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Caries Management and Vertical Dimension Modification Using Stainless Steel Crowns in Pediatric Patients with Multiple Carries: Case Reports

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ABSTRACT

Dental caries is the most common chronic oral disease in children and remains the leading cause of tooth structural loss. In the case of some caries, extensive destruction can result in a reduction in the vertical dimensions of the occlusion, which can negatively impact chewing, speech, aesthetics, and even craniofacial development. Therefore, a comprehensive management strategy is essential, combining caries elimination, dental restoration, and occlusal rehabilitation. Stainless Steel Crown (SSC) is considered a reliable restorative material in pediatric dentistry due to its durability, full-coverage protection, and ability to reconstruct occlusal vertical dimensions. This case report aims to describe the management of multiple caries in pediatric patients using SSC as a definitive restoration and tool for vertical dimension modification. A 5-year-old girl was presented with some caries involving several primary molars, accompanied by a decrease in vertical dimensions. Clinical and radiographic evaluation confirmed extensive carius lesions. Treatment involves caries removal and pulp therapy on the indicated tooth, followed by the placement of SSCs on the severely affected molars. SSC restoration successfully restored occlusal contact and corrected the loss of vertical dimensions. The use of SSC in this case not only provides long-term protection for the primary caryrius molars but also restores occlusal balance through vertical dimensional adjustment. This results in improved chewing, patient comfort, and functional stability with no reported complications. SSC thus has the dual role of a restorative solution and a tool for occlusal rehabilitation. SSC is an effective treatment modality in pediatric patients with multiple caries, offering structural preservation and modification of vertical dimensions. Its application supports optimal oral function, comfort, better eating behavior, and weight gain.

Keywords: Multiple caries, pediatric dentistry, stainless steel crown, vertical dimensions, case report.

INTRODUCTION

Dental caries remains a significant global health challenge, particularly among pediatric populations (Kazeminia et al., 2020; Nath et al., 2023; Peres et al., 2019; Wen et al., 2022; Zhai et al., 2025). The World Health Organization identifies dental caries as the most prevalent chronic disease in children, with a substantial proportion of school-age children affected worldwide. In developing countries, this condition often manifests as multiple caries or Severe Early Childhood Caries (S-ECC), a particularly aggressive form that rapidly destroys primary dentition. Beyond its direct impact on oral health, S-ECC profoundly affects a child's quality of life, leading to eating difficulties, sleep disturbances, impaired physical growth, and negative psychosocial development (Dean et al., 2015).

Multiple caries of the primary tooth can lead to extensive loss of clinical crown structure (BaniHani et al., 2022; Lynch, 2013). Loss of posterior tooth tissue that acts as an occlusion buffer has the potential to cause changes in occlusal relationships, one of which is a decrease in the vertical dimension of occlusion (DVO). A decrease in DVO in children can affect mastication function, phonetics, facial aesthetics, and craniofacial growth balance. Some studies report that DVO loss is more common in children with severe caries in the elder tooth period than in children without caries (Widyagarini & Budiardjo, 2014).

The management of multiple caries in children should ideally focus not only on the elimination of the disease, but also on the rehabilitation of oral function as a whole. Rehabilitation of the oral cavity in pediatric patients requires a multidisciplinary approach that

considers growth factors, neuromuscular adaptation, and patient and parental compliance. Therefore, the selection of the right restoration material is a crucial aspect in the success of long-term treatment (Bansal et al., 2016).

This identified gap highlights the need for more granular, patient-centered reports that illustrate the practical application of this concept. There is an urgent need to document not just the what and the how, but also the why behind key clinical decisions—such as the selection of specific teeth for OVD elevation, the precise measurement of the required increase, and the management of the post-treatment adaptation period. Such documentation is crucial for translating theoretical principles into actionable clinical guidance for practitioners facing similar complex cases.

The novelty of this case report lies in its comprehensive and integrated presentation of the entire rehabilitative process. It provides a detailed, stepwise account of managing a high-risk pediatric patient with multiple caries and confirmed OVD loss. By meticulously documenting the diagnostic assessment, the rationale for treatment choices, the staged intervention (including pulp therapy, extractions, anterior esthetics, and strategic SSC placement for bite opening), and the post-treatment outcomes at a 3-month follow-up, this report offers a valuable blueprint for clinicians. It explicitly demonstrates the dual role of SSCs as both a definitive restorative material and an active orthodontic-rehabilitative tool.

