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**BOMBYX MORI SILK FIBER–REINFORCED COMPOSITE STRIP CROWN
 FOR EARLY CHILDHOOD CARIES: A CASE REPORT**

Endytiastuti¹⁾, Putri Kusuma Wardani Mahendra²⁾

¹⁾Specialist Study Program of Pediatric Dentistry, Faculty of Dentistry,
 Universitas Gadjah Mada, Yogyakarta, Indonesia

²⁾Department of Pediatric Dentistry, Faculty of Dentistry, Universitas Gadjah Mada,
 Yogyakarta, Indonesia

Abstract

Background: Early childhood caries (ECC) commonly affects multiple teeth and can rapidly progress to pulpal necrosis. Managing and maintaining affected teeth until their natural exfoliation presents a clinical challenge. A promising conservative approach involves the use of strip crowns reinforced with Bombyx mori silk fiber–reinforced composite following endodontic therapy. **Objective:** This case report describes the restoration of primary maxillary incisors with severe crown destruction due to ECC using Bombyx mori silk fiber–reinforced composite posts and strip crowns after root canal treatment. **Case:** A 5-year-8-month-old boy presented to the Pediatric Dentistry Clinic, Prof. Soedomo Dental Hospital, Universitas Gadjah Mada, accompanied by his mother, with a complaint of several decayed upper anterior teeth. The child had a history of nocturnal breastfeeding and daily UHT milk consumption, along with poor oral hygiene. Clinical examination revealed dentinal caries on teeth 51, 52, and 62, and severe crown destruction with pulpal necrosis on tooth 61. **Managing case:** Root canal treatment was performed on tooth 61, followed by placement of a Bombyx mori silk fiber–reinforced composite post and strip crown restoration. Strip crown restorations were also placed on teeth 51, 52, and 62. At the one-month follow-up, all restorations remained intact, functional, and aesthetically pleasing, with no dislodgement or failure observed. **Conclusion:** Strip crowns represent an effective and aesthetic restorative option for children with ECC, particularly in the anterior region. The use of Bombyx mori silk fiber–reinforced composite posts in cases of severe coronal destruction enhances retention, durability, and long-term clinical outcomes.

Keywords: Bombyx Mori Silk Fiber Reinforced Composite, Early Childhood Caries, Strip Crown

Correspondence: Putri Kusuma Wardani Mahendra, Department of Pediatric Dentistry, Faculty of Dentistry, Universitas Gadjah Mada, Yogyakarta, Indonesia, 55281, putrikusuma_64@ugm.ac.id, +62-274-515307.

INTRODUCTION

Early childhood caries (ECC) is an infectious disease affecting the primary dentition of children.¹ If left untreated at an early stage, it may lead to severe destruction of tooth structure and consequently affect the development of the succeeding permanent teeth.¹ Children often present to the dentist with complaints of caries involving the anterior region at a very young age.² Demineralization in primary teeth progresses more rapidly than in permanent teeth, thereby requiring prompt and appropriate intervention.² Increasing parental awareness regarding the detrimental effects of dental caries has led many parents to prefer retaining their children's primary teeth in the oral cavity as long as possible, aligning to their natural functional lifespan.¹ This growing awareness has resulted in a higher number of restored teeth in recent years compared to previous periods.¹

Early childhood caries is characterized by the presence of one or more decayed (non-cavitated or cavitated), missing (due to caries), or filled tooth surfaces in any primary tooth of a child aged 71 months or younger.³ It is a multifactorial disease caused by poor oral hygiene, bacterial invasion, unhealthy dietary habits, and other predisposing factors.⁴ The condition primarily affects children from low-socioeconomic backgrounds, with prevalence rates ranging from 1–12% in developed countries and up to 70% in developing nations.^{4,5} Initially, early childhood caries typically manifests in the cervical third of the maxillary anterior teeth and progresses rapidly, causing extensive coronal destruction.⁶ The maxillary primary incisors are usually the first teeth to be affected, followed by the rapid involvement of other primary teeth, which may lead to premature tooth loss, loss of vertical dimension, speech difficulties, malocclusion, reduced masticatory efficiency, tongue-thrusting habits,

space loss, and psychological or emotional disturbances.⁶ Moreover, early childhood caries significantly impacts a child's quality of life by interfering with essential daily activities such as eating, speaking, and social interaction, which may, in turn, reduce self-confidence and academic performance.⁴

