K. Bücher*, I. Metz**, V. Pitchika*, R. Hickel*, J. Kühnisch*

Ludwig-Maximilians-University, Munich, Germany
**Department of Conservative Dentistry*
***Department of Prosthetic Dentistry*

email: kbuecher@dent.med.uni-muenchen.de

DOI: 10.23804/ejpd.2017.18.03.13

Flowable composite as a direct restoration technique for primary molars

ABSTRACT

Aim *Although primary teeth are temporary and have assessable life expectancies, restoration of carious primary teeth is required for preventing further damage, such as abscesses or space loss for the successors. To provide fillings with the required longevity, restorative materials with age-appropriate time management and the necessary material characteristics are needed. Therefore, composites are gaining increasing popularity in modern paediatric dentistry. Meeting these requirements, we present a fast and easy alternative technique for filling primary molars using a flowable composite.*

Case reports *Using this incremental technique, only few steps are needed to provide fillings that meet the demands of paediatric patients. Data presented on the longevity of molar fillings with this technique show acceptable survival rates for Class I and satisfactory results for Class II restorations.*

Conclusion *This technique can be used as an alternative to composite restorations of primary molars.*

Keywords *Composite restorations; Filling technique; Flowable composites; Primary teeth; Survival probability.*

Introduction

Over recent decades the use of tooth-coloured filling materials has become increasingly popular in paediatric dentistry [Bürkle et al., 2005]. This is due to problems related to the use of amalgam and also to the growing demand for aesthetics of the primary teeth. Lately, there is more research available that provides long-term data on the longevity of these materials when used in paediatric patients [Hickel et al., 2005; Qvist et al., 2010; Bücher et al., 2014; Pinto Gdos et al., 2014; Bücher et al., 2015]. Aesthetics and material properties have made compomer and composites more attractive, especially over the use of conventional glass-ionomer cements. Even in high-risk caries populations, tooth-coloured composite fillings have been successfully used in the primary dentition [Bücher et al., 2014; Pinto Gdos et al., 2014; Bücher et al., 2015]. When applying composites in paediatric patients, material-related issues, such as tooth isolation, correct application, light curing of adhesives and composite, as well as patient-related issues, such as limitations regarding the duration of treatment, have to be met. Hence, for paediatric patients, a simple technique that provides long-lasting fillings is beneficial. This can be achieved by the filling technique presented in this article using conventional flowable composites (Fig. 1, 2). This easy alternative technique can be used for the treatment of cavities in primary molars. The efficacy of this technique has been illustrated by survival data for these fillings on a larger population.

The aim of the present study was to determine the clinical success of this restoration technique in primary teeth.

Case reports

Here, we report the use of our alternative restoration technique in two cases. In case 1, the patient presented with a Class I cavity, whereas case 2 needed a Class II cavity restoration in the primary molar.

Case 1

A 5-year-old girl presented with a deep dentin lesion on her upper left second primary molar (Fig. 1a). Rubber dam isolation was applied after application of local anaesthesia. After access cavity preparation, areas near the pulp were carefully excavated by hand instrumentation until solid (Fig. 1a-c). Areas near the pulp were covered with a calcium hydroxide liner (Kerr Life®, Kerr, Orange, CA, USA). Afterward, the dentin and enamel were prepared with a total etch system (Syntac Classic®, Ivoclar Vivadent, Shaan, Liechtenstein) prior to the first composite increment (Fig. 1d). The cavity floors were lined up to a height of approximately 0.5 mm with a flowable composite as the first filling step (Tetric Evo Flow A1®, Ivoclar Vivadent, Shaan, Liechtenstein) (Fig. 1e). After curing, the distal part of the cavity was filled to the edge and cured as was the proximal part (Fig. 1f). As a last step, the surface was modeled and cured, before polishing (Enhance®,


FIG. 1A


FIG. 1B


FIG. 1C

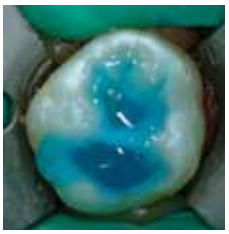

FIG. 1D


FIG. 1E


FIG. 1F


FIG. 1G


FIG. 1H


FIG. 1I


FIG. 1J

FIG. 1 A-J The upper left second primary revealed a deep occlusal caries after preparation of the access cavity. It was restored using a flowable composite with the described technique.

