ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 02(C), pp. 30830-30833, February, 2019

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Case Report

DENTAL MANAGEMENT OF A CHILD WITH CONGENITAL HEART DISEASE - A CASE REPORT

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DOI: http://dx.doi.org/10.24327/ijrsr.2019.1002.3134

ARTICLE INFO

Article History:
Received 6th November, 2018
Received in revised form 15th December, 2018
Accepted 12th January, 2018
Published online 28th February, 2019

Key Words:
Tetralogy of Fallot, Congenital Heart Disease, Oral health, Full mouth rehabilitation, General anesthesia

ABSTRACT

Introduction: Children with Tetralogy of Fallot (TOF), a cyanotic type of congenital heart disease can present with significant oral health risk. The present article discusses the dental management of one such case under general anesthesia.
Aims and objectives: The aim of this case report is to furnish the fundamentals of managing a child with TOF on a dental and anesthetic prospective. The objectives include proper examination, prophylactic/therapeutic measures and special considerations along with a proper interdisciplinary approach.
Materials and methods: A brief case history was obtained followed by a thorough clinical examination after which preventive and corrective dental treatment protocols were planned. Considering the patient's general and oral health, full mouth rehabilitation was done under general anesthesia in a single visit. Various precautionary measures were taken considering her cardiac condition during general anesthesia administration.
Results: The entire dental needs were met with safe anesthesia, minimal stress and discomfort to the child. The comprehensive treatment plan helped to restore good oral health.
Conclusion: This case report highlights the precautionary measures to be followed during the administration of general anesthesia to prevent the risks and potential complications associated with it in patients with congenital heart disease. It also emphasizes the essentials of planning a structured and multi-disciplinary treatment plan for a child with TOF.

INTRODUCTION

Heart disease is one of the most common developmental abnormalities among children, occurring in approximately 8 to 10 in 1,000 births[1]. Congenital heart diseases (CHDs) are abnormalities in the cardiovascular structure or function due to abnormal heart development during fetal life [2, 3]. TOF, a cyanotic type of congenital heart disease, accounts for around 10% of all CHD, with a prevalence of >2 per 10,000 births, with a male prediliction[4-6]. TOF constitutes the following 4 cardiac abnormalities: (i) ventricular septal defect; (ii) subpulmonary stenosis; (iii) overriding of aorta, and (iv) right ventricular hypertrophy [7, 8]. The exact etiology is unknown but the associated conditions include: low birth weight; short gestational duration; rubella; maternal infections; smoking or alcoholism; drugs such as Thalidomide, Warfarin, and Phenytoin[5, 9], and gene mutations[10, 11]. When such a patient reports to a dental clinic, treatments should be provided with immense care and concern with minimal discomfort.Oral abnormalities associated with TOF are i) cyanosis, most prominently in the mucous membranes of the lips and mouth or in the nail beds ii) delayed eruption of dentitions (Deciduous and Permanent)[12] and iii) enamel hypoplasia[13]. Children with moderate and severe CHD have significant oral health risk factors like feeding difficulty, frequent vomiting, malabsorption, and increased energy demands due to increased respiratory and cardiac work load which may lead to frequent meals even during the night[14]. Some cardiac drugs like digoxin, when available in a sucrose-based suspension, can increase the caries risk[15, 16]. The systemic effect of CHD might induce

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developmental defects of the enamel (DDE), since ameloblasts are highly sensitive to changes in metabolic conditions and can result in enamel hypoplasia in the primary dentition[17]. Also, enamel defects with rough, pitted or exposed dentine surfaces increase susceptibility for caries[18]. Due to all these predisposing factors, children with CHD are reported to be more prone to develop carious lesions and gingivitis when compared to healthy children.

Clinical Significance

The dental management of children with CHD needs special consideration because these children are predisposed to develop Infective endocarditis (IE), an infection of the heart's inner wall (endocardium) including the heart valves. Untreated oral diseases such as periodontitis increase the risk of bacteremia [19, 20]. Therefore, it is necessary to conduct a thorough oral examination, preventive oral health programs followed by the promotion of individual hygiene measures and the implementation of therapeutic procedures in children affected by CHD at an early stage [21]. Additionally, acyanotic heart disease with pulmonary artery hypertension and history of recurrent respiratory tract infection may pose problems during dental procedures performed under GA before the surgical correction of the cardiac defect. Thus, this case report highlights about the dental and anesthetic management of a child with congenital heart disease.

CASE REPORT

Diagnosis

A 5-year-old old female child diagnosed with congenital heart disease soon after birth was referred for dental opinion prior to cardiac surgery. Her medical history revealed that she had dyspnoea on exertion since birth and she was found to have TOF (Ventricular septal defect, Patent ductus arteriosus, Supramitral membrane) with severe pulmonary artery hypertension. On intraoral examination, she was found to have poor oral hygiene and multiple deep carious lesions in relation to 51, 52, 54, 61, 62, 64, 73, 74, 75, 84 and 85. The patient was an uncooperative patient with high levels of dental anxiety. The child was continued on her routine cardiac medications.

Fig1 Pre-Operative view Right lateral aspect

Fig 2 Pre-Operative view Upper occlusal aspect

Fig 3 Pre-Operative View Lower occlusal aspect

Treatment Plan

The treatment plan was divided into preventive treatment and corrective treatment procedures. In the preventive treatment protocol, fluoride prophylaxis, diet counseling and oral hygiene instructions were given to the child and her parents. The corrective treatment plan included pulpectomy in relation to 51,52,61,62,74,75, 84, 85, pulpotomy in relation to 54, 64 and composite restoration in relation to 73.

