

Comparison of the Conventional Band and Loop Space Maintainers with Modified Space Maintainers: A Split-mouth Randomized Clinical Trial

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Abstract

Background: Space maintainers (SMs) have been utilized to fill in the gaps left by the elimination of deciduous teeth before expected time period. The most often utilized band and loop SM (B and L SMs) have a number of drawbacks, including non-functionality, inadequate periodontal condition, restricted durability, development in a laboratory, and a lengthy technique, among others. **Aim:** In terms of gingival inflammation, overall survival, this study was conducted to compare the effectiveness of traditional B and L SMs with conventional tube and loop (CTL), bonded tube and loop (BTL), and bonded band and loop. **Materials and Methods:** Thirty children between 4 years and 8 years of age with at least two fresh extraction sites of primary molars contra- or bilaterally in each child (total 60 fresh extraction sites) were included in the study. Conventional band and loop on one site while bonded loop or CTL or BTL on the other site were delivered, based on random allocation. An evaluation was done at 1st, 3rd, 6th, and 9th months for survival time, gingival health. Results were statistically analyzed using independent *t*-test and Chi-square test. **Results:** 100% Band and loop and CTL while only 60% bonded loop and 80% BTL survived till the end of the study. For gingival health, statistically significant differences were obtained at 1st, 3rd, 6th, and 9th month's intervals ($P < 0.05$) with less incidence of gingivitis in CTL as compared with other SM. **Conclusion:** CTL SMs were found to be most efficacious in terms of survival time and gingival health.

Keywords: Conventional band and loop space maintainers, Modified space maintainers, Clinical trial

INTRODUCTION

Space maintainers (SMs) have been utilized to fill in the gaps left by the elimination of deciduous teeth before expected time period. The most often utilized band and loop SMs (B and L SMs) have a number of drawbacks, including non-functionality, inadequate periodontal condition, restricted durability, development in a laboratory, and a lengthy technique, among others.^[1,2]

Tube and loop (T and L) SMs were developed to address the shortcomings of B and L SMs. The T and L SM has a basic, fast, and simple design that may also be used as a space extender. It is a 1-time process that does not involve additional lab work, so it is more convenient than traditional B and L SMs.^[3]

To solve the problems of banded SMs, efforts were made to use modern ingredients to produce of SMs that do not required band adjustment. Because bonded SMs need not involve

impressions or band adjustment, they can indeed be completed in one session with hardly any inconvenience towards the recipient. Whereas, in the bonded T and L (BTL) SMs, molar tubes are bonded to the buccal surface of the teeth with the help of composite resin, and a loop is inserted in them.^[4]

There seems to be minimal controlled trials assessment of banded versus bonded SM currently accessible due to a paucity of literature.^[5,6] In order to compare the effectiveness of traditional B and L SMs with conventional tube and loop

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(CTL), BTL, and bonded loop SM in terms of gingival inflammation, median survival, this study was conducted.

MATERIALS AND METHODS

A study sample of thirty apparently normal children between the ages 4 and 9 years with extensively disfigured solitary molars present on either side necessitating extraction or newly removed solitary molars symmetrically in almost the same arch or opposing arch were chosen. A total of sixty extraction sites were chosen. Prior to the study, ethical approval was obtained. The parents or guardians of the study participants gave their informed consent.

Procedure

A short description was collected for each child, accompanied by a clinical evaluation. For such molar to be removed, computerized IOPA images were acquired. For the creation of the study model and space evaluation, impressions were taken. The patients were randomly assigned to one of three categories.

1. Category One—In each participant, B and L SMs were delivered in one quadrant, whereas Bonded loop was administered in another quadrant
2. Category Two—In each participant, B and L SMs were administered in one quadrant whereas BTL SM was administered in another quadrant
3. Category three—In each participant, B and L SMs were administered in one quadrant whereas CTL SM was administered in another quadrant.

Type I Glass Ionomer Cement (luting) was used to cement banded SM, while composite resin was used to fuse bonded SMs. Guidelines regarding oral hygiene maintenance and appliance maintenance were provided both to parents and children.

- Use an orthodontic brush and fluoride toothpaste twice a day
- After each meal, rinse
- To stay away from sticky foods.

At the 1st, 3rd, 6th, and 9th months, all of the patients were brought back to evaluate their effectiveness of overall survival, periodontal health using the basic guidelines:

SMs' time to survive

De-cementation, debonding, solder breakage, loop breakage, band breakage, and/or abutment tooth fracture were all examined on both SMs. The abutment tooth's gingival health. At each follow-up appointment, the gingival health of both abutment teeth was measured using the criteria established by Loe and Silness¹ in 1963, and the results were documented.

Statistical analysis

Employing SPSS version 20.0 software, the results were statistically evaluated using independent *t*-tests and Chi-square tests. For the current investigation, a 5% threshold of significance was used.

RESULTS

At distinct follow-up periods (0 months, 1 months, 3 months, 6 months, and 9 months), the survival rate of various SM (B and L, BL, BTL, CTL) was evaluated (Table 1). All of the SM in each categories successfully survived after a 1-month follow-up. Two BL SM got failed owing to lack of proper bonding after a 3-month interval, whereas the other SM survived. Two cases of BTL SM did not come for follow-up after a 6-month of recall, whereas successful survival of remaining SM was reported. Two additional BL SM got failed as a result of debonding during the 9 month period, but all of the remaining SM got survived successfully. The survival rate difference at 3, 6, and 9 months was statistically insignificant ($P > 0.05$).