Dentsply Corporate, York, PA, USA) (Fig. 1g-i).

Case 2

The upper left quadrant of an 8-year-old boy showed discrete discoloration on the distal ridge of the first primary molar, which corresponded to a D3-cavity observed radiographically (Fig. 2a,b). After administration of local anaesthesia and isolation by cotton rolls, occlusal access to the caries was gained (Fig. 2c). After removal of the affected enamel and dentin, a metal matrix band was placed and the tooth was prepared by total etch technique (Syntac Classic®, Ivoclar Vivadent, Shaan, Liechtenstein) (Fig. 2d). Again, the cavity floor was lined with a flowable composite and light cured (Tetric Evo Flow A1®, Ivoclar Vivadent, Shaan, Liechtenstein) before the cavity was filled in a second step (Fig. 2e-g). The third step comprised modeling of the occlusal surface before polishing (Enhance, Dentsply Corporate, York, PA, USA) (Fig. 2h-j).

Clinical data

Data on composite fillings using the described technique (Fig. 1, 2) in 229 Class I and 682 Class II molar cavities in 911 patients were retrospectively evaluated by two independent dentists (Ethical approval project no. 030-13) [Bücher et al., 2015]. All fillings had been placed by two experienced paediatric dentists (other than the investigators) and were needed due to carious lesions with dentin involvement. The Kaplan Meier estimator was used to express the survival probability using the R version 3.1.1 (R Core Team 2014, Vienna, Austria). The mean observation period was 1.26 ± 1.3 years. The caries experience of the study subjects (mean age 6.8 ± 2.2 years; m: f = 1.4:1) was generally high with a mean dmft of 6.5. The survival analysis showed no significant difference between the two operators with regards to the longevity of the fillings (Fig. 3a). In terms of cavity classes, the survival probability for Class I fillings was significantly higher than for Class II cavities, with a 75% survival probability of 3 years for Class I and 1.7 years for Class II (Log-rank-test; $p<0.01$) (Fig.3b).

Discussion and conclusion

The illustrated technique offers a caries-oriented cavity preparation with an easy high-quality filling. In addition, it provides good aesthetics for the primary dentition, as well as reliable survival rates even for the high caries risk patients as supported by the accompanying clinical data [Bücher et al., 2015]. In general, the filling survival was found to be higher in Class I cavities compared to Class II cavities.

The main requirement for primary molar restoration is to provide tooth restoration appropriate to the tooth's life expectancy so that ideally, it will not have to be replaced until the tooth exfoliates physiologically. This and smaller cavity sizes in primary molars may justify the use of flowable composites in the molar region, despite their mechanical properties being inferior to those of conventional nanohybrid composites [Ilie et al., 2009]. While no final consensus was found regarding the preference of one layering technique over another, it is well accepted that in general, layering significantly reduces stress over the use of a single or bulk layer with conventional composites [Nikolaenko et al., 2004; Park et al., 2008]. The introduced layering technique, which solely uses flowable composite increments is simple for both clinicians and patients. Although the sole use



FIG. 2A



FIG. 2B



FIG. 2C



FIG. 2D



FIG. 2E



FIG. 2F



FIG. 2G



FIG. 2H



FIG. 2I



FIG. 2J

FIG. 2 A-J The upper left second primary revealed a deep occlusal caries after preparation of the access cavity. It was restored using a flowable composite with the described technique.

