

Laser-Assisted Caries Management as a Patient Motivator: A Clinical Case

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Abstract

A 34 year old female patient presented in the School of Dentistry clinic with rampant caries manifesting throughout the entire dentition. Following radiographic and clinical examination, non-restorable teeth were planned for extraction. The remaining dentition was targeted for comprehensive caries management, which included patient counseling/hygiene instructions, fluoride treatments, and minimally invasive surgical intervention. Low patient self-esteem due to the esthetic state of her dentition, along with handpiece-induced dental anxiety, presented a challenge for treatment. An Er:YAG laser was presented as an alternate method for carious tissue excavation of the maxillary incisors, which the patient accepted. Teeth #7-10 were conservatively prepared with the erbium laser, and then restored with a layered, esthetic resin composite. The patient was pleased with the initial operative experience, and was receptive to completing the restorative treatment plan with a traditional dental handpiece.

Keywords

Caries; Dental caries; Esthetic dentistry; Laser dentistry; Minimally invasive dentistry

Introduction

Rampant caries in adults is defined as multiple active caries lesions that affect the majority of the permanent dentition [1]. This process can occur in a previously low caries-risk patient if major adverse changes have occurred in the oral environment [2]. For example, systemic diseases or side effects from medications can diminish salivary flow, which is thought to act as a buffer against the caries process [3].

Besides being the markers of a current disease process, the presentation of active carious lesions can also negatively affect patient self-esteem [4-5]. Motivating a patient to work with the dentist to comprehensively reverse the caries process can initially be challenging, especially in rampant caries cases where disease manifestation is so pervasive. Thus, to recover patient confidence and encourage cooperation, the dentist may elect to begin operative management of rampant caries with the anterior teeth. At the same time, counseling about oral health and caries preventive measures should take place.

Caries management for a rampant caries patient will therefore be a combination of medical and behavioral approaches, along with conservative operative/restorative procedures – these modalities all

fall under the general philosophy of minimal intervention dentistry [6]. For selected cases, lasers can be a powerful clinical and motivational tool for the practice of minimal intervention dentistry. Specifically, the erbium family of lasers can selectively remove infected dentin and avoid excessive tooth preparation. In addition, this minimally invasive technique has been linked to bactericidal effects and good healing properties. The following case details the use of an erbium laser as part of the esthetic restoration of the maxillary incisors in a rampant caries patient, especially as it served as a catalyst for comprehensive care.

Case Presentation

A 34 year old asymptomatic female patient presented to the School of Dentistry clinic with rampant caries, manifesting in hopeless teeth and deep caries lesions (Figure 1). Her medical history was significant for gastroesophageal reflux disease and gastritis (patient referred to her physician for medical management), with no remarkable social history. Patient chief complaint was the appearance of her dentition.

Full mouth and panoramic radiographs were exposed (Figures 2-3). Oral hygiene was poor, clinical intraoral soft tissue exam revealed generalized plaque induced gingivitis. Hard tissue findings were charted. A caries risk assessment form was completed to identify high-risk behaviors, in order to alter these behaviors (Figure 4). The preventative measures for her high-risk caries category included nutritional counseling and oral hygiene instructions. The patient was also placed on a 3-month prophylaxis and fluoride varnish recall. A prescription for 5% NaF toothpaste (Prevident 5000 Dry Mouth, Colgate-Palmolive, New York City, New York, USA) was given to the patient to help halt the caries process.

After clinical and radiographic assessment, the findings were discussed with the patient. A treatment plan was presented with various treatment options and accepted by the patient. To begin, a prophylaxis was performed, with subsequent fluoride varnish placement and post-operative instructions. To further lower the bacterial load present in the oral cavity, the extraction of non-restorable teeth #1, #2, #3, #4, #16, #17, #18, #19, #20, #28, #31, #32 was completed in two separate appointments.

