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A Customized Jig for Lingual Retainer

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Aim: To report the application of a novel type of jig that is customized according to each patient to help secure and bond a fixed lingual retainer.
Materials and methods: This paper reports the use of a 3D printing pen to fabricate a customized jig using polylactic acid (PLA) filament. The jig is fabricated by ejecting molten PLA over a dental model with an adapted retainer wire on the labial and incisal surface, extending only on the interdental embrasures lingually, thus stabilizing the retainer wire. The lingual or palatal surfaces of the teeth were not covered, allowing for composite resin placement and light-curing for bonding the retainer intraorally. This jig along with the retainer wire was removed and transferred intraorally after bonding preparation. The jig was able to stabilize the retainer wire in position facilitating an easy bonding procedure.
Results: A customized jig fabricated using a 3D printing pen was simple to fabricate chair-side, easy to handle, able to stabilize the retainer wire intraorally while bonding, and made the overall process simple and time-efficient. The use of a 3D printing pen is an innovative approach that can be easily performed chair-side. The PLA filament used in the pen is biodegradable and biocompatible, making it an ideal material for medical applications.
Conclusion: The clinical procedure for bonding the lingual retainer using the customized jig was found to be very convenient and time-efficient for the clinician and comfortable for the patient. This method can be adopted in clinical practice for bonding lingual retainers for all types of patients and all types of retainer wires. However, this is technique sensitive and its clinical preference for usage may differ from clinician to clinician.

Keywords: Orthodontics, Retention, Indirect Bonding, Clinical tip

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Introduction

Long-term stability of orthodontic treatment outcome depends on a number of factors of which orthodontic retention plays a crucial role. Orthodontic retention can be defined as the holding of teeth following orthodontic treatment in the treated position for the period of time necessary for the maintenance of the result.[1] In some situations, patients may require fixed retention.[2]

The lingual bonded retainer, otherwise called fixed retainer or permanent retainer, is an efficient means of retention post orthodontic treatment to prevent relapse.[3,4] Over the years, different practitioners have practiced different techniques for bonding fixed lingual retainers. It is a challenge to stabilize the wire while bonding which has led many orthodontists to use different materials to stabilize it for accurate bonding. Silicone impression material, vacuum-formed trays, dental floss thread, elastics and magnets, are some of the materials that have been used.[5-9] These methods have certain shortcomings inherent to them. Some of these methods are uncomfortable for the patient and sometimes hassle some to the operator. Some are yielding, imprecise, or difficult and time-consuming to fabricate. Hence, we have proposed the fabrication of a customized jig which was found to be convenient, efficient as well as a comfortable technique to both the patient and the operator.

A 3D printing pen was used to fabricate a customized jig for bonding fixed lingual retainers. This jig is simple to fabricate chair-side, easy to handle, able to stabilize the retainer wire intraorally while bonding, and makes the process simple and time-efficient. It was also comfortable for the patient.

Fabrication of the jig

This technique was done on a patient who had undergone fixed orthodontic treatment and indicated for fixed retention protocol. Alginate impressions were taken and dental models were made. The retainer wire was adapted on these models and the ends were stabilized using wax drops (Figure 1). The jig was now fabricated using a 3D printing pen.

Figure 1: Retainer wire stabilized on models

A 3D printing pen is a device that uses a polymer filament and softens it by heat to construct solid 3D objects.[10] PLA (polylactic acid) is a thermoplastic polymer with a melting range of 160-180°C. It is a biodegradable and a biocompatible polymer that has recently gained popularity in the medical field.

The 3D printing pen was loaded with PLA filament and set at maximum flow to ensure good flowability. The jig is fabricated by ejecting molten PLA around the tooth on the labial and incisal surface and extending only on the interdental embrasures lingually, thus stabilizing the retainer wire (Figure 2). The lingual or palatal surfaces of the teeth were not covered to allow for composite resin placement and light-curing for bonding the retainer intraorally (Figure 3). The jig along with the retainer wire was now removed from the model and ready to be transferred to the patient's mouth (Figure 4).

