

Integrating Myofunctional Therapy and Cariogram-Based Caries Risk Assessment in the Management of Crowding and Tongue Biting During Mixed Dentition: A Case Report

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ABSTRACT

Background: Young children in the second phase of mixed-dentition commonly have malocclusion due to crowding and bad habits. Without immediate treatment, malocclusion might cause caries. Risk variables can predict multifactorial caries. The application's "cariogram" can predict new caries. The purpose to report anterior and posterior crowded and tongue biting with myofunctional treatment and predict the occurrence of new caries with a "cariogram".

Case Report: A 9-year-old girl came with complaints of large cavities in the lower teeth and teeth that grow crookedly. The results of the intra-oral examination showed multiple caries, pulp necrosis, anterior and posterior crowded, accompanied by bad habits of tongue biting. The results of panoramic X-ray examination showed all tooth buds and no abnormalities, cephalometric examination showed a class I skeletal pattern, retrognathic skeletal with retrusive mandible, mandibular growth vertically and downwards more than normal. New caries is predicted using a periodic "cariogram", fissure sealant, restoration on multiple caries, extraction on necrotic teeth, topical fluoride, Myobrace, and routine checkups. The "cariogram" was used to estimate caries risk at the initial visit and at the third and sixth months. Cariogram-based teaching was given to patients. Nighttime children used Myobrace. After insertion, control was done weekly and then monthly.

Conclusion: Preventing malocclusion and caries by treating crowded teeth and tongue biting. Correcting malocclusion requires Myobrace and "cariogram" prediction of new caries.

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INTRODUCTION

Nine-year-olds are in the transition from childhood to adolescence. They experience physical and psychological changes. Another change they experience is the arrangement of their teeth, which is the second phase of mixed dentition. During this period, the dimensions of deciduous teeth change to permanent teeth, which can cause many problems. Crowding is a common problem. In children aged 6–12, the prevalence of crowding is 26.75%.¹

Other problems that often arise during this period include the development of bad habits such as thumb sucking, mouth breathing, and tongue habits such as tongue thrusting and tongue biting. Tongue biting is usually caused by stress or other factors, such as the onset of mixed dentition, when teeth begin to fall out.² Having the tongue between the teeth at rest can cause malocclusion, and if left for a long time, it can cause an open bite.^{3,4} Malocclusion that is not treated immediately can cause caries.

Caries is one of the most prevalent oral diseases. According to the 2018 Basic Health Research, the prevalence of caries in children aged 5–9 years was 92.6%, and in children aged 10–14 years, it was 73.4%.⁵ Caries status can be linked to the mother's age and education as well as socioeconomic status.⁶ The causes of caries are multifactorial. Caries can be influenced by general health, diet, food types, the number and types of bacteria in the oral cavity, oral hygiene, salivary factors, and fluoride exposure.^{7–9}

A caries risk approach must consider various factors that influence caries activity and predict the likelihood of new caries. Predicting new caries can be done using the "cariogram" application. "Cariogram" is a computer-based program developed by Petersson and Bratthall to illustrate caries risk assessment. This program can illustrate caries-related factors and determine the actual chances of avoiding new caries.^{10,11}

Predicting new caries using a cariogram is an important factor before and during treatment for tongue biting and crowding. One treatment for tongue biting and crowding is the use of Myobrace. Myobrace is a functional orthodontic device that combines functional devices, positioners, and myofunctional devices. Myobrace corrects tooth alignment, jaw development, and bad habits.¹² Myobrace effectively trains the tongue to position itself correctly in the upper jaw, training the oral muscles and applying light force to widen the jaw and align the teeth. Myobrace is effective for use in the late mixed dentition, or between the ages of 8 and 12.¹³ This paper aims to report on anterior and posterior crowding, tongue biting associated with myofunctional treatment, and the prediction of new caries occurrence using a "cariogram" in children aged 9 years and 6 months.

