TWENTY-NINE-MONTH FOLLOW-UP OF A PAEDIATRIC ZIRCONIA DENTAL CROWN

CASE REPORT

[1] Department of Peadiatric Dentistry,
Université de Nantes,
Faculté de Chirurgie Dentaire,
Nantes, France

[2] Service d'Odontologie
Conservatrice et Pédiatrique,
Centre Hospitalier Universitaire
de Nantes, Hôtel Dieu,
Nantes, France

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Serena Lopez Cazaux,[1,2]
Isabelle Hyon, [2]
Tony Prud'homme,[1,2]
Sylvie Dajean Trutaud[1,2]

CORRESPONDENCE TO

DR SERENA LOPEZ CAZAUX
serena.lopez-cazaux@univ-nantes.fr

SUMMARY

The aim of this paper is to present the long-term follow-up of one paediatric zirconia crown on a deciduous molar. Preformed crowns are part of the armamentarium in paediatric dentistry. In recent years, aesthetic alternatives to preformed metal crowns have been developed, first preveneered crowns and then zirconia crowns. This paper describes the restoration of a primary molar with a zirconia crown (Sprig formerly EZ-Pedo, Loomis, California, USA) in an 8-year-old boy. In this clinical case, the protocol for the implementation and maintenance of zirconia crowns is detailed. The patient was followed up for 29 months until the natural exfoliation of his primary molar. The adaptation of the zirconia crown, the gingival health and the wear on the opposing tooth were considered. In this case, the paediatric zirconia crown allowed sustainable functional restoration while restoring a natural appearance of the tooth.

BACKGROUND

The treatment of decayed primary molars is common for paediatric dentists. Early childhood caries are still found in many children; therefore, primary molars may have to be treated, even in very young children. Different restorative options can be chosen: we can either put a filling material or use a preformed crown.[1,2] Preformed paediatric crowns are the best option for restoring a decayed primary molar in young children. [3–6] Currently, preformed metal crowns remain the gold standard. Preformed metal crowns are known to be the most durable and protective restorations of the primary dentition.[5,6] The placement of preformed metal crowns is also easy and time-efficient. Despite the favourable qualities of preformed metal crowns, few dental practitioners adopt their use in clinical practice.[7] One of the reasons for this is their poor aesthetic appearance.

To solve this issue, manufacturers have developed better-looking crowns. Various aesthetic crowns for primary teeth have appeared on the market. Initially preformed preveneered crowns were developed. Preveneered crowns are preformed metal crowns with mechanically or chemically bonded aesthetic material (IE, thermoplastic resin or composite resin) that covers one or more surfaces of the crown. The initial data for these crowns are promising, and the initial parental satisfaction is excellent, but longterm follow-ups have revealed the frequent fracturing of the aesthetic material when preformed preveneered crowns are used to restore primary molars.[8–11] The high failure rate of the resin facings is problematic for the aesthetic appearance because, even if the fracture can be repaired with an adjunction of composite resin, this type of repair has a low success rate.[12] Next, in 2008, preformed or paediatric zirconia crowns were developed. These crowns are preformed and made completely with ceramic materials (tetragonal zirconia). Paediatric zirconia crowns are an aesthetic option for the management of dental caries in primary molars.[13] In this article, through a clinical case, we present the protocol and implementation of a paediatric zirconia crown and its long-term follow-up.

