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EFFECTIVENESS OF ENAMEL INFILTRATION AFTER RADIATION THERAPY IN PATIENTS WITH ORAL CAVITY CANCER

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ABSTRACT — Prevention and treatment of dental hard tissue pathologies in patients exposed to combined and radiation treatment of oral cavity and pharyngeal malignancies are an urgent and challenging issue for the clinical dentistry. Deterioration of tooth enamel after radiation is similar to caries in the spot stage, which allows using infiltration of tooth enamel. AIM OF THE STUDY: to identify the effectiveness of enamel infiltration with *Icon* in patients subjected to radiation therapy for the oral cavity cancer. MATERIALS AND METHODS: enamel infiltration was performed for the vestibular and proximal surfaces of 35 teeth in patients who received radiation therapy for oral cancer (squamous cell tongue carcinoma, squamous cell amygdala carcinoma). The study outcomes were evaluated 6 months, 1 year and 1.5 years following the treatment. RESULTS AND DISCUSSION: enamel gloss was recovered in 32 teeth; chalky spots disappeared completely in 28 cases, while another 7 cases featured significantly decreased severity. In total, the progression of the carious process was to be observed in 14.3% of the cases within 1.5 years, mainly on the proximal surfaces of the teeth. CONCLUSION: enamel infiltration with Icon is an effective treatment for enamel demineralization in patients who underwent radiation therapy.

KEYWORDS — radiation caries, enamel infiltration method.

INTRODUCTION

The recent years have witnessed an increase in the overall intensive incidence of oral cavity and pharyngeal cancer. Treatment of such patients in most cases is combined; as claimed by the WHO, about 70–75% of such patients need radiation therapy [1, 2], which has a number of complications. One of the late effects is radiation caries. The effects of radiation depend on both the radiation nature and its dose, and may have different clinical manifestations [3, 4, 29]. Most often, 3–6 months after radiation therapy, the teeth enamel loses its typical gloss and gets dull, as well as it acquires some grayish hue. The enamel film becomes more erased, which leads to enamel fragility on all surfaces of the teeth. As the process progresses, it causes local enamel necrosis, gradually turning into circular lesions of the teeth. The necrosis foci expand gradually, affecting a larger part of the tooth surface. If there are no drastic measures taken to treat the teeth, in 1–2 years over 96% of the teeth will be affected [3].

Modern practical dentistry has made a breakthrough in recent decades not only by introducing new methods of prevention, diagnosis and treatment of dental issues, but also by improving the scientific knowledge and manual skills [10–19]. Comprehensive approach to teeth aesthetic restoration with chemical and technological compatibility of all materials and medication should be applied after diagnosing caries in all treatment stages. It includes a follow-up examination. Such approach is extremely important and requires in-depth study [20–28].

So far prevention and treatment of the dental hard tissue pathology in patients after combined and radiation therapy for oral cavity and pharyngeal cancer remain unresolved [4–6]. All the above mentioned explain the relevance of the problem and a search of effective restoration options.

Relying upon the fact that initial changes in the teeth enamel after exposure to radiation are similar to caries in the spot stage, our idea was to investigate possible use of tooth enamel infiltration to treat the initial stages of radiation caries and prevent the caries progress.

The technique of enamel infiltration with *Icon* implies removing the pseudo-intact enamel layer with 15% hydrochloric acid, then filling the lesion with a mixture of synthetic resins featuring a high penetration coefficient, while their optical properties are to be similar to those of intact tooth enamel [5]. After treatment with the *Icon* system, the tooth shows improved aesthetic properties, whereas the enamel surface is sealed hermetically at the carious spot. This leads to higher stability of the teeth hard tissues and to stabilization of caries progression [7–9]. Therefore, this method seems rather promising for management of initial stages of radiation caries and preventing its progression.

Aim of study: to identify the effectiveness of enamel infiltration with *Icon* in patients after radiation therapy for the oral cavity cancer.