In many cases, destruction of the primary tooth structure involves nearly the entire crown, leaving only dentine available for restorative retention.⁶ This structural loss contributes to the high failure rate of restorations in extensively damaged primary teeth.⁷ Therefore, the introduction of fiber-reinforced materials as intracanal or intracoronal posts has been suggested to enhance retention and improve the longevity of restorations in children affected by early childhood caries. Synthetic fibers in the form of fibers-reinforced composites (FRC), such as polyethylene fibers, glass fibers, glass fiber-reinforced composite resins, and carbon fibers, have been widely used in restorative and endodontic post systems in dentistry, including in Indonesia.^{6,8} These materials offer several advantages, such as favorable elastic modulus, high tensile strain, and excellent strength. However, they have high cost, limited availability in Indonesia, and a non-biodegradable nature, which contribute to microplastic pollution and remain major drawbacks.^{9,10} An alternative material that can be utilised is *Bombyx mori* silk fiber, a natural protein-based fiber produced by silkworms (*Bombyx mori*) that feed on mulberry leaves (*Morus sp.*) in Central Java, Indonesia.¹⁰ This fiber exhibits mechanical strength comparable to that of glass and polyethylene fibers.^{10,11} The silk fiber *Bombyx mori* has the properties required for biomaterial applications, including biocompatibility, low toxicity, no irritation and good mechanical properties.¹¹ Considering the limited supply and high cost of synthetic fibers in Indonesia, *Bombyx mori* silk fiber represents a promising locally available and eco-friendly alternative for clinical applications.¹² This case report describes the restoration of primary maxillary incisors with severe crown destruction due to early childhood caries using *Bombyx mori* silk fiber-reinforced composite posts and strip crowns after root canal treatment.

CASE

A 5-year-and-8-month-old boy was brought by his parents to the Pediatric Dentistry Clinic at Prof. Soedomo Dental Hospital in Yogyakarta. The parents reported that several of the child's upper anterior teeth were decayed, leaving only root remnants in some areas. The child was embarrassed to smile or speak because of the condition of his teeth. The mother requested treatment and restoration of the child's anterior teeth. The child was otherwise healthy with no systemic abnormalities reported. A comprehensive medical and dental history, clinical examination, and radiographic evaluation were performed to establish the diagnosis and formulate an appropriate treatment plan. The patient's history revealed prolonged nocturnal breastfeeding and daily intake of ultra-high-temperature (UHT) milk since 2.5 years of age. In addition, irregular oral hygiene practices were noted, contributing to the development of multiple carious lesions in the primary dentition. Clinical examination revealed dentinal caries on teeth 51, 52, and 62, and extensive crown destruction with pulp necrosis on tooth 61 (Figure 1).



Figure 1. Intraoral condition before dental treatment.

CASE MANAGEMENT

The dental treatment was carried out over multiple visits to ensure optimal clinical outcomes. At the first visit, a strip crown restoration was placed on tooth 51 using a flowable composite resin, and root canal treatment was initiated on tooth 61 (Figure 2). For tooth 51, the appropriate crown form was selected according to its mesiodistal width. Carious tissue was completely removed using a round bur, followed by a tapered bur, and an incisal preparation was performed. A glassionomer cement (GIC) base was applied to the prepared surface to protect the underlying dentine. Shade A2 composite resin was selected to achieve color harmony with the adjacent teeth. The tooth surface was etched with 37% phosphoric acid, rinsed thoroughly, and dried with gentle air flow. A bonding agent was applied and light-cured for 15 seconds. Flowable composite resin was then inserted into the selected

crown form, which had been adjusted to fit the prepared tooth. Excess resin was removed with a dental explorer, followed by light curing for 60 seconds on both the labial and palatal surfaces. The crown form was carefully removed using an explorer, and the restoration was finished and polished to achieve a smooth, aesthetic surface.