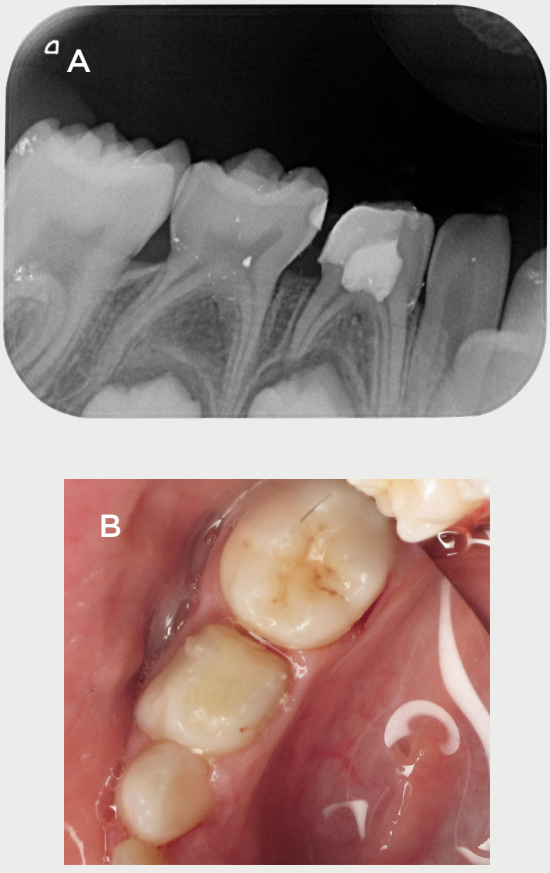

FIGURE 1 Initial Situation. **A** Radiography after pulpotomy. **B** Clinical View.

CASE PRESENTATION

This paper describes the restoration of a primary mandibular right first molar in an 8-year-old boy. The child presented with a high risk of caries. A pulpotomy and a temporary restoration with a glass ionomer had previously been performed (figure 1A,B). The tooth required a full-coverage restoration, and both the child and the parent were highly concerned with the aesthetic appearance of the restoration. We decided to restore the primary mandibular right first molar with a paediatric zirconia crown (Sprig formerly EZ-Pedo, Loomis, California, USA).

TREATMENT

CROWN SELECTION

The selection of the appropriate crown size was performed prior to the tooth preparation. We considered the mesiodistal dimension and selected the crown size to be used based on the original size of the tooth. In this case, we used a standard crown size of 4.

TOOTH PREPARATION

Local anaesthesia was applied prior to the tooth preparation.

OCCLUSAL PREPARATION

Using the marginal ridge of the adjacent teeth as a reference point, 1.5–2 mm of occlusal reduction was performed. An adequate occlusal reduction is extremely important for the proper fit and placement of paediatric zirconia crowns. The final occlusal plane of the seated paediatric zirconia crown is determined by the amount of occlusal reduction.

PERIPHERAL PREPARATION

We removed 0.75–1.75 mm of the tooth structure around the entire circumference of the tooth. We removed the tooth structure following the natural contours of the original tooth, and this reduction began at the gingival margin and ended with a rounded transition onto the occlusal plane of the preparation.

SUBGINGIVAL PREPARATION

We extended the preparation subgingivally 1–2 mm down to the cement–enamel junction while carefully avoiding damaging the gingival tissues. We paid special attention to sufficiently reducing the circumference of the tooth and to the removal of all of the coronal contours above the cement enamel junction to allow for a good fit and placement of the crown. Finally, we rounded the preparation and removed the sharp angles (figure 2).

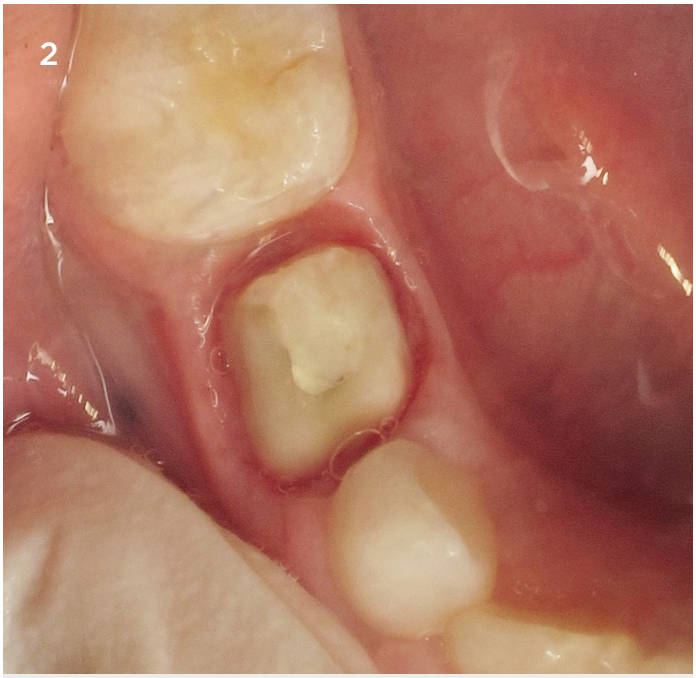

FIGURE 2 Tooth preparation: clinical occlusal view.

