

*Full Length Research Paper*

# Esthetic and functional rehabilitation of soft-drink eroded teeth with prosthodontic approach: A case report

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Dental caries and enamel erosion are among the several health problems related to unusual consuming of soft drinks as an extrinsic factor of dental erosion. In this report, a 27-year-old man complaining of severe worn-out of all his teeth was presented. He had a history of unusual drinking of cola (4 to 6 L daily) for 6 years and had a poor oral hygiene. Severe decays were present in the incisors, canines, premolars, and molars. Counseling about healthy nutrition and drinking was used as an important aspect of management plan. Conservative management of dental caries was performed and during 3-year follow-up including counseling about nutrition and oral hygiene, the patient had no complaint related to the dental management. To prevent dental erosions related to drinking, it is necessary to increase awareness of people about public health problem related to the adverse effect of excessive soft drink consumption. For the long-term success of dental restoration as the presented case, the maintenance of lifestyle changes and regular follow-up are the most important factors to prevent the deterioration of dental health.

**Key words:** Dental erosion, soft drinks, prosthodontics, cola, acid.

## INTRODUCTION

Dental erosions are defined as a loss of dental hard tissue caused by acid in contrast to caries without bacterial involvement (Trushkowsky and Garcia-Godoy, 2014). They may occur on all accessible dental surfaces, triggered by extrinsic or intrinsic factors (Hellwig and Lussi, 2014). The frequent use of acidic medications that come in direct contact with teeth has also been identified as an extrinsic etiologic factor in dental erosion, not only for adults but also for children and adolescents (Salas et

al., 2015). Marked increases in dental erosion have been noted in some countries to be due to an increased consumption of acidic drinks, and dental erosion in children has thus aroused considerable clinical interest (Johansson et al., 2012). Several case-control and observational clinical studies in adults and children, have shown a clear variable relationship between gastroesophageal reflux disease and tooth erosion (Ranjitkar et al., 2012).

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**Figure 1.** Dental images before prosthodontic treatment. (a) Aesthetic appearance of the teeth lost. (b) The image after Erosion occlusion of the maxilla and mandible. (c) The occlusion to the right of the image. (d) Occlusion of the left image. (e) Detailed image of the maxilla. (f) Detailed image of the mandible.

There are two factors increasing the risk of tooth decay related to excessive soft drinks. These factors will lead to changes in pH. Sugar is easily fermented by bacteria in the mouth (Kleinberg, 2002). Phosphoric acid in coke weakens the tooth enamel and increases the risk of caries (Tahmassebi et al., 2006). However, the high sugar concentration prepares an appropriate environment for bacteria (Marsh, 2003). The effect of diet on dental tissue can be affected by a number of factors such as corrosive acid environment and hot drinks (Wongkhantee et al., 2006). Related to many of these variables, limited information is available (Ganss et al., 2012).

Huysmans et al. (2011) found in their study that erosive wear linked to tooth erosion is defined as loss of tissue and stated that while the chemical process was related to "dental erosive wear", clinical process deal with the external view. Erosions are usually observed on the facial, lingual and occlusal surfaces of the teeth (Grippio et al., 2004). Anatomical and functional factors affect the anterior teeth in the early period; this localization is another important reason for exposition of dentin