Figure 2. Strip crown restoration on tooth 51

Root canal treatment for tooth 61 was carried out in several stages. A periapical radiograph was initially obtained to evaluate the condition of the root canals (Figure 3A). The canal was prepared using K-files up to size 70, followed by irrigation with sodium hypochlorite (NaOCl) and saline solution. The canal was dried with paper points, and a calcium hydroxide (CaOH₂) paste was applied as an intracanal dressing. The cavity was sealed with a temporary restoration. The patient was instructed to return for follow-up in 7 days, at which time obturation would be performed if no symptoms were present.

During the second visit, obturation was completed on tooth 61. The obturation material used was a calcium hydroxide paste containing iodoform, which was inserted into the canal, followed by placement of a temporary filling. A periapical radiograph was taken to confirm adequate canal filling (Figure 3B). The patient was advised to return for follow-up in 7 days.

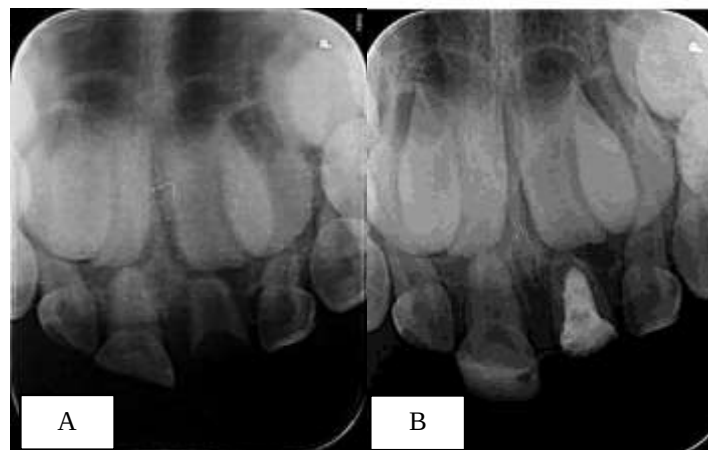


Figure 3. Periapical radiograph examination. Periapical radiograph before endodontic Treatment. (B) Periapical radiograph showing obturation of tooth 61 following root canal therapy

During the third visit, a strip crown restoration was performed on tooth 61 using a fiber post following completion of endodontic treatment. The fiber material used was silk fiber derived from *Bombyx mori* (Dental SilkBon®, Yogyakarta) (Figure 4). Placement of the *Bombyx mori* silk fiber required approximately 3 mm of post space from the cemento-enamel-junction. The obturation material was removed using a fissure bur, after which the canal was irrigated with a saline solution and dried with a cotton pellet. The prepared post space was etched with 37% phosphoric acid, rinsed thoroughly, and dried. A bonding agent was then applied to the internal canal walls, evenly distributed with a gentle air stream, and followed by light curing for 20 seconds.

Flowable composite resin was inserted into the prepared post space, after which the *Bombyx mori* silk fiber was positioned. Both the fiber and composite resin were light-cured together for 60 seconds. The coronal portion of the post was covered with flowable composite to form the core build-up and was light-cured for 60 seconds (Figure 5).



Figure 4. *Bombyx mori* silk fiber (Dental SilkBond®, Yogyakarta)



Figure 5. Core build-up on the *Bombyx mori* silk fiber post.

The subsequent procedure consisted of restoring tooth 61 with a strip crown using shade A2 flowable composite resin. The composite was placed into a preselected crown form that had been adjusted to match the mesiodistal width of the tooth. The filled crown form was then positioned over the fiber post, and light curing was performed for 60 seconds on both the palatal and labial surfaces. The crown form was carefully removed using a dental explorer, followed by finishing and polishing to achieve a smooth, glossy, and aesthetic restoration.