ADJUSTMENT

We tried the crown carefully because paediatric zirconia crowns are not flexible. We made a small cervical reduction of the crown using a bur under a water spray. However, if the crown does not fit, the preparation (occlusal and subgingival steps) should be reconsidered first.

CEMENTATION

The tooth and the crown were cleaned of all blood residues. Haemostasis of the gingiva was obtained via pressure applied with a finger. A glass ionomer cement (Fuji One PLUS, GC, Louvain, Belgium) was used for the cementation.

FIGURE 3 Follow up of gingival health
A and **B** Clinical views after 3 days. Note the quick healing of the gingiva after the tooth preparation.

OUTCOME AND FOLLOW-UP

The patient was followed for 29 months until the natural exfoliation of his tooth. The adaptation of the paediatric zirconia crown, the gingival health and the attrition of the antagonist tooth were considered.

In our case, the tooth preparation was slightly aggressive with respect to the gingiva (which is often the case when we place a paediatric zirconia crown). However, after 3 days, the gingiva had healed (figure 3A,B) and the long-term follow-up also indicated the good health of the periodontal tissues (figure 4A–D).

At 29 months, the gingiva around the zirconia crown was inflamed, but this inflammation was related to the natural mobility of the primary mandibular right first molar (which exfoliated 2 weeks later) and to poor oral hygiene, as indicated by inflammation around the other teeth.

FIGURE 4
Long term follow up of gingival health

A Clinical views after 4 months.

B Clinical views after 1 year.

C Clinical view after 2 years.

D Clinical view after 29 months.

Note the good gingival integration of the zirconia crown over time.

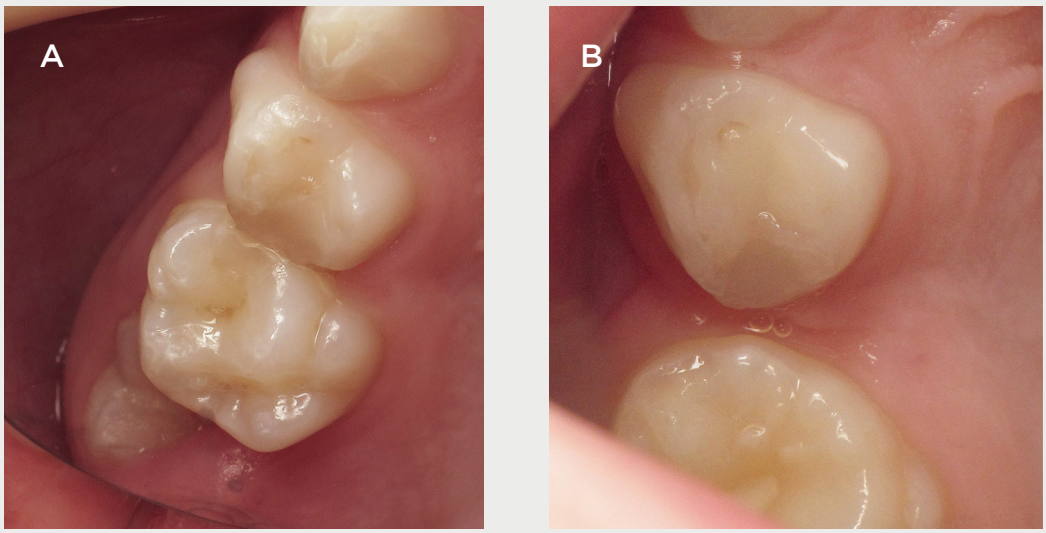

FIGURE 5 Follow-up of the wear of the antagonist tooth, that is, the primary maxillary right first molar. **A** Clinical view of the primary maxillary right first molar 3 months before the restoration of the primary mandibular right first molar with a zirconia crown. **B** Clinical view of the primary maxillary right first molar after 1 year.

