

Preventive effect of fissure sealant on dental caries - Long-term observation results on Juvenile First Molars

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Abstract

Caries incidence was investigated for child patients who had been under long-term observation after treatment in order to clarify the caries-preventive effect of fissure sealants (FS).

Of the child patients (with the average age of six years two months) who received an FS treatment immediately after the eruption of the first molar, 90 child patients (45 boys and 45 girls) who had been observed for the average of five years and three months were used as the subjects of this study. Material used was glass ionomer cement. A dental caries examination of the left and right first molars of the upper and lower jaws was conducted, and the results were compared with the figures reported in the 2016 Dental Disease Actual Condition Survey (Ministry of Health, Labor and Welfare).

The results were that out of the 90 children, the first molar suffering dental caries numbered six (6.7%) and seven (7.8%) on the right and left side of the upper jaw, seven (7.8%) and six (6.7%) and on the right and left side of the lower jaw, respectively. The first molar caries incidence rate in the same-age child patients from 2016 Dental Disease Actual Condition Survey (Ministry of Health, Labor and Welfare), excluding those who received FS treatments, was 24.0% while the first molar caries incident rate in this study was 7.3% on the average.

It was clarified that FS has a long-term caries-preventive effect.

Introduction

Although the caries prevalence rate status of deciduous teeth and permanent teeth is improving in recent years, in the survey values of actual condition of dental illness in 2016 (Ministry of Health, Labour and Welfare) [1] (hereinafter abbreviated as actual survey values), the average caries prevalence rate of the first molar of 10-14 year-olds was approximately 25.8% (first molar of the right side of the lower jaw) when not receiving pit and fissure filling treatment, and one in four people are still suffering from dental caries. Furthermore, in the age group of 60-64-year-olds, the current state is that the loss rate is approximately 45% for the first molar of the left side of the lower jaw, which is the highest rate among the upper and lower first molars.

Juvenile first molar teeth are susceptible to caries due to factors such as difficulty in cleaning as a result of complicated morphology of pits and fissures and immature calcification of fissure enamel. Regarding the dental caries prevention effect against pit and fissure caries, since Buonocore, *et al.* [2] and Williams, *et al.* [3] used glass ionomer cement for the first time as a material, the pit and fissure filling method (hereinafter abbreviated as FS) has been developed and established as a method for prevention of caries. Research on this FS involves clinical assessment [4,5] as a matter of course, and studies are being conducted from both the basic and clinical aspects on issues such as the adhesive strength of the sealant material to enamel [6,7] as well as the effect on enamel of acid treatment when using resin material, that is, regarding factors such as the type, concentration, action time [8,9], decrease in recovery from demineralization etc. [10].

However, due to the lack of the evidence-based medicine, on long-term effectiveness of FS treatment, the penetration rate to the general public is still low at the present time.

In this study, in order to obtain guidelines for efficiently preventing caries with glass ionomer cement in clinical practice in Pediatric dentistry, the caries prevalence rate was investigated in children whose follow-up was observed for a long time after FS treatment and the effectiveness of FS treatment was investigated.

Subjects and methods

From among children who did not have advanced caries and dentition irregularities who were visiting Wakaba Dental Clinic in Shizuoka Prefecture for regular check-ups who underwent FS treatment immediately after eruption of the first molar (treatment age: average 6 years 2 months), the subjects were 90 children (45 boys, 45 girls) who could be observed for an average of 5 years and 3 months (up to age 11 years 5 months).

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Glass ionomer cement (Fuji III LC®, GC company) was used as the FS material.

The FS treatment on the first molar was performed with simple moisture proofing, and after that periodic examinations were done approximately every five months. If the material had fallen out, FS treatment was performed again. The FS procedure was according to the normal method.

Dental caries examinations of the upper and lower jaws and left and right first molars after an average of 5 years and 3 months were conducted by a dentist who had 5 years or more experience with dental treatment. The results were compared with actual survey values.

Results

The teeth suffering from caries of the first molar, were, among 90 teeth in each category, 6 teeth on the upper right jaw side (6.7%), 7 teeth on the upper left jaw side (7.8%), 6 teeth on the lower right jaw side (6.7%) and 7 teeth on the lower left jaw side (7.8%). There was no significant difference between upper and lower or left and right. All other first molars were healthy teeth.

The results are shown in the figure by comparing with the values calculated by excluding the population that underwent FS treatment from the values in the actual survey values for the 10-14-year-old age group. As a result, the average caries prevalence rate of the four types of first molars in the actual survey values was 24.0%, and the average caries prevalence rate according to the present study was 7.3% (Figure 1).

