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Ceramic Cantilever Bridge as a Transitional Solution for Lateral Maxillary Incisor Replacement: A Case Report

Amal Esghir[1*], Brahim Boukadida[2], Rahma Mkhinini[3], Leila Mamlouk[3], Ibtissem Grira[1], Nabiha Douki[4]

[1]Faculty of Dental Medicine, University of Monastir, Prosthodontics CHU Sahloul of Sousse, Sousse, Tunisia
[2]Faculty of Dental Medicine, Buccal Surgery CHU Sahloul of Sousse, Sousse, Tunisia
[3]Faculty of Dental Medicine, Prosthodontics CHU Sahloul of Sousse, Sousse, Tunisia
[4]Faculty of Dental Medicine, University of Monastir, Endodontics CHU Sahloul of Sousse, Sousse, Tunisia

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***Corresponding author:** Amal Esghir
Faculty of Dental Medicine, University of Monastir, Prosthodontics CHU Sahloul of Sousse, Sousse, Tunisia

Abstract **Case Report**

The loss of a lateral maxillary incisor can significantly impact a patient's aesthetics, function, and self-esteem. This case report details the use of a ceramic cantilever bridge as a pre-implant temporary solution for restoring a missing lateral incisor in a 22-year-old female patient who presented with agennesic lateral incisors. A ceramic cantilever bridge was fabricated to provide immediate aesthetic and functional restoration while awaiting definitive implant placement. The bridge was designed to match the color and morphology of the adjacent teeth, ensuring seamless integration into the patient's smile. Results indicated that the ceramic cantilever bridge effectively restored aesthetics and function without complications such as debonding or fracture. The patient reported high satisfaction with both the appearance and functionality of the bridge throughout the temporization period. This case underscores the effectiveness of ceramic cantilever bridges as a viable pre-implant solution for lateral maxillary incisor replacement. By providing immediate restoration, this approach not only enhances aesthetics but also supports oral health and patient confidence during the transitional phase before implant placement. Further studies are warranted to evaluate long-term outcomes and refine treatment protocols for similar clinical scenarios, contributing to improved strategies in restorative dentistry.

Keywords: Ceramic Cantilever Bridge, Agenesis, Lateral Incisor, Pre-implant Restoration, Aesthetic Restoration.

INTRODUCTION

The loss of a lateral maxillary incisor can significantly impact a patient's aesthetics, function, and self-esteem. In many cases, the immediate restoration of this missing tooth is crucial for maintaining smile harmony and ensuring adequate masticatory function. Ceramic cantilever bridges emerge as an effective temporary solution, offering an aesthetic alternative while minimizing invasiveness compared to more traditional restorative options.

This type of restoration utilizes adjacent teeth as support, allowing for the replacement of the missing one without requiring extensive preparation. Due to their superior aesthetic properties, ceramic bridges are particularly well-suited for anterior regions where appearance is paramount. This treatment is often considered a transitional solution while awaiting the placement of a definitive dental implant.

This article examines the long-term effects of using a ceramic cantilever bridge to replace a lateral maxillary incisor. We will discuss the benefits, and the challenges associated with the use of ceramic cantilever bridges as a pre-implant solution through a clinical situation.

CLINICAL OBSERVATION

The patient is a young individual with congenitally missing maxillary lateral incisors, which were addressed through orthodontic treatment. This treatment facilitated the creation of appropriate spaces for future restorations. The left side exhibited an open space suitable for an implant supported crown, while the right space between the canine and the central incisor was closed (Fig 1).