Stainless steel crown (SSC) has long been recommended as a restoration of choice on posterior primary teeth with extensive damage or after pulp treatment. In addition to providing full-coverage protection and high restoration resistance, SSC is also able to reconstruct the clinical crown height and maintain occlusal relationships. In recent decades, SSC has been increasingly used as a means of modifying vertical dimensions and bite openings in pediatric patients with DVO loss due to severe caries (Widyagarini & Budiardjo, 2014).

Although the use of SSC as a first-tooth restoration has been widely reported, case reports that specifically address its role in vertical dimension modification in children with multiple caries are still limited, especially in the context of comprehensive oral cavity rehabilitation. Therefore, this case report aims to describe the management of pediatric patients with multiple caries and vertical dimension reduction using stainless steel crowns as part of oral rehabilitation, as well as evaluate the clinical outcomes on mastication function, patient comfort, and patient quality of life.

The primary purpose of this case report is to describe the comprehensive management of a pediatric patient with multiple caries and reduced occlusal vertical dimension, utilizing stainless steel crowns as a key component of oral rehabilitation. The objective is to evaluate the clinical outcomes of this approach on masticatory function, patient comfort, and quality of life. The contribution of this report is to provide a practical, evidence-informed clinical example that reinforces the value of SSCs in complex pediatric rehabilitation, thereby benefiting clinicians in their treatment planning and execution. Ultimately, this report aims to underscore the importance of a holistic approach to caries management in children, where restoring function is given equal priority to arresting disease.

RESEARCH METHODS

This study was prepared in the form of a clinical case report which aimed to describe the management strategy of a pediatric patient with multiple caries accompanied by a reduction in the vertical dimension of occlusion through a comprehensive oral rehabilitation approach. This case report was conducted at the Department of Pediatric Dentistry, Dental and Oral Teaching Hospital, Faculty of Dentistry, Padjadjaran University, Bandung, Indonesia. The

subject of the report was a 5.5-year-old female patient who presented with complaints of cavities in nearly all primary teeth, without spontaneous pain, but accompanied by impaired masticatory function and clinical signs of posterior vertical dimension decline. This case report approach was chosen to provide an in-depth overview of the clinical decision-making process, treatment stages, and results obtained based on the patient's individual condition.

The examination procedure was carried out thoroughly through extraoral and intraoral evaluations, accompanied by radiographic examination to assess the extent of tooth tissue damage. Caries risk assessment was conducted based on the American Academy of Pediatric Dentistry (AAPD) guidelines and showed that the patient fell into the high caries risk category. Vertical dimension measurements were performed using the Niswonger method with subnasale and menton reference points to determine the difference between the vertical dimension at rest and the vertical dimension of occlusion. The examination results showed a freeway space of 3 mm, which became the basis for planning physiologically and safely elevating the vertical dimension in the planned rehabilitative treatment.

Management was carried out in stages with a comprehensive oral rehabilitation approach which included non-pharmacological behavioral management, caries prevention, pulp treatment of the involved posterior primary teeth, tooth extraction of extensively damaged teeth that could not be retained, and dental restoration using stainless steel crowns on the posterior teeth as full-coverage restorations and bite opening to improve the vertical dimension of occlusion. Evaluation of treatment outcomes was performed through post-treatment follow-up visits to assess occlusal adaptation, masticatory function, patient comfort, as well as changes in eating behavior and physical growth. All procedures were carried out with parental consent and in accordance with ethical principles and the patient's best interests.

Case and Handling

Patient Information

A 5.5-year-old female patient came to the Department of Pediatric Dentistry at RSGM Universitas Padjadjaran with her parents with complaints of cavities almost all of her teeth. The patient did not complain of spontaneous pain, but had a long eating habit. The medical history shows that the patient had suffered from Tuberculosis at the age of 1.5 years and had completed treatment in 2020.

