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Research Paper

Apexum-Lets make apex smile

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ABSTRACT
Aim: *To focus the technique and benefits of Apexum, a non-surgical treatment modality for periapical lesions.*
Introduction: *Since long time, surgeries have been considered as the last resort for periapical lesions. With recent advances and patients' awareness non-surgical treatment modalities are replacing conventional surgical treatment. Time has come to adopt such techniques to keep in pace with technology and patients' satisfaction. This article reviews Apexum, which consists of –Ni-Ti Ablator – Made up of Nickel-Titanium wire within a tube of the same, is coarse with pre-bent Shape Memory and PGA Ablator – Fine wire made up of Poly Glycolic Acid.*
Method : *Access opening is done and canal is widened by passing a #30 file 1mm beyond the apex to create an opening of 330microns in diameter. Then it is rinsed with sterile saline and Ni-Ti Ablator is introduced periapically and rotated at 5000-7000rpm for 30 seconds followed by rinsing with saline. Then PGA Ablator is introduced and rotated at 5000-7000rpm for 30 seconds to form a coagulum or plug. Finally whole periapical area is again rinsed with saline. Patient is recalled for follow-up for 6-12 months.*
Advantages : *Better and faster healing when compared to only endodontically treated tooth, No post-operative pain and swelling, Clean bloodless operating field and Psychological benefit.*
Conclusion : *Apexum can become a boon to Clinicians, for management of periapical lesions.*
Keywords : *Apexum, Ni-Ti Ablator, PGA Ablator, Periapical lesion.*

I. INTRODUCTION

The ultimate target of any endodontic treatment, when applied to teeth with periapical lesions, is to induce complete bony healing of the lesion and restoration of the periodontal ligament. Achieving this target often requires long duration without cent percent results as shown by a reliable, evidence-based estimation[1,2]. In an extensive retrospective study, Ørstavik[2] concluded that (1) in 6 months period, only 50% of the cases that will eventually heal show clear signs of complete healing, and (2) in 12 months period, 88% of the lesions will show clear signs of healing. On the other hand, healing is much faster when the periapical inflammatory tissue is removed during apical surgery[3]. This difference in healing kinetics might be due to long-lasting activation of macrophages in the periapical lesion that persists long after root canal treatment[4,5]. Surgical removal of the periapical, chronically inflamed tissue allows a fresh blood clot to form, thereby converting a chronic inflammatory lesion into a new granulation tissue where healing might proceed much faster[4,5]. Nevertheless, surgery for every case of periapical lesion is not recommended and is unjustified[6,7]. Thus, with recent advances and patients' awareness non-surgical treatment modalities are replacing conventional surgical treatment so as to finish the case with a permanent restoration as soon as possible.This

new approach represents a shift from the current endodontic paradigm because it does not limit the endodontic intervention to the removal of the cause (bacteria), but instead it enters the periapical lesion beyond the apical foramen to convert a chronic lesion into new granulation tissue and promotes tissue repair. This process is commonly carried out as far as the working length, i.e., 0.5–1.0 mm short of the apical foramen, to maintain the apical constriction[8,9]. The Apexum protocol was designed to carry the debridement concept one step further into the apical foramen proper and beyond it into the periapical lesion itself[5]. This is accomplished through a root canal access by using a procedure that is minimally invasive compared with open flap surgery. It has been designed to be applied during, and as a supplementary stage to, conventional root canal treatment. It is aimed to add to such treatment the faster healing kinetics that typically occurs with apical surgery, but without the use of scalpels, periosteal elevators, or sutures.

1.1 Indications[10]

1. Lesion mean diameter: 3-6 mm, Peri-Apical Index score 4 or 5.
2. Roots with open apices(3,4).
3. Routine conventional root canal treatment cases, to promote faster periapical healing.
4. Medically compromised patients in whom surgery is contraindicated.
5. Cases with recurrent lesions.
6. Chronic inactive periapical lesion.
7. Patients anxious for surgery.

Contraindications[10]

1. Roots with abnormal root canal morphology.
2. Active acute infection – cellulitis, abscess.
3. Proximity of vital anatomical structures to the periapical lesion.

II. DEVICE

The Apexum kit[11-13] consists of two devices, the Apexum NiTi Ablator and Apexum PGA Ablator, designed to be used sequentially. Both instruments are for single use. The Apexum NiTi Ablator consists of a specially preshaped Nitinol wire. One end is bent and is designed to enter the periapical tissues through the root canal and apical foramen, whereas the other end has a latch-type connector to allow its operation by a low- speed contra-angle hand piece. The bent part is initially concealed in a straight super elastic Nitinol tube that serves as a sheath allowing its introduction up to the apical foramen. When pushed, the wire emerges from its sheath and through the apical foramen and resumes its preshaped form. The special retrograde design of the bent part allows it to rotate in the periapical soft tissues at 200 to 250 rpm and coarsely grind them while being deflected from the surrounding bone . The Nitinol sheath is used first to allow the introduction of the Nitinol wire to the apical foramen and second to allow unobstructed rotation of the wire in the root canal without twisting of the wire. The second device is the Apexum PGA ablator, built from a Nitinol Shaft, equipped at one end with a latch type connector to allow its operation by a low-speed contra-angle handpiece. At the other end,a bioabsorbable filament is attached, which is designed to enter the periapical bony crypt & rotate at 5,000 to 7,000 rpm, turning the tissue that was initially minced with Ni-Ti ablator into a thin suspension that may be flushed through the root canal.