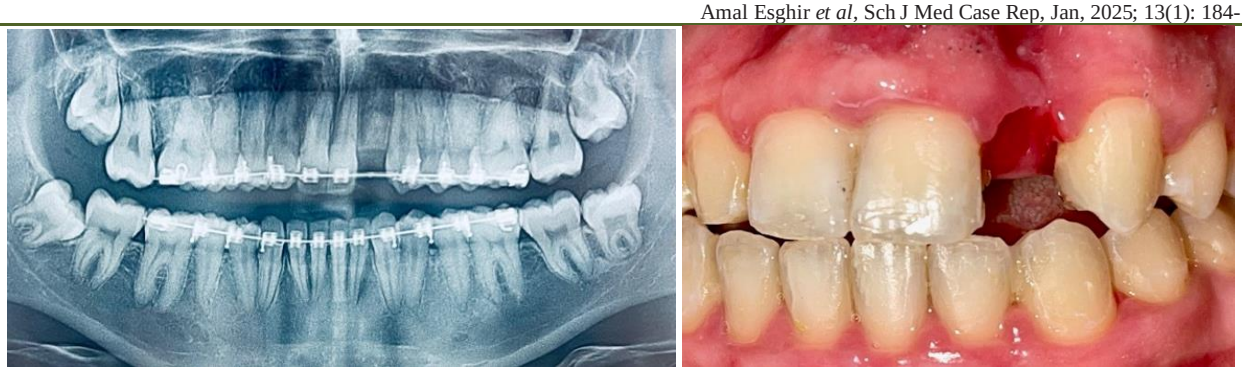

Figure 1: Initial clinical situation: a) Panoramic radiography; b) Intrabuccal view

Prosthetic Decision:

- Bonded Cantilever ceramic Bridge: Indicated for the left maxillary lateral incisor space having the 23 as a tooth support.
- Ceramic Veneer: Indicated for the right canine to ensure aesthetic balance.

Pre-prosthetic treatment Planning

The treatment plan involved:

- Tooth surface scaling
- Gingivectomy for the central maxillary incisors as well as the first maxillary right premolar in a way to equalize the level of the tooth collars (Fig 2).

Figure 2: Gingivectomy for the two central incisors and for the right first premolar

Prosthetic procedure

After healing of the gingival tissue, the palatal surface of the 23 was prepared as well as the buccal surface 13. Both preparations were localized in the enamel layer. Then, a digital impression was taken and sent to the Prostheses laboratory. Provisionals were fabricated to protect the prepared surfaces. The color of the ceramic was chosen following the color of adjacent teeth (Fig 3 to Fig 5).

Figure 3: Preparation of the palatal surface of the canine

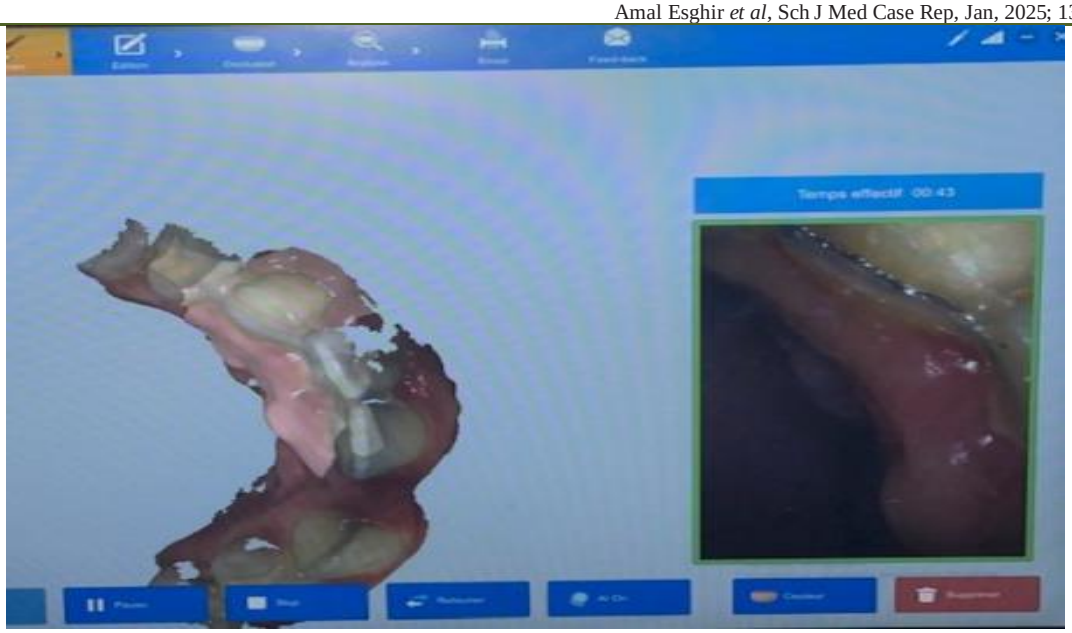

Figure 4: Digital impression using Lunca® Scanner

Figure 5: Provisionals for the canine and the lateral incisor

Once received from the laboratory, the veneer and the cantilever bridge were tried on teeth in a way to validate the adaptation and the aesthetic result. Then the bonding protocol has debuted with the isolation of the concerned teeth using a sectorial fenestrated rubber dam (Fig 6).