Procedure

Considering the stress to the patient during multiple dental visits and the patient's non-cooperation, full mouth rehabilitation was proposed to be performed under general anaesthesia in a single sitting. A written informed consent and opinion was obtained from the parents and clearance was obtained from the pediatric cardiologist. Antibiotic prophylaxis of Amoxicillin 50mg/kg body weight was given one hour prior to the procedure. Considering the high pulmonary pressure and recurrent RTI of the patient, the consultant anaesthetist suggested the following protocols during general anesthesia administration.

i. Good premedications
ii. Achieve deeper plane of anesthesia while intubation as any pain stimuli will aggravate the existing PAH. Severe (Pulmonary Artery Hypertension) PAH precipitated during anesthesia may produce tachycardia, hypotension and desaturation.
iii. Need hyperventilation with 100% oxygen to produce hyperoxyia and hypocarbia, as high PO_2 and low PCO_2 will reduce pulmonary hypertension.
iv. Needs endotracheal tube suction to remove the secretion which if present will produce bronchospasm and precipitate severe PAH.
v. Good antibiotic cover with bronchodilator IV or nebulisation
vi. Duration of anesthesia should be shorter as long duration warrants more anesthetic drug which delays the recovery and sometimes, mechanical ventilation may be needed after the dental procedure.
vii. A dose of steroids before extubation necessary to reduce bronchospasm related to neostigmine and secretions.
viii. The child would need an O_2 mask to improve oxygenation and vital parameters should be monitored to prevent post operative hypoxia and PAH.

Anesthetist's instructions were strictly followed and full mouth rehabilitation (pulpectomy in relation to 51,52,61,62,74,75, 84,

85, pulpotomy in relation to 54, 64 and composite restoration in relation to 73) were performed under general anaesthesia with continuous cardiac monitoring (ECG, Heart rate, and Blood Pressure and Oxygen saturation). The patient recovered normally from general anesthesia post-operatively. After completion of the dental procedures, the patient underwent a successful surgical correction of her TOF.

Figure 4 Full mouth rehabilitation performed under general anaesthesia

Figure 5

Fig 5 Full mouth rehabilitation performed under general anaesthesia

DISCUSSION

Patients with congenital heart diseases have a higher rate of untreated carious lesions and a higher percentage of enamel defects, showing high vulnerability and a higher risk for the development of caries. Sivertsen *et al*. in a cross sectional study showed that caries prevalence at dentine level was significantly higher in patients with CHD[11]. Hawary *et al* showed that CHD leads to alteration in the structure of enamel and dentin of deciduous incisors at an ultrastructural level. It also leads to a significant decrease in mineral content (Ca and P) of deciduous enamel and dentin when compared to healthy controls, rendering the dentition at increased risk of dental caries. Also several disease-related factors may be involved in producing these changes which include hemodynamic alterations, malnutrition, infective endocarditis, medications and hypoxia [22]. In the present case, the child had severe early childhood caries (S-ECC) which was related to the child's diet (high in carbohydrates) and prolonged nocturnal bottle feeding practices in addition to the above mentioned predisposing factors.

The presence of plaque and gingivitis can increase the risk for bacterial endocarditis in children with congenital heart disease[23]. Hence, it is essential to emphasize the importance of preventive measures through oral health education, motivation and active involvement of family members in the child's oral health [9]. This may avoid the need for invasive procedures. If these procedures are mandatory in patients with CHD, they should always be preceded by antibiotic prophylaxis [24, 25]. In this case, diet counselling was given to the child's parents and oral hygiene instructions were given in the preventive treatment protocol. This was followed by the antibiotic prophylaxis (Amoxycillin) prior to the invasive procedure.

Babaji et al in the dental management of a child with tetrology of fallot performed oral prophylaxis, restoration and extraction of non-restorable 85, under local anaesthesia with antibiotic coverage [26]. Ayala*et al* in 2016 in the dental management of a child with tetrology of fallot provided a rehabilitation treatment by installing a fixed partial denture with a Nance appliance following the extraction of few teeth under antibiotic coverage [9]. In the present case, the child had multiple carious teeth requiring pulpotomy and pulpectomy. Stress to the patient during dental procedures is known to induce cyanotic events in patients with congenital heart disease which may induce hypoxemia, hyperpnoea and irritability [27, 28]. Hence to avoid stress to the child during multiple dental visits, the child was planned to be treated under general anaesthesia (GA) in a single sitting.

In summary, the following points should be considered in the dental management of patients with Congenital Heart Disease [26].

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. General anesthesia should be administered carefully for a shorter span of time with the above mentioned precautions.
6. Antibiotic prophylaxis is mandatory for procedures like deep scaling, minor surgical procedures and restorative procedures involving clamping and banding.
7. Child should be instructed to avoid vigorous brushing to prevent bacteraemia.
8. Active dental diseases should be treated before cardiac surgery is carried out.

Consistent with the literature, in this case the treatment was planned following a detailed medical and dental history, thus achieving a proper diagnosis and treatment. Inter-disciplinary consultation with the Pediatric cardiologist and the consultant anesthetist reduced the patient's risk of developing serious systemic complications.

CONCLUSION

The relationship between oral and systemic health should be considered as an important criteria and should be consistently reinforced, especially to parents of children with cardiac diseases. Pediatric Dentists, Pediatric Cardiologists, Anesthetists and other associated health practitioners should work together as a team in order to treat them successfully without any complication and to create awareness among children affected with congenital heart diseases and their parents. Knowledge of cardiac conditions and their management is absolutely essential for effective delivery of dental care and also to enhance oral health-related quality of life in this vulnerable population.

This article highlights the role of precautionary anesthetic measures to be followed to prevent the associated risks and complications of general anesthesia for patients with congenital heart diseases and also emphasizes the need for a structured and inter-disciplinary treatment plan.

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