

Modified Bacci Bonding System with 2D Lingual Brackets

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Abstract

In the recent years, esthetics of the anterior teeth has been a significant issue and most frequently cited reason for patients seeking orthodontic treatment. The lingual orthodontic treatment is attributed to the fact that it is superior in esthetics and is considered completely "invisible". Indirect bonding technique is an important component of lingual orthodontics. Many laboratorial techniques are available for indirect positioning and bonding of lingual brackets. In this article we present a modified Bacci bonding system with reduced number of laboratorial phases, simple bracket positioning and added advantage of individual customized trays.

Key Words: Bacci bonding system, Lingual brackets, Lingual surface

Introduction

A few aspects of dentistry have undergone a dramatic boom in recent years because of increased concerns about dental esthetics. These enhanced esthetic concerns have led to increased demand for invisible orthodontics in 21st century. Lingual orthodontic technique is a very successful approach in the orthodontic treatment of adult patients, although it is considered one of the most difficult techniques, to follow. Lingual orthodontics require great manual skills, experience, more chair side time and often long treatment times with satisfactory results as compared to labial orthodontics. The reason for increased demand & success for lingual orthodontics could be attributed to the fact that it is superior in aesthetics to all the other treatment options, and it is the only technique that can be considered completely "invisible."

Bracket placement is a crucial step; misplacement of bracket in the SWA can cause deviations in terms of rotation, tipping, extrusion/intrusion, first, second & third order angulations. In lingual orthodontics, limited access and visibility, greater variation in lingual surface morphology (especially of the maxillary anterior teeth), shorter lingual crown height, a wide range of labiolingual crown thicknesses, sloped lingual surfaces, smaller interbracket distance, and tongue interference can all contribute to inaccurate bracket placement.¹ Brackets can be bonded directly or indirectly. The labial direct bonding technique was initially described by Newman² and

has been modified. In the indirect bonding technique, orthodontic brackets are initially placed on a dental cast and later transferred, affixed to a tray, to the patient's mouth. This has been proposed as the preferable bracket placement technique for both lingual and labial orthodontics.¹

Case Report

A self-motivated 14 year post pubertal female patient reported with chief complaint of irregularly placed upper and lower front teeth. Extra oral examination revealed concave profile with slightly recessive lips with respect to E-Line. Intraoral examination revealed class I molar & incisor relationship, over jet & overbite of 1 and 3 mm respectively with midline coinciding (Fig. 1 & 2). Pre-treatment cephalometric (Fig. 3) findings reveal a mild class III skeletal pattern with ANB - 3 degrees with hypo divergent growth pattern (Table 1). The maxillary incisors were optimally positioned over the maxillary basal bone & the mandibular incisors with an IMPA of 90°. The maxillary deciduous canine in respect to maxillary right quadrant was retained resulting in buccal permanent canine. There was a single tooth cross bite in respect to left lateral incisors.

Diagnosis & Etiology

Based on the observations she was diagnosed as a case of mild skeletal Class III jaw relationship, with Angle's Class I malocclusion characterized by single tooth cross bite in relation to left laterals with, infralabioversion of the

maxillary right canine, decreased over jet, recessive upper/lower lips & concave facial profile.

Treatment Progress

The treatment called for was extraction of retained deciduous right canine followed by, protraction of maxillary incisors to create space for the crowding. The patient expressed concerns about the esthetic appearance of labially fixed orthodontic appliance over a potentially long period. So, we decided to implement lingual orthodontic technique.

A PVS (polyvinyl silicone, rubber base impression material) impression was taken both of

maxillary & mandibular arch and dental stone setup models were fabricated. Lingual set up was carried out according to Bacci Bonding system³ which was given by Henrique Bacci,³ but with modification of construction of individual or single tooth transfer trays.

Treatment Results

The results achieved were class I molar and canine relationship bilaterally, with improved smile esthetics with respect to maxillary incisors after treatment (Table 1, Fig. 12). At the end of the treatment positive over jet & overbite with coinciding midlines was established with good facial esthetic balance & harmony. (Fig. 10 & 11).

Table 1: Cephalometric analysis

Cephalometric analysis	Norm	Initial	Final
SNA	82±2°	76°	78°
SNB	80±2°	78°	78°
ANB	2±2°	-2°	0°
wits	0 mm	-3mm	-2mm
U1-NA	22°	32°	36°
L1-NB	25°	19°	21°
FMA	25°	23°	23°
IMPA	90±5°	90°	95°
Jaraback ratio	60-65%	68%	69%
Nasolabial angle	102±8°	90°	81°
E-Line	U:0±1 mm L:2±1 mm	U:-6mm L:-8mm	U:-4mm L:-5mm

Modified Bacci Bonding System

Bacci bonding system³ is a simple laboratorial protocol that doesn't demand special machines; neither set up models and can be done by the professional himself with relative simplicity.

