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Golden Rules in Dental Lamina and E-Max Cementation

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ABSTRACT

Esthetic dentistry is experiencing a surge in demand, with smile aesthetics playing a pivotal role in boosting individuals' self-confidence and enhancing social relationships. The Dental Lamina Cementation procedure involves bonding thin, specially shaped porcelain or composite sheets to the teeth's surface, addressing issues such as color discrepancies, tooth shape correction, and gap closure. Recognized as a crucial element in smile transformations, dental lamina cementation proves to be effective in enhancing patient satisfaction and overall quality of life. On the other hand, E-max Cementation, utilizing the revolutionary "lithium disilicate" ceramic material developed by Ivoclar Vivadent, stands out as a groundbreaking advancement in porcelain restorations. With its notable features of high bending strength and translucency, E-max Cementation proves to be a preferred choice among dentists for meeting aesthetic expectations, enhancing tooth durability, and streamlining treatment processes.

INTRODUCTION

Aesthetic dentistry is receiving increasing demand and interest today. Smile aesthetics is an important factor that increases individuals' self-confidence and positively affects their social relationships. Among these aesthetic improvements, factors such as color, size, shape and arrangement of teeth play a major role. A variety of restorative dentistry procedures are available to restore teeth to their natural appearance or to meet desired aesthetic criteria. One of these procedures, " Dental Lamina Cementation," has become an indispensable part of aesthetic improvements and smile transformations. Dental laminate cementation means bonding thin, specially shaped porcelain or composite sheets to the surface of the teeth. This procedure is used to improve the appearance of the teeth, eliminate color differences, correct the shape of the teeth and even close the gaps between the teeth. Dental lamina cementation is considered an effective method to increase patient satisfaction and quality of life (1-3).

E-max cementation is considered a revolution, especially in the field of porcelain restorations. Dentists prefer this innovative material and method to meet the aesthetic expectations of patients, increase the durability of teeth and optimize treatment processes. E-max cementation is based on "lithium disilicate", a specially designed ceramic material developed by the company Ivoclar Vivadent. This metal-free material, named after "aesthetic maximum", has offered a groundbreaking advancement in terms of both aesthetics and durability. This material, which stands out with its bending strength and translucency, is used in the SiO2-Li2OK2O-ZnO-P2O5-Al2O3-ZrO2 system and in computer-aided-design and computer-aided-manufacturing (CAD/CAM).) is produced by the method. Dentists have a great advantage in providing their patients with more aesthetic and natural smiles by using long-lasting E-max ceramics. E-max cementation has many clinical advantages that improve many aspects of aesthetic dentistry. The fact that this procedure offers superior aesthetic results, durability and minimally invasive approach compared to other restoration options attracts the attention of dentists and their patients. Therefore, E-max cementation is successfully applied in many different clinical scenarios such as tooth color correction, thin laminates, porcelain veneers and aesthetic improvements (3-7).

DENTAL LAMINA AND E-MAX RESTORATIONS IN AESTHETIC DENTISTRY

Dental laminate cementation is a treatment option that fits perfectly with the principles of aesthetic dentistry. This procedure is used to improve patients' smiles and achieve their aesthetic goals, while also having the potential to provide a natural appearance and color harmony. When aesthetic dentistry and dental laminate cementation come together, the transformation in patients' smiles is fascinating and the aesthetic improvements are compatible with their facial features. Dental laminate can be defined as the application of thin and specially designed porcelain or composite resin coatings to the front surface of the teeth. These restorations are used to improve or correct the color, shape and size of teeth. Dental laminate stands out as an option that generally requires

minimal tooth preparation and provides fast results. The dental laminate application process involves preparing customized restorations based on the patient's needs. A special preparation and measurement of the teeth are performed. Laboratory technicians create laminates suitable for the patient's tooth structure. Finally, laminates are permanently bonded to the teeth (1-4, 8-11).

E-max cementations are restorations made especially of porcelain ceramics and offer excellent results in terms of aesthetics and durability. These restorations are used to improve or correct the color, shape and size of teeth. E-max cementations are an option that provides both aesthetic and functional improvements. The process of performing E-max cementation involves preparing personalized restorations based on the patient's specific needs and goals. Special preparations of the teeth are made and measurements are taken. Laboratory technicians produce restorations suitable for the patient's tooth structure. In the final stage, E-max restorations are bonded to the teeth safely and durablely (3-6, 12-14).

Dental Lamina Materials

The dental lamina cementation process involves special materials used to solve the aesthetic and functional problems of teeth. Porcelain laminates are one of the most commonly used materials for dental laminate cementation. These laminates contain specially designed and sized porcelain sheets. Porcelain has a translucency similar to natural teeth, making aesthetic results look natural. Porcelain is long-lasting and resistant to decay. It does not tend to change color over time.