CASE REPOST

A 9-year-old girl presented with concerns regarding severe caries and teeth crowding. The bottom left posterior tooth exhibited a significant cavity. The pain started about 3 months ago. It hurt especially when eating. The tooth is no longer painful, but food often gets stuck. The maxillary teeth have become misaligned and require orthodontic correction. The child resides in the countryside with her parents and does dental hygiene twice daily following meals. The findings from the extraoral test revealed a convex facial profile (Figure 1), a symmetrical face, and harmonic vertical proportions. The results of the intra-oral examination showed multiple caries on teeth 55, 65, 26, 46, pulp necrosis on tooth 75, anterior and posterior crowded, tooth 13 labioversi, tooth 12 mesiolabio torsiversi, tooth 23 distolabio torsiversi, tooth 34 mesiobucco torsiversi, tooth 45: distolabio torsiversi, accompanied by bad habits of tongue biting (Figure 2). Oral hygiene score 2,8. The results of

panoramic X-ray examination showed all tooth buds and no abnormalities (Figure 3), cephalometric examination showed a class I skeletal pattern, retrognathic skeletal with retrusive mandible, mandibular growth vertically and downwards more than normal (Figure 4).

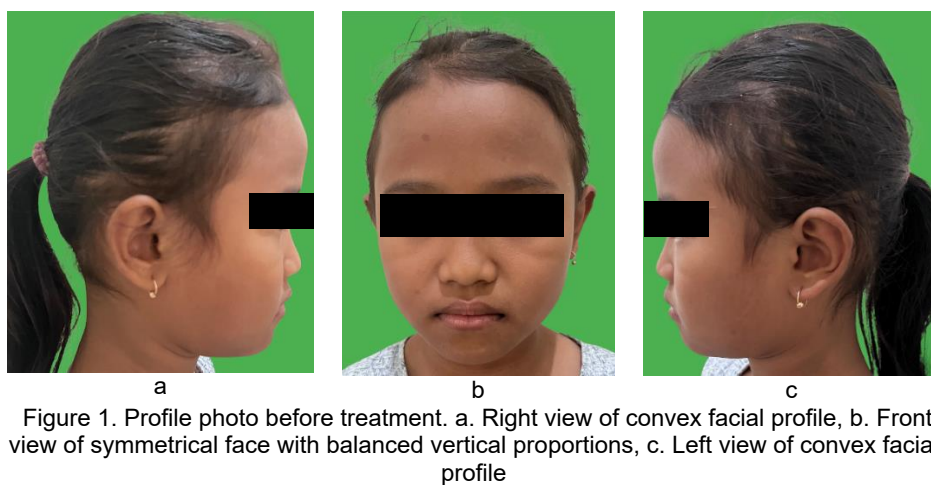


Figure 2. Tongue Biting Habit



Figure 3. Panoramic X-ray Examination



Figure 4. Cephalometric Examination

The treatment performed was to predict the occurrence of new caries with a periodic "cariogram", fissure sealant, restoration on multiple caries, extraction on necrotic teeth, topical fluoride application, use of Myobrace K¹ and routine check-ups. Caries risk assessment was using the "cariogram" was conducted on the initial visit (Figure 5), with subsequent evaluations at the third (Figure 6) and sixth months (Figure 7). Patients received education in accordance with the suggestions derived from the cariogram analysis. Myobrace was utilised by children at nighttime for about 8 hours (Figure 8). Controlling was conducted a week post-insertion and evaluated monthly thereafter.

