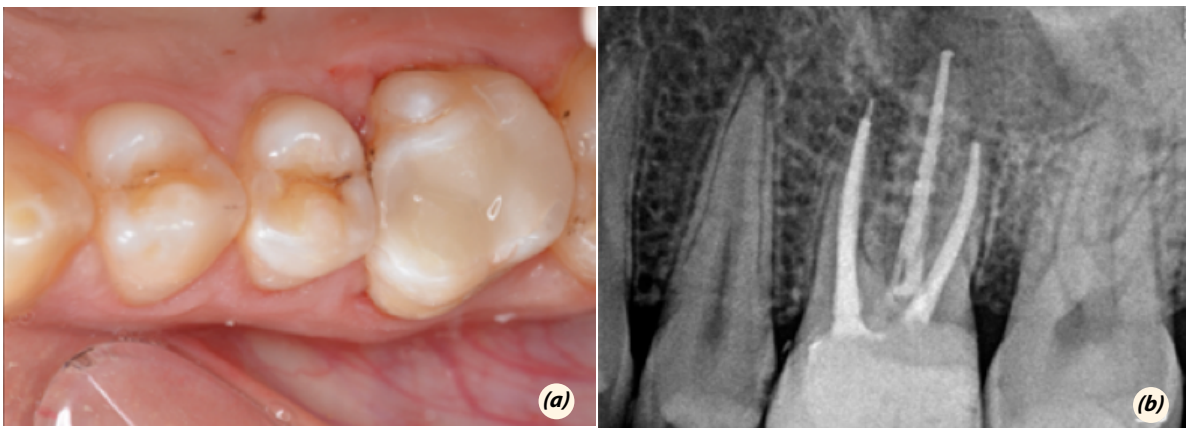


**Fig. 5.** **(a)** Intraoral view after composite restoration, **(b)** Periapical radiograph taken after obturation of root canals

Final irrigation completed by 17% EDTA, followed by 10 ml distilled water. Completion of the root canal treatment proceeded with obturation through lateral condensation using gutta-percha. Access cavities were restored with composite resin (Z250, 3M Corporation, Saint Paul, MN, USA), and a final radiograph was taken (Fig. 5a and b).

## Discussion

The use of an intracanal medication in conjunction with mechanical cleaning and irrigation of the root canal system is an important part of endodontic therapy. Cresatin, camphorated parachlorophenol, and formocresol were found to be effective in inhibiting the growth of microorganisms in the root canal, but they release toxic materials (8,9). Due to their toxicity, they are no longer used in modern dentistry. In this case, the treatment of a patient who presented with severe contact dermatitis due to improper use of formocresol is reported. This case demonstrates the rarity of such lesions and the paucity of information in the dental literature.

Formocresol has been used for root canal disinfection for many years. It contains formaldehyde, an effective alkylating agent, and cresol, a protein-coagulating phenolic compound (8). Formaldehyde is one of the components of formocresol that interacts with cellular proteins. The addition of cresol to formaldehyde appears to potentiate the effect of formaldehyde on protein (10). In a study using human pulp fibroblast cultures, formaldehyde was shown to be the major component of formocresol that caused cytotoxicity which was more toxic than cresol (11). Formocresol's action is believed to be due to the release of formaldehyde vapors which act as a germicidal agent. Clinical success has been reported to be high in pulpotomies performed with formocresol (5,12,13). Clinical success is generally considered as the absence of factors such as pain, fistula development, mobility, and radiographic evidence of pathology. However, histological examinations after formocresol pulpotomies show different results. It has been reported that fixated pulp tissue segments respond with areas of inflammation and necrosis (12,13). Moreover, Powell et al. (5) have shown that when formocresol was implanted subcutaneously in the connective tissue of rats, the surrounding tissue was severely damaged; causing necrosis as well, along with abscess formation. Results of previous studies have shown that formaldehyde and tricresol diffuse through the apical foramen within minutes after formocresol is sealed in the root canal and affect the periapical area (14,15). The "long distance" effect of formaldehyde (16) refers to its diffusion into the surrounding periodontium by means other than the main apical foramen through continual vaporization (17,18). Formaldehyde released through dentin has a destructive effect on periodontal and bone tissues (19). Different side effects related to formaldehyde released through dentin have been reported, such as infection, inflammation, necrosis, arthritis, paresthesia of the dental branch of the mandibular nerve, and fungal caseous sinusitis (20-22). A recent case report on an accidental chloroform injection showed permanent motor nerve damage to the branches of the facial nerve (23). Furthermore, in 2004, the International Agency for Research on Cancer concluded that chronic exposure to high levels of formaldehyde causes nasopharyngeal cancer in humans (24). Because of all these, the American Association of Endodontists issued a position paper on the use of formaldehyde-and paraformaldehyde-containing materials in which they recommended that they should not be used during endodontic treatment due to their toxicity and carcinogenicity (25).

Most adverse reactions are related to formaldehyde's toxic and irritant effects, such as necrosis or irritant dermatitis from cutaneous exposure, nasal, laryngeal, and bronchopulmonary lesions appearing upon inhalation and gas-

trointestinal lesions appearing upon ingestion (26,27). In addition, hypersensitivity or allergic reactions such as rhinitis, asthma, generalized urticaria, angioedema, and anaphylactic shock have been described (14,28). Formaldehyde release from root canal sealant has been demonstrated in vitro and in vivo and may induce anaphylactic reactions after reacting with other proteins to become a complete allergen (29).

Irritant contact dermatitis to formaldehyde is a commonly seen clinical manifestation (30). A severe contact dermatitis lesion during dental treatment such as the one presented in this case, is, however, rarely encountered. After this iatrogenic accident, the patient's first dentist did nothing except antibiotic prescription. If the dentist had worked under rubber dam isolation, maybe this accident could have been avoided. It is known that a reduction in the concentration of formocresol is accompanied by a reduction in its cytotoxic effects (19). According to Finkelstein et al. (31), water or saline irrigation is the emergency treatment choice to minimize the product's effects. Value of early treatment with copious lavage of water was overlooked in this case and the patient applied to us late. But still, the lesion responded positively to drug treatment prescribed by the dermatologist and healed within 1 week.

### *Conclusion*

Dentists should be aware of the toxicity, carcinogenicity, and genotoxicity of formocresol and should choose from other newer and less toxic medicaments for any type of endodontic procedure. They should also focus on paying attention to rubber-dam isolation during endodontic treatment to avoid the potential hazard of inflicting such an iatrogenic injury whilst using dental materials.

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