

it was filed with Ca(OH)_2 for 10 days. The root canal was definitively obturated using apical barrier of calcium phosphate bioceramic in order to improve both, clinical and radiographic outcome.

This apical barrier initiated regeneration processes in the periapical area and created conditions for maximum sealing of the root canal and eliminated overfilling within the zone. The calcium phosphate bioceramic has the capacity to stop bleeding after application in the periapical zone and gives its antimicrobial effect (Figure 2. a-f).

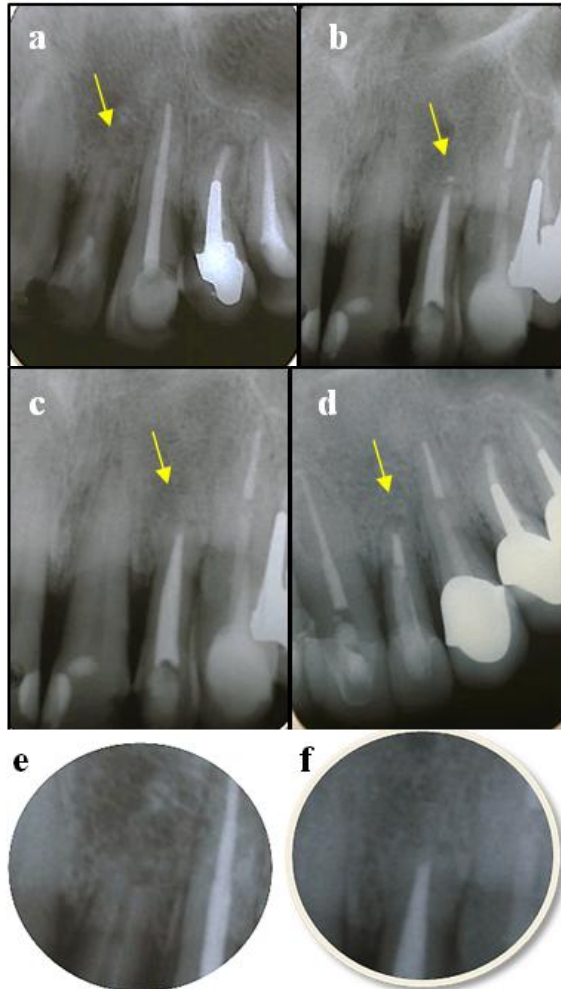


Figure 1: a/initial x-ray presents the periapical condition of tooth 22 after apical surgery 9 years ago; b/control x-ray after obturation using biphasic calcium phosphate ceramic as a apical barrier and AH Plus as a sealer and gutta-percha; c/control x-ray at 6th month; d/control x-ray after FRC post placement e/ zoom at initial clinical situation; f/zoom at 4th year after definitive obturation.

4. Discussion

The basis for success of endodontic treatment is to remove the cause, i.e. all necrotic debris, bacteria and their byproducts. As early as in 1939, it was known that the root canal was the seat of infection [6, 10]. After debridement and disinfection of root canals, periradicular lesion had healed even without obturation of root canal [23]. Research suggests that the high pH and released calcium ions are required for the materials, which should stimulate

mineralization in the process of hard tissue healing in teeth with CAP.