Generally speaking, the patient reported dental anxiety, especially related to the sound of the dental handpiece – this resulted in reluctance to begin operative management of existing cavitated lesions. The option of utilizing an erbium laser in place of the dental handpiece was presented to the patient, specifically for use in the maxillary anterior region. Patient accepted this alternative method for cavity preparation, and teeth #7-#10 were tested for vitality using Endo Ice (Coltene/Whaledent, Altstätten, Switzerland), percussion, and palpation. Test results indicated vital teeth within normal limits. Patient and operator jointly determined shade selection of nano-hybrid composite (Enamel Plus HRI, Micrium S.p.A, Italy) UE2 and UD2 composite. Caries removal was completed with an Er:YAG laser (HOYA ConBio, California, USA), at 15 HZ, 150 MJ / 250MJ with water and air spray. Personnel and patient followed safety protocol and laser guidelines. The appropriate laser setting (enamel, dentin, and caries setting) was used to excavate the cavity preparation (Figures 5-6), along with hand instruments (Figure 7). The teeth were rinsed and dried.

With appropriate rubber dam application, a thin layer of resin-modified glass ionomer liner (Vitrebond, 3M ESPE, St. Paul, Minnesota, USA) was applied to axial wall of #8 and #9 (Figure 8), air dried,

and light cured for 30 seconds. Acid etch was applied (enamel 30 seconds, dentin 15 seconds), rinsed, and air dried. A thin layer of etch-and-rinse adhesive (Optibond Solo Plus, Kerr, Orange, California, USA) was applied, lightly air dried, and light cured for 30 seconds. Composite shade UD2 was applied incrementally to create a dentinal layer and light cured. A 0.5 mm layer of composite shade UE2 was applied incrementally to create an enamel layer with a final light cure of 60 seconds (Figure 9). The restorations were polished and smoothed with carbide burs and finishing discs (Sof-Lex, 3M ESPE, St. Paul, Minnesota, USA), as well as pumice paste. Occlusion was checked, verified, and adjusted as needed. Patient stated restoration was smooth and comfortable (Figure 10). Post-operative instructions were given and all patient questions were answered. The patient left in no pain or discomfort and remains asymptomatic 12 months post-operative. After the initial treatment to regain patient's trust, subsequent treatment was phased as follows: (1) periodontal therapy; (2) replacement of 3 unit-bridge teeth #13-15, root canal therapy and crown on tooth #12, crown on tooth #30 (Figure 11), and composite resin restorations on remaining carious teeth; and (3) removable partial dentures to replace remaining posterior edentulous areas. For tooth preparation during these phases, a conventional rotary handpiece was utilized.

Discussion

One of the main concerns of patients with rampant caries is the poor appearance of their teeth. It will not be unusual for a rampant caries patient to experience loss of self-confidence and self-esteem, especially when the esthetic region is involved [4-5]. Management of these extreme high caries risk patients should be customized according to the individual's condition. In this clinical case, motivating the patient and increasing her awareness of oral health and appearance was determined to be a priority. During the initial visit, the patient entered the clinic with limited verbal communication and with her hand over her mouth when she spoke – she explained that she was embarrassed by the appearance of her teeth.

It is well understood within the dental profession that management of dental caries will be a partnership between practitioner and patient [7]. The dentist can provide education and acute treatment for lesions with a clinical presentation, but the patient also needs to do his or her part by maintaining proper oral hygiene and perhaps altering dietary and/or other habits. In order for the comprehensive treatment of the caries to be successful, the process involves of lifestyle changes [8]. Because making such significant changes can be daunting, especially for a patient with a psyche negatively affected by the esthetic manifestation of dental caries, an initial “motivator” may be helpful to build momentum for caries management. With this in mind, the patient presented in this case was intentionally scheduled for esthetic restoration of her maxillary incisors first.

Besides damaged patient self-esteem, dental fear presented an additional barrier to treatment. The patient stated that dental handpiece noise was not pleasant – this contributed to her fear of the dentist. Thus, an erbium laser was selected as the caries removal tool. A minimal intervention approach using the erbium laser allowed selective removal of caries without involving the pulpal tissue. Erbium lasers, such as the one used in this clinical case, function by the selective ablation of tissues/substances that have an “affinity” for the specific wavelength of the laser light – depending on the setting of the laser, enamel, dentin, and carious dentin can be precisely targeted for removal [9]. Good preservation of tooth structure is important, and the erbium laser allows for this because of the selective categories that are

present. Additional advantages of using the laser over the traditional high-speed handpiece include selective caries removal with less noise and vibration, absence of smear layer, good preservation of tooth structure, microbial reduction, and post-operative sensitivity reduction [9-10]. The primary disadvantage of utilizing a laser for caries removal is the increased treatment time, as compared with a high-speed handpiece [11].

