

Guiding Unerupted Teeth using Lasers: Review and Case Series

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ABSTRACT

When the teeth do not erupt at the expected time, it is crucial for the clinician to determine the etiology and formulate an appropriate treatment plan. This case series describes the use of diode lasers in guiding the eruption of unerupted central incisor into occlusion during the mixed dentition stage. Traditional methods of removing fibrotic gingiva overlying unerupted teeth using scalpels or electrosurgery may produce postoperative discomfort and prolonged healing. Lasers provide a simple and safe alternative for children while at the same time reducing the chances of infection, swelling, discomfort, and scarring, besides fear and anxiety, common symptoms related to this specific group in surgical procedures.

Keywords: Dental laser, Unerupted teeth, Impacted teeth, Diode laser, Fibrotic gingiva.

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INTRODUCTION

The goal of pediatric dentistry is to provide preventive education for parents and patients; early diagnosis, interpretation and repair of oral anomalies and disease and to provide this treatment in a safe and pleasant manner. The 'light saber' dentistry is the newest weapon today in treating children to achieve these goals.¹ Lasers are extremely safe and effective when the user has a proper understanding of laser physics. Using lasers for soft tissue treatment can reduce postoperative discomfort, infection and make it possible for dentists to provide safe, simple treatments. As missing incisors are regarded as unattractive this may have an effect on self-esteem and general social interaction, and it is important to detect and manage the problems as early as possible.² The maxillary incisors are the most prominent teeth in an individual's smile, they are also the teeth that are on maximum display during speech in most individuals and the normal eruption, position and morphology of these teeth are crucial to facial esthetics and phonetics.³

Etiology

Eruption is the axial or occlusal movement of the tooth from its developmental position within the jaws to its functional position in the occlusal plane. Teeth that cease to

erupt before emergence are known as impacted teeth.⁴ The etiology of unerupted teeth is multifactorial. The common and important reasons attributed to delayed eruption are usually insufficient space, early loss of primary teeth with eventual closure of space, trauma to primary teeth, and dilacerations of permanent teeth, crowding of arches and ectopic position or rotation of tooth buds. Syndromes, metabolic, and hormonal disorders are also other causes of unerupted teeth. Supernumerary teeth and odontomes cause impaction of permanent incisors due to a direct obstruction for the eruption. Excessive fibrous tissue over an erupting tooth is one of the most common causes, with eruption cysts being relatively rare.

Epidemiological studies have reported dental impactions to affect 25 to 50% of the population.⁵ Multiple impactions are seen rarely and are usually associated with systemic conditions and syndromes. Multiple impacted teeth are usually present in syndromes are cleidocranial dysostosis, Gardners syndrome, Gorlin-Sedano syndrome and Yunis-Varon syndrome.⁶

In the case of hormonal disorders hypothyroidism, hypoparathyroidism, and pseudohypoparathyroidism are to be considered. Metabolic disorders like vitamin D deficiency rickets are also associated with impacted teeth.⁶

An accurate diagnosis may be obtained after thorough clinical and radiographic examinations.

Clinical Examination

Complete history pertaining to unerupted teeth should be done. Parents and patients should be questioned regarding any history of dental trauma even in early childhood. Medical history and systemic conditions to be reviewed. Important clinical signs are over-retention of the corresponding primary teeth while the contralateral permanent tooth has already erupted; substantial reduction in the available space for permanent tooth eruption or space closure; rotation and inclination of the adjacent teeth; elevation of the soft tissue of the palatal or labial mucosa depending on the tooth location; absence of a bulge in the buccal sulcus at 1 to 1.5 years before the expected time of tooth eruption.⁷⁻⁹

Radiographic Examination

Panoramic radiograph is considered the standard radiographic, because it give low dose and reveals the entire dentition as

a whole. Computer tomography (CT) has proven to be superior to other radiographic methods in visualizing bone tissue: three-dimensional computer tomography (3D CT) images clearly show the intraosseus location, inclination and morphology of impacted teeth as well as the distance from adjacent structures.

Recently cone-beam CT (CBCT) has been introduced as a technique dedicated to the imaging of dental and maxillofacial structures. It has one-sixth of the radiation of computer tomography, is more time efficient, more cost effective, and is still able to provide three-dimensional images, excellent bone differentiation and an unlimited number of views.¹⁰ In some cases periapical radiographs are as important as the techniques cited above.

Treatment Modalities

1. Wait and watch.
2. Surgical removable of overlying tissue using scalpel.
3. Electrocautery.
4. Laser-assisted soft tissue management.

The objective of this case series is to increase awareness of cases of unerupted incisors in which multiple etiologies need to be discussed and investigated. Furthermore, to highlight the use of (e.g. laser) to manage this common problem in pediatric dental practice.

