Esthetic smile rehabilitation of enamel hypomineralized teeth with E-max prosthesis: Case report

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Abstract Developmental enamel hypomineralization is a condition affecting quality of enamel resulting in low translucency and opacity area that compromise patient smile. Lithium disilicate Emax prosthesis report superior properties in esthetic treatment. This report is aimed to determine the effectiveness of lithium disilicate (E-max) prosthesis in managing esthetic demand of patient with enamel hypomineralized teeth.

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1. Introduction

Today the esthetic dentistry attracts patient’s attention through the social media and community. That result in raise patient’s demands to get perfect smile with high quality materials and techniques and involving the patient more in decision making (Naura Venâncio et al., 2014).

Teeth discoloration consider one of the most esthetic problems encourage person to seek dental treatment. There are many factors can cause teeth discoloration mainly divided to extrinsic factors affecting outer surface of the tooth like food or drinks, or intrinsic factors affecting inner surface like drugs, excessive exposure to fluoride, trauma or systemic diseases. Other reasons like enamel or dentine anomalies are consider (Menon, 2014). Developmental enamel defects one of common conditions affecting both dentition and classified mainly to two groups: enamel hypomineralization and hypoplasia. The difference between them that in hypomineralization quality of enamel is affected so it appears with low translucency while the hypoplasia is quantitative defect of enamel (Jîlevik and Norén, 2000).

Diagnosis of discoloration is essential step to plan and select proper treatment for each case in order to get predictable
result. Minimal invasive methods can be used such as different abrasive techniques or bleaching (Menon, 2014). Recently, different types of ceramic become more widely used in field of esthetic dentistry due to their properties of matching enamel and dentine characteristic, biocompatibility in addition to the mechanical properties (Kelly and Benetti, 2011). Among all ceramic types, lithium disilicate, named also E-max, consider one of best choices for esthetic anterior teeth. A study compared ceramic materials zirconia and lithium disilicate properties, reporting superior ability of natural tooth color matching due to its variable level of translucency. Also, it can be used in different forms in mean of prosthesis, as full contoured crown or substructure which give both dentist and lab technician wide range of choices (Succaria and Morgano, 2011).

The aim of this report is to determine the effectiveness of lithium disilicate (E-max) prosthesis in managing esthetic demand of patient with enamel hypomineralized teeth.

2. Case report

A 16 years old Saudi female was come to comprehensive clinical dentistry clinics, Collage of Dentistry, Imam Abdulrahman bin Faisal University, complain of unsatisfied of the appearance of her smile. Patient deny any medical condition or allergy. Consent was signed by patient for treatment acceptance in the collage. All patient records include impression, radiographs and photos were taken (Figs. 1–3).

| Teeth number (#) | Findings                                      |
|------------------|-----------------------------------------------|
| Maxillary teeth  | Generalized staining                          |
| All teeth        | Plaque and calculus                           |
| 2, 3, 15, 31     | Occlusal caries                                |
| 4, 9, 12, 13, 18, 19, 20 | Proximal caries                              |
| 28               | Buccal caries                                  |
| 5, 7             | Root canal treatment (RCT) with large restoration |
| 8, 9             | Fracture composite veneers                    |
| 30               | Defective occlusal restoration with fracture lingual wall |

![Fig. 1 Pre-operative panoramic radiograph.](image)

![Fig. 2 Pre-operative full mouth radiographs.](image)

![Table 1 Intra-oral findings in both mandibular and maxillary teeth.](image)

![Fig. 3 Intra-oral and extra-oral pre-operative photos. (a) Smile view, (b) frontal view, (c) right side view, (d) left side view, (e) maxilla occlusal view, (f) mandible occlusal view.](image)
Intra-oral findings were recorded in order to diagnose and prepare comprehensive treatment plan in phases (Table 1). After complete periodontal charting, patient was diagnosed with localized mild to moderate periodontitis (Of et al., 2015). For endodontic assessment, tooth #12 was diagnosed as irreversible pulpitis with normal preapical tissue and tooth #30 was diagnosed as necrotic pulp with diagnosed as normal preapical tissue, so both are required root canal treatment (RCT). However, teeth #5, 7 were checked and diagnosed as endodontically treated teeth with normal preapical tissue (Edition et al., n.d.). Based on clinical presentation of teeth stained and lack of family history of same condition, teeth were finally diagnosed to enamel hypomineralization (Garg et al., 2012).

Treatment plan on phases were finalized after multiple consultations and patient agreement on time, cost and methods that will be used (Table 2). In phase 1, patient education regarding oral hygiene and instruction along with scaling and root planing were performed as a first step to ensure establish good habits of oral health care, gingival health and prevent further dental issues. Smile was analyzed using diagnostic cast and preoperative photos and future crown margins were determined indicate the need of crown lengthening procedure. Wax up was made for teeth #4–13 based on previous analyzing and duplicated (Fig. 4). In addition, wax up was made for tooth #30 to aid in evaluation of its restorability and needs for crown lengthening. Mock up was done for the patient to get her opinion and comments for any further adjustment need before starting of next phase.

In phase 2, RCT was performed for teeth #12, 30 and post, initial core build-up and provisional crown for tooth #30. Also, surgical guide made based on wax up to be used in crown lengthening procedure. In order to determine periodontal surgery type and amount of removal of both soft and bony tissue needs, bone sounding was used to assess facial osseous-gingival tissue relationship. These measurements were located on solid cast of maxilla then connected to draw a line in gray color determine bone crest location. Future crown margin line was draw in green color using surgical guide while current gingival margin line draw in red color (Fig. 5). Crown lengthening procedure including both soft and bony tissue removal for teeth #3–6, #11–14 and #29–31 indicated due to close distance between future crown margin and bone crest. However, only gingivectomy was performed on #7–10 (Fig. 6). Patient was come after 2 months for post-operative follow up.