Steps involved in modified Bacci bonding system

- Mouth preparation:** Mouth preparation was carried out to eliminate irregularities that obstruct the perfect settlement of the lingual brackets.
- Work model making:** Using PVS rubber base impressions, maxillary & mandibular arch working models were constructed with type IV dental stone (Fig. 4).
- Lingual bracket height determination:** Bracket height determination is one of the most critical aspects in lingual orthodontics. The measurement of crown length were done as suggested in Bacci Bonding System³ to determine the height of the brackets of central incisors for the upper arch and of the lower incisors for the lower arch, no anomaly in size or shape of the crown of U/L central incisor was seen. The height of lingual brackets as being the distance measured from the incisal margin of the tooth until the incisal edge of the base of the bracket (Chart 1).

Chart 1: Height of bracket placement for U/L anterior teeth

	Length of the crown of the central incisor	Central incisors	Lateral incisors	canine
Maxillary	11	3.5	3.0	4.0
Mandibular	10	2.5	2.5	3.5

- 4. Bracket bonding in the models:** The orientation lines for bracket positioning were drawn on the models according to Bacci bonding system³. Cast isolator was applied & left to dry followed by the bracket placement on the models with conventional orthodontic resin which allows the use for curing lights, according to the guidelines given by Bacci (Fig. 5).
4. **Fabrication of the transfer trays:** As compared to the Bacci Bonding system where a transfer tray made of hot glue was used for segmental bonding of teeth, we modified the technique by fabricating customized individual trays with cold cure acrylic resin for each tooth (Fig. 6).
5. **Finishing of the trays and bracket preparation:** Individual trays fabricated were trimmed & polished. The brackets composite base was micro etched with aluminum oxide and washed with 70% alcohol (Fig. 7).

Tooth preparation was carried out followed by bonding with the help of individual trays. Alignment and levelling was carried out with 0.014 nickel titanium round wire, excluding the maxillary canines & mandibular left lateral incisors & canine (Fig. 8). The space for buccally displaced and rotated teeth was created using Niti open coil spring in both the arches (Fig. 9). Subsequent levelling was carried out with rectangular .016''x .016'' Niti & stainless steel arch wire. The space required for maxillary crowding was gained by proclining the retroclined incisors with relatively low incidence of bond failures.



Fig. 1 (a)



Fig. 1(b)



Fig. 1(c)



Fig. 1(d)

Fig. 1: Pretreatment extraoral photographs

Fig. 2(a)



Fig. 2(b)



Fig. 2(c)



Fig. 2(d)



Fig. 2(e)

Fig. 2: Pretreatment intraoral photographs



Fig. 3(a)



Fig. 3(b)

Fig. 3: Pretreatment lateral cephalogram & OPG



Fig. 4(a)

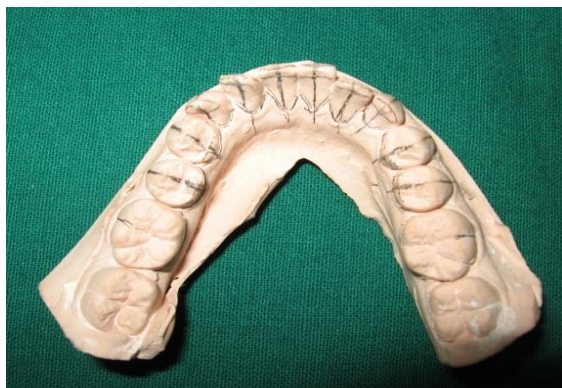


Fig. 4(b)

Fig. 4: Maxillary & mandibular working models with orientation lines for lingual bracket height determination



Fig. 6(a)



Fig. 6(b)

Fig. 6: Lingual brackets with the transfer trays on models



Fig. 5(a)



Fig. 5(b)

Fig. 5: Bonding brackets on the malocclusion models



Fig. 7(a)



Fig. 7(b)



Fig. 8(a)



Fig. 7(c)



Fig. 8(b)

Fig. 8: Alignment & levelling with .014 Niti in maxillary & mandibular arch



Fig. 7(d)



Fig. 9(a)



Fig. 7(e)

Fig. 7: Lingual brackets with transfer trays placed intraorally in the patient



Fig. 9(b)