Composite laminates are another material option used for aesthetic improvements. These laminates contain specially designed and shaped composite resin sheets. Composite laminates can be made thinner and require less preparation of the teeth. If damage occurs, composite laminates can be repaired more easily. It is a more economical option than porcelain laminates.

Some other materials other than porcelain and composite can also be used in dental laminate cementation. The use of these materials may vary depending on the patient's specific circumstances and wishes. For example, in some cases, zirconium laminates or ceramic laminates may be preferred. Dental laminate materials can be personalized for the patient and appropriate options should be selected by the dentist.

E-Max Material

The basic material of E-max systems is lithium disilicate ceramic. This type of ceramic has many advantages in the field of dentistry. Lithium disilicate offers an aesthetic appearance very close to natural teeth, thus allowing patients to achieve the aesthetic results they want. This material is extremely durable and can withstand daily chewing forces. Lithium disilicate ceramics do not experience color change over time, which allows patients to maintain long-term color stability of their smiles (6-8, 19-22).

INDICATIONS AND CONTRAINDICATIONS

For dental lamina and e-max cementation (3-7):

Indications:

- Color changes in teeth can be corrected with dental lamina and E-max cementation. This method can be especially effective on teeth that are stained or yellowed as a result of bleaching.
- tooth deformities, small or large teeth, or fractures need to be corrected.
- Gaps between teeth can be closed with dental lamina and E-max cementation. This method may be preferred, especially if the gaps between the teeth are aesthetically disturbing.
- Broken or cracked teeth can be repaired with laminates. This may be effective in restoring the functionality and aesthetic appearance of the tooth.
- If the teeth become shorter due to wear or their surfaces are damaged, it is possible to reshape the teeth using laminates.

Contraindications:

- Dental laminate cementation does not solve severe dental problems such as serious tooth decay, periodontal disease or root problems. Such conditions must be treated first.
- If there is serious damage or major caries on the teeth, E-max cementations may be insufficient. In these cases, more extensive restorations may be required.
- If there is a major loss of teeth, dental lamina and E-max cementation may be insufficient. In this case, more comprehensive restorative options such as implants or bridges should be considered.
- The risk of long-term failure of veneers increases if the patient is unable to maintain good oral hygiene.
- In cases where tooth enamel is insufficient, E-max cementations can be applied, but should be evaluated carefully.
- If there is a significant color mismatch between the natural color of the teeth and the laminates, this may cause an aesthetic problem. In this case a better color matching may be required.
- E-max cementations are not suitable for patients with active gum diseases or gum problems. These problems need to be treated first.
- In patients with chewing function problems, E-max cementations may not be suitable. In these cases, the dentist should recommend a more appropriate treatment option.
- It should not be applied to patients with excessive crowding and rotation.
- People who engage in close combat sports such as boxing and karate have a high risk of fracture.
- In patients with primary teeth and severe fluorosis, roughening may not be sufficient.

PREOPERATIVE POINTS TO BE CONSIDERED

Aesthetic dental restoration procedures such as dental laminate and E-max cementations must be carefully planned to achieve successful results. In the preoperative period, the following factors should be taken into account, taking into account the patient's condition and expectations (2-6, 9-12, 23-26):

General points:

- The patient's medical history should be evaluated in detail. In particular, medication use, allergies and systemic diseases should be included in this evaluation.
- The patient's current dental condition should be examined. Problems such as cavities, gum problems, or gum line abnormalities should be identified.
- The patient's aesthetic expectations and desired results should be determined in detail. Preferences in color, shape, size and arrangement of teeth should be taken into account.
- The natural color and tone of the teeth is an important factor in choosing the color of the restorations. The aim should be to ensure that the restorations are compatible with the natural color of the teeth.
- Tooth preparation and resetting process for dental lamina and E-max cementations should be planned in advance. Dental laminates that require minimal tooth preparation or situations that require more preparation should be considered.
- The compatibility of the teeth with the restorations is important. Color selection should be done sensitively to preserve the natural look.
- Collaboration should be made for the laboratory processing of restorations. Communication with laboratory technicians is critical to achieving the results the patient desires.
- The patient should be informed about the details of the procedure and its results. Maintenance and hygiene issues should be included.
- The dental lamina and E-max cementation plan should be discussed in detail with the patient and approval should be obtained.