Clinical Findings

Extraoral examination showed a symmetrical face with a flat profile and a negative lip seal. Intraoral examination showed a late primary dentition with multiple caries on almost all of the first teeth, posterior gingivitis regio, as well as an anterior deep bite image indicating a decrease in posterior vertical dimensions.

Diagnostic Assessment

Caries risk assessments based on American Academy of Pediatric Dentistry (AAPD) guidelines show patients fall into the category of high caries risk. Vertical dimension measurements were carried out using the Niswonger method with subnation and menton reference points. The rated vertical dimension of rest (DVR) is 49.5 mm and the vertical dimension of occlusion (DVO) is 46.5 mm, indicating a freeway space of 3 mm.

Vertical Dimensionsof Occlusion

Vertical Dimension Rest

Therapeutic Interventions

Treatment is carried out in stages with a comprehensive oral cavity rehabilitation approach, including:

1. Management of nonpharmacological behaviors (tell-show-do and positive reinforcement).
2. Caries prevention measures (topical application of fluoride).
3. Pulp treatment (pulpotomy and pulpectomy) on the posterior primary teeth involved.
4. Anterior aesthetic restoration using crown strips and GICs.
5. Extraction of teeth 51, 52, 61, 62 because the damage is already extensive is not possible to treat.
6. Installation of stainless steel crowns on gears 54, 55, 64, 74, 84, and 85 as a full-coverage restoration as well as bite opening to increase DVO by 3 mm according to the value of freeway space.

Photos before treatment

Photos after treatment

Follow-up and Results

Patients experience mild discomfort on the first day after SSC insertion which is reduced with analgesics and disappears within a few days. At the control visit, mastication function improved, there were no complaints about the temporomandibular joint, and the facial appearance showed better balance of the lower third proportions. At the 3-month follow-up

visit, the patient's eating behavior improved, no longer consumed, and the weight gained by almost 2 kg.

RESULTS AND DISCUSSION

Dental caries is the most common dental disease in children and is multifactorial. Risk factors for caries include cariogenic eating habits, difficulty brushing teeth, enamel hypoplasia or other disorders of enamel structure, the role of parents or caregivers, low socioeconomic status, history of chronic diseases, and low levels of education. Children who receive their first dental checkup after the age of 2 are also reported to have an increased risk of developing caries. These factors need to be considered in caries management, so each pediatric patient needs a caries risk assessment to determine a management pathway and treatment plan that is appropriate to their level of risk (Butera et al., 2022).

The patients in this case report had several risk factors for caries, including delays in the first visit to the dentist, eating habits, and a history of systemic diseases in the form of tuberculosis at the age of 1.5 years. Although a direct link between tuberculosis and dental caries has not been causally conclusive, systemic conditions and long treatment periods can affect diet, oral hygiene, and attention to children's dental health. According to the parents' statement, the patient never complained of toothache so that caries was not detected until it reached the advanced stage and almost all of the first teeth were severely damaged.

Visits to the dentist from an early age are an important part of preventive efforts in maintaining children's oral health. The American Academy of Pediatric Dentistry (AAPD) recommends the first visit to the dentist at the age of 1 year or six months after the first tooth eruption. Early visits allow for early detection of caries, provision of preventive therapies such as topical fluoride application, and education of parents about the hygiene of children's oral cavities (Padung et al., 2022). Delays in visits to the dentist, as in this case, result in the undetectability of the initial lesion, the loss of preventive care opportunities, and the limited treatment options remaining to curative care (Chou et al., 2013).

In addition to having an impact on dental conditions, treatment delays also affect aspects of patient behavior. The patient in this case showed a response of rejection and fear when action was about to be taken, on a level 2 Frankl scale. Children who have experienced a first visit to the dentist at a later age or have limited dental experience tend to show higher levels of anxiety and low cooperation. Therefore, behavior management approaches such as desensitization, tell-show-do, and step-by-step actions are needed to increase patient acceptance of treatment (Porritt et al., 2012).

The selection of restoration material in this case is adjusted to the severity of the lesion and the patient's condition. Glass ionomer cement (GIC) is used for the restoration of teeth with small to moderate caries lesions due to its ability to release fluoride, chemically bind to dental tissue, and be tolerant of moisture so that it is suitable for use in pediatric patients. For primary teeth with extensive loss of crown structure, stainless steel crown (SSC) is the primary restoration option. SSC is recommended in teeth that have undergone pulpotomy or pulpectomy treatment, as well as in patients at high risk of caries and poor oral hygiene (American Academy of Pediatric Dentistry, 2023).