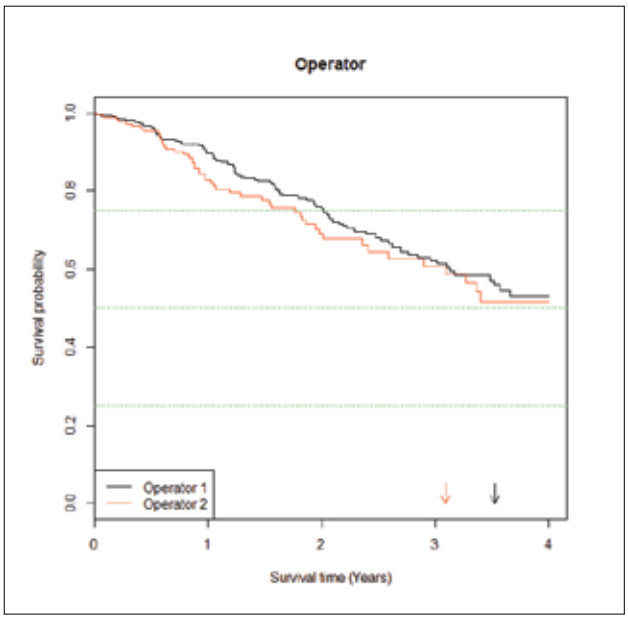


FIG. 3A

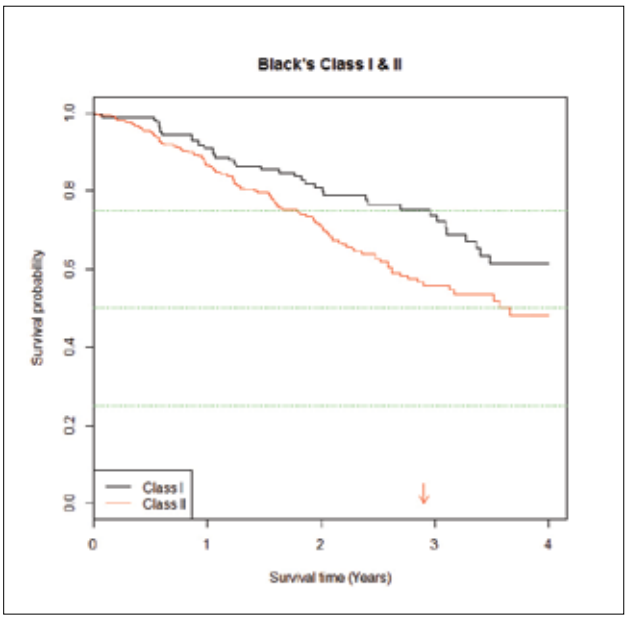


FIG. 3B

FIG. 3 A-B All fillings used composites with no significant differences in terms of survival probability for the two operators. b. Class I cavities performed significantly better than the class II cavities ($p<0.01$). (The curves were terminated when the number of observed cases dropped below n>10

of flowable composites on stress bearing surfaces is usually not recommended, good outcomes for Class II fillings in permanent teeth has been described [Rocha Gomes Torres et al., 2014]. In addition, the use of flowable composites as lining materials of the wall, similar to the described technique, has been shown to relieve polymerisation contraction as well [Leevailoj et al., 2001; Attar et al., 2004].

To date, cavity configuration for composite fillings is primarily caries-oriented. The "classical" cavities on the primary molars being the Class I or Class II type cavities with a c-factor of 5 or 4 [Lynch et al., 2014]. This highlights the use of an incremental technique to reduce de-bonding, especially when using conventional composite materials in deep cavities [Nikolaenko et al., 2014].

In our population, the chosen technique with flowable composite showed acceptable results in primary molars of high caries risk populations, although survival decreased significantly with filling extension (Fig. 3a,b) [Pinto Gdos et al., 2014]. Compomers are described to perform equally or better in the long run, but flowable composite materials show less microleakage and have better marginal adaption due better adhesion properties and higher flexibility of the material [Hickel et al., 2005; Qvist et al., 2010; Tung et al., 2000]. Additionally, in moderate cavities, the incremental use of flowable composites is still feasible, whereas highly filled nano-hybrids, bulk fill composites or compomers would be difficult to apply due to small cavity access.