Figure 6: Isolation using sectorial fenestrated rubber dam

As for the dental surface treatment, an MR2 adhesive system was chosen, etching by the mean of orthophosphoric acid 37% and the application of a layer of adhesive (Fig 7 & Fig 8).

Figure 7: Etching of the dental surface using orthophosphoric acid 37%

Figure 8: Application of the adhesive layer

The prosthetic surface was also treated with fluoric acid (9%) for 20 seconds of etching. After rinsing and air drying, silane Monobond® was applied for one minute (Fig 9 & Fig 10).

Figure 9: Surface etching using fluoric acid 9%

Figure 10: Application of the silane

Once the bonding resin (Variolink®) was malaxed and applied to the prosthetic surface, the restorations were correctly positioned on the teeth and then light curing was realized for 40 seconds per surface (Fig 11 & Fig 12).

Figure 11: Positioning of the cantilever bridge for bonding

Figure 12: Light curing for 40 seconds per surface

After curing the resin, a delicate elimination of the excess was performed as well as polishing the dental-prosthetic joint to obtain the final result (Fig 13).

Figure 13: The final result after bonding

DISCUSSION

The use of a ceramic cantilever bridge as a pre-implant solution for replacing a lateral maxillary incisor presents a unique approach in restorative dentistry, particularly in managing aesthetic and functional concerns associated with tooth loss. As demonstrated in this case report, the cantilever bridge effectively addresses the immediate needs of the patient while awaiting definitive treatment through dental implants. In the context of this case, it is essential to explore the implications of using a cantilever bridge, including its advantages, potential complications, and overall impact on patient satisfaction.

In fact, this prosthetic restoration requires limited preparation of the abutment teeth, primarily restricted to enamel, which preserves tooth structure (Kern & Strub, 2004; Sailer *et al*., 2012).

The design allows for optimal aesthetic outcomes, as it can be crafted to match the natural dentition closely (Botelho, 2017).

Besides, it can provide adequate support and stability when properly bonded to the tooth surface (M. Drossart, 2017).

The cantilever bridge functions as a fixed prosthesis where the pontic is supported by a single abutment tooth. This design minimizes stress on the supporting tooth and allows for better proprioception during function. Studies indicate that these bridges exhibit greater fatigue resistance compared to traditional double-wing designs (Isidor & Kahnberg, 2003; Sailer *et al*., 2012).

When selecting an abutment tooth for a cantilever bridge, several specific criteria must be

considered to ensure the success and longevity of the restoration.

First, the tooth should not exhibit advanced destruction or significant coronal damage. If the destruction is severe, a post and core may be needed; however, extensive damage beneath the gumline typically disqualifies a tooth from being used as an abutment (Kern & Strub, 2004).

The size of the abutment tooth should be at least equal to or larger than that of the pontic to ensure adequate load distribution and prevent excessive stress on the restoration. This parameter led us to choose the canine in our case as well as having the post-orthodontic treatment contention of the two central incisors. (Kihara T *et al*., 2023).

Then, the occlusal scheme must be evaluated to ensure that forces are evenly distributed across the abutment teeth. Ideal candidates are those that can maintain a stable occlusion without excessive loading on the pontic. A thorough evaluation of static and dynamic occlusal relationships is essential to optimize outcomes. Although it is a risk taken in terms of occlusal distribution of forces when the tooth support (23) and the pontic (22) are not in the same Roy plan, this design can still be indicated without long term failure. (Albert JR *et al*., 2020).

Advancements in CAD/CAM technology allow for precise fabrication of cantilever bridges, ensuring that they meet both functional and aesthetic requirements. This technology enhances predictability in achieving desired outcomes by accurately modeling the prosthesis according to individual anatomical variations (Botelho, 2017; Sailer *et al*., 2012).