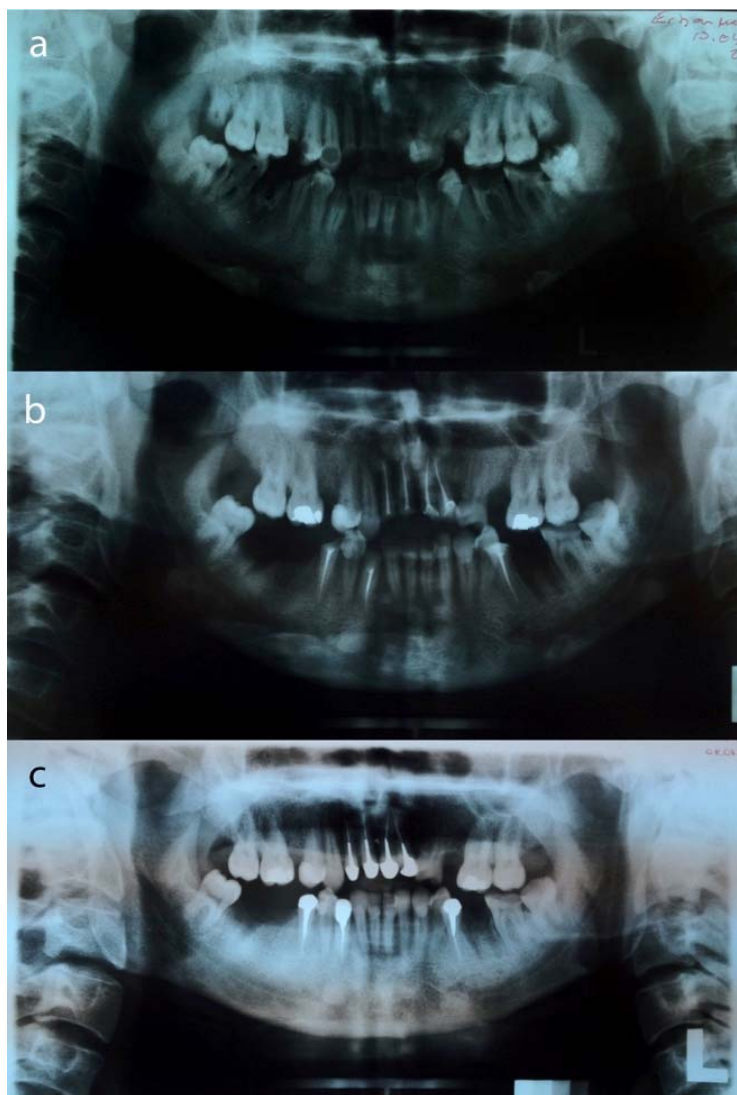
(Fonseca et al., 2008). In a relevant study, it was demonstrated that cola and orange juice reduced the surface hardness of tooth enamel in accordance with the daily-consumed food and beverages (Edwards et al., 1998).

In this paper, a case of dental erosion and severe caries caused by excessive consumption of soft drinks was reported.

### CASE REPORT

Written informed consent of the patient was obtained for this case presentation. A 28 year-old male patient with bad breath, lack of chewing, and speech difficulty, was admitted to our prosthodontic service with aesthetic problems. Intraoral examination revealed many teeth of the mandible and the maxilla eroded (Figure 1).

After obtaining a detailed history of the patient, the cause of erosion was considered as related to the acid content in the diet. There was no history of gastro-



**Figure 2.** Dental radiographs while continuing of prosthodontic treatment. (a) The first examination radiography of the patient. (b) Post-radiographic image after root canal treatments and tooth extractions. (c) Radiographic image the after post-core applications.

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
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**Figure 3.** FDI (World Dental Federation) classification for teeth.

esophageal reflux disease and drug use of systemic disorders. The patient was informed against the excessive drinking of cola. In the context of diagnostic workup, panoramic radiographs of the patients were

taken (Figure 2).

Pulp vitality tests were performed for all teeth. According to FDI classification (Figure 3), root canal treatment was performed to severely eroded and devital





**Figure 4.** Dental images after 2 year the prosthodontic treatment. (a) The patient's aesthetic design image. (b) Treatment of anterior images. (c) Closing the right image after the treatment. (d) Closing the left image after the treatment. (e) Detailed image of the maxillary teeth after treatment. (f) Detailed image of the mandibular teeth after treatment.