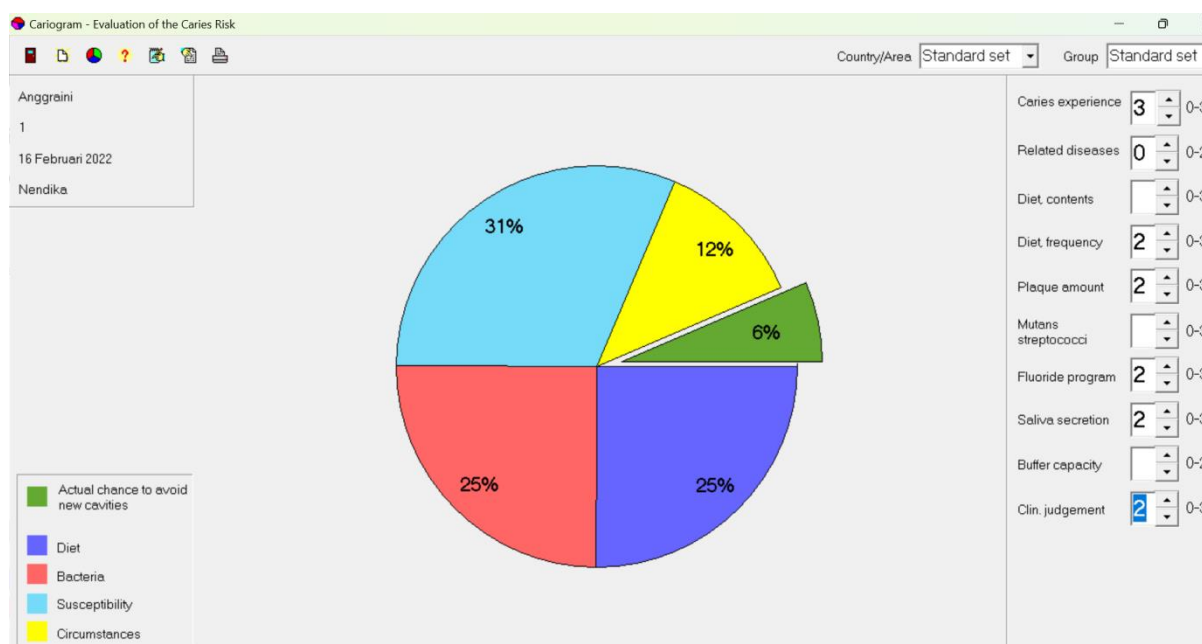


Figure 5. caries assestment risk with "cariogram" before treatment

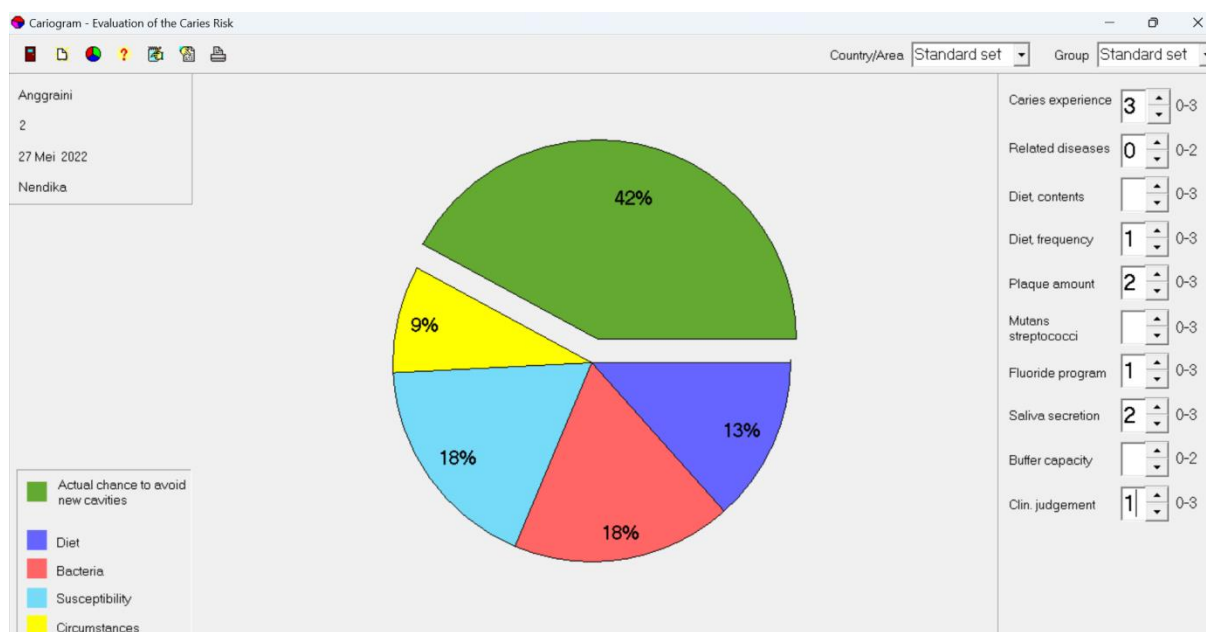


Figure 6. caries assestment risk with "cariogram" after 3 month treatment

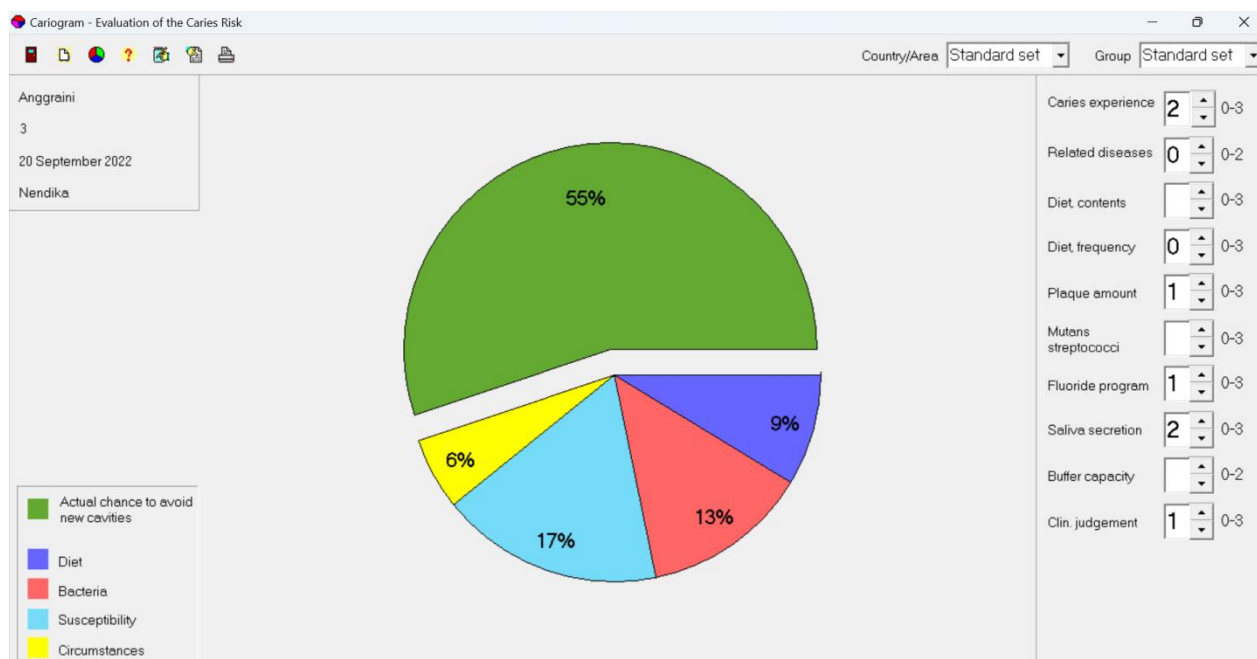


Figure 7. caries assestment risk with "cariogram" after 6 month treatment



Figure 8. Myobrace Usage

The treatment results indicated that the caries risk assessment using a cariogram reduced from very high to intermediate risk. Cariogram analysis indicated a decrease in the prevention of new caries, namely from 6% to 42% in the second assessment and 55% in the third assessment. Following the application of Myobrace, the detrimental practice of tongue biting was rectified, teeth malposition was corrected, and a tooth stayed incorrect which previously 45 distolabio torsiversi became 45 bucco versi (Figure 9 dan 10).



Figure 9. intra oral photo before treatment



Figure 10. intra oral photo after treatment

DISCUSSION

The result of this treatment was the correction of the child's bad habit of tongue biting. The Myobrace, a myofunctional appliance, successfully treated the patient's bad habit of tongue biting. Myobrace is a three-phase system designed to correct bad oral habits that cause jaw development problems. The purpose of this appliance is to properly position the tongue in the upper jaw.¹⁴

Myobrace has a tongue tag component. The tongue tag is positioned on the retro-incisive papilla, which provides proprioceptive stimulation to the tip of the tongue and acts as a myofunctional trainer to correct tongue posture.¹² The Myobrace is the perfect choice for eliminating tongue biting. The extended tongue position complements this appliance's ability to correct tongue placement.^{13,15}

Another function of Myobrace is to stimulate the muscles of the mouth to align the teeth.¹⁴ In this case, tooth malposition and crowding can be corrected with the use of Myobrace. Myobrace is made of hard polyurethane, which allows for proper tooth alignment. Myobrace also includes a tooth guide and labial and

buccal shields. The tooth guide functions to align the teeth. The guide is narrower anteriorly and wider posteriorly. The upper and lower jaws are separated by a 2 mm thermoplastic material. The labial and buccal shields prevent lip and cheek interposition and apply minimal pressure to misaligned front teeth. Furthermore, Myobrace also functions as a lip bumper to prevent mentalis muscle hyperactivity.¹²