During the fourth visit, strip crown restorations were carried out on teeth 52 and 62 using flowable composite resin shade A2, following the same procedure as that performed on tooth 51. The crown forms were carefully removed using a dental explorer, followed by finishing and polishing to refine the contours and achieve smooth, aesthetic surfaces on teeth 52 and 62 (Figure 6A). A one-month follow-up examination was conducted after completion of treatment. The restorations on teeth 51, 52, 61, and 62 remained intact, with no dislodgement, discoloration, or surface roughness. Both the child and his parents reported satisfaction with the aesthetic appearance and functional outcomes of the treatment (Figure 6B).

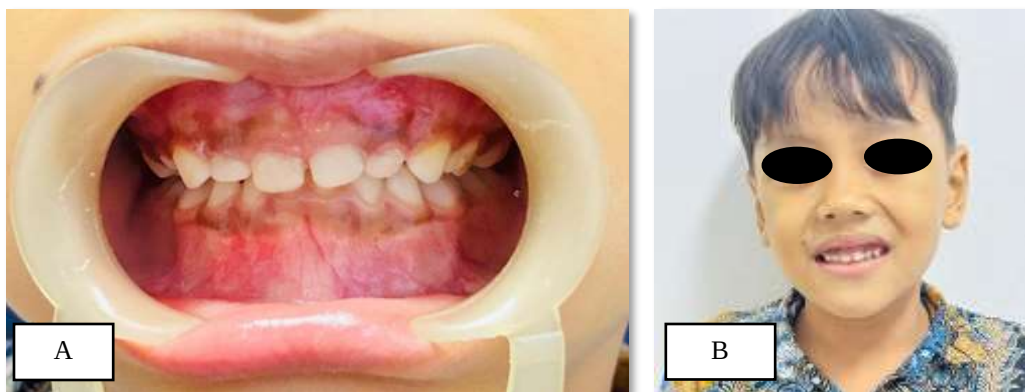


Figure 6. Composite strip crown restoration. (A) composite strip crown restoration on teeth 51,52,61,62. (B) one month follow up after treatment.

DISCUSSION

Early childhood caries (ECC) is a multifactorial and highly prevalent disease affecting children from birth to 71 months of age.¹³ The etiology of early childhood caries involves a complex interaction of biological, behavioral, and environmental factors. Poor oral hygiene, frequent consumption of sugar-rich foods and beverages, whether through bottle feeding or direct intake and inadequate plaque removal have been identified as major contributing factors.^{13,4} Moreover, nocturnal breastfeeding has been recognized as an additional risk factor associated with the development of early childhood caries.^{4,13,14} Infants who breastfeed during sleep often retain the mother's nipple in the mouth, allowing prolonged contact between the tongue and the nipple. This position restricts salivary flow and facilitates the pooling of breast milk around the tooth surfaces. The accumulation of milk provides a sustained source of fermentable carbohydrates that serve as substrates for cariogenic bacteria.¹⁴

Extraction has traditionally been the treatment of choice for severely damaged primary teeth.¹ However, advances in dental materials and techniques now allow clinicians to preserve and restore such teeth successfully.¹ Retaining primary teeth is crucial for maintaining arch length, preventing malocclusion, and supporting speech and mastication. Comprehensive communication with parents about the consequences of premature tooth loss can

significantly enhance their motivation to preserve affected teeth rather than extract them through restorative procedures.¹ In this case, the parents were successfully motivated to retain their child's severely compromised primary teeth. Further evaluation is necessary to assess whether the use of fiber posts may affect the eruption of the underlying permanent teeth.

The use of *Bombyx mori* silk fiber and strip crowns was indicated in this case due to extensive coronal destruction, particularly in tooth 61, which required a fiber post to enhance the retention of the composite strip crown. Teeth 51, 52, and 62 retained sufficient tooth structure and were restored with strip crowns only. The combination of *Bombyx mori* silk fiber and strip crowns offers excellent aesthetics, high biocompatibility, and sufficient mechanical strength, making it a promising option for anterior restorations in pediatric patients.

