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Comprehensive Dental Rehabilitation in A Child With Ventricular Septal Defect: A Case Report

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Abstract

Ventricular septal defect (VSD) is a congenital heart condition characterized by abnormal blood flow between the heart's ventricles, which can lead to various complications, including an elevated risk of bacterial endocarditis. This case involves a four-year-old male patient with VSD and early childhood caries who successfully underwent routine dental treatment. Despite the complexities of his systemic condition, the dental procedures were meticulously planned and carried out without the use of general anesthesia. The treatment required continuous monitoring of his overall health, with a particular focus on oxygen saturation levels, and the administration of antibiotic prophylaxis to reduce the risk of bacterial endocarditis due to the invasive nature of the procedures. This case highlights the importance of careful planning, vigilant monitoring, and a patient-centered approach in managing dental care for individuals with complex medical histories.

Keywords

Ventricular septal defect, Dental Caries, Heart Disease, Antibiotic Prophylaxis

Introduction

Congenital heart diseases (CHDs) are among the most prevalent developmental abnormalities in children, occurring in approximately 8 to 10 out of every 1,000 births.[1] These structural or functional defects in the cardiovascular system arise from abnormal heart development during fetal life. Ventricular septal defect (VSD), the most common form of CHD, accounts for about 20% of all heart defects in children and affects both genders equally.[2] VSD is characterized by a hole in the septum that separates the heart's right and left chambers, allowing abnormal bloodflow between the two sides.[3]

The causes of VSD can be either genetic or environmental. Although VSD is present at birth, its symptoms may not be immediately evident. While some congenital heart defects have few or no symptoms, more severe cases can manifest in newborns through signs such as rapid breathing, cyanosis, fatigue, poor circulation, and heart murmurs.[4]

Children with VSD face an increased risk of dental health issues, including a slightly higher incidence of dental caries, periodontitis, and elevated saliva lactobacilli counts.[5] Additional oral manifestations may include delayed tooth eruption, stomatitis, glossitis, and cyanosis of the mucous membranes, tongue, and gingiva.[6] Neglecting dental caries and delaying treatment can worsen these conditions, potentially leading to the need for treatment under general anesthesia. Furthermore, children with VSD are at a higher risk for infective bacterial endocarditis and increased mortality and morbidity associated with anesthesia-related cardiac arrest. Anesthesia and surgical complications may include cyanosis, polycythemia, and coagulopathy.[5]

Given these risks, and in light of the patient's cooperation, we opted to perform routine dental treatment without the use of general anesthesia. This approach aims to minimize complications while effectively managing the patient's dental health. In this article, we present a case involving a four-year-old child with VSD, illustrating our approach to managing dental care in this high-risk population.

Case Report

A 4-year-old boy was brought to our department by his parents after being referred by his pediatric cardiologist for an evaluation of his decayed teeth. The parents reported noticing decay in his upper front teeth about a month ago. A comprehensive medical and family history was obtained from the parents. The boy has had a systolic murmur since birth, which was diagnosed as a Restrictive Perimembranous Ventricular Septal Defect (VSD) with a left-to- right shunt. He is under annual monitoring by his pediatric cardiologist and is not currently on any medication. The patient is physically active and engages in activities comparable to those of his peers without any noticeable limitations.

On intraoral examination, all primary teeth were present in both the maxillary and mandibular arches. In the maxillary arch, labial surface caries were observed on teeth 51, 52, 53, 61, 62, and 63, with deep occlusal caries on teeth 54 and 65, deep mesio-proximal caries on tooth 64 and palatal pit caries with 55. In the mandibular arch, deep occlusal caries were noted on teeth 75 and 85, along with disto-proximal caries on teeth 74 and 84 (Figure 1). This suggests extensive dental decay affecting both anterior and posterior teeth in both arches, indicating a need for comprehensive dental treatment. Since the patient was cooperative, it was decided to proceed with treatment in a routine dental environment.