Furthermore, the success of ceramic cantilever bridges as a restorative solution for replacing missing anterior teeth, particularly lateral maxillary incisors, heavily relies on the choice of surface treatment protocol and resin bonding techniques.

The surface treatment used for bonding ceramic cantilever bridges must be selected based on the material properties of the restoration. For zirconia-based restorations, sandblasting with alumina oxide followed by silane application is recommended to increase the surface area and promote chemical bonding between the zirconia and the adhesive resin. The use of adhesives containing methacryloyloxydecyl dihydrogen phosphate (10-MDP) is particularly effective for zirconia, as it forms a strong bond with the ceramic surface, thereby improving retention and reducing the risk of debonding (Van Meerbeek *et al*., 2010).

In contrast, lithium disilicate ceramics require different bonding protocols. After etching with hydrofluoric acid to create micro-retentive surfaces, a silane coupling agent is applied to enhance adhesion to the resin cement. This two-step process has been shown to significantly improve bond strength and durability in clinical settings (Kern & Strub, 2004; Sailer *et al*., 2012).

The application of resin bonding techniques is equally important for achieving optimal outcomes with cantilever bridges. Proper isolation of the operative field using a rubber dam is essential to prevent contamination during bonding procedures. The tooth surface should be etched with phosphoric acid to enhance micromechanical retention before applying the adhesive system (V Gresnigt MMM *et al*., 2024).

The choice of resin cement also influences the success of the restoration. Dual-cure resin cements are often preferred due to their ability to polymerize in both light and self-curing modes, providing versatility in various clinical situations where light access may be limited (Isidor & Kahnberg, 2003). However, appearance of a greyish color underneath the restoration, mainly veneers, might occur with dual cure resins.

For instance, a systematic review reported high survival rates for all-ceramic cantilever bridges when proper bonding techniques were employed. Conversely, inadequate bonding can lead to complications such as debonding or fracture, which are among the most common failures associated with these restorations (Hirofumi Yatani *et al*., 2020).

Furthermore, understanding the biomechanical aspects of cantilever bridges is essential. The single-retainer design allows for more straightforward stress distribution compared to traditional two-retainer designs, reducing occlusal forces on the abutment tooth (Zhang & Lawn, 2018). Nevertheless, this necessitates a robust adhesive bond to withstand these forces over time.

Ceramic cantilever bridges, particularly those made from lithium disilicate-reinforced ceramics, have shown promising long-term survival rates. In a clinical evaluation involving 211 bonded cantilever bridges, Botelho found a success rate of 84% after 15 years. His findings highlight that cantilever bridges can outperform two-wing bonded bridge solutions due to reduced stress at bonding joints. This durability is attributed to the material's aesthetic properties and mechanical strength, which provide adequate support for anterior restorations. The cantilever design allows for a distribution of occlusal forces that can enhance the longevity of the prosthesis when properly managed (Botelho, 2017).

While ceramic cantilever bridges can be effective, they are not without complications. One of the primary concerns with cantilever bridges is the risk of debonding due to inadequate bonding or excessive occlusal forces. This risk is heightened in cases where the abutment tooth is not structurally sound or if there are underlying periodontal issues (Mendes JM, 2021).

Ceramic materials, while strong, can be prone to fracture under excessive load or impact. Studies indicate that fractures may occur at rates comparable to those seen in traditional bridges, particularly if the restoration is subjected to high-stress environments such as bruxism. According to a study by Isidor *et al*., one of the main disadvantages of cantilever bridges is that they are subjected to significant dislodging forces at the abutment teeth, particularly the farthest ones from the pontic. This mechanical stress can lead to an increased risk of failure (Isidor & Kahnberg, 2003).

The health of the abutment tooth is crucial to the success of the cantilever bridge. Complications such as caries or periodontal disease can lead to failure if not addressed promptly. Regular monitoring and maintenance are essential to mitigate these risks (Kern & Strub, 2004).

However, it is essential for dental professionals to set realistic expectations regarding durability and maintenance needs. Patients should be informed about potential complications and encouraged to maintain good oral hygiene practices to prolong the life of their restoration (Meisan Ali Bukhari, 2022).