Discussion

It is a known fact that the caries sensitivity of juvenile permanent teeth shortly after eruption is high, and many studies on dental caries prevention of juvenile permanent teeth have been done. It has been reported that initiation of management from the dentition stage at age 6 or younger can subsequently suppress the onset of dental caries in permanent teeth [11]. In addition, Hata, *et al.* [12] reported that occlusal dental caries occurred in 74.4% of first molars without FS among children who had oral care from the dentition stage, and that many of these cases were suffering from dental caries before moisture proofing with a rubber dam could be done. Based on these findings, it is thought that an urgent pits and fissure filling procedure for the first molar that is about to erupt is important when performing oral cavity management.

Glass ionomer cement itself has dentin adhesion and fluoride releasing properties and is thought to be superior as a pits and fissure

filling material for juvenile permanent teeth shortly after eruption. Since the glass ionomer cement filling material used in this study is surgically added with acid treatment to improve dentin adhesion and cement hardening is almost completed after light irradiation, it has been reported that it has been improved in terms of adhesion, retention rate and aesthetics [5,6].

Conventional fissure sealant was insufficient if it was done under simple moisture proofing, and rubber dam moisture proofing was thought to be an essential condition; however, it seems that photocurable glass ionomer cement type filling material under simple moisture proofing was effective for first molars that are about to erupt, for which rubber dam moisture proofing is difficult. Also from these results, the caries suppression rate was kept at a very high rate without using rubber dam moisture proofing at all. It is thought that the advantage of light curing reduces the influence of saliva on water sensitivity and it seems that the photocurable glass ionomer cement is less susceptible to the wet environment than the conventional glass ionomer cement.

In this report, all children were obliged to undergo regular check-ups. It can be said that attempting re-filling promptly is a major factor suppressing the occurrence of caries when it is discovered that the sealant material is falling out at each visit. Komatu, *et al.* [5] reported that development of caries can be suppressed for a long time by re-filling the sites where the glass ionomer cement has fallen out. In addition, it has been reported that cement-based glass ionomer filling material has a strong role as a storage for releasing fluoride and that sustained released fluoride lowers the proportion of *Streptococcus mutans* in plaque over a long period of time [13]. It is conceivable that the length of time that the filler material exists in the pits and fissure portion greatly affects the suppression of dental caries; however, it seems that the effects of glass ionomer cement sealant will be more reliable by managing the falling out of sealant agent with routine examinations.

In this survey, it was judged that it is possible to expect the protection of pits and fissures and the effect of suppressing caries by treating with a glass ionomer type fissure sealant at an early stage after eruption of permanent teeth. In comparison with the average caries prevalence rate (about 23.0%) of the first molar in the population not receiving FS treatment from the actual survey values, the caries prevalence rate of this study was about 7.3%, and it was possible to prevent caries to a great extent.

The first molars have the greatest occlusal force among all the tooth types and play an important role in forming and maintaining normal dentition. Considering that many people have lost their first molar teeth by middle age and that the biggest cause of tooth loss is caries, measures for caries prevention in first molars are indispensable for maintaining lifelong healthy oral function.

Conclusion

As a result of FS treatment on the upper and lower left and right juvenile first molar teeth and observation by regular examinations on average for 5 years and 3 months, the caries prevalence rate was 7.3% on average.

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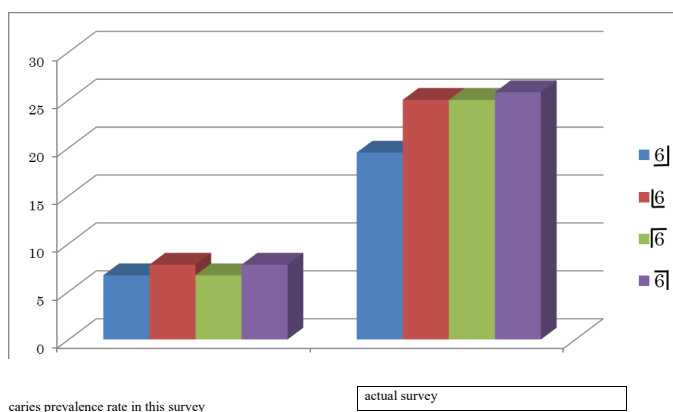


Figure 1. Comparison of caries prevalence rate in this survey and actual survey

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