Figure 2: Fabrication of jig using 3D printing pen

Figure 3: Jigs fabricated using PLA

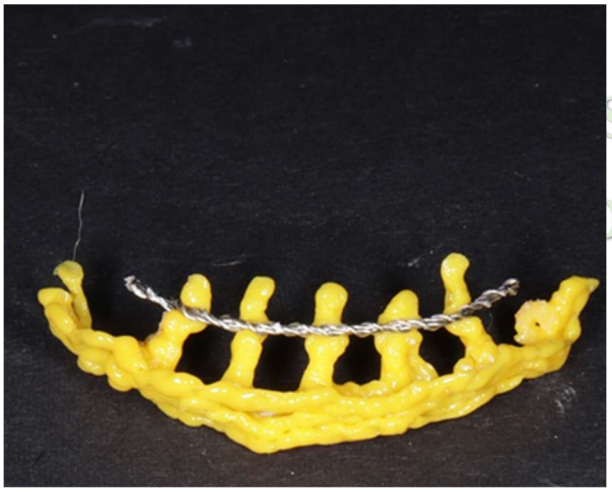

Figure 4: Jig along with retainer wire ready for bonding

Clinical procedure

The patient was then prepared for bonding the retainer. Isolation is a very important factor in bonding lingual retainers and proper measures should be taken to ensure thorough isolation throughout the procedure. The palatal/lingual surfaces from canine to canine (for 3-3 retainer) were etched and primed. The jig with the retainer wire was transferred intraorally. It was ensured that the jig was seated properly and snugly fit before bonding (Figure 5). Composite resin was light- cured to fix the retainer wire to each tooth following which the jig was separated and removed from the patient's mouth. The procedure was done for both upper and lower arches separately (Figure 6).

Figure 5: Intraoral stabilization of retainer wire using the customized jigs

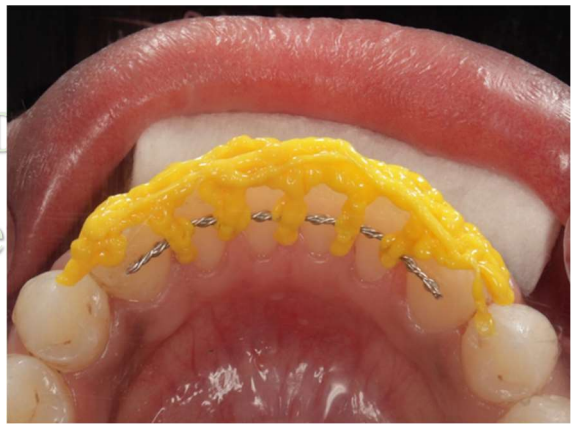

Figure 6: Upper and lower lingual bonded retainers

This technique of bonding the lingual retainer was found to be very convenient and time-efficient for the clinician and comfortable for the patient. An added advantage is that following the use of this jig, PLA being a

biodegradable material will ensure that after discarding, it does not pollute the environment due to its biodegradable nature.

The patient was followed up and a review after six months showed the retainers intact with no patient complains and a stable post-treatment occlusion.

Discussion

The success of orthodontic treatment outcomes depends on several factors, and orthodontic retention is crucial for long-term stability. Fixed retainers have been shown to be an effective means of retention to prevent relapse, but their proper placement can be challenging due to the difficulty in stabilizing the wire during bonding. Several reports have been published on different techniques and materials for bonding lingual retainers to maintain the results of orthodontic treatment. Hobson and Eastaugh (1993)[5] proposed the use of a silicone putty splint for rapid placement of direct-bonded retainers. Lee (1981)[6] studied the use of lower incisor bonded retainers in clinical practice over a three-year period. Corti (1991)[7] introduced an indirect-bonded lingual retainer. Shah et al. (2005)[8] described a technique for placing a lower bonded retainer, and Hahn et al. (2008)[9] conducted a pilot study on the use of a neodymium-iron-boron magnet device for positioning a multi-stranded wire retainer in lingual retention.

In contrast, this report proposes the fabrication of a customized jig using a 3D printing pen to bond a fixed lingual retainer. This technique is found to be convenient, efficient, and comfortable for both the patient and the operator. Unlike some of the methods described in the previous studies, this technique does not involve the use of uncomfortable or time-consuming materials such as dental floss thread or magnets. The jig also provides stability to the wire during bonding, which can be a challenge with other techniques. Additionally, the use of biodegradable PLA material in the jig makes this technique an environmentally friendly alternative to some other methods. Overall, this report offers a unique approach to bonding fixed lingual retainers that has potential benefits over other existing methods.

A customised jig fabricated using a 3D printing pen provides quick and accurate placement of a fixed lingual retainer with no risk of accidental ingestion by the patient. It can be used with any type of retainer wire. The retainer wire can also be bonded using this technique before debonding the fixed appliance. This technique was hassle-free and convenient to the operator, and comfortable for the patient.

Conclusion

In conclusion, the use of a customized jig made using a 3D printing pen for bonding fixed lingual retainers is a novel technique that can provide efficient and comfortable results for both the patient and the operator. Further studies could be conducted to evaluate the effectiveness of this technique in larger patient samples and compare its efficiency with other techniques used for bonding fixed lingual retainers.

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