Ongoing maintenance is vital for sustaining the integrity of the bridge. Patients should be advised on effective oral hygiene practices and regular dental check-ups to monitor both the bridge and abutment tooth health.

CONCLUSION

In summary, using a ceramic cantilever bridge as a temporary solution for replacing a lateral maxillary incisor offers several advantages, including aesthetic appeal and rapid restoration of function. While long-term survival rates are promising, clinicians must remain vigilant regarding potential complications such as debonding and fracture. Proper case selection, material choice, and patient education are critical components in ensuring the longevity and success of this restorative option. As advancements in materials and techniques continue to evolve, ceramic cantilever bridges will likely remain a valuable tool in contemporary restorative dentistry for managing anterior tooth loss effectively.

REFERENCES

- Kern, M., & Strub, J. R. (2004). Clinical performance of ceramic cantilever bridges: A review of the literature. *International Journal of Prosthodontics*, *17*(2), 151-156.
- Sailer, I. (2012). Long-term performance of zirconia-based fixed dental prostheses: A systematic review. *Journal of Dental Research*, *91*(5), 467-472. https://doi.org/10.1177/0022034512442438
- Botelho, M. G. (2017). Long-term performance of bonded cantilever bridges: A clinical evaluation. *Journal of Prosthetic Dentistry*, *117*(5), 674-680. https://doi.org/10.1016/j.prosdent.2016.10.019
- Drossart, M., Cheron, R., & Tirlet, G. (2017). All-ceramic cantilever resin-bonded fixed dental prostheses: a therapeutic option to replace a missing front tooth. *Journal of Dentofacial Anomalies and Orthodontics*, *20*(3), 306. DOI: 10.1051/odfen/2017016
- Kihara, T., Shigeta, Y., Ikawa, T., Sasaki, K., Shigemoto, S., & Ogawa, T. (2022). Designing anterior cantilever resin-bonded fixed dental prostheses based on finite element analysis. *Journal of Prosthodontic Research*, *67*(3), 418-423. doi: 10.2186/jpr.JPR_D_22_00103. Epub 2022 Dec 12. PMID: 36372436.
- Isidor, F., & Kahnberg, K. E. (2003). The influence of cantilever design on the success of fixed dental prostheses: A clinical study. *Clinical Oral Implants Research*, *14*(2), 153-158. https://doi.org/10.1034/j.1600-0501.2003.140203.x
- Albert, J. R., Livingstone, D. W., Manivasakan, S., & Ravichandran, V. (2020). Cantilever resin-bonded bridge design: A review. *J Sci Dent*, *10*(1), 28-30.
- Van Meerbeek, B. (2010). Adhesive dentistry and the restoration of the dental hard tissues: A review of the literature and clinical implications for practice. *Dental Clinics of North America*, *54*(3), 507-532. https://doi.org/10.1016/j.cden.2010.03.008
- Gresnigt, M. M., Jonker, J. A., & van der Made, S. A. (2024). The cantilever contact-point resin bonded bridge; adhesion 2.0. *Journal of Esthetic and Restorative Dentistry*, *36*(1), 37-46. doi:10.1111/jerd.13179
- Hirofumi, Y. (2020). The survival and complication rates of all-ceramic cantilever bridges: A review of the literature. *Annals of Japan Prosthodontic Society*, *12*(3), 209-224. https://doi.org/10.2186/ajps.12.209
- Zhang, Y., & Lawn, B. R. (2018). Mechanical reliability of dental ceramics: A review of the literature and clinical implications. *Dental Materials*, *34*(1), 1-12. https://doi.org/10.1016/j.dental.2017.08.004
- Mendes, J. M., Bentata, A. L. G., de Sá, J., & Silva, A. S. (2021). Survival rates of anterior-region resin-bonded fixed dental prostheses: an integrative review. *European journal of dentistry*, *15*(04), 788-797. doi: 10.1055/s-0041-1731587. Epub 2021 Aug 24. PMID: 34428850; PMCID: PMC8630935.
- Meisan Ali, B. (2022). International Journal of Community Medicine and Public Health, 9(1), 359-363. http://www.ijcmph.com