Dental Education 2018: Restoring Congenitally Missing Mandibular Central Incisor Using Lithium Disilicate Based Resin Bonded Prostheses: A Case Report- Elifnur Guzelce -Gazi University Emek- Turkey

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Abstract

Oral health plays a key role in public health. Dental treatments like orthodontic, prosthodontic and surgical treatments are expensive. Some of the frequent dental anomalies need an expensive treatments. One of them is congenitally missing teeth which is generally called as Hypodontia, a highly common dental anamoly. CMT has an occurrence of the dental germ developing after the surrounding tissues have closed the space needed for the tooth development. Other studies demonstrated that delays in tooth development and reductions in tooth size correlate with advanced CMT. Both of these might accord with the terminal reduction theory. It is suggested that anterior agenesis may depend more on genes while posterior missing might be sporadic. It usually occurs in females and in the permanent dentition as well as it tends to occur more in the maxilla or mandible. Patients with missing permanent teeth suffer from an unfavorable appearance as malocclusion periodontal damage, lack of alveolar bone growth, reduced chewing ability, inarticulate pronunciation, changes in skeletal relationships. Different therapeutic approaches for missing mandibular incisors includes resin-bonded fixed dental prosthesis (RBFDP), orthodontic treatment, full- veneer fixed dental prosthesis (FDP), dental implant for a single tooth replacement, extraction of one or more incisors and restoration with an implant supported FDP, extraction of one or more teeth and restoration with an FDP, extraction of one or more teeth and restoration with a removable dental prosthesis (RDP). Implant restorations in the anterior maxillary region is the most difficult challenge in treating CMT. The combination of aesthetic demands, biomechanical/functional issues, and phonetic challenges require implant placement. The incisive foramen is the exit site of the nasopalatine canal where as the terminal branch of the descending palatine artery and nasopalatine nerve pass through the oral cavity. When Implant treatment is not satisfactory, resin-bonded fixed dental prosthesis (RBFDP) is used with the two retainers design for a replacement of missing teeth, which was introduced by Brochette in 1963. In Ceram Alumina which is used in the initial practices of all ceramic RBFPDs.

Different ceramic materials including reinforced with leucite, lithium disilicate and zirconium oxide have been used in producing of RBFPDs . Lithium disilicate, acts as a dental restorative material. Currently, it has been updated and improved, and named as the IPS e.max Press system. Primarily, this system includes two phases, phase I which has homogeneously distributing lithium disilicate crystals and lithium orthophosphate in a glass matrix that creates phase II. Existence of these crystals in the structure highly increase the mechanical properties of the material.

A 17-year-old female had congenitally missing mandibular right central incisor. After clinical examination, study casts were performed. After the evaluation, the RBFPD was designed to maintain the patient's aesthetic and dental unity. This design was made with IPS E-max press. Initially, the process began with the Teeth Preparation. The diagnostic cast was waxed to assess the size and morphology of mandibular incisors. The preparation edges were drawn. Later it is reported on teeth limited only at enamel boundaries. The mandibular right lateral incisor and left central incisor teeth were examined and prepared. 1mm supragingival reduction extends to the centre of the interproximal contact, with an incisal finish line 2mm short of the incisal edge and 0,5-mm lingual reduction of the enamel. Lithium disilicate glass-ceramics derived from the SiO_2–Li_2O system. It was first investigated by Stookey at Corning Glass Works in the year 1950. They contain highly of fine rod-like entangled $Li_2Si_2O_5$ crystals, and a minor amount of lithium orthophosphate (Li_3PO_4) crystals which are randomly oriented

and uniformly dispersed in the glassy matrix. P_2O_5 plays a key role and acts as a heterogeneous nucleating agent which promotes volume nucleation of the lithium silicate phases. The mechanism of crystallization involves a volume crystallization where the crystals nucleate and grow throughout the glass. Crystallization of lithium disilicate is heterogeneous and this can be achieved through two different processing 2 to 3 stages. Glass-ceramic is intended to be used as a machinable block for the CAD/CAM milling technique or as a pressable ingot for the lost wax hot pressing technique. The parent glass is formed into glass blocks or ingots by pressure-casting into a steel mold, a glass melt of synthetic raw materials that
contains quartz, lithium oxide, phosphor oxide, alumina, potassium oxi de, and color-imparting oxides. Before cooling down to room temperature, the poured melt is transferred into a pre-heated furnace at 450–550°C to relax the glass block and avoid stress build-ups in the glass. At this stage, the glass block can be kept in the furnace at the same temperature for about 1 hour and nucleation of the lithium silicate phases begins. Lithium disilicate-based ceramic provides an ideal aesthetics. The RBFPD produced with IPS e.max Press. The retainers of the bridge were then provided with hydrofluoric acid and concentration 9.5% and silane was applied. The teeth, under dam, were etched with 37% orthophosphoric acid and rinsed with distilled water and dried with air and then the bridge was cemented with a dual-cure resin cement. Finishing results in an aesthetic and functional successful outcome. The patient was followed-up clinically for one year. The survival rate of RBFPDs is less than conventional fixed partial dentures. The main reason for failure is possible debonding of the framework from the abutment teeth. Studies revealed that, where cementation was performed under dam or with the simple use of cotton rolls, the estimated survival probability for the debonding or failure. The use of dental dam during cementation reduced the risk of debonding by ten times. Many studies have proven that the success rate of single-retainer all-ceramic RBFDPs made from glass-infiltrated alumina ceramic, observed for 10 years, success rate was found 94.4%. 35 RBFPDs with substructures fabricated from IPS Empress or IPS e. max Press and veneered with IPS e.max Ceram were performed. Research Studies reported 100% survival rate approximately 4-year clinical follow-up of 35 anterior RBFPDs fabricated from IPS e.max Press. Also studies performed a randomize clinical trial on thirty anterior zirconia ceramic RBFPDs were in the follow-up period two debondings happened. 100% survival rate was reported after three years observation. RBFPD indicates a minimally invasive, better aesthetic and durable treatment modality in young patients with single missing teeth when implant therapy is not satisfactory. By selecting the most suitable material, all-ceramic RBFPDs provides aesthetic and minimally invasive restorations and when following a suitable clinical procedure, the survival rate of the RBFDPs is comparable to conventional FDPs.

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