In this case, the Myobrace used is type K, which starts from stage 1 to stage 3. This tool is effective for mixed dentition at the age of 5–10 years.^{13,15} Myobrace K1 supports the correction of bad habits and adapts the dental arch and malocclusion. This appliance has excellent retention because it is worn at night. Myobrace K2 provides dental arch correction while still correcting bad habits. This stage features Dynamicore with Frankel tissue, which helps enlarge and develop the jaw. The final stage, or Myobrace K3, focuses on correcting bad habits, final tooth alignment, and retention with a stronger polyurethane construction. This stage also facilitates the final positioning of the tongue directly in the correct position.^{15,16}

The use of Myobrace has the potential to affect several key components of the Cariogram. These include plaque accumulation, salivary flow rate, cariogenic bacteria count, and the patient's ability to maintain oral hygiene.¹⁷ In this case, children with bad tongue-biting habits can experience anterior and posterior crowding. Crowding increases the difficulty of mechanical cleaning, allowing plaque to accumulate more easily in the interproximal and cervical areas of the teeth.

Previous research on the use of cariograms in orthodontic patients has shown that in patients with a high filled surfaces index (DFS) before orthodontic treatment, it often indicates a low percentage of the “actual chance of avoiding new cavities.” Cariograms are very useful and practical and help predict caries risk in patients with orthodontic appliances.¹⁸

“Cariogram” as an application to predict the presence of new caries has been proven to be beneficial in assessing and identifying the factors causing caries individually.¹⁹ In this case, a decrease was demonstrated in bacterial factors, from 25% to 18% and 13%, respectively. The decrease in bacterial factors was due to the children's improved ability to clean their teeth, resulting in a decrease in plaque scores. The decrease in plaque scores is inseparable from the role of parents, as children aged 10 years can already perform activities independently but still with parental supervision.²⁰

A decrease in the caries severity index in this case also demonstrated the success of the treatment. The caries severity index at the initial examination was 16.67%, decreasing to 7.6% at the second examination and 4.16% at the third examination. The caries severity index may have decreased due to tooth restoration and extraction. Furthermore, at the third examination, the restored deciduous teeth had fallen out due to physiological resorption.

In this case, the corrective action taken to prevent new caries is to educate the patient and their parents about how and when to brush their teeth, nutritious and bad foods for dental health, and daily meal frequency. This education can be a key factor in predicting new caries, which will influence the amount of plaque on the teeth and the frequency of eating.²¹ A decrease in dietary factors was demonstrated at each examination. Dietary factors at the beginning of the examination were 25%, decreasing to 13% and 9%, respectively.

Treatment to increase the likelihood of preventing new caries is to add fluoride through topical fluoride application. Fluoride can prevent demineralisation and promote remineralisation.²² “Cariogram” has been proven effective in predicting the occurrence of new caries.^{19,23} Cariograms are effectively used to evaluate various caries prevention programs in patients at high caries risk.²⁴

The “Cariogram” is an interactive version of the caries risk estimation tool introduced by Bratthal in 1996 to understand the interaction of various caries-causing factors. The computer version of the “Cariogram” displays graphical images that illustrate the overall likelihood of caries risk scenarios.^{10,25} Caries risk assessment with a “cariogram” is aimed at identifying individuals who are likely to develop caries and at providing appropriate preventive measures and treatment to stop caries from occurring.²⁶

Caries risk assessment approaches include past caries experience, socioeconomic factors, and biological factors. Past caries risk experience provides a simple and rapid method. Several previous cases have shown that caries lesions at an early age tend to develop more frequently in later years. Children with these conditions are considered high-risk individuals. Socioeconomic factors can identify high-risk individuals. People with low socioeconomic status are at higher risk. Biological factors are crucial in activating the caries process. These include bacteria, diet, saliva, and exposure to fluoride.^{22,27,28}

Factors in a cariogram are weighted differently. This means that factors that promote or inhibit caries development have a stronger influence than others. Factors involved in the caries process have their own formations or defence mechanisms.²⁹

In this case, the first cariogram examination showed a green colour chart of 6%, the second examination showed 42%, and the third examination showed 55%. This means there was an improvement in the treatment given based on the cariogram evaluation. The green colour in the small diagram indicates a high caries risk.²⁵

CONCLUSION

Caries risk assessment using Cariogram and myofunctional therapy are comprehensive approaches to treating children with mixed dentition, tongue biting, and crowding. The Cariogram helps determine caries risk and preventive measures. Myofunctional treatment with the Myobrace device improves tongue posture, oral muscle function, and dental arch growth. Functional correction and caries risk assessment may improve prevention, long-term oral health, and caries risk.

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