During the follow-up, we checked for any unusual, accelerated attrition of the opposing tooth (figure 5A–C). In our case the two primary maxillary first molars exhibited similar amounts of wear after 29 months (figure 6A,B). The primary mandibular right first molar exfoliated 29 months after the zirconia crown cementation. After this natural exfoliation, a good marginal adaptation of the crown was noticed. The lingual and mesial walls of the tooth were in contact with the crown. The distal wall exhibited a small gap (0.5 mm) and the buccal wall exhibited an acceptable gap (1 mm) (figure 7).

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FIGURE 5 **C** Clinical view of the primary maxillary right first molar after 24 months.

Note the stability of the natural wear of the primary maxillary right first molar.

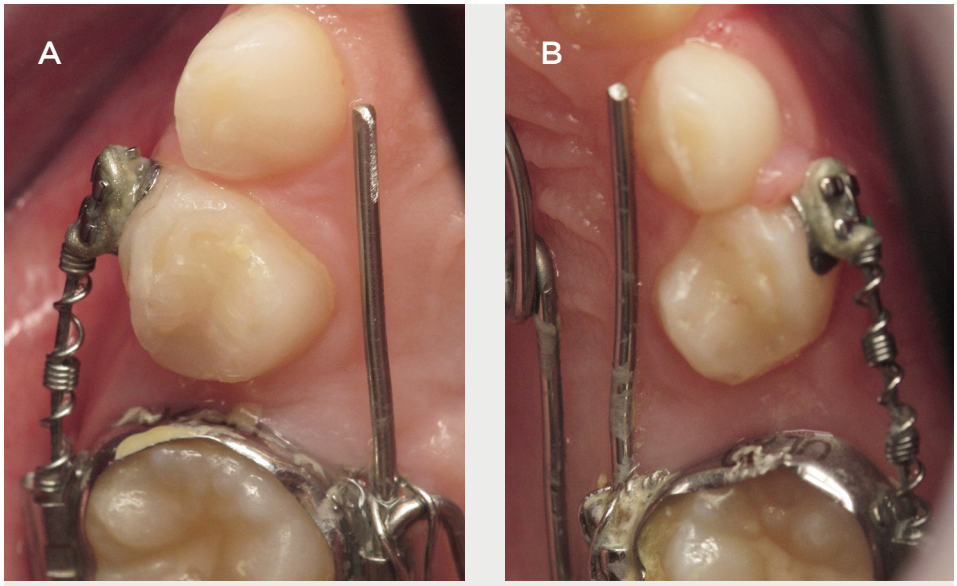

FIGURE 6 Follow-up of the wear. **A** Clinical view of the primary maxillary right first molar (antagonist) after 29 months. **B** Clinical view of the primary maxillary left first molar after 29 months. Note the similar wear on the two primary maxillary first molars.

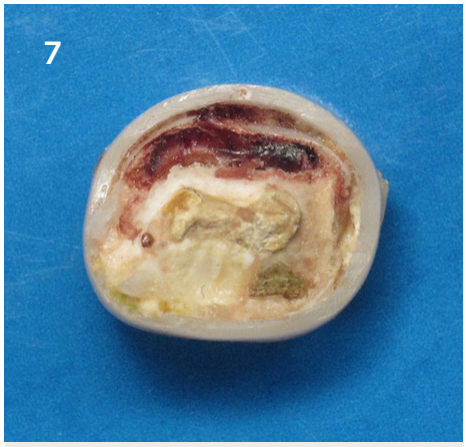

FIGURE 7 The natural exfoliation of the primary mandibular right first molar after 29 months.

Note the good adaptation of the crown.

