

## Lingual Orthodontics: A Systemic Review

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### Abstract

### Review Article

The high esthetic demands led to the promotion of various esthetic appliances like lingual orthodontics. This study aimed to review clinical outcome and potential complications of lingual orthodontics to achieve an evidence-based decision for orthodontic therapies. This systematic review shows that despite the drawbacks of these appliances such as pain and eating difficulties, they can accomplish treatment goals with the same outcomes in comparison with conventional approaches, within the same duration and even lesser anchorage loss.

**Keywords:** Lingual Orthodontics esthetic.

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## INTRODUCTION

The aesthetic demands of patients have been increased during the years regarding not only the treatment objectives, but also the influence of orthodontic appliances in patient's aesthetic appearance. Conventional orthodontic treatment has been shown to compromise facial appearance and this is a major concern of patients seeking orthodontic treatment. As a result, aesthetic materials and techniques have been introduced in clinical practice to overcome these limitations. Lingual orthodontics comprise a fundamental expression of this necessity. Since its introduction in 1980s, several systems and techniques have been introduced, revealing the increased interest of patients and doctors for this treatment approach. The major advantage of lingual orthodontics is that the appliances are not visible. However, lingual orthodontics comprises a relatively new treatment option that has certain differences to the well-established labial orthodontic treatment, mainly attributed to the position of the appliances

Fixed appliance treatment has become an integral part of modern orthodontics and has been a major focus point of orthodontic research. Traditionally, orthodontic appliances have been fixed on the outer (labial) surface of the teeth (from here on termed labial

appliances). In recent years, the increased number of adult patients seeking orthodontic treatment and their higher esthetic demands have led to the development of various esthetic treatment approaches, including esthetic brackets, clear aligners, and appliances fixed on the inner (lingual or palatal) surface of the teeth (from here on termed lingual appliances). Since introduction of lingual appliances by FUJITA, progress has been seen in their design, manufacturing, and mechanotherapy.

### Historical perspective

In 1975, Dr. Craven Kurz of Beverly Hills, California created his own lingual appliances by modifying labial edgewise appliances, and utilized them on a limited basis in his practice. He limited his treatment to the mandibular arch for fear that the forces of occlusion would dislodge brackets placed on the lingual surface of the maxillary anterior teeth. Later in 1976, Dr. Kurz submitted specific designs and concepts to the U.S. Patent Office for the patent rights to his unique edgewise lingual appliance. He joined with Ormco Corporation to develop and produce a prototype of this appliance.

### Advantages

- Facial surfaces of the teeth are not damaged from bonding, debonding, adhesive removal, or

decalcification from plaque retained around labial appliances.

- Facial gingival tissues are not adversely affected.
- The position of the teeth can be more precisely seen when their surfaces are not obstructed by brackets and arch wires
- Four distinct situations exist where lingual appliances may be more effective than labial appliances because of their unique mechanical characteristics. These include:
  1. Intrusion of anterior teeth.
  2. Maxillary arch expansion.
  3. Combining mandibular repositioning therapy with orthodontic movements.
  4. Distalization of maxillary molars

#### Disadvantages

- One of the most significant drawbacks to lingual therapy appears to be the discomfort to the tongue, and with it, difficulty in speech, both of which usually improve after 2 to 3 weeks of appliance placement.
- Also, the sensitivity of the laboratory techniques and the extended chair time needed for appliance placement and adjustments have made the treatment prohibitively expensive for many patients.

#### Periodontal considerations

- The status of the periodontium must be carefully evaluated.
- Short lingual clinical crowns can present a contraindication to optimum lingual bracket positioning.
- The lingual appliance can cause gingival hypertrophy, as the brackets are bonded close to the gingival crest. Brackets must be 1mm away from gingiva.
- Patients with a history of periodontal problems or in whom oral hygiene motivation is questionable may not be the best candidates for lingual therapy.

#### Restorative considerations

- In cases where there is a loss of several teeth, extreme tipping, and multiple or complex bridgework, the lingual appliance may be contraindicated.
- Porcelain-fused-to-metal crowns or other metallic restorations may need to be replaced with provisional plastic crowns to permit lingual bonding.