Modern materials, such as the bulk fill technology, have made the single layer technique possible, which is time-saving with less microleakage than other layering techniques [Duarte et al., 2007; Ilie et al., 2014]. Another advantage of the described technique over the use of bulk fill is that the flowable composite materials can be used for modeling of the surface, whereas flowable bulk fills have such a low surface tension that they will result in a bowl-shaped occlusal surface that would require coverage with a packable bulk-filling material. Until now, no long-term clinical data were published for the use of bulk fill materials in primary teeth.

Direct restoration of primary teeth with few layers of flowable composite can be used as an alternative technique for small to moderate cavity extensions in primary molars. For proximal restorations, a significantly lower survival rate was observed. On the basis of our clinical experience, this technique provides an opportunity to perform tooth-colored restorations in minimal time.

Acknowledgments

The authors declare that they are free of conflicts of interests. We thank both patients for their contribution regarding consent to present clinical photos of their cases.

References

› Attar N, Turgut MD, Güngör HC. The effect of flowable resin composites as gingival increments on the microleakage of posterior resin composites. Oper Dent 2004;29:162-167.
› Bücher K, Metz I, Pitchika V, Hickel R, Kühnisch J. Survival characteristics of composite restorations in primary teeth. Clin Oral Investig 2015;19:1653-62.
› Bücher K, Tautz A, Hickel R, Kühnisch J. Longevity of composite restorations in patients with early childhood caries (ECC). Clin Oral Investig 2014;18:75-782.
› Buerkle V, Kuehnisch J, Guelmann M, Hickel R. Restoration materials for primary molars-results from a European Survey. J Dent 2005;33:275-281.
› Duarte S Jr, Dinelli W, da Silva MH. Influence of resin composite insertion technique in preparations with a high C-factor. Quintessence Int 2007;38:829-835.
› Hickel R, Kaaden C, Paschos E, Buerkle V, García-Godoy F, Manhart J. Longevity of occlusally-stressed restorations in posterior primary teeth. Am J Dent 2005;18:198-211.
› Ilie N, Hickel R. Investigations on mechanical behavior of dental composites. Clin Oral Investig 2009;13:427-438.
› Ilie N, Schöner C, Bücher K, Hickel R. An in-vitro assessment of the shear bond strength of bulk-fill resin composites to permanent and deciduous teeth. J Dent 2014;42:850-855.
› Leevailoj C, Cochran MA, Matis BA, Moore BK, Platt JA. Microleakage of posterior packable resin composites with and without flowable liners. Oper Dent 2001;26:302-307.
› Lynch CD, Opdam NJ, Hickel R, Brunton PA, Gurgan S, Kakaboura A, Shearer AC, Vanherle G, Wilson NH. Guidance on posterior resin composites: Academy of Operative Dentistry - European Section. J Dent 2014;42:377-383.
› Nikolaenko SA, Lohbauer U, Roggendorf M, Petschelt A, Dasch W, Frankenberger R. Influence of c-factor and layering technique on microtensile bond strength to dentin. Dent Mater 2004;20:579-585.
› Park J, Chang J, Ferracane J, Lee IB. How should composite be layered to reduce shrinkage stress: incremental or bulk filling? Dent Mater 2008;24:1501-1505.
› Pinto Gdos S, Oliveira LJ, Romano AR, Schardosim LR, Bonow ML, Pacce M, Correa MB, Demarco FF, Torriani DD. Longevity of posterior restorations in primary teeth: results from a paediatric dental clinic. J Dent 2014;42:1248-1254.
› Qvist V, Poulsen A, Teglers PT, Mjör IA. The longevity of different restorations in primary teeth. Int J Paediatr Dent 2010;20:1-7.
› Rocha Gomes Torres C, Rêgo HM, Perote LC, Santos LF, Kamozaki MB, Gutierrez NC, Di Nicoló R, Borges AB. A split-mouth randomized clinical trial of conventional and heavy flowable composites in class II restorations. J Dent 2014;42:793-799.
› Tung FF, Estafan D, Scherer W. Microleakage of a condensable resin composite: an in vitro investigation. Quintessence Int 2000;31:430-434.