Action points:

- The mouth should be checked for color compatibility.
- It should be checked for inclusions, and care should be taken not to cause cracks during the check. In cases where correction is required, medium speed diamond burs can be used and application should be made with light pressure.
- In order for the E-max glass ceramic porcelain to last for a long time, to be able to transmit the chewing pressure to the teeth better and to be able to settle completely, a tooth cut called a step should be made on the tooth surface and for this purpose, the dental layer in the area where the lamina or e-max will be placed should be cut appropriately. In the intra-enamel window type preparation, one of these incisal edge preparation methods, the restoration is resistant to axial stresses, but the incisal edge is weakened and it becomes difficult to store the cement. Feather edge type preparation is performed up to the incisal edges, but the possibility of fracture is high in protrusive movement. Beveled type preparation is preferred on teeth with short crown length, the restoration is seated comfortably during cementation, incisal edge aesthetics are easily achieved, and the margins are not exposed to non-protrusion shear effects. In overlap preparation, the restoration fits comfortably, modification of incisal edges is easy, but the possibility of microleakage is high and the risk of cohesive fracture is increased.
- Sharp corners and angles should be avoided when making this cut, as this may cause the lamina or e-max not to fit properly to the teeth, to be mobile, or to not be able to fully transfer resistance to the teeth during chewing.
- During this cutting, the tooth should be constantly checked from the right, left, bottom and top, and efforts should be made to adjust the correct alignment relative to other teeth.
- The cutting should start from the gum line and continue to the areas where other teeth come into contact with the sides. In this way, after the lamina/e-max is placed, it is ensured that the place where the lamina or e-max begins cannot be noticed from the outside.
- In order to ensure the stability of the restoration, the layer thickness should be kept to a minimum.
- Measuring E-max with CAD/CAM shortens the construction time and ensures that the process is completed in a single visit.
- Lamina or e-max must be thoroughly cleaned before the procedure.
- The patient should not gargle with mouthwash as it may negatively affect the bonding of adhesives to the tissue.
- Cement, adhesive and bonding materials should be selected from the highest quality materials produced with up-to-date technology.

Points regarding the material:

The cement to be used in dental lamina/e-max cementation should have the following properties:

- It must have the necessary compression and tensile strength.
- It must be able to show high resistance to cutting forces when forming a thin layer.
- It must have sufficient fracture resistance.
- It should be able to provide a permanent and strong connection between materials.
- It should be able to wet the tooth and laminate/e-max surface.
- It must have appropriate viscosity.
- It should not dissolve in the mouth.
- It must have tissue compatibility.
- It must have sufficient hardening and working time.

- It must have properties such as fatigue resistance and erosion resistance.
- It should prevent micro or nano leakage.
- Especially the optical properties of the cement to be used in IPS e-max cementation should be different from conventional cements, these cements should not be opaque and should allow natural light transmission. Composite resin-containing cements are known to comply with these properties.

Glass ionomer cements are frequently preferred because they are easy to use, have bacteriostatic properties, have thermal expansion coefficients similar to dentin, show absolute shrinkage on dentin, bond well to enamel and dentin, have good microleakage resistance and high compression resistance. However, since they are sensitive to moisture and expand by absorbing water during the hardening reaction, it can cause cracking of full ceramic restorations, therefore it is used in the cementation of metal-containing restorations.

Compomers, developed with the combination of resin and glass ionomer cements, are polyacid modified composite resin based cements. It may cause fractures in all-ceramic restorations because the hydroxyethyl methacrylate it contains expands much more than traditional cements when in contact with water.

CEMENTATION PROCESS STEPS AND POINTS TO BE CONSIDERED DURING THE PROCESS

- Before starting dental laminate or E-max cementation procedures, the patient's general dental health and aesthetic goals should be evaluated. The dentist should take into account the patient's current tooth structure, color tone, and desired aesthetic changes. This stage is critical to successful planning of the transaction.
- The second step involves the preparation of the teeth to which dental laminate or E-max will be applied. At this stage, the dentist lightly sands and shapes the existing tooth structure. This ensures that the laminates fit correctly and achieve a natural appearance. When necessary, a thin layer can be removed from the tooth surface.
- The dentist takes measurements of the prepared teeth. These measurements are used to make laminates that will be specially designed and produced by the dental laboratory. At this stage of the procedure process, the patient may use temporary veneers, thus protecting the teeth while awaiting the results of the aesthetic improvement.
- After the measurements are taken, the dental laboratory custom-designs and manufactures the laminates. Laboratory technicians create a custom digital design using the oral measurements taken. This design takes into account the unique shape and aesthetic requirements of the patient's teeth. Digital modeling software allows this design to be created in detail.
- Laminates can be made of porcelain or composite material and are shaped according to the patient's wishes and the dentist's recommendations. E-max cementations are produced using special technology. These cementations are specially prepared to perfectly fit the patient's tooth structure. After the design is completed, special glass ceramic blocks are processed with CNC (Computerized Numerical Control) machines. These machines achieve the desired sizes and shapes of E-max cementations by precisely machining special designs.
- Once the laminates or E-max are produced, the dentist permanently cements them to the patient's teeth. This step is performed using a special adhesive and requires precise placement of the laminates in the correct position and to achieve the desired aesthetic results. Cementations are firmly bonded to the tooth surface. This step ensures long-term durability and aesthetic harmony of the cementations.
- After laminate or E-max cementation, the dentist makes the final touches and adjustments. The harmony of the teeth, bite function and aesthetic results are examined and fine adjustments are made when necessary.
- After successful completion of E-max cementations, the patient is recommended to maintain good oral hygiene and attend regular dentist check-ups. This is important to maintain the long-term durability of cementations.

