

# Evaluation of Survival Rate of Direct Bonded Lingual Retainers among Adults Aged 18 - 25 Years - A Prospective Study

Dr. Sharath Kumar Shetty<sup>1</sup>, Dr. Bopanna K M<sup>2</sup>, Dr. Mahesh Kumar<sup>3</sup>

<sup>1</sup>HOD, Department of Orthodontics and Dentofacial Orthopaedics, KVG Dental College Sullia

<sup>2</sup>PG Student, Department of Orthodontics and Dentofacial Orthopaedics. KVG Dental College

<sup>3</sup>Professor, Department of Orthodontics and Dentofacial Orthopaedics. KVG Dental College

**Abstract:** Bonded retainers are highly efficient, reliable, independent of patient co-operation. Most studies regarding the survival rate of retainers are retrospective. The aim of this investigation was to prospectively evaluate the failure rate of bonded lingual retainers, and to determine the distribution of failure over a 6-month period. Maxillary and mandibular lingual retainers bonded among 65 patients who underwent orthodontic fixed treatment in the department of orthodontics KVG dental college Sullia were evaluated. There were 46 females and 19 males of age group between 18 to 25yrs. A twisted conventional ligature wire was used with Transbond LR. Following bonding, the patients were observed monthly. 24 retainers failed, 19 mandibular and 5 maxillary, 15 in mandibular right side, and 4 in left side, 3 maxillary right side and 2 left side. The highest failure rate was seen in the first month. 6 patients had repeated failures. The failure rate was higher in mandibular and in right side, the total survival rate was.

**Keywords:** Bonded lingual retainers, failure rate, orthodontic treatment, survival rate, prospective evaluation

## 1. Introduction

Orthodontic treatment has become increasingly prevalent among young adults seeking to achieve optimal dental aesthetics and function. It involves the movement of teeth to achieve proper alignment and occlusion. Following the active phase of treatment, a retention phase is necessary to prevent the teeth from relapsing to their original positions. Various retention methods have been employed, including removable retainers, fixed retainers, and lingual retainers. Lingual retainers, attached to the lingual or inner surface of the teeth, have become a popular choice due to their inconspicuous nature and continuous retention. As a fundamental aspect of orthodontic care, retention strategies play a crucial role in maintaining the achieved results and preventing relapse. Lingual retainers, bonded directly to the lingual surface of the teeth, have gained popularity as an effective means of maintaining post-orthodontic tooth alignment.

The conventional use of removable retainers often poses challenges, as patient compliance can be variable. Fixed retainers, on the other hand, provide constant support but may interfere with oral hygiene and pose challenges in repair and maintenance. Lingual retainers attempt to address these concerns by offering a discreet and efficient means of post-orthodontic retention. Direct bonding of lingual retainers to the teeth eliminates the need for patient compliance and facilitates long-term stability.

Despite the growing use of lingual retainers, there is a paucity of comprehensive studies evaluating their survival rates among specific age groups. The age range of 18–25 years represents a critical period in young adulthood when individuals are transitioning from adolescence to full maturity. During this phase, lifestyle factors, oral habits, and

overall oral health may significantly impact the success of lingual retainers. Therefore, a dedicated study focusing on the survival rate of direct bonded lingual retainers in this age group is essential for understanding the nuances of retention in a demographic that is actively engaging in various social and lifestyle activities. The need for this prospective study arises from the existing gaps in the literature concerning the long-term success and challenges associated with direct bonded lingual retainers, particularly among young adults aged 18–25 years. By focusing on this age group, the study aims to capture a crucial period in individuals' lives when they are more likely to experience lifestyle changes, including the pursuit of higher education, entering the workforce, and potentially undergoing life events that may influence oral health habits. Understanding the survival rate of lingual retainers in this demographic is crucial for orthodontic practitioners, as it will contribute to evidence-based decision-making in the choice of retention methods for young adults. Additionally, the findings of this study may inform orthodontic treatment planning, patient counseling, and the development of strategies to enhance the durability of lingual retainers. This prospective study aims to evaluate the survival rate of direct bonded lingual retainers among adults aged 18–25 years, shedding light on the long-term efficacy and challenges associated with this retention method.