DISCUSSION

Acquiring new skills in our practice is often not easy. The clinical procedure for seating paediatric zirconia crowns took longer than that for preformed metal crowns, when we began to use zirconia crowns. After training, the procedure became quick and easy. Case selection was also important when we began to use paediatric zirconia crowns. The fitting of a paediatric zirconia crown on a mandibular molar is easier to do than fittings on anterior teeth or upper molars. Performing a single unit restoration first is easier than performing back-to-back restorations. Good patient cooperation is necessary, and the use of sedation could be helpful. Relative to preformed metal crowns, zirconia crowns require additional preparation.[14] The subgingival preparation is the most difficult step but is also the most important step. For this step, the use of a Zekrya Gingival Protector (Dentsply, York, Pennsylvania, USA) can be helpful in terms of preserving the gingival tissues around the preparation. When there is a loss of space (IE, a mesiodistal space reduction), the situation is more complicated, but it is still possible to place a paediatric zirconia crown. The specialized sizes developed by manufacturers will be helpful in such cases.

An evaluation of the long-term success of paediatric zirconia crowns is required.[15] To date, only few studies have been published on this type of crown.[13 16–19] Thus far, there are no published prospective clinical trials about the performance of paediatric zirconia posterior crowns, but the initial observations of anterior primary teeth indicate that they perform well over time. Any metric of success must consider the survey rate, the aesthetic integration and the health of the surrounding structure. Based on our experience with paediatric zirconia crowns, some positive observations can be made. Paediatric zirconia posterior crowns seem to be durable. Paediatric zirconia crowns are retentive after cementation and do not break. The monolithic zirconia construction eliminates the problem of chipped or fractured facings. The aesthetic integration of paediatric zirconia crowns is also very good. These crowns look natural and exhibit excellent color stability.

Paediatric zirconia crowns are thicker than preformed metal crowns and a subgingival preparation is necessary. These two aspects could influence the periodontal response and the periodontal health. However, the periodontal response to

paediatric zirconia crown is similar to that of any other type of crown. This response depends on the oral hygiene of the patient. When the oral hygiene is good, there is no gingival inflammation.

The risk of wear on the opposing tooth must also be considered. Indeed, the wear on the opposing tooth is part of the criteria defined by the FDI World Dental Federation (Fédération Dentaire Internationale) for the evaluation of direct and indirect restorations; wear is one of the functional parameters. [20] Moreover, several studies have suggested that ceramic substrates produce more wear on the opposing tooth structure than enamel.[21 22] However, no unusual or accelerated attrition of the opposing tooth was observed in our case report. Our observations agree with those of the review published by Miyazaki et al.[23] Zirconia has a high hardness, but wear strongly depends on the microstructure of the restorative material and the degree of surface finish. Because zirconia has a fine uniform structure and is suitable for creating mirror-polished surfaces, no important wear is observed. There is no need to fear the wear of the enamel of the opposing teeth against zirconia restorations.[23] However, these considerations are based on in vitro studies or on observations in adult patients. Our patient was an 8-year-old boy. His first permanent molars are completely erupted and the key aspects of the occlusion have been defined, which could also explain the absence of wear on the opposing tooth. However, this phenomenon could be different in younger patients (under 6 years of age). To the best of our knowledge, no studies have investigated the wear on the opposing tooth when a ceramic restoration is placed on a temporary molar in a young child. Further studies are necessary to evaluate the risk of wear before the eruption of the first permanent molars.

Paediatric zirconia crowns are presented as an aesthetic alternative to preformed metal crowns. During the 29 months of follow-up, a very good integration of the crown was observed. However, randomized controlled trials evaluating long-term clinical performance of paediatric zirconia crowns are now necessary.

LEARNING POINTS

- THE FUNCTION OF THE TOOTH WAS MAINTAINED.
- THE AESTHETIC APPEARANCE WAS RESTORED.
- THE STRUCTURES AROUND THE CROWN WERE PRESERVED.
- THE PLACEMENT OF PAEDIATRIC ZIRCONIA CROWNS IS A GOOD METHOD FOR RESTORING DECAYED PRIMARY MOLARS.

CONTRIBUTORS

SLC is responsible for care and treatment of the patient in the hospital and had written the article. IH and TP participated in the follow-up and critically revised the article. SDT critically revised the article. Competing interests None declared. Patient consent Obtained from Guardian. Provenance and peer review Not commissioned; externally peer reviewed.

COMPETING INTERESTS

None declared.

PATIENT CONSENT

Obtained from guardian

PROVENANCE AND PEER REVIEW

not commissioned; externally peer reviewed

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