III. PROCEDURE

The treatment protocol[11,13] is identical to that of the conventional treatment with the addition of the Apexum procedure. A #20 K-file is passed through the apical foramen and beyond the apex to verify patency. It is followed by a rotary #30 file (Profile .04, Maillefer) that is passed 1 mm beyond the apical foramen. The Apexum NiTi Ablator is then inserted, while encased in its sheath, to the working length as established at the cleaning and shaping stage. The sheath is stabilized to the occlusal surface of the tooth using glass-ionomer cement.The Nitinol filament is then pushed manually through the enlarged apical foramen and into the periapical tissues. The filament is first rotated manually to verify mobility with no solid obstruction and then attached to a low-speed contra-angle hand piece. The NiTi Ablator is then rotated in the periapical tissues for 30 seconds at 200 to 250 rpm to initially mince the tissues. The stabilizing glass-ionomer cement is then removed and the NiTi Ablator withdrawn from the root canal with its sheath to examine it for any mechanical damage or missing parts. The root canal will be rinsed with sterile saline, and the Apexum PGA Ablator is manually inserted through the root canal and into the periapical tissues. It was then connected to a low-speed contra-angle hand piece and rotated for 30 seconds at 5,000 to 7,000 rpm to turn the minced tissues into a thin suspension. Next, it is withdrawn from the root and examined for any mechanical damage or missing parts. The tissue suspension is now washed out with sterile saline solution by using a syringe adapted with a 30 guage blunt needle. The needle is passed through the enlarged apical foramen into the periapical space, and

the solution is slowly and gently injected to flush the tissue suspension out. The cross-sectional area between the enlarged apical foramen and the outer surface of the needle is 3.4 times larger than that of the needle's lumen. This facilitates an unobstructed backflow and prevents pressure buildup in the periapical crypt. Nevertheless, special attention should be given to visually monitor the backflow of the blood red suspension through the root canal continuously so that pressure buildup did not occur in the periapical space. To allow for continuous monitoring, aspiration is performed at a distance from the access cavity so that the operator could visually evaluate the in-and out flow rates. When the suspension turns pale during the process, the flushing was stopped and the needle was removed when clear solution appeared. The root canal will then be dried with sterile paper points and obturation will be done at a later date.

IV. DISCUSSION

It should be noted that the Apexum procedure is substantially different from simple over-instrumentation during root canal treatment. The later traumatizes the tissue and might also introduce bacterial antigens into a tissue primed to respond to them[5]. When this happens, an acute inflammatory response with resulting edema is likely to occur in the periapical tissue; thus, symptoms or flare-up might be expected[14,15]. The Apexum procedure, on the other hand, did not end with just such a trauma, allowing the above events to occur. On the contrary, it might have removed the tissue in which such response could occur and allowed the crypt to be filled with a fresh blood clot in which the above mechanisms are not present. The extent of tissue removal and the exact nature of the processes that follow will require further verification by histologic studies.Healing of similar lesions after apical surgery is much faster. Kvist and Reit[3] have demonstrated that lesions of apical periodontitis that were treated surgically healed with kinetics significantly faster than those treated with nonsurgical retreatment, even if both groups eventually showed similar healing rates after 48 months. Nevertheless, surgery is an invasive procedure associated with certain adverse effects[7]. Therefore, it is not routinely used just to enhance the healing kinetics of periapical lesions. According to studies, the healing of periapical lesions in the Apexum-treated group was significantly faster than in the conventional treatment group. This implies that adding the new procedure as a supplementary stage in the process of conventional root canal treatment might alter the outcome, at least as far as the healing kinetics is concerned.Other field of dentistry that can be benefitted from this technique is Implantology: When a broken down toothwith a large periapical lesion has to be extracted and replaced by an implant, the implantologist is presented with a dilemma, if there was no bone defect around the apex, immediate implant can be successfully placed. However, when there is a large periapical lesion and no bone to engage the implant's apical part, augmentation will be required which becomes either a long and expensive story or compromised procedure. Of course, the implantologist would prefer to have bone at the depth of extraction socket. It is precisely such bone augmentation that the Apexum procedure provides within a relatively short time is beneficial. Furthermore, the implantologist will also be happy to preserve the alveolar socket walls for his implant. These requests can be provided by the natural tooth which will be retained in the socket until the day of extraction.

V. CONCLUSION

Apexum resulted in significantly less post-operative pain or discomfort than conventional root canal treatment or conventional apical surgery. It has resulted in faster periapical healing as compared to conventional root canal treatment. The removal or debulking of periapical inflamed tissues, using Apexum procedure, seems to enhance healing kinetics with no adverse events.

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