

## **A to Z Endodontic Planning, The key for Long Term Success: Case Report**

**Jenner Argueta<sup>1\*</sup>, Yakelline Castillo<sup>2</sup> and Jimena Martínez<sup>3</sup>**

<sup>1</sup>*Guatemalan Endodontics Academy President, Certified Researcher at the Guatemalan National Council of Science and Technology, Faculty Endodontics Professor at Mariano Galvez de Guatemala University, Guatemala*

<sup>2</sup>*Faculty Professor at Mariano Galvez de Guatemala University, Guatemala*

<sup>3</sup>*Br. Dentistry Student at Mariano Galvez de Guatemala University, Guatemala*

**\*Corresponding Author:** Jenner Argueta, Guatemalan Endodontics Academy President, Certified Researcher at the Guatemalan National Council of Science and Technology, Faculty Endodontics Professor at Mariano Galvez de Guatemala University, Guatemala.

**Received:** January 02, 2020; **Published:** February 28, 2020

### **Abstract**

**Aim:** To highlight the importance of a multidisciplinary treatment planning by means of presenting a long-term follow-up to a clinical case in the upper anterior maxillary zone.

**Conclusion:** In the initial state the patient presented deep caries, demineralizations, periapical radiolucent areas, previous root canal treatments and non-adapted coronal restorations. To restore the function in the affected areas, procedures such as: Apical microsurgery, root canal retreatments, surgical extrusion, anatomical fiber glass posts placement and metal-free crowns were performed.

The long-term follow-up shows a complete reestablishment of biological, mechanical and aesthetical function.

**Keywords:** *Periapical Microsurgery; Surgical Extrusion; Crown Fracture; Ferrule; Final Restoration; Post*

### **Introduction**

One of the main goals of endodontics is to provide an adequate biological environment for preventing periapical disease or to propitiate healing when the periapical tissues are already affected [1-3]; obtaining a satisfactory sealing at apical and coronal areas are crucial factors for achieving good results. The apical seal should be created during the endodontic therapy, while the coronal lock is provided by the well adapted final restoration, this last one is also responsible of preventing a re-infection of the root canal system and to maintain the tooth functioning mechanically and aesthetically [4,5]. Keeping the aforementioned in mind, the key for long term successful clinical results relies on the achievement of an appropriate integral diagnosis and the establishment of an adequate treatment plan.

Providing high quality and successful dental treatments relay on several factors, a chain of intercorrelated procedures in which the first step (integral planning) will guide the evolution of every executed procedure. The definition of success has been a topic of debate in past years, according to the European Society of Endodontology, endodontic success is accomplished when next factors are present: 1. No loss of function 2. Intact lamina dura 3. Normal periodontal ligament space 4. Absence of clinical signs and symptoms [3]. The main objective of this case report is to demonstrate the importance of a multidisciplinary treatment planning, execution and patient's commitment to achieve the desire final result.

### **Clinical Case Description**

A 21-years-old male patient required dental treatment for the upper anterior maxillary zone (Figure 1 and 2) at the Dentistry School of Mariano Galvez de Guatemala University. During the clinical and radiographic examination, we were able to diagnose as follows:



**Figure 1:** Patient's Initial clinical picture. Deep caries in vestibular zone and demineralization is observed in tooth No 6. and No. 7.



**Figure 2:** Patient's Initial panoramic radiograph, big radiolucent area is evident at the periapex level of tooth No. 6 and previous root canal treatments in teeth No. 6 and 7. It is also possible to confirm the good oral status of the patient in other oral regions.

- **Tooth No. 6 (Figure 3):** Asymptomatic apical periodontitis + previous root canal treatment. The root canal obturation was short due to a transportation at the apical curvature; a non-radiopaque composite restoration was present in the coronal area.
- **Tooth No. 7 (Figure 4):** Previous root canal treatment + normal periapical tissues. By the help of 3D radiographic imaging it was confirmed that the periapical radiolucency was not involving teeth 7 and 8 (Figure 5). The palatal cervical area of tooth No. 7 was severely destroyed due to a deep caries process (Figure 6).
- **Tooth No. 8 (Figure 4):** Asymptomatic Irreversible Pulpitis + normal periapical tissues. The irreversible pulpar status could be related to a previous traumatism in the area.



**Figure 3:** Initial periapical radiograph of tooth No. 6, a radiolucent area is present at periapical level, it is also possible to observe a transportation at the apical curvature of the root canal and a non-radiopaque composite restoration.