The *Bombyx mori* silk fiber used in this case was unidirectional. *Bombyx mori* silk fibres are available in two types: unidirectional and braided. Each type has its advantages, unidirectional fibers are easier to adapt and manipulate, whereas braided fibers offer better control and adaptability to the contours and curvature of the teeth.⁹ Unidirectional fibers are generally used to reinforce restorations, serve as dental bridges, splints, and endodontic posts, while braided fibres are preferred when greater masticatory strength is required.¹⁰ Several studies have supported the potential use of *Bombyx mori* silk fiber as an alternative to synthetic fiber posts. Fransiska et al. (2018) reported that *Bombyx mori* silk fiber could serve as a viable composite-reinforcing material in dentistry when rendered more hydrophobic and treated with a coupling agent to improve the fiber–resin interface.¹³ Sunarintyas et al. (2023) demonstrated that *Bombyx mori* silk fiber exhibits flexural strength and elasticity comparable to polyethylene fiber, while its unidirectional configuration provides greater strength than some synthetic alternatives, including polyethylene and quartz fibers.⁹ These properties suggest superior mechanical performance, wear resistance, and long-term stability within the oral environment. The use of fiber posts is indicated for severely damaged or fractured maxillary anterior primary teeth to restore coronal form and structural integrity.⁷ Nevertheless, fiber posts have some limitations. They may be prone to mechanical failure and could potentially interfere with the physiological root resorption of primary teeth if placed deeper than approximately 3 mm below the cemento-enamel-junction.¹⁶

Strip crowns were selected in this case because they offer several advantages, including ease of adjustment, rapid placement, a smooth and glossy surface finish, aesthetic appeal, cost-effectiveness, and ease of repair.¹⁶ They are particularly indicated for extensively carious, fractured, or endodontically treated anterior primary teeth.^{17,18,19} A potential drawback of strip crowns is the risk of composite discoloration when contamination by saliva or blood occurs during placement. In this case, the child was advised to avoid biting hard foods with the restored teeth to prevent possible fracture or debonding of the crowns.²⁰ The clinical outcomes observed at the one-month follow-up further confirm the durability and aesthetic reliability of this restorative approach.

The one-month follow-up revealed that all restorations remained intact, functional, and aesthetically satisfactory. This outcome suggests that the combination of strip crowns and *Bombyx mori* silk fiber posts can be considered a viable conservative treatment option for managing early childhood caries in anterior primary teeth. The use of *Bombyx mori* silk fiber–reinforced composite posts in cases of severe coronal destruction enhances retention, durability, and long-term clinical outcomes.

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REFERENCES

1. Agarwal P, Nayak R, Elangovan G. A predictable aesthetic rehabilitation of deciduous anterior teeth in early childhood caries. *Case Rep Dent*. 2018;2018:1742529. doi:10.1155/2018/1742529
2. Sathyaprasad S, Irfana I, Aravind A. Anterior crowns in pediatric dentistry: a literature review. *Int J Curr Res*. 2020;12(11):14510–14515. doi:10.24941/ijcr.40214.11.2020
3. Zou J, Qin D, Ge L, Wu J, Wang X, Li Y, Song G, Zhao W, Chen X, Jiang B, Mei Y, Huang Y, Deng S, Zhang H, Li Y, Zhou X. Expert consensus on early childhood caries management. *BMC Oral Health*. 2022;22:35. doi:10.1038/s41368-022-00186-0
4. Alazmah A. Early childhood caries: a review. *J Contemp Dent Pract*. 2017;18(8):732–737. doi:10.5005/jp-journals-10024-2116
5. Aljohani AA, Ahmad IA, Mubarak FA, Faisal FA, Alsharif MA, Mashael TA, Nada WA, Lulah SA, Hassan DA, Rawan RA, Hanan MA, Bandar MB. Managing early childhood caries: a comparative review of preventive and restorative approaches. *Cureus*. 2024;16(11):e74704. doi:10.7759/cureus.74704
6. Sanjeev MN, Harsimran K, Rishika, Ramakrishna Y. Posts in primary teeth—an upright pillar for better smile. *Indian J Forensic Odontol*. 2020;13(2):84–87. doi:10.21088/ijfo.0974.505X.13220.4