The periodontal condition of the abutment teeth was compared utilizing gingival index advised by Loe and Silness) in all categories at various time periods, i.e., 0 months, 1 months, 3 months, 6 months, and 9 months). Mild gingivitis (0.1–1.0) was found in all cases until the 1st month. However, beginning in the 3rd month, the BL group developed moderate (1.1–2.0) gingivitis (Table 2). 100% B and L and CTL while only 60% BL and 80% BTL survived till the end of the study. For gingival health, statistically significant differences were obtained at 1st, 3rd, 6th, and 9th month's intervals ($P < 0.05$) when CTL was compared with B and L, BL, and BTL.

DISCUSSION

In order to address the issues with banded SM, efforts were made to develop SMs that did not require band adjustment using current components. Because bonded SMs do not require impressions or band adjustments, they may be completed in a single appointment with minimal disruption to the receiver. Molar tubes are glued to the buccal surface of the teeth with composite resin, and a loop is put in them in the BTL SMs.^[7,8]

Due to a scarcity of research, there appear to be just a few controlled experiments comparing banded versus bonded SM now available.^[9,10] The purpose of this study was to compare the effectiveness of traditional B and L SMs with traditional tube and loop (CTL), BTL, and bonded loop SM in terms of gingival inflammation and median survival. After a 1-month follow-up, all of the SM in each category had survived. After a 3-month break, two BL SM failed due to improper bonding, but the remaining SM survived. After a 6-month recall, two cases of BTL SM did not return for follow-up, while the remaining SM were reported to have survived. During the 9-month time frame, two more BL SM failed due to debonding, but the remaining SM survived. At 3, 6, and 9 months, the difference in survival rates was statistically negligible ($P > 0.05$).

The use of SMs has been used to fill in the gaps left by the removal of deciduous teeth ahead of schedule. The most often used B and L SMs have a number of disadvantages, including non-functionality, poor periodontal health, limited durability, laboratory development, and a lengthy process, to name a few.^[11,12]

Table 1: Group comparison of survival time at a different follow-up interval

Group		Survival time of space maintainer	Follow-up				
			0 month	1 month	3 months	6 months	9 months
Group I	B and L	Survived	10	10	10	10	10
		Failed	0	0	0	0	0
	BL	Survived	10	10	8	8	6
		Failed	0	0	2	2	4
	P-value		—	—	0.313 (NS)	0.314 (NS)	0.225 (NS)
Group II	B and L	Survived	10	10	10	10	10
		Failed	0	0	0	0	0
	BTL	Survived	10	10	10	8	8
		Failed	0	0	0	2	2
	p value		—	—	—	0.313 (NS)	0.314 (NS)
Group III	B and L	Survived	10	10	10	10	10
		Failed	0	0	0	0	0
	CTL	Survived	10	10	10	10	10
		Failed	0	0	0	0	0
	P-value		—	—	—	—	—

NS: Non-significant, *($P < 0.05$): Significant, CTL: Conventional tube and loop, BTL: Bonded tube and loop**Table 2: Group comparison of gingival health of abutment tooth at a different follow-up intervals**

Group		Follow-up	n	Mean	Std. deviation	Mean difference	P-value
Group I B and L versus BL	B and L	0 month	10	0.41	0.521	0.211	0.547 (NS)
	BL		10	0.21	0.448		
	B and L	1 month	10	0.61	0.549	0.411	0.243 (NS)
	BL		10	0.20	0.358		
	B and L	3 months	10	1.21	0.556	0.811	0.021*
	BL		10	0.42	0.659		
	B and L	6 months	10	1.51	0.659	1.213	0.03*
	BL		10	0.41	0.659		
	B and L	9 months	10	1.71	0.657	1.311	0.008*
Group II B and L vs BTL	B and L	0 month	10	0.51	0.659	0.121	0.631 (NS)
	BTL		10	0.11	0.556		
	B and L	1 month	10	0.71	0.651	0.511	0.313 (NS)
	BTL		10	0.11	0.556		
	B and L	3 months	10	1.31	0.946	0.911	0.222 (NS)
	BTL		10	0.51	0.659		
	B and L	6 months	10	1.51	0.656	1.111	0.01*
	BTL		10	0.40	0.637		
	B and L	9 months	10	1.51	0.619	1.111	0.03*
Group III B and L vs CTL	B and L	0 month	10	0.51	0.651	0.311	0.614 (NS)
	CTL		10	0.31	0.556		
	B and L	1 month	10	0.71	0.659	0.111	0.59 (NS)
	CTL		10	0.51	0.659		
	B and L	3 months	10	1.31	0.947	0.511	0.284 (NS)
	CTL		10	0.91	0.556		
	B and L	6 months	10	1.51	0.973	0.511	0.328 (NS)
	CTL		10	0.91	0.556		
	B and L	9 months	10	1.51	0.659	0.711	0.03*
	CTL		10	1.11	0.111		

NS: Non-significant, *($P < 0.05$): Significant, CTL: Conventional tube and loop, BTL: Bonded tube and loop

To solve the drawbacks of B and L SMs, T and L SMs were created. The T and L SM is a straightforward, quick, and

straightforward design that may also be utilized as a space extender. It is more convenient than typical B and L SMs

because it's a 1-time technique that doesn't require subsequent lab work.^[13,14]

The periodontal status of the abutment teeth was compared in all categories at various time periods (i.e. 0 months, 1 month, 3 months, 6 months, and 9 months) using the Loe and Silness gingival index. Until the 1st month, all of the patients had mild gingivitis (0.1–1.0). The BL group, on the other hand, developed moderate (1.1–2.0) gingivitis starting in the 3rd month. Only 60% of BL and 80% of BTL survived to the end of the research, while 100% B and L and CTL did. When CTL was compared to B and L, BL, and BTL for gingival health, statistically significant changes were found at the 1st, 3rd, 6th, and 9th month intervals.

CONCLUSION

CTL SMs were found to be most efficacious in terms of survival time and gingival health.

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