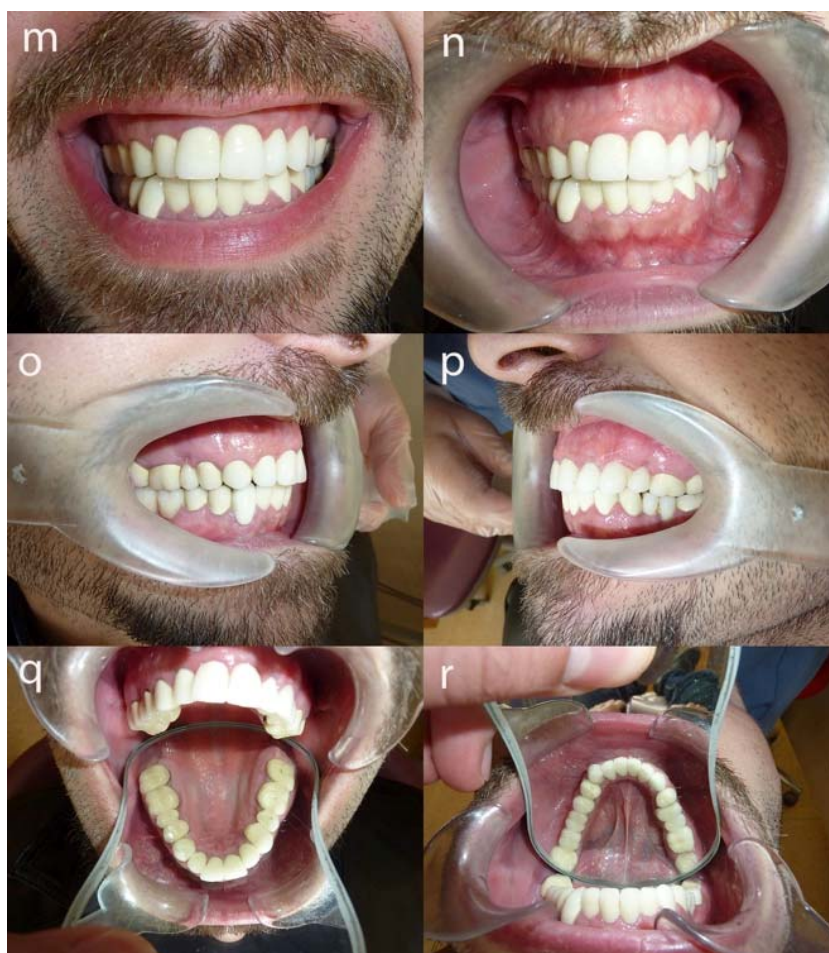
teeth including 11, 12, 21, 22, 34, 43, and 45 and extraction was required for teeth 15, 25, 36, 46, and 47 that could not be saved. In the unhealthy teeth, there were apical lesions and periodontal withdrawal. After root-canal treatment of teeth, post-operative follow-up examination revealed no complication and uneventful recovery. Post-core treatment was performed on the root canal of the teeth. Prosthodontic treatment was planned. Because of the aesthetic requirements of anterior regions, the zirconium-enabled ceramic crowns were performed on anterior teeth, while metal-ceramic crowns and bridges were performed on the posterior teeth (Figure 4).

The patient was followed up for 5 years. Periodontal, endodontic, and prosthetic examinations were made (Figure 5) periodically. Follow-up examinations revealed that the patient did not drink cola irresponsibly as well as

he ate acidic food according to the dietary suggestions. Patient had no complaints related to chewing and speaking.

## DISCUSSION

Citric acid is added to many commercially produced drinks (diet coke, etc) (Kitchens and Owens, 2007). High citric acid has a potential for erosive effects (Lussi et al., 2012). In terms of dental health, critical pH level is 5.5 and phosphoric acid has a pH level below 5.5 (Dawes, 2003). Diet coke has higher pH value than those with the regular form (McCloy et al., 1984). In the presented case, teeth erosion of the patient was considered as a result of excessively consumed diet coke with a low pH value. In addition, the high concentration of sugar in the coke may



**Figure 5.** Dental images after 5 years the prosthodontic treatment. (a) 5 years after the patient's aesthetic image. (b) Monitoring the relationship of occlusion and periodontal. (c) The closure of the image from the right. (d) The closure of the image from the left. (e) Follow-up post-the image of the maxillary teeth. (f) Follow-up post-the image of the mandibular teeth.

present a good environment for the bacteria that cause tooth decay (Kitchens and Owens, 2007).

The restoration of tooth wear with many different materials and techniques can be used for patients with dental erosion (Dahl et al., 1993). Restoration of lost tooth structure with increase in the durability of the tooth can be achieved as a result of reduction of stress, with restorative work that occurs in the cervical region to prevent dentin sensitivity causing pulpal damage (Blair et al., 2002; Peutzfeldt et al., 2014). In this case, eroded hard tissue of the teeth was mended with root canal therapy and post-core treatment. With crown and bridge restoration, the chewing efficiency is improved by adjustment of chewing forces (Trushkowsky and Garcia-Godoy, 2014).

Outcome and clinical performance of fixed dental prosthesis (FDP) can be affected many parameters such

as the size and position of teeth, tooth cavity and the used materials (Anusavice, 2012). Tetragonal zirkonyttria stabilizopolycrystal (Y-TZP) materials as a suitable alternative is a molten metal (PFM), because of biocompatibility and positive aesthetic considerations (Filser et al., 2001). In the current patient, long-term and excessive cola consumption induced the erosion of the teeth that are treated conservatively including root canal treatments. In this case, according to the preference of patient and aesthetic considerations, PFM-porcelain system was performed for posterior teeth, Y-TZP-porcelain system was used for anterior part of the mouth. After 5-years follow-up, patient satisfaction was observed with no complaints related to the prosthetic treatment. Obtaining a detailed history, general and dental health of the patient is the most important factor during differential diagnosis of etiology of excessive dental erosion and

caries. We think that improving compliance of patient to the management plan and his adaptation to the lifestyle changes and regular follow-up are the major determinants of long-term success of management of dental erosion related to excessive cola consumption.

### Conflict of interest

The author declares that there is no conflict of interest.

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