In phase 3, post and core build up were done for teeth #5, 7 and temporized. All carious teeth were restored by composite on multiple visits. Teeth #5–12 and 30 were prepped for all ceramic crowns while teeth #4, 13 prepared for veneers, impression was taken by stock tray, Impregum™ Penta™ Soft Heavy-Body and Light body Impression Material 3M ESPE then temporized using putty and Protemp™ Plus Temporization Material 3M ESPE. Bite registration was taken for prepared teeth and shade was selected as A1 for more natural look and according to patient preference. Full layering E-max crowns and veneers were used and tried in patient mouth and get her acceptance before cementation. All prosthesis cemented using Multilink Automix-Adhesive Cementation System. Excess cement was removed, esthetic and phonetic

| Table 2 Treatment plan on 3 phases with all treatment steps. |
|----------------|----------------|
| Treatment phases number (#) | Treatment steps |
| Phase 1 | Patient education, Oral Hygiene instructions Scaling and root planing Impression and wax-up for teeth #4–13 and 30 Mock up for teeth #4–13 |
| Phase 2 | Crown lengthening #3–6, #11–14 and #29–31 Gingivectomy on #7–10 RCT #12, 30 Post and core #5, 7, 30 |
| Phase 3 | Multiple Composite restoration: Cl. I on #2, 3, 15 Cl. II on #18, 19, 20 Cl. V on #28 Build up for #31 E-max crowns on #5–12 and 30 E-max veneers on #4, 13 |

Fig. 4 Duplicated wax up.

Fig. 5 Solid cast of maxilla show bone crest line (gray color), Future crown margin line (green color), current gingival margin line (red color). (a) Left side view, (b) frontal view, (c) right side view.
were checked. Post-operative radiographs and photos were taken immediately after cementation then post-operative photos taken after 3 days (Figs. 7–10). Follow up after 6 months show proper gingival health and improvement of oral hygiene. Scaling and root planing performed after taken some photos for documentation (Fig. 11).

3. Discussion

Continuous improvement and change in modern prosthodontics dentistry are marked internationally in all aspects. Increase the patient demands for more esthetic and natural appearance raise the standards of treatment and require a high quality of both materials and methods used to provide without compromising the biomechanics properties and essential principles of successful accepted prosthesis (Kumar et al., 2016).

Developmental enamel hypomineralization is condition where enamel mineralization (maturation phase) is affected. The exact etiology is unknown as it complex and can be due to several factors such as systemic diseases affect the child before or after birth, use some antibiotics low weight birth or may because of toxic in breast feeding. Therefore, proper history evaluation and clinical presentation is important to differentiate it from other condition. In this case, patient present with white-yellowish chalky, opaque areas spread over many teeth in maxilla along with slight amount of low translucency (Garg et al., 2012).

Esthetic treatment should consider proper diagnosis of the case in biological and mechanical aspects along with esthetic aspect. Ceramic prosthesis considers one of excellent materials in providing predictable result in cosmetic dentistry. However, contraindication like parafunctional habits such as bruxism and very poor oral hygiene can limit its use. Also, as ceramic
require certain amount of tooth preparation, dentin sensitivity can be a possible disadvantage occur in addition to difficulty in repairing in case of failure and higher wear resistance than natural teeth and restoration (Naura Venâncio et al., 2014).

In this case, patient present with multiple dental problems require several treatments in order to achieve optimum result. Multidiscipline treatment approach show successful result where team work address different problems that can affect the quality of patient’s main complain (Galler et al., 2009). Oral hygiene instruction is essential in any case to establish a healthy base line of oral cavity and reduce the incidence of carious and periodontal diseases (Al-Ahmad et al., 2010). Planning for a comprehensive case include many steps of taken accurate records and measurements. Using of both wax up and mock up can give a clinician a visual accurate imagination of future prosthesis properties and required procedures to achieve it. In patient side, communication and understanding of demands and each step in treatment phases is better (Thomas and David, 2014).

On of important step in smile rehabilitation is to analyze crown diminution and amount of soft tissue displacement. Short crown can compromise the appearance of patient smile and the stability of future crown. Several etiologies can be contributed to cause this condition like excessive teeth wear, excessive maxillary growth, caries or partial eruption of anatomical crown. Corrective periodontal surgery is consider in order to maintain a biological width. Minimal of 3 mm from crown margin to crest of the bone should be maintained to ensure preserve gingival health (De Oliveira et al., 2015).

Provisional restorations play important role in maintain gingival countered around the preparation, protect the tooth from oral environment and improve final crown fit. Each provisional material has its own properties that perfect for certain case. In this case, Bis-acrylic resin based with direct technique. It is reported with high flexural strength and acceptable esthetic (Bellot-arcı et al., 2018).

The case was checked after 3 days where initial gingival healing and patient adaptation to new smile start to establish. Follow up after 6 months show maintained of proper oral hygiene and improvement in function and health of teeth and oral health overall. Patient was satisfied with treatment outcome and become more confident.

4. Conclusion

Using lithium disilicate (E-max) prosthesis show optimum result in managing enamel hypomineralization condition. A proper history evaluation and diagnosis to is essential to differentiate between other enamel anomalies. Management of such cases must consider improving esthetic condition of the teeth along with enhance their function and strengthen the structural weakness following standard guidelines.

Conflict of interests

The authors declare that there is no conflict of interests in regard the publication.

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