After initial treatment was completed, the patient became more compliant and significantly improved oral hygiene and nutritional intake. It continued to be important to reinforce oral hygiene. After completion of treatment of teeth #7-10, the high-speed handpiece was suggested to complete the remaining restorative procedures, and the patient accepted and tolerated the procedures well. Due to patient's anxiety, other strategies were implemented to improve her experience in the dental office. First, the patient was advised to let the dentist know if she needed anything at any point during treatment; this gave the patient some control and helped to reduce the fear factor. Secondly, the dentist utilized the "Tell-Show-Do" philosophy that is widely used for pediatric patients [12]. Additionally, for relaxation the patient brought her own personal media device to listen to music during the appointments.

Conclusion

Rampant caries patients may be reluctant to pursue comprehensive caries management. Erbium lasers can be very helpful in not only performing minimal intervention operative procedures, but also motivating a patient to move in the direction of improved oral health.

Figures



Figure 1

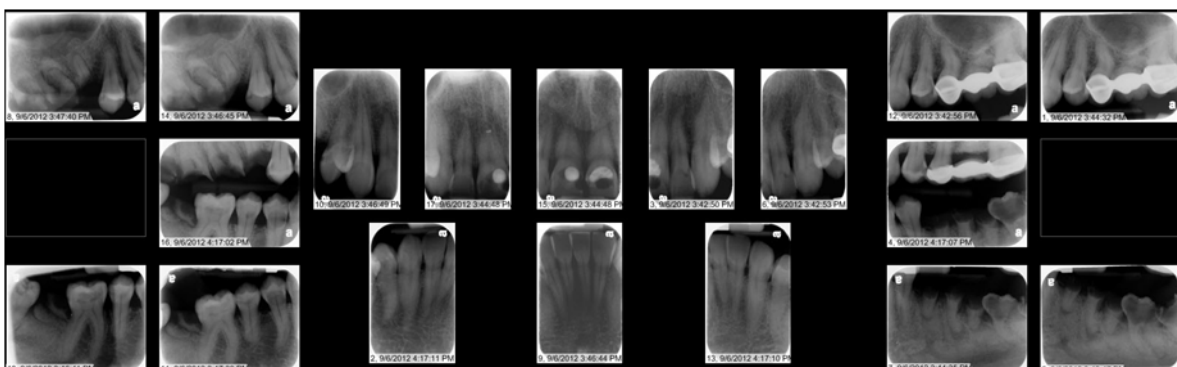


Figure 2



Figure 3

Caries Risk	
Form Question	Answer
Caries Risk Assessment Form	
Disease Indicators	
Visible cavities?	Y
Radiographic penetration into dentin?	Y
Radiographic interproximal lesion?	Y
White spots on smooth surfaces?	Y
Restorations in last 3 years?	Y
Saliva flow ≤ 0.5 ml/min*?	
Risk Factors	
Saliva flow 0.5-1.0 ml/min*?	
Saliva reducing factors (med/rad/sys)?	
Cariogenic bacteria medium or high?	
Visible heavy plaque on teeth?	Y
Deep pits and fissures?	N
Exposed roots?	Y
Orthodontic appliances?	N
Frequent snacks/sipping on drinks?	Y
Recreational drug use?	N
Protective Factors	
Saliva flow > 1.0 ml/min*?	
Primary drinking water fluoridated?	Y
Fluoride toothpaste at least 1x/day?	Y
Fluoride toothpaste at least 2x/day?	N
5000ppm F fluoride toothpaste daily?	N
Fluoride mouth rinse daily?	N
Fluoride varnish in last 6 months?	N
In office fluoride gel/foam in last 6 months?	N
Chlorhexidine used 1 week each of the last 6 months?	N
Xylitol gum/lozenges 4x daily for last 6 months?	N
Calcium and phosphate paste during last 6 months?	N
Risk Level: (double click)	
*Saliva Flow Rate: (ml/min, stimulated)	n/a
Cariogenic Bacteria Level:	high