MATERIALS AND METHODS

The study focused on working with 35 teeth in patients exposed to radiation therapy for oral cancer (squamous cell tongue carcinoma, squamous cell amygdala carcinoma).

For impregnation, the teeth were selected featuring a loss of gloss and enamel transparency, chalky spots as a manifestation of demineralization of the enamel surface layer and without signs of its destruction and defects. Enamel infiltration was performed on the vestibular and proximal surfaces.

Enamel impregnation with Icon (DMG, Germany) was carried out as follows. Initially, dental deposits were removed with a brush using the Detartrine paste (Septodont, France), after which the teeth were thoroughly washed with a stream of water and dried.

Afterwards, the teeth were isolated using liquid photopolymerized cofferdam Liquid Dam (Amazing White, USA). Then, some etching gel Icon-Etch, containing 15% hydrochloric acid, was applied to the enamel demineralization foci.

The medicine was allowed to have its effect on the tooth enamel for 120 seconds, after which the tooth surface was washed with distilled water for 30 seconds. Then the tooth enamel was air-dried. In order to completely remove the moisture remaining in the enamel pores, some ICOP-Dry air conditioner containing ethanol was applied to the surface, which was further dried by a jet of air supplied from a compressor, which created proper conditions for the polymer resins adhesion.

The lesion infiltration was performed with a component of the Icon-Infiltrant medication. For this purpose, a nozzle was screwed onto the syringe, which allowed the infiltration, with some excess, to be applied by rubbing movements onto the enamel surface. The exposure time of the infiltrant on the enamel was 3 minutes, after which it was photopolymerized for 40 seconds. To increase microhardness and compensate for polymerization shrinkage, the infiltrate was applied again for 1 minute, after which it was photopolymerized for another 40 seconds. Further on, the cofferdam was removed, to be followed with removal of the excess material, the oxygen-inhibited layer; then the teeth were polished with polishing heads and disks.

The patients were recommended to practice good dental hygiene and use a remineralizating toothpaste. The follow-up period was 1.5 years; control check-ups were carried out 6, 12 and 18 months after the procedure of dental infiltration with *Icon*.

RESULTS AND DISCUSSION

After the treatment, the enamel gloss was restored on 32 teeth (91.4% of cases); the chalky spots disappeared completely in 28 cases (80%), and in 7 cases (20%) their severity decreased significantly.

6 months later, there were no cases of caries progression on the treated teeth. 12 months after the enamel infiltration, carious cavities development was registered on the treated surfaces of 3 teeth (vestibular surface of 1 canine, circular caries of 1 premolar, approximal surface of 1 molar).

A study conducted after 18 months revealed 2 more cases of cavity caries (approximal surfaces of 2 premolars), as well as an increase in the chalky spots area on the vestibular surface of 3 teeth treated with Icon; the infiltration effectiveness was incomplete.

Fig. 1 below shows the effectiveness of enamel infiltration with *Icon*.

Fig. 1. *Oral cavity status after radiation therapy (46-year-old patient) (a), at treatment stage (b), and 6 months after enamel infiltration with Icon (c)*

During 1.5 years of monitoring the teeth condition treated with Icon, progression of caries was to be observed in 14.3% of cases — mostly on the proximal surfaces of the teeth. Comparing the rate of caries progression after intensive exposure to radiation (without dental treatment, over the course of 1–2 years after the radiation therapy, more than 96% of teeth get affected by radiation caries), we can conclude that treatment of radiation caries with tooth enamel infiltration Icon

proves as highly effective. In addition, if it is complemented with procedures aimed at enamel remineralization, this method can significantly reduce the caries progression in irradiated patients.

CONCLUSION

Our clinical observation has proven the effectiveness of enamel infiltration with Icon in treatment of initial stages of radiation caries, especially when it is used on the teeth vestibular surface. This demonstrates a promising potential of further studying of this approach in regard to the hard dental tissue issues in irradiated patients with cancer of the oral cavity tissues and organs.

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