### Aim:

To evaluate the survival rate of direct bonded lingual retainers among adults aged 18–25 years following the completion of orthodontic treatment.

### Objectives

- Assessing the overall survival rate of lingual retainers over a specified follow-up period.

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- Investigating factors influencing the success or failure of lingual retainers in the specified age group.
- Documenting any adverse events, including debonding, breakage, or other complications associated with lingual retainers.
- Analyzing patient - reported outcomes and satisfaction levels with lingual retainers in young adults.

## 2. Methodology

### Study Design:

This prospective study will employ a longitudinal design to evaluate the survival rate of direct bonded lingual retainers among adults aged 18–25 years. The study will adhere to ethical guidelines and obtain approval from the Institutional ethics committee prior to commencement.

Informed consent will be obtained from all participants prior to enrollment in the study. Participants will be assured of confidentiality, and their rights will be protected throughout the research process. Any potential conflicts of interest will be disclosed, and the study will adhere to ethical standards outlined by relevant regulatory bodies.

**Data source:** Participants will be recruited from outpatient orthodontic department. KVG dental college and hospital Sullia. Dakshina Kannada Karnataka

### Inclusion criteria:

Willing adults aged 18–25 years who have completed orthodontic treatment with the placement of direct bonded lingual retainers.

### Exclusion criteria:

Individuals with systemic conditions affecting oral health, history of orthodontic retreatment, or inability to provide informed consent.

### Sample Size Calculation:

Using the formula,  

$$n = \frac{2 (SD)^2 (Z_{1-\alpha/2} + Z_{\beta})^2}{(d)^2}$$

Where,

SD = standard deviation

$Z_{1-\alpha/2} = 1.96$  at 95% confidence interval

$Z_{\beta} = 0.84$  at 80% power

d = Mean difference

Substituting the values, we get

**n = 59.69**

**By adding 10% sample loss if any we get n = 65**

**Therefore, the total sample size is 65.**

### Data Collection:

Baseline data will be collected at the time of retainer placement for all 65 participants, including demographic information (age, gender), orthodontic history, dental arch characteristics, and oral hygiene habits. Lingual retainer specifications, such as wire material, dimensions, and bonding technique, will also be documented.

### Follow - Up Protocol:

Participants will be scheduled for follow - up appointments at regular intervals, starting from retainer placement and extending over 6 months period. At each monthly once visit, clinical assessments will be conducted to evaluate the integrity of lingual retainers, including visual inspection for debonding, breakage, or other complications. Any necessary repairs or adjustments will be performed according to clinical judgment.

### Outcome Measures:

The primary outcome measure will be the survival rate of lingual retainers, defined as the proportion of retainers remaining intact and functional at each follow - up interval. Secondary outcome measures will include the occurrence of adverse events (e. g., debonding, breakage), patient - reported outcomes (e. g., satisfaction levels), and factors influencing retainer survival (e. g., oral hygiene practices, dietary habits).

### Data Analysis:

Descriptive statistics will be used to summarize demographic characteristics and baseline data. Kaplan - Meier survival analysis will be employed to estimate the cumulative survival probability of lingual retainers over time. Cox proportional hazards regression analysis will be performed to identify factors associated with retainer failure. Subgroup analyses may be conducted to assess the impact of specific variables on retainer survival. Statistical significance will be set at  $p < 0.05$ .