Dental lamina is a restoration material consisting of ceramic and composite materials. It is important to follow the following golden rules for dental lamina cementation (3-8, 27-33):

- Preparation surfaces must be clean and dry. Temporary cement residues and necrotic dentin should be completely cleaned with pumice or oxygenated water.
- The cementing agent must be suitable for the restoration and preparation surfaces. Cementing agents specially developed for dental lamina should be used.
- The cementation process should be done carefully and meticulously. The cementation agent should be applied homogeneously to the restoration and preparation surfaces.
- The restoration must fit correctly and completely into the preparation. The restoration should be gently pushed to ensure a true and secure fit into the preparation.
- The restoration should be fixed by light polymerization. The dental lamina must be fixed by light polymerization.

Some points that should not be applied in dental lamina cementation are:

- Preparation surfaces should not be wet. If the preparation surfaces are wet, the adhesion strength of the cementing agent will decrease.
- Cementation agent should not be applied too much. If too much cementing agent is applied, the restoration may come out of the preparation.
- If the restoration does not fit correctly and completely into the preparation, it should not be forced. If the restoration does not fit correctly and completely into the preparation, forcing it may damage the restoration.
- Emax is a ceramic restoration material produced from lyophilized glass. It is important to follow the following golden rules for Emax cementation:

- Preparation surfaces must be clean and dry. Temporary cement residues and necrotic dentin should be completely cleaned with pumice or oxygenated water.
- The cementing agent must be suitable for the restoration and preparation surfaces. Cement agents specially developed for Emax should be used.
- The cementation process should be done carefully and meticulously. The cementation agent should be applied homogeneously to the restoration and preparation surfaces.
- The restoration must fit correctly and completely into the preparation. The restoration should be gently pushed to ensure a true and secure fit into the preparation.
- The restoration should be fixed by light polymerization. Emax must be fixed by light polymerization.

Some points that should not be applied in Emax cementation are:

- Preparation surfaces should not be wet. If the preparation surfaces are wet, the adhesion strength of the cementing agent will decrease.
- Cementation agent should not be applied too much. If too much cementing agent is applied, the restoration may come out of the preparation.
- If the restoration does not fit correctly and completely into the preparation, it should not be forced. If the restoration does not fit correctly and completely into the preparation, forcing it may damage the restoration.

Points regarding processing and material:

- Since IPS E-max type glass ceramics are extremely fragile, temporary bonding should be avoided.
- The surface of the lamina or e-max that will adhere to the tooth must be roughened with hydrofluoric acid, called etching gel. This process should not exceed 20 seconds. Afterwards, it should be washed with water.
- In order for the cement to adhere better, a silane suitable for laminate or e-max should be applied and then dried.
- Appropriate cheek-lip retractors, cotton rolls and saliva ejectors should be used to ensure thorough oral dryness during cementation.
- The surfaces of the teeth should be thoroughly cleaned.
- The surface of the teeth should be etched with 37% orthophosphoric acid. This process should be applied for 5-10 seconds for dentin and 25-30 seconds for enamel. After this process, it should be washed with plenty of water for the same amount of time.
- Multiple adhesive systems should be used in cementation.
- Before multiple adhesive, a bonding material should be applied to the teeth for 15 seconds, then an adhesive should be applied for 10 seconds. Afterwards, a light-curing bonding material is applied to the inner surface of the lamina or e-max, and then a bonding cement containing resin is applied and e-max is placed on the tooth. This placement should be done very carefully and excess cement between the tooth and lamina/e-max may be observed to protrude from the edges.
- Excess cement overflowing from the edge should be completely cleaned with brush, pellets, cretuar or drill. Any cement remaining between the teeth should be completely removed with dental floss.
- Then, polymerization should be done with high-power LED light. This process should be performed for approximately 40 seconds, allowing you to see the tooth from all directions. Insufficient polymerization may cause discoloration of the cement.
- Depending on the situation, marginal parts can be polished with silicone rubber.