In this case, SSCs are installed on teeth 55, 54, 64, 74, 84, and 85 that still have enough tooth structure to receive restoration. Some anterior teeth are extracted due to the loss of a very

extensive tooth structure that reaches the subgingiv. The selection of SSC aims to protect the rest of the tooth structure, maintain the first tooth until the time of permanent tooth eruption, and support mastication function at a relatively young age of patients.

In addition to serving as a restoration, SSC in this case is also used as a bite riser to increase the vertical dimension of the occlusion. Loss of posterior tooth structure due to extensive caries can lead to a decrease in vertical dimensions that impacts facial mastication, aesthetics, and balance function. Elevation of molar teeth using SSC provides a bite elevation effect that allows the development of dentoalveolar and the re-establishment of occlusal contact in a new vertical dimension (Yoana & Sasmita, 2019). In addition, vertical dimensional elevation is also necessary to provide adequate space and thickness for restoration materials in oral rehabilitation (Widyagarini & Budiardjo, 2014).

The vertical dimensions in this patient were measured using the subnation–menton distance measurement method with the letter M pronunciation method and saliva swallowing functionally. The use of more than one measurement method is recommended to improve the accuracy of vertical dimensional loss determination (Widyagarini & Budiardjo, 2014). The measurement results show the difference between the vertical dimension of rest and the vertical dimension of occlusion by 3 mm, so that the elevation of the vertical dimension can be carried out safely without exceeding the limits of physiological space or freeway space. Research states that permanent vertical dimensional elevation of 2 to 5 mm can be done safely without adverse consequences, with the symptoms arising being self-limiting (Abduo, 2012).

Patients had complained of discomfort and pain when chewing a few hours after the SSC insertion. These complaints are a common reaction during the adaptation period to vertical and temporary elevation. According to previous reports, the complaints are self-limiting and generally disappear within one to two weeks. In this patient, the complaints were no longer felt after one week after the installation of the SSC.

Improvement in oral function after comprehensive oral rehabilitation is expected to occur in mastic, aesthetic, and speech functions. At the post-treatment control, parents reported that patients were able to eat more voraciously and no longer complain of pain when chewing. The patient's weight also increased within three months of treatment. This is in line with the report of Sachdev et al. (2016), which states that comprehensive dental rehabilitation in children with severe early childhood caries contributes to improving the growth parameters and quality of life of children.

The aesthetic improvement in this case can be seen from the reduction of overbite and the improvement of the balance of the vertical face. Vertical dimension elevation using SSC can also be seen as a form of interceptive orthodontics on the vertical dimension, which has the potential to support a more balanced growth of the jaw and face. Healthy primordial condition and good occlusal relationships are important factors in supporting optimal craniofacial growth (Parisotto et al., 2009).

Although the improvement of speech function has not been optimally evaluated due to the absence of permanent anterior tooth eruption, long-term monitoring is still needed to assess the development of speech function, vertical dimensional stability, and possible need for interventional orthodontic treatment. These patients belong to the high risk group of caries, so preventive measures such as topical fluoride application and periodic caries monitoring every

three months are highly recommended according to the AAPD protocol, especially if the patient undergoes orthodontic treatment in the future.

CONCLUSION

Multiple caries in primary teeth can cause impaired oral function and a decrease in the vertical dimension of occlusion if not treated early. Comprehensive oral rehabilitation in pediatric patients at high caries risk, through preventive approaches, behavioral management, and appropriate restorative selection, provides good clinical outcomes. Stainless steel crowns on posterior primary teeth not only serve as full-coverage restorations but are also effectively used as bite raisers to increase the vertical dimension of occlusion within physiologically safe limits. These treatments contribute to the improvement of masticatory function, oral comfort, eating behavior, and weight gain. Future research should focus on long-term follow-up studies to evaluate the stability of vertical dimension correction using stainless steel crowns in primary dentition, as well as its impact on the development of permanent dentition and craniofacial growth patterns in children.

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