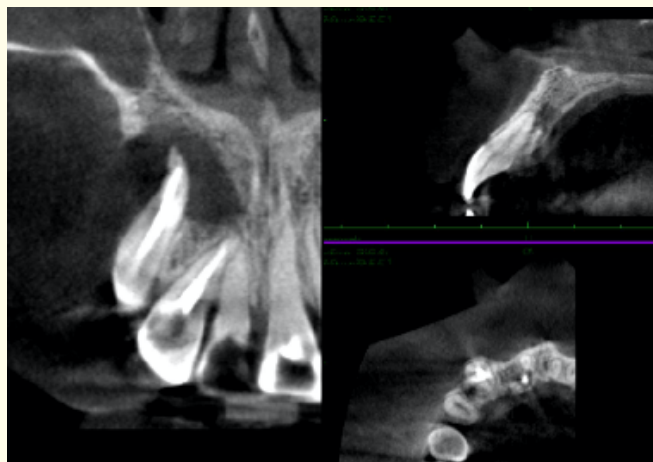


**Figure 4:** Initial periapical radiograph of the affected teeth in the upper anterior maxillary zone. There is a failed root canal treatment on tooth No. 7.

In concordance with the above-mentioned diagnosis and the general oral status of the patient, the established treatment plan was next:

- **Tooth No. 6:** Periapical Microsurgery, Root canal retreatment, Fiber post and a metal free crown as coronal restoration.
- **Tooth No. 7:** Root canal retreatment, Fiber Post and a metal free crown as coronal restoration.
- **Tooth No. 8:** Root canal treatment and a direct composite as final restoration.

The decision of treating the tooth No. 6 with micro-periapical surgery instead of a retreatment was the transportation in the apical area because, when there is an endodontic failure caused by perforations, transportation or over-seals, it is occasionally necessary to consider a surgical technique for eliminating the potential causes of persistent periapical inflammation [6,7]. The big lesion affecting the tooth (Figure 5), was another factor taken in consideration to choose the surgical technique. The periapical microsurgery was performed successfully using a putty silicate based material for retro-obturation, a demineralized bone graft was placed in the area to guide the healing of the through and through bone lesion [8] (Figure 7). Two months after the surgical approach, retreatment of the middle and coronal thirds of the root canal was performed; approximately 5 mm of thermoplasticized gutta-percha were placed at the middle radicular third, by the help of the EQ-V device (Figure 7.1), thermoplasticized guttapercha injection techniques are very convenient in this kind of cases [9]. An anatomical fiber post was placed in the same appointment. For being able to place the post in the same appointment, AdSeal was used as resin based root canal sealer [10].



**Figure 5:** Cone beam computed tomography slices, where it is possible to observe that the periapical radiolucency is not involving teeth 7 and 8.



**Figure 6:** Clinical picture of tooth No. 7, the palatal cervical area was very damaged due to the deep caries process.



**Figure 7:** Radiograph of tooth No. 6 after the microsurgery where it's possible to observe the retro-obturation in the apical radicular third.



**Figure 7.1:** EQ-V Thermoplastized endodontic obturation device by MetaBiomed.

The root canal retreatment was performed successfully on tooth No. 7 using rotary files (Aurum Blue 25.06), Adseal was used as the endodontic sealer of choice for the thermo plasticized obturation technique using the EQ-V. It was not possible to place an anatomical fiber post in the same appointment, so it was planned to place the post days after, sadly, before the post placement the patient suffered a coronal fracture, this situation leaves the tooth without the must needed ferrule effect (Figure 8) to create a long lasting and predictable coronal restoration [11]. To gain coronal structure, a surgical extrusion was performed applying the technique suggested by Argueta., *et al.* in 2018 [12]. By the help of a successful surgical extrusion, it was able to obtain 2 mm of ferrule effect; this 2 mm in height + 1 mm in width are enough for distributing properly the occlusal forces in the cervical area [13]. The post was placed 15 days after the extrusion procedure (Figure 9).



**Figure 8:** Clinical view, of tooth No. 7 after the coronal fracture. The tooth did not have the needed ferrule effect, the tooth wasn't able to bear a crown restoration without the risk of fracture.



**Figure 9:** Pictures of the surgical extrusion procedure: (1) Initial state of the tooth No. 7 after the crown fracture. (2) Clinical picture right after the surgical extrusion, elevators were used in this technique to sindesmotomy and surgical elevators were used to place the tooth in a more coronal position. (3) A semi-rigid splint was used to immobilize the tooth for 2 weeks. (4) The fiber post was placed 15 days after the procedure. (5 and 6) Thanks to this successful technique we gained enough healthy supra-coronal dental structure (>2 mm) This picture shows the stump reconstruction with direct composite in combination with the dental tissue.

Although there are techniques for clinical lengthening in the anterior area, it is important to consider that the conventional technique could cause gingival asymmetry and compromise the aesthetics in the anterior sector. Surgical extrusion has been shown as a successful alternative technique to surgical crown lengthening [12,14].