POSTOPERATIVE POINTS TO BE CONSIDERED

After aesthetic dental restoration procedures such as dental laminate and E-max cementations, there are a number of postoperative factors that patients should pay attention to to ensure the long-term success of the results and the preservation of their oral health (1-5, 7-9, 34-36):

- Good dental hygiene is essential to protect the dental lamina and E-max cementations. Patients should keep their teeth clean by regular brushing, flossing and mouthwash.
- Routine dental check-ups are essential to monitor the condition of restorations and detect any potential problems early. Compliance with dentist recommendations is important.
- Consumption of hard and sticky foods should be limited. Excessively hard objects can damage dental restorations. It may be necessary to use a protective mouth guard for the teeth.
- Clenching or grinding teeth can damage restorations. These situations should be prevented by using a mouthguard day or night.
- Although it is known that dental laminate and E-max cementations provide color stability, it is important to stay away from substances that may cause stains, such as smoking, coffee or tea.
- It is important to be prepared for emergencies. In case of breakage or damage to the restorations, it is necessary to consult a dentist immediately.
- The patient should carefully follow the post-procedure care instructions. If there are any questions or concerns, the dentist should be consulted.
- Patients should evaluate aesthetic results regularly and share any changes or concerns with the dentist.

ADVANTAGES AND DISADVANTAGES

Dental lamina and E-max cementation have some advantages and disadvantages (1,4,8-10, 15, 41-44).

Advantages:

- Dental lamina and E-max cementation can be customized in terms of color, opacity, light transmittance, shape and size.
- These are procedures that require less tooth preparation than other restorative options.
- It can be completed in a short time.
- They have color stability and do not change color over time.
- These materials do not encounter an antigenic reaction.
- It is long-lasting, has high mechanical strength and can withstand daily chewing forces and can last for years when cared for with good oral hygiene.
- It provides both aesthetic and functional improvements. In addition to improving the aesthetic appearance of teeth, it can also restore chewing function.

Disadvantages:

- It may be more costly than other restorative options.
- Their fragility continues.
- Lamina or e-max can be eroded by opposing natural teeth.
- During the preparation of teeth, small amounts of material are lost and this process is irreversible. Therefore, once applied, changes cannot be undone.
- In some cases, minimal tooth preparation may be required. This may mean changing the natural structure of the teeth.
- If the bonding process of the laminates is not carried out properly, problems such as displacement or falling of the laminates may occur.
- It is difficult to repair.

FUTURE TECHNOLOGIES

There are some predictions for dental restorations in the future. Digital scanners and software allow dentists to make more precise measurements and ensure a perfect fit of the laminates to the teeth. It is expected that materials that are more durable, better aesthetically matched and less invasive will be used in the future. This can enable patients to benefit from longer-term results and less dental preparation. Biomimetic design aims to develop restorations that mimic natural tooth structure. In the future, the materials and design approaches used in dental lamina and E-max cementation may be reproduced more closely to natural teeth. In the future, dental lamina and E-max cementation may become even thinner and more aesthetic.

In the future, dental lamina and E-max cementation procedures are likely to become faster and less invasive. Digital technologies can be used to better predict the results of the dental laminate and E-max cementation process and provide visual simulations to patients. Digital dental technology will further improve the design and manufacturing processes of E-max cementations. Digital scanning enables design and production processes to be faster and more precise. The development of material technology may increase the longer-term durability of dental laminates and E-max cementations. This helps patients maintain their aesthetic and functional results for a longer period of time (11,44).

CONCLUSION AND IMPLICATIONS

Studies and current research show that dental laminate and E-max cementations play an important role in aesthetic dentistry and are an effective and reliable option for many patients. Dental laminate and E-max cementations are pioneering methods used in aesthetic dentistry to obtain reliable and aesthetically satisfactory results. These restorations can restore natural tooth appearance and function. Dental laminate and E-max cementations can be applied in accordance with the principles of minimally invasive dentistry. These methods, which require minimal tooth preparation, provide aesthetic improvements while preserving the natural structure of the teeth.

Both dental laminate and E-max cementations are known for their long-term color stability and ability to blend into natural teeth. These features ensure that patients are satisfied with the aesthetic results for a long time. Aesthetic improvements can increase patients' self-confidence and contribute to psychosocial recovery. Dental laminate and E-max cementations can improve the quality of life by ensuring that patients are satisfied with their smile.

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