Figure.1: Preoperative photographs showing (A) Maxillary arch (B) Mandibular arch (C) Labialview

The diagnosis was made as Severe Early Childhood Caries. Radiographs revealed pulpal involvement in the maxillary arch with teeth 51, 52, 54, 61, 62, 64 and 65, as well as in the mandibular arch with teeth 74, 75, 84, and 85, indicating irreversible pulpitis. Additionally, dentinal caries were observed in teeth 53, 55, and 63, suggesting reversible pulpitis.

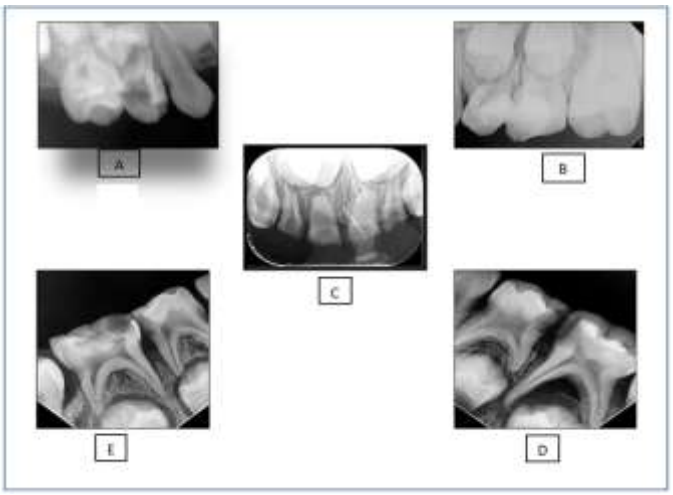

Figure 2: Pre-operative radiographs showing (A) Deep occlusal caries with pulpal involvement 54 (B) Deep proximal caries with pulp involvement 64, 65. (C) Grossly decayed 51,52,61,62 (D) Proximal caries with pulp involvement 74, 75. (E) Deep occlusal caries 85, disto-proximal caries with pulp involvement 84

Treatment Plan

The treatment objectives were to restore the carious teeth, perform endodontic treatment on the pulpally involved teeth using rubber dam isolation, arrest and control the carious process, implement preventive measures, and achieve esthetic and functional rehabilitation.

During the first visit, written informed consent was obtained from the parents, and clearance was secured from the pediatric cardiologist. Parent counseling was conducted to stress the importance of maintaining a diet chart and ensuring twice-daily brushing with fluoridated toothpaste. Antibiotic prophylaxis with Amoxicillin at a dose of 50 mg/kg body weight was administered one hour before the procedure. Restorations were then performed on teeth 53 and 63 using the Tell-Show-Do technique.

During the second visit, Glass ionomer restorations were placed on teeth 55 followed by stainless steel crowns. In subsequent visits, as the patient's cooperation improved, pulpectomy was performed on teeth 51, 52, 61, and 62, followed by the placement of strip crowns. Additionally, pulpectomy was completed for teeth 54, 64, 65, 74, 75, 84, and 85, followed by the placement of stainless-steel crowns. Full mouth rehabilitation was done. Post-operative IOPAs were taken.

Figure 3: Postoperative Photographs showing (A) Maxillary arch (B) Mandibular arch (C)Labial view

Figure 4: Post-operative radiographs showing (A) Pulpectomy with 54. (B) Pulpectomy with 64, 65 (C) Pulpectomy w.r.t 51,52,61,62 (D) Pulpectomy with 74, 75. (E) Pulpectomy with 84, 85.