7. Shah S, Bansal S, Anuradha KVR, Nikhil P. Post in primary teeth: a smile for better smile. *J Adv Med Dent Sci Res*. 2016;4(1):58–64.
8. Alshabib A, Althaqafi KA, AlMoharib HS, Mirah M, AlFawaz YF, Algamaiah H. Dental fiber-post systems: an in-depth review of their evolution, current practice and future directions. *Bioengineering*. 2023;10(5):551. doi:10.3390/bioengineering10050551
9. Sunarintyas S, Irnawati D, Harsini H, Rinastiti M, Nuryono N. Impregnation of various fiber tapes toward mechanical properties of dental fiber-reinforced composites. *Maj Kedokt Gigi Indones*. 2023;9(1):16–21. doi:10.22146/majkedgiind.80060
10. Fakultas Kedokteran Gigi Universitas Gadjah Mada. Buku petunjuk dental Silkbon. Yogyakarta: FKG UGM; 2022.
11. Khan MI, Abbas YM, Fares G. Review of high and ultrahigh performance cementitious composites incorporating various combinations of fibers and ultrafines. *J King Saud Univ Eng Sci*. 2017;29(4):339–347. doi:10.1016/j.jksues.2017.03.006
12. Hamidi YK, Yalcinkaya MA, Guloglu GE, Pishvar M, Amirkhosravi M, Altan MC. Silk as a natural reinforcement: processing and properties of silk/epoxy composite laminates. *Materials (Basel)*. 2018;11(11):2135. doi:10.3390/ma11112135
13. Fransiska A, Siti S, Rini D. Effect of Bombyx mori silk-fiber volume on flexural strength of fiber-reinforced composite. *Maj Kedokt Gigi Indones*. 2018;4(2):75–81. doi:10.22146/majkedgiind.25186
14. Crowder L. Management options of early childhood caries. *Evid Based Dent*. 2021;22:106–107. doi:10.1038/s41432-021-0197-8
15. Tham R, Bowatte G, Dharmage SC, Tan DJ, Lau MXZ, Dai X, KJ A, CJ L. Breastfeeding and the risk of dental caries: a systematic review and meta-analysis. *Acta Paediatr*. 2015;104(S467):62–84. doi:10.1111/apa.13118
16. Pratiwi GAI, Willyanti S. Penggunaan fiber glass pada pasien early childhood caries: laporan kasus. *J Indones Dent Assoc*. 2018;1(2):210–213.
17. Helmy RH, Pansai AM, Yomna MI, Mai M, Eldokmak E, Eman MS, Amal I-El-Naggar, Aya AA. A dental materials approach to pediatric dental full coverage—a review. *Alex Dent J*. 2023;48(3):200–209. doi:10.21608/adjalexu.2023.249332.1446
18. Shrestha S, Koirala B, Dali M, Birajee G. Anterior crowns in pediatric dentistry: a review. *J Nepal Assoc Pediatr Dent*. 2020;1(1):32–38.
19. Almajed OS. Shaping smiles: a narrative review of crown advancements in pediatric dentistry. *Cureus*. 2024;16(1):e52997. doi:10.7759/cureus.52997
20. Vaghela LL, Megha CP, Rohan KB, Chhaya NP, Kaushal RJ. Clinical performance and parental satisfaction with composite strip crown and prefabricated zirconia crown for primary anterior teeth. *J Contemp Dent Pract*. 2021;22(12):1462–1470. doi:10.5005/jp-journals-10024-326