Fig. 9: Space creation for buccally displaced & rotated teeth using Niti open coil spring with stainless steel base arch wire



Fig. 10(c)



Fig. 10(a)



Fig. 10(d)

Fig. 10: Post treatment extra oral photographs



Fig. 10(b)



Fig. 11(a)



Fig. 11(b)



Fig. 11(c)



Fig. 11(d)



Fig. 11(e)

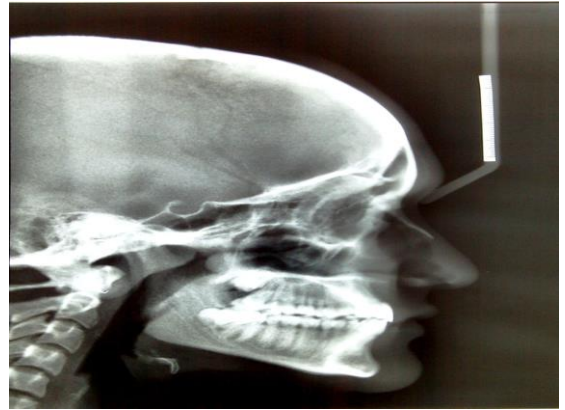
Fig. 11: Post treatment intraoral photographs

Fig. 12(a)



Fig. 12(b)

Fig. 12: Post treatment lateral cephalogram & OPG**Discussion**

Smith & Kurz et al⁴, reported twelve keys to success in lingual orthodontic therapy: (1) patient selection, (2) bracket placement accuracy, (3) indirect bonding, (4) vertical & transverse control of buccal segments, (5) double over-ties on anterior teeth, (6) buccal & lingual molar attachments, (7) correcting rotations, (8) arch form & arch wire sequence, (9) arch wire stiffness & torque control, (10) en mass retraction, (11) light resilient wire for detailing, and (12) gnathological positioner and retention. Other key factors⁵ to success include the inter bracket distance, the retraction force vector with respect to C^{RES} of the maxillary anterior segment, the inclusion of second molars into the treatment mechanics, established torque before space closure, and segmental mechanics to correct the crowding.

The lingual surface of teeth has a unique morphology that makes it difficult to place brackets in ideal positions. To overcome these discrepancies indirect bonding system has become very popular & most common method of bonding.

In the past some of the popular indirect bonding systems were TARG,^{6,7} CLASS^{6,7} etc. in which silicone transfer trays were used for bonding, later with the introduction of treatment method for the cases of simple crowding with no extraction, known as LLS(Light Lingual System),⁸ new path for lingual orthodontics were set.

Over the years countless laboratorial methods were suggested in lingual orthodontics & were mainly focused in simplifying the laboratorial phase with bracket positioning directly on the malocclusion model without the need for the set up. One such simple new laboratorial method includes Bacci Bonding System introduced by Henrique Bacci, which consists of reduced number of laboratorial phases with simple positioning of brackets on lingual surface of the malocclusion model. Transfer trays were made of hot glue & consist of anterior tray including all anterior brackets & two posterior trays consisting of premolars & molars.

Few of the difficulties encountered during usage of this technique include bond failure during indirect bonding procedure, & improper bracket placement due to excessive flexibility of transfer tray. In case of debonded brackets rebonding of single teeth was difficult. Thus to overcome this we modified the transfer tray into individual hard trays for each tooth. This was done by bonding bracket on the malocclusion model (Fig. 6) followed by construction of individual trays with cold cure acrylic resin which was trimmed & polished before transferring to the patient. Individual bracket indirect bonding increases precision of lingual bracket placement, decreased transfer tray flexibility because of the hardness of cold cure acrylic helped us to position the bracket in pre-planned position. The difficulty of removing the excessive flash from the bracket base before curing the brackets was overcome in this technique.

In the present case non extraction treatment was planned as the patient had concave profile and the space for buccally placed maxillary canine was achieved by proclining the maxillary incisors. The pre & post treatment superimposition show improved axial inclination of maxillary incisors with good inter digitation of the posterior teeth with increased lip support & smile esthetics (Microesthetics). The prognosis for stability is good as all the roots have been up righted.

Summary & Conclusion

Lingual treatment has obvious advantages over labial treatment for the patient with no damage to labial or buccal surfaces of the teeth, no labial or buccal gingival hypertrophy or gingivitis, and better visualization of tooth alignment and facial contours. The modified Bacci bonding system has shown reduced number of laboratorial phases with simple bracket positioning with added advantage of individual customized trays.

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