Discussion

Congenital Heart Diseases (CHD) occur in approximately 8-10 per 1,000 live births worldwide and involve structural and functional abnormalities of the heart.[1] Common forms include ventricular septal defect (VSD), patent ductus arteriosus (PDA), transposition of the great arteries, and pulmonary atresia (PA). When treating children with CHD, especially those with PA or VSD, several factors must be considered, such as the increased risk of dental caries, bacterial endocarditis, and challenges with patient cooperation.[7]

Enamel defects such as hypoplasia and hypocalcification are prevalent among children with CHD, making their teeth more susceptible to plaque accumulation and rapid caries progression. The heightened sensitivity of these defective teeth also complicates oral hygiene, as children may experience discomfort during brushing, leading to inadequate plaque removal.[8] In this case, the presence of severe early childhood caries (S-ECC) likely heightened the risk of systemic infections, such as bacteremia and bacterial endocarditis, which are significant concerns in CHD patients. The interplay between these enamel defects and systemic vulnerabilities highlights the need for preventive oral health measures from an early age.[1]

Medications used to manage CHD can impact oral health by altering saliva, plaque, and the condition of the mucosa and gingiva. Careful evaluation of potential drug interactions is necessary when prescribing dental treatments, often requiring consultation with the child's medical or cardiology team.[4] In cases like severe early childhood caries (S-ECC), which is associated with high-carbohydrate diets, excessive bottle use, and frequent consumption of sweetened liquids, the risk of bacteremia increases following invasive dental procedures.[9] This risk is further heightened by the chronic use of sugar-containing medications, which promote the growth of cariogenic bacteria such as Streptococcus mutans and lactobacilli. Additional factors like xerostomia from diuretic drugs, poor oral hygiene, and feeding difficulties may necessitate a single visit for comprehensive dental treatment.[5]

The risk of infective endocarditis is a critical concern in children with congenital heart disease (CHD), particularly following invasive dental procedures. Bacteremia, which can occur from routine activities like tooth brushing or more complex procedures such as extractions, poses a significant threat to these patients.[10] In children with dental caries and gingivitis, the likelihood of bacteria entering the bloodstream increases substantially, which can result in infective endocarditis, a potentially life-threatening condition.[6] In the case of this patient, who presents with severe early childhood caries (S-ECC) and potential gingival inflammation, the risk of bacteremia becomes a primary consideration during treatment. Given these risks, the implementation of antibiotic prophylaxis prior to any invasive dental procedures is crucial to

prevent serious complications such as infective endocarditis.[11]

Preventive care plays a vital role in managing the oral health of children with CHD. In this context, it is essential not only to provide professional dental care but also to actively involve family members in maintaining the child's oral hygiene. Educating parents and caregivers about the critical connection between oral and systemic health is key to preventing dental issues that could exacerbate the patient's cardiac condition.[1] They should be instructed on proper brushing techniques, the importance of regular dental check-ups, and dietary modifications to reduce sugar intake. In this case, early and consistent preventive measures could have mitigated the progression of S-ECC, potentially avoiding the need for invasive dental treatments.[8] Furthermore, family members need to be aware of the risks associated with poor oral hygiene, including the increased likelihood of bacterial endocarditis, and the importance of adhering to recommended antibiotic prophylaxis when necessary.[8]

In summary, the following points should be considered in the dental management of patients with congenital heart disease.[12]

1. A thorough medical history should be taken.
2. Treatment should be done under stress-free conditions in conjunction with behaviour management techniques.
3. Premedication with anti-anxiety drugs should be administered to reduce anxiety.
4. Uncooperative children should be managed with conscious sedation or general anaesthesia.
5. Antibiotic prophylaxis is mandatory for procedures like deep scaling, minor surgical procedures and restorative procedures involving clamping and banding.
6. Child should be instructed to avoid vigorous brushing to prevent bacteraemia

Conclusion

The relationship between oral and systemic health is crucial, especially for children with congenital heart diseases (CHD). Pediatric Dentists, Pediatric Cardiologists, Anesthetists, and other healthcare professionals must collaborate to ensure safe and effective treatment, while also raising awareness among parents. Understanding the specific needs of children with CHD is essential for delivering appropriate dental care and improving their overall quality of life.

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