## 3. Results

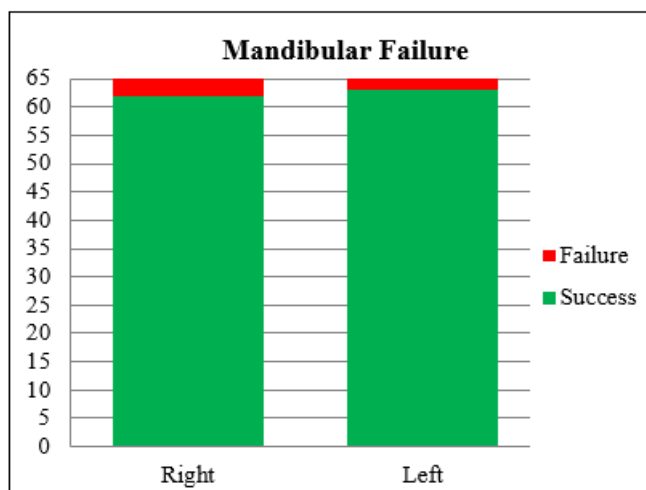
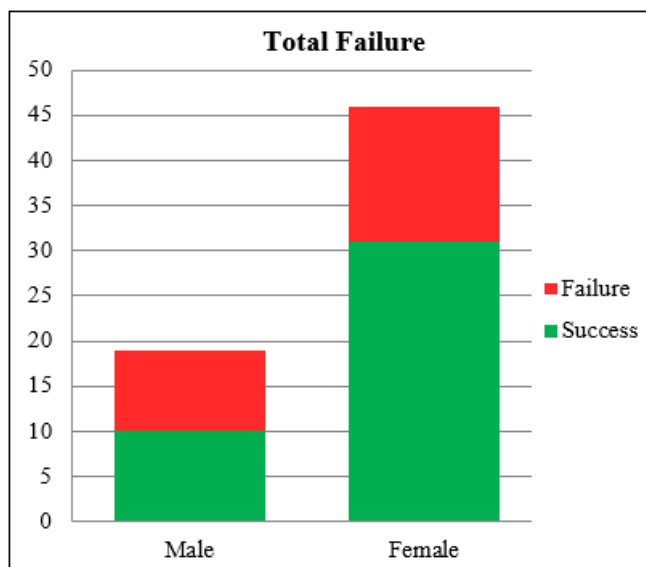
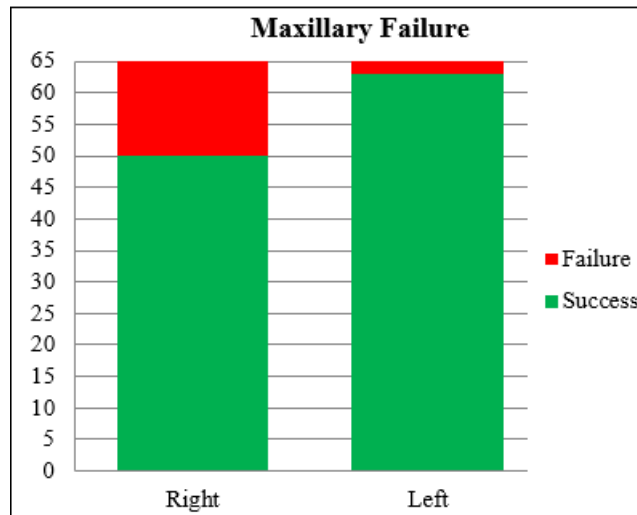
The study included a total of 65 participants, with 19 (29.25%) male and 46 (70.75%) female, revealing a statistically significant gender distribution ( $p < 0.01$ ). The study was conducted between 2022 and 2023. In terms of maxillary failure, 19 participants (29.25%) experienced issues with their lingual retainers, with 15 (23.1%) reporting problems on the right side and 4 (6.2%) on the left. Similarly, mandibular failure was observed in 5 participants (7.69%), with 3 (4.6%) on the right side and 2 (3.1%) on the left, both of which demonstrated statistical significance ( $p < 0.01$ ). (Table No.1)

When considering total failure, which includes both maxillary and mandibular issues, 24 participants (36.92%) encountered problems with their lingual retainers. Breaking it down by gender, 9 males (13.8%) experienced total failure compared to 15 females (23.1%). However, this difference was not statistically significant ( $p = 0.35$ ). (Table No.1)

The mean age of the participants was calculated to be  $20.36 \pm 2.83$  years. The provided standard deviation indicates a relatively small dispersion of ages around the mean, emphasizing the homogeneity of the age distribution within the study population.