Four children of age group 8 to 10 years (1 boy and 4 girls) were referred to us to correct there unesthetic smile, we explained the treatment modalities to the parents, all the parents wished to get treated under laser. After clinical examination and radiographs, parents consent was taken for laser treatment. We used two different Diode lasers of wavelength 810 nm (nanometer) and 940 nm to treat the overlying tissue of unerupted teeth. Local anesthetic (LA) gel or spray was used, laser settings between 0.6 W (watt) and 1.2 W in CW (continuous working) mode was used. Most of the cases were done only with LA spay or gel, but few needed LA infiltration due to hypertrophic or fibrous nature of the overlying tissue. Initially the laser setting were started from 0.6 W and then slowly increased to 1.2 W to complete the procedure. Photographic recording of cases before, during and after the procedure were done. Review and recall visits were done at 24 hours, 3 days and 1 week. Case 1: 10 years old girl presented with unerupted upper centrals was treated using 810 nm diode laser (Figs 1 to 4). Case 2 : 8 years old boy reported with unerupted lower centrals was treated using 940 nm diode laser (Figs 5 to 8). Case 3 : 9 years old girl presented with unerupted upper left central was treated using 940 nm diode laser (Figs 9 to 12). Case 4 : 9 years 6 months old girl reported with unerupted upper



Fig. 1: Intraoral view (case 1)

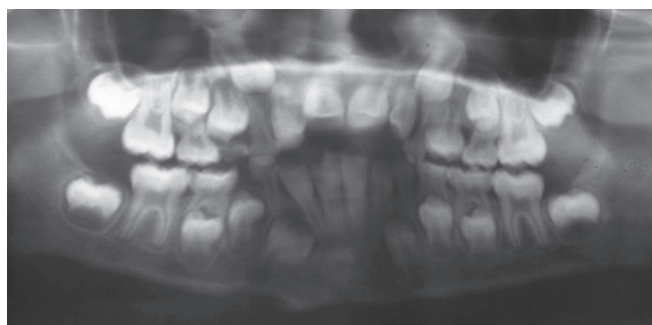


Fig. 2: Panoramic radiograph (case 1)



Fig. 3: Immediate postoperative view (case 1)



Fig. 4: Three months postoperative view (case 1)

centrals was treated with 940 nm diode laser (Figs 13 to 15). Pain assessment scale using pictorial representation was done. Laser safety precautions like laser safety sign display and laser safety goggles were taken for all these cases.



Fig. 5: Intraoral view (case 2)



Fig. 9: Intra-oral view (case 3)



Fig. 6: Panoramic radiograph (case 2)



Fig. 10: Periapical radiograph showing unerupted central incisor (case 3)



Fig. 7: Immediate postoperative view (case 2)



Fig. 11: Immediate postoperative view (case 3)



Fig. 8: One month postoperative view (case 2)



Fig. 12: Three months postoperative view (case 3)



Fig. 13: Intraoral view (case 4)



Fig. 14: Immediate postoperative view (case 4)



Fig. 15: One month postoperative view (case 4)

DISCUSSION

Guided eruption of many teeth with the help of coordinated multidisciplinary management is needed for patients with multiple unerupted teeth. Tooth eruption is considered to be delayed, if emergence of a tooth into the oral cavity occurs at a time deviating significantly from norms established for the person's sex and ethnic background. Generally, a permanent tooth should erupt no later than 6 months after natural exfoliation of its predecessor, but a

delay of up to 12 months may be of little or no importance in an otherwise healthy child. Therefore, most practitioners consider eruption delayed only if the interval extends to more than 1 year.¹¹ Cases discussed in this series were exact indication cases for removal of hypertrophic or fibrotic tissue overlying the unerupted teeth. Deviation from normal sequence of eruption, e.g. permanent lateral incisors erupt prior to the central incisor, or eruption of adjacent teeth occurred 6 months previously (with both incisors unerupted lower incisors erupted 1 year previously), are other signs of delayed eruption of maxillary incisors. Similar oral status was considered as delayed eruption of teeth by Jones JW et al and Roberts-Harry D et al.^{2,12}

Diode lasers can be used for multiple of dental procedures which are predominantly soft tissue procedures and include soft tissue surgery, periodontal pocket therapy, peri-implantitis, root canal disinfection, and laser assisted tooth whitening. Diode laser are characterized by a high absorption in chromophores found in soft tissues, e.g. hemoglobin, resulting in excellent soft tissue incision, ablation and coagulation performance as well as antibacterial effectiveness, due to relatively deep highly localized tissue heating. Soft tissue near infrared (NIR) diode lasers include wavelength from 810, 940 and 980 nm.¹³ Based on our clinical experience, we like to share the concept of prelasering, that is conditioning the tissue to laser in noncontact mode for few minutes before the tissue is subjected to ablation using contact mode. Patients who have bleeding disorders and require hemostasis for soft tissue surgery can benefit with a diode laser. The diode laser targets the pigmented vessels and shuts down the potential for bleeding. For this reason, patients with hemophilia or von willebrand's disease may be treated without medical intervention. This saves the patient from bleeding complications as well as the cost of medication to control bleeding. The diode laser also can be used to treat patients taking blood thinner medications due to organ transplant or cardiac valve replacement such treatment may allow these patients to continue their blood thinner medication with no alterations.¹³

CONCLUSION

Lasers allow pediatric dentists to provide optimal care without many of the fear factors that result from conventional dental techniques. Using lasers for soft tissue surgeries reduce postoperative pain, discomfort, infection and advantage of less or no bleeding and faster healing compared to scalpel. Dentists with knowledge of laser physics and safety can provide patients with a new standard of dental care.

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