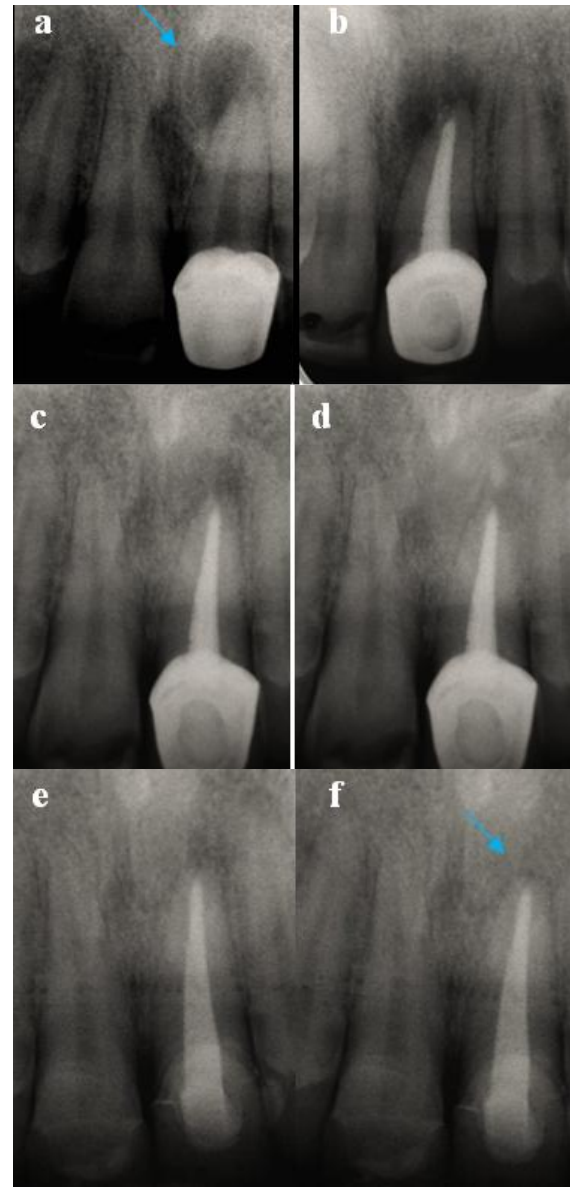


Figure 2: a/initial x-ray presents the periapical condition of tooth 21 indicated for primary endodontic treatment; b/definitive obturation of root canal using apical barrier from biphasic calcium phosphate ceramic and after that sealer and gutta-percha; c/control x-ray at the 3rd month; d/ control x-ray at the 6th month and after that the old metal-ceramic crown were replaced with new one; e/x-ray after 1 year; f/ x-ray after 4 years.

The effect of overfilling is varied, determined by the type of sealer and sealer's quantity which passes through the apical foramen. Based on these factors, the most common effects of overfilling are inflammation reaction of the tissue in apical zone causing severe pain accompanied by swollen tissue, periodontal ligament breakage, and periapical lesion persistence [15, 31, 42,21]. It is documented that in cases of apical periodontitis, intra-canal bacteria can penetrate dentin to a depth of 150-250 μ , where they remain protected from the action of medicament and irrigants [4,22]. Therefore, apical canal widening to 300-500 μ is required to thoroughly cleanse the apical portion of the canal. Apical foramen widening was done with gradually increasing number of

files till #025 or #030. This allowed thorough cleaning of cemental part of the canal and also ensured subsequent smooth passage of instrument taken past the foramen without breakage [37]. When healing process starts the amount of inflammatory mediators, metalloproteinases, and growth factors released by immune cells is substantially reduced in the lesion.

Apical clearing, apical foramen widening and over-instrumentation into the periapical region were done to induce bleeding near the apical foramen. It is assumed that the clot formed provides a scaffold into which locally residing stem cells can get seeded and the cascade of healing process can initiate [37].

The periapical tissues have a rich blood supply, lymphatic drainage and abundant undifferentiated cells. The periapical region of teeth is rich in various stem cells such as - periodontal ligament stem cells, dental pulp stem cells, bone marrow mesenchymal stem cells and the more recently identified stem cells from apical papilla [14]. These stem cells are documented to play a significant role in maturation processes of immature teeth using revascularization procedure [14]. Shah (2012) wrote, that it could be hypothesized that the same mechanism probably takes place in cases of mature teeth. The bleeding and clot formed in the area of apical foramen by over-instrumentation can lead to seeding of stem cells, their proliferation, differentiation and mineralized tissue formation, sealing the apical foramen [37]. Bhaskar suggested that if instruments are extended 1 mm beyond the apical foramen, the inflammatory reaction that develops destroys the cyst lining and converts the lesion into a granuloma. Once the causative factors are eliminated, the granuloma heals spontaneously [3]. Bender added that penetration to the center of the apical lesion might help in resolution by establishing the drainage and relieving pressure [1].

According to the latest data, removal of the smear layer is an essential of root canal disinfection and sealing. Contrary to the vulnerable planktonic state, bacteria are protected from the antibacterial agent in biofilms. To date, many methods and antibacterial agents have been proposed against biofilms and are effective within a wide range of activity [29, 13, 33].

Endodontic pathogens have different survival strategies when the conditions are unfavorable. The microbes penetrate the dentinal tubules in 1000 µm depth, creating a firmly bonded biofilm. The use of red light is giving good results in photoactivated disinfection of the root canals as a new method of treatment. The latest results in this area demonstrate the need for further research associated with bacterial pathogens for achieving the best results possible.

5. Conclusion

After the endodontic infection is effectively eliminated by nonsurgical orthograde treatment, inflammation of the periapical lesion gradually subsides, and the healing process is initiated. The biomimetical obturation of dental apex and overfilling of the apical periodontal lesion with calcium phosphate bioceramic, stimulate the remodeling healing processes in the periodontal zone. Most probably the

effective orthograde treatment and the application of bioceramic stimulate the reduction of the amount of inflammatory mediators, metalloproteinases, and the growth factors released by the immune cells in the lesion.

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