

## Survival of different types of space maintainers

Chiara Baroni, MD, DDS Anna Franchini, DDS Lia Rimondini, DDS

### Introduction

Premature loss of primary molars often causes undesirable drifting and loss of space.<sup>1</sup> However, immediate insertion of space maintainers to preserve arch length can prevent or limit the malocclusion development.<sup>2</sup> Biocompatibility with anatomical requirements, soft tissue, and supporting teeth is always a concern.<sup>3</sup> Interference with sequence of eruption and alveolar bone development should be stressed in planning these appliances.<sup>4</sup> Clinical observation suggests that monolateral space maintainers fall in the first class of problems, while bilaterals represent the second type. However no statistical analysis has ever pointed out how and when they occur. The aim of the study was to evaluate the longevity of space maintainers by the life table method.

### Methods and materials

The selected sample includes 88 space maintainers (36 lingual arches, 33 band and loops, and 19 Nance appliances) placed either on first permanent or second primary molars in 61 patients aged 5–9 years who were followed for a maximum of 53 months.

The space maintainers were placed under standard procedure by the authors in the pediatric dentistry department of University of Bologna, Italy from 1986–91.

All appliances were fabricated individually for each patient, were trial fitted, and were cemented with polycarboxylate cement (Durelon ESPE, Seefeld, Oberway, Germany). Each patient was seen for mandatory 6-month recall during which the following were performed: space maintainer removal with scaling, check up of "anchor" teeth (both clinically and radiographically when required by the contacts), and topical fluoride application before insertion.

All failures were recorded at each scheduled recall or emergency visit with a note on the time interval from insertion.

The failure criteria were: 1) cement loss, 2) solder failure, 3) soft tissue lesion (gingival submergence or decubitus), and 4) interference with the eruption sequence.

The cumulatively evaluated survival rate was set at 53 months from insertion. The life table method used for survival analysis allowed the pooling of information from cases followed for less than the entire period of observation (i.e., cases lost to followup and/or inserted later) thus calculating an average survival rate for the entire sample.<sup>5–7</sup>

Comparison of failure rates was performed by chi-square analysis.

### Results

The clinical performance evaluation as success or failure was based on an average of 23.6 months (SD = 13 months) followup of the sample (77 of the space maintainers were still in use at the end of the study).

The clinical performance described in the table shows the distribution of failures by class of maintainer. The overall incidence of failure is 30.5%.

Loss of cement accounted for 10.2% at an average of 14 months (SD = 11.6) from insertion, 11.3% were due to solder failures at 12.5 months (SD = 6.2), 5.7% involved soft tissue lesions at 11 months (SD = 4.5), and

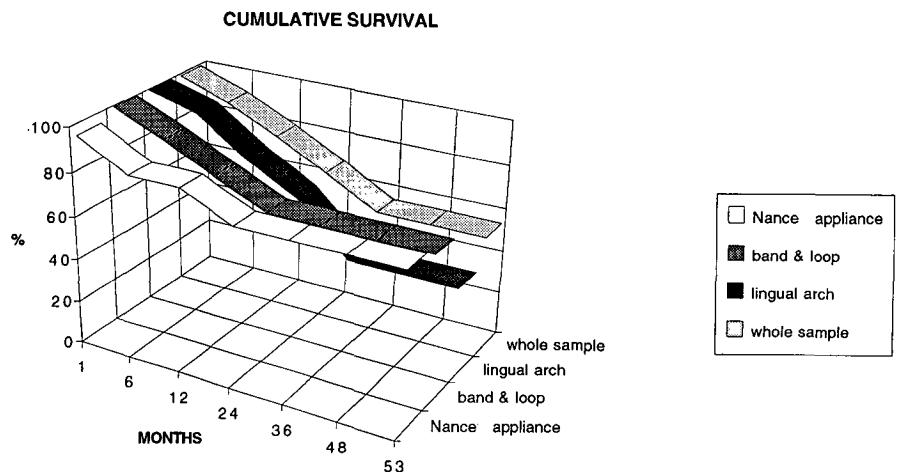


Figure. Cumulative survival of space maintainers related the performance of each type of appliance.

3.4% were caused by interference with the eruption sequence at 19 months (SD = 15.1).

Frequency did not differ among appliances cemented on permanent or primary molars (chi-square test,  $P > 0.05$ ).

Chi-square analysis did not indicate significant differences in the type of failure by space maintainer class.

The Figure shows the survival rate described by life table analysis as suggested by Thylstrup and Rolling.<sup>5</sup>

At the 24-month level the survival curves of bands and loops and lingual arches decline in parallel, with a slower decrease for Nance appliances. At the 24- to 36-month interval, Nance appliances and band and loops maintain a 70% constant survival, while the lingual arches curve rapidly falls to 40%. The difference in survival reflects the higher number of failures for the lingual arch group as shown in the Table.

## Discussion

Regarding space maintainer performance as a whole we conclude that soft tissue lesions are mainly due to monolateral space maintainers while eruption interference is related only to lingual arch during permanent incisor eruption.

The relatively high number of solder and cement breakdowns compared with tissue problems shows the relevance of mechanical stress in long-term use to be more important than appliance design. That's why these appliances are reliable only under strict followup. This study shows mortality patterns (i.e., accidental causes requiring adjustment or temporary removal) to be as

**Table. Failures of types of space maintainers**

	Lingual Arch	Nance Appliance	Band & Loop	Total
Cement loss	5	1	4	9
Solder failure	5	2	3	10
Soft tissue lesion	0	2	3	5
Eruption interference	3	0	0	3
No failure	23	14	23	61
Total	36	19	33	88

Chi-square analysis not significant.

high as 30.5%. When using space maintainers very long term (up to 7 or 8 years), we suggest changing the appliance as the patient grows.

Even though it has been impossible to identify the risk rate for type of failure related to each class of maintainers (since the chi-square test is unable to cross the low number of accidents for each type of appliance),

life table analysis provided a valid alternative to methods of standardization by comparison because it predicts the probability of failure based on the time of total clinical use.

Dr. Baroni is assistant professor of pediatric dentistry, Dr. Franchini is clinical instructor, and Dr. Rimondini is lecturer of preventive dentistry, University of Bologna, Italy.

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