Figure 4

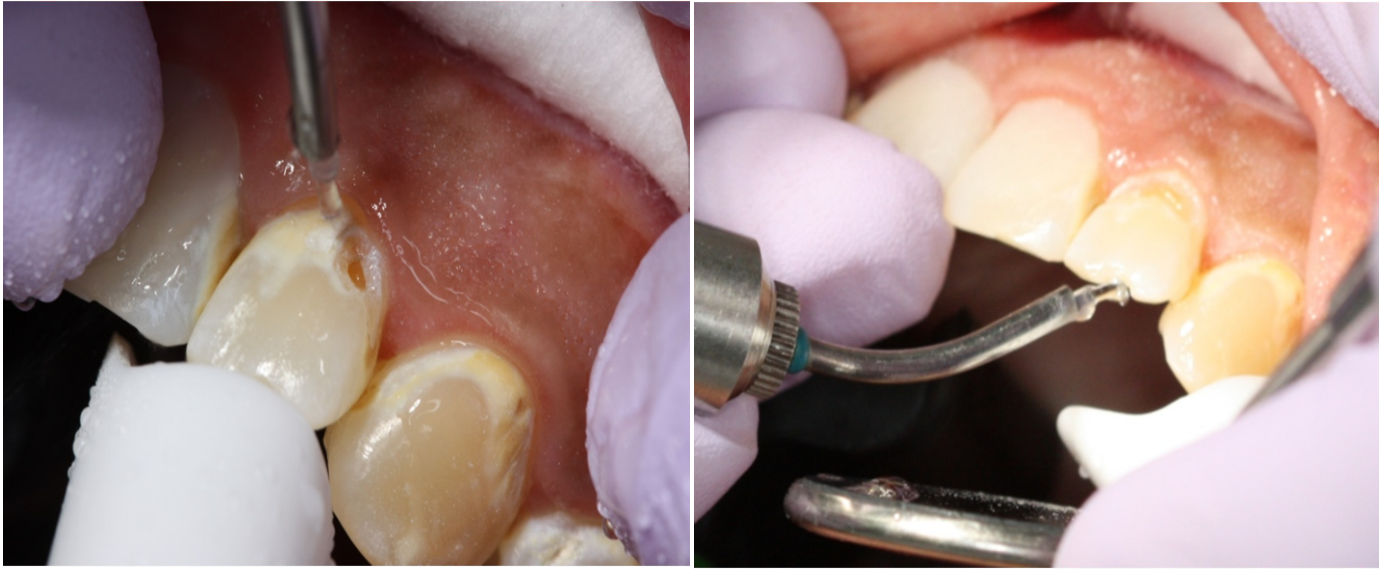


Figure 5 & 6



Figure 7 & 8

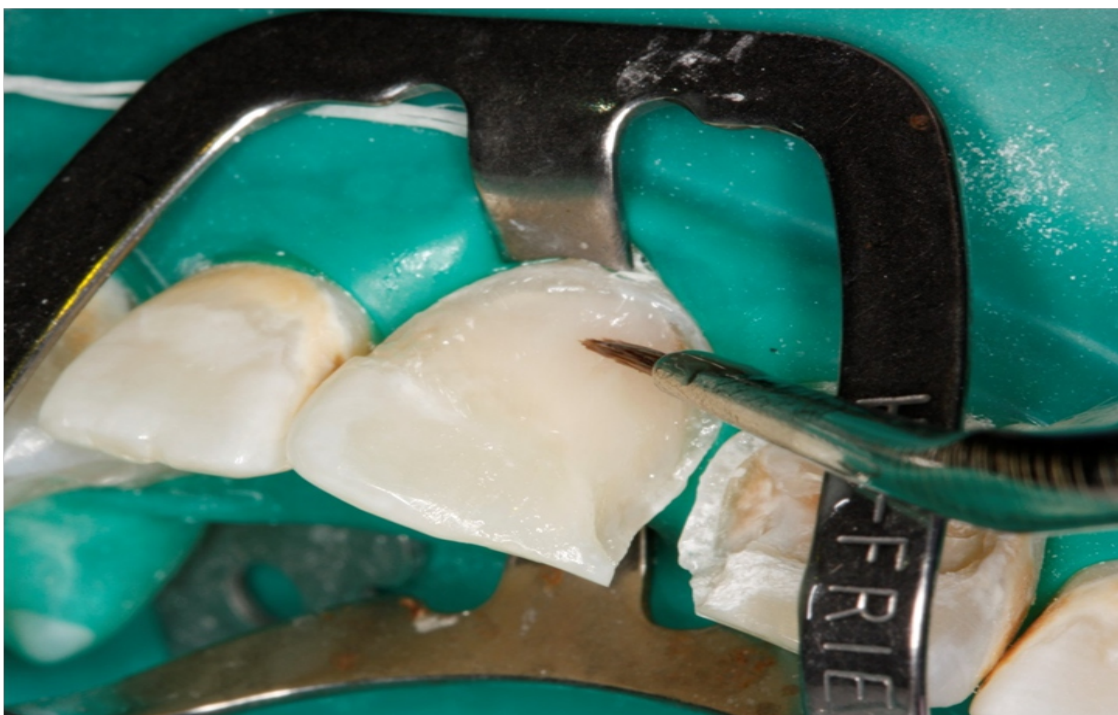