**Table 1:** Basic Socio Demographic and Failure Distribution with mean age of the studied population

Sl. No	Variables	Frequency (N=65)	Percent (%)	p value
<b>1</b>	<b>Gender</b>			
a.	Male	19	29.25	<b>&lt;0.01</b>
b.	Female	46	70.75	
<b>2</b>	<b>Maxillary failure – 19 (29.25%)</b>			
a.	Right	15	23.1	<b>&lt;0.01</b>
b.	Left	4	6.2	
<b>3</b>	<b>Mandibular failure – 5 (7.69%)</b>			
a.	Right	3	4.6	<b>&lt;0.01</b>
b.	Left	2	3.1	
<b>4.</b>	<b>Total Failure – 24 (36.92%)</b>			
a.	In Males	9	13.8	0.35
b.	In Females	15	23.1	
<b>5.</b>	<b>Mean Age – 20.36±2.83</b>			



**4. Discussion**

The findings from the study provide valuable insights into the survival rate of direct bonded lingual retainers among young adults aged 18–25 years, shedding light on the long-term efficacy and challenges associated with this retention method. The observed gender distribution, with a significantly higher proportion of female participants experiencing lingual retainer failure compared to males, warrants further discussion and exploration.

The higher prevalence of lingual retainer failure among females may be attributed to various factors, including differences in oral health habits, dietary patterns, and hormonal fluctuations. For instance, studies have suggested that females tend to exhibit higher levels of plaque accumulation and gingival inflammation compared to males, potentially increasing the risk of retainer debonding or breakage (Al - Sibai et al., 2018). Moreover, hormonal changes during menstrual cycles or pregnancy may affect the stability of dental structures and alter the biomechanical properties of the oral tissues, influencing retainer retention (Sivarajan et al., 2020).

Contrary to our findings, some studies have reported no significant gender differences in lingual retainer survival rates (Dumbreck et al., 2019). However, these studies primarily focused on pediatric or adolescent populations and may not fully capture the unique challenges faced by young adult females in terms of oral health maintenance and lifestyle factors. Therefore, further research specifically targeting young adults aged 18–25 years is warranted to elucidate the underlying mechanisms driving gender disparities in lingual retainer outcomes.

The observed side-specific variations in maxillary and mandibular lingual retainer failure rates also merit attention. The higher incidence of maxillary failure, particularly on the right side, suggests potential biomechanical or functional differences between the two dental arches. Previous studies have highlighted the asymmetry in masticatory forces and occlusal contacts between the right and left sides of the dental arch, which may contribute to uneven stress distribution and increased susceptibility to retainer failure (Kanzaki et al., 2017).

Moreover, the documented total failure rate of 36.92% underscores the need for improved retention protocols and patient education strategies to enhance the durability of lingual retainers in young adults. Patient compliance with oral hygiene practices, regular dental check-ups, and dietary modifications may play a crucial role in minimizing the risk of retainer debonding or breakage. Additionally, advancements in bonding materials and techniques, such as the use of high-strength adhesives or customized retainer designs, may offer potential solutions to enhance retainer longevity and stability (Shah et al., 2021).

In conclusion, the findings of this study contribute to our understanding of the survival rate of direct bonded lingual retainers among young adults aged 18–25 years, highlighting gender-specific and side-specific variations in retainer outcomes. Further research is needed to elucidate the underlying factors driving these disparities and develop targeted interventions to optimize lingual retainer retention in this demographic. By addressing the challenges associated with lingual retainer failure, orthodontic practitioners can ensure long-term stability and satisfaction among their young adult patients undergoing post-orthodontic retention.

## 5. Conclusion

- 1) Failure occurred in 36.92 per cent of patients during the 6 months observation follow up.
- 2) The highest bond failure was seen in the first month.
- 3) Maxillary quadrant failure was more than the mandibular quadrant.
- 4) Failure in the right side of the quadrant was slightly higher than the left side.
- 5) The lower incisors were more susceptible to breakage.

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