Ceraseal (Figure 9.1) was selected as silicate based endodontic sealer for the treatment of tooth No. 8 because there were hints of an internal root resorption at apical third (Figure 10). Although, complete crown as final restoration is the most appropriate option when there is a significant loss of dental tissue, a direct composite was placed as final restoration because this tooth had enough coronal structure for supporting occlusal forces [5,10].



Figure 9.1: Ceraseal, Silicate based endodontic sealer by MetaBiomed.

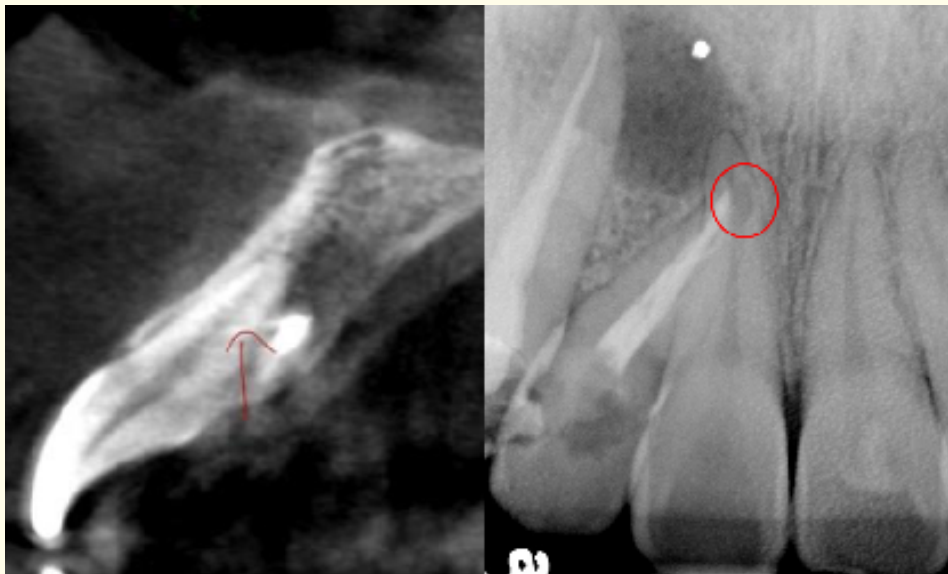


Figure 10: Sagittal plane CBCT image and initial radiograph of tooth No. 8, where its possible to observe hints of internal root resorption at apical third.

Eight weeks after the surgical extrusion procedure in tooth No. 8, periodontal tissues were stable enough in the area to prepare teeth for the final prosthetic restorations, the temporization was executed by previously confirming that a proper ferrule height and thickness were effectively present and full ceramic crowns were placed (Figure 11).



**Figure 11:** Smile view with the final restorations, Class VI direct restoration in tooth No. 9 is pendant

After 14 months follow up period, it is possible to observe (Figure 12) a complete healing of the periapical area, well adapted coronal restorations and successful root canal treatments. Thorough the appropriate execution of the treatment plan we were able to provide an adequate biological environment for the body to heal, and to create aesthetically and mechanically functional coronal restorations.



**Figure 12:** 14 months follow up radiograph, it is possible to see complete healing of the periapical area, successfully accomplished root canal treatments and well adapted coronal restorations.

## Discussion

Endodontic therapy represents a feasible and practical way to preserve function in cases where aspects as prosthetic restorability, bone quality, esthetic demands, cost-benefit ratio, potential of adverse effects, and patient preferences has been evaluated an adequate diagnosis.

Restore endodontically treated teeth when coronal structure retention is compromised usually involve the use of intra-radicular posts and crown lengthening techniques [11,15]. According to Argueta, J., *et al.* in 2018 [12] Different techniques have been proposed as clinical procedures for crown lengthening. In anterior aesthetic regions, the preservation of the gingival margin and the interdental papillas are required to obtain satisfactory aesthetic results [16].



Important aspects in the selection of an ideal post are: remaining coronal structure, esthetics, post material, post design, post width, bonding ability, canal configuration and post adaptability [17]. Anatomically prepared posts has been presented as a good alternative in flared roots, they will improve the fitting to the canal, reduce the cement thickness, stress in the adhesive interphase and decrease the risk of root fractures by the use of resin based materials with an elasticity modulus close to dentin [15,18,19].

### Conclusion

The main goal of the treatment plan was to preserve dental structure by a multidisciplinary management, it was possible to achieve biological health and stability of periapical tissues by means of endodontic procedures; mechanical, and esthetic function were obtained through an adequate prosthodontic approach.

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**Volume 19 Issue 3 March 2020**

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