#### Dental considerations

- The most suitable teeth are those with long smooth surfaces
- Incisors with lingual surface shorter than 7mm should be reconstructed
- The presence of prominent cingulae, marked marginal ridges, or prominent cusp of carabelli are

unfavorable and if possible they should be reduced or reconstructed

- Teeth with crowns and large restorations need to be treated with special bonding techniques

#### Temporomandibular joint considerations

- Lingual orthodontic treatment can lead to relief of joint symptoms, probably due to the disarticulating effect of the anterior brackets.

#### Extraction vs. Non-extraction considerations:

- In lingual orthodontics, strong molar anchorage, especially in the lower arch, makes mesial movement of molar difficult.
- Hence, in Class I cases, extraction of upper first and lower second premolars is preferred.
- In Class II cases, it is better to avoid lower arch extractions.
- In open bite and Class III cases, four first premolar extractions are considered

#### Various lingual appliances

##### Fujita lingual bracket (1979)

- The presently available Fujita system is still based on an occlusal slot opening, but has multiple slots.
- Anterior teeth and premolars have three slots: occlusal, lingual, and vertical.
- Molar brackets have five slots: one occlusal, two lingual, and two vertical

##### Begg's lingual brackets

- Dr. Stephen Paige introduced the Lingual Light Wire technique in 1982. The bracket currently used in the Begg system is the Unipoint combination bracket (Unitek), with the slot oriented in the occlusal direction
- Molar tube design: Oval tube with a mesio-lingual hook. The squashed oval tube has some advantages in that it allows molar control, and will accept a ribbon arch.

##### CONCEAL BRACKETS (1989)

- Foundation of design is opening of archwire slots to the occlusal aspect rather than lingual aspect. 3 slot width for 3 different functions: tip, torque, rotations

##### STB (SCUZZO- TAKEMOTO BRACKET)

- Takemoto and Scuzzo in 2001 found that the bucco-lingual distances at the gingival margins do not vary substantially. This led them to conclude that straight archwires could be used in lingual orthodontics if they were placed as close to the gingival margin as possible. Flossing is easier.
- Mesio-distal width of the bracket is smaller, allowing adequate inter-bracket distances. Rotations can be more easily accomplished as the archwire can be tied tightly to the bottom of bracket slots. Torque control is improved.

### Self-ligating lingual brackets

Macchi *et al.* (2002) introduced Standard medium twin bracket, Narrow single, Large twin bracket., Three- wing bracket

#### • Clinical applications

Post – treatment retention, Closure of minor spaces, Limited intrusion, Correction of simple tooth malalignments.

### Changes induced by the lingual appliance

#### Vertical changes

The most immediate and readily apparent appliance-induced change is the bite opening resulting from the lower incisors occluding on the maxillary incisor bracket bite planes. This bite opening is beneficial in brachyfacial cases, TMD cases and rapid tooth movement due to posterior disocclusion

#### Antero-posterior changes

Because of the vertical opening and the immediate rotation of the mandible (down and back), the lingual appliance also induces a Class II tendency. With bite opening, A-P molar correction is easier

#### Transverse changes

The lingual appliance has an expansive nature. This is coupled by posterior disocclusion. There is tendency to cause mesio-buccal molar rotation during space closure. Thus, placement of transpalatal arch is important.

#### Bowing Effect

Anterior teeth to tip lingually, posterior teeth to tip mesially and posterior bite to open. Retraction is always done on stiffer wires to prevent “bowing effect”, both in the transverse and vertical planes.

### CONCLUSION

Lingual Orthodontics is the most aesthetic treatment modality, and is the best treatment option for adult patients, since the brackets are invisible, it provides a high level of control, and is excellent for the treatment of all kinds of malocclusions.

Correct diagnosis and treatment planning, patient selection and with the help of lingual orthodontic service laboratories the quality of results obtained with Lingual appliance is comparable to ones achieved with labial orthodontics

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