Figure 9



Figure 10

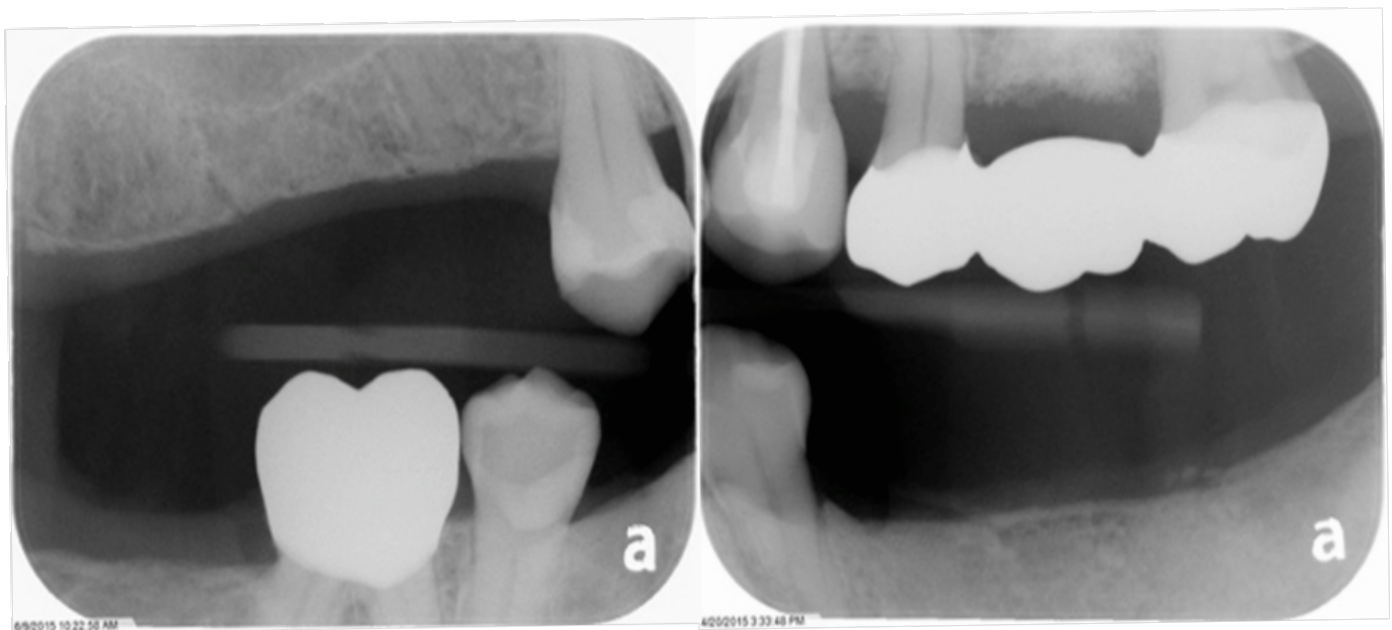


Figure 11

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