Oral rehabilitation of a 4-year-old child with early childhood caries under general anaesthesia: a case report on long-term outcome

ABSTRACT

Background Young patients with early childhood caries (ECC) commonly undergo oral rehabilitation under general anaesthesia (GA), often because of problems with behaviour management. Children with a history of ECC are highly susceptible to the development of new caries, even after comprehensive oral rehabilitation.

Case report The present paper reports the case of a female patient, aged 4.1 years, with ECC who was referred for treatment to the Department of Paediatric Dentistry of the Universitat Internacional de Catalunya. On account of the requirement for extensive dental treatment, and because of behaviour management problems, her dentition was restored under GA. A combination of restorative approaches and techniques was used, including the placement of composite resins, preformed metal crown restorations, extractions, and space maintainers. The patient was followed for 24 months, both clinically and radiographically.

Conclusion This case reflects the need to provide adequate support to children at high risk for ECC, together with their families by developing more acceptable and effective biological and behavioural interventions in order to reduce caries relapse after oral rehabilitation under GA.

Keywords Early childhood caries; General anaesthesia; Primary teeth; Rehabilitation.

Introduction

Early childhood caries (ECC) is a relatively new term that is used to describe rampant caries in infants and toddlers [Tinanoff and O’Sullivan, 1997]. The condition typically affects the primary maxillary anterior teeth, and then leads to involvement of the primary molars. The disease of ECC is defined by the presence of one or more decayed, missing, or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. In children who are younger than 3 years of age, any sign of smooth-surface caries is indicative of severe ECC (S-ECC) [Ismail, 2003; Jose and King, 2003]. Studies [Horowitz, 1998; Bowen, 1998] have shown that children with ECC have a higher risk of new caries in their permanent teeth than those who do not suffer from the condition, and extensive dental treatment is required routinely for these children [Berkowitz, 2003]. Considerable attention has been focused on the use of the nursing bottle in ECC [Bowen, 1998]. The American Academy of Pediatric Dentistry (AAPD) recognises that this distinctive pattern of caries is associated with frequent or prolonged consumption of liquids that contain fermentable carbohydrates [AAPD 2006-07].

Management of the behaviour of paediatric patients is essential in the practice of paediatric dentistry. Children with ECC often present challenges for behaviour management. Consequently, they commonly receive oral rehabilitation under general anaesthesia (GA) [Tinanoff and O’Sullivan, 1997]. The decision to perform dental treatment under GA is based upon the age of the patients, their ability to cooperate in a normal setting, their medical status, and the extent of the treatment required [Berkowitz et al., 1997]. The AAPD recognises that a population of patients will benefit from deep sedation or GA, because of their need for extensive treatment, acute situational anxiety, uncooperative age-appropriate behaviour, immature cognitive functioning, disability, or medical condition [AADP 2005].

General anaesthesia is a controlled state of unconsciousness that is accompanied by the loss of protective reflexes, including the ability to maintain an airway independently and to respond purposefully to physical stimulation or verbal commands [Bohaty and Spencer, 1992]. The indications for GA include the need for immediate comprehensive oral/dental care, extensive dental treatment in very young children, and orofacial trauma [AAPD 2007]. Dental care under GA for preschool children has been reported to be accepted well by parents and is perceived to have a positive social impact on their child [Fung et al., 1993]. Parents have reported an increased frequency of smiling, improved school performance, and increased social interaction after the procedure [Fung et al., 1993].

Several studies [Enger and Mourino, 1985; Vermuele et al., 1991; O’Sullivan and Curzon, 1991; Bohaty and Spencer, 1992; Berkowitz et al., 1997; Almeida et al., 2000] have described the clinical characteristics of both
healthy and medically complex paediatric patients who required dental treatment under GA. In a study of 300 paediatric patients treated under GA, rampant caries was the most common indication for such treatment, followed by problems with behaviour management [Leagault and Auger 1972]. The recurrence of caries and the outcomes of treatment provided under GA have also been the focus of multiple reports [Enger and Mourino, 1985; Vermeulen et al., 1991; O’Sullivan and Curzon, 1991; Bohaty and Spencer, 1992; Nunn et al., 1995; Berkowitz et al., 1997].

Various studies [Worthen and Mueller, 2000; Berkowitz et al., 1997; Enger and Mourino, 1985; Primosch et al., 2001; Sheehy et al., 1994] have shown that parents do not see the benefits of regular recall visits after treatment under GA. This is demonstrated by studies showing that many patients who undergo GA for dental treatment are lost at the 6-month follow-up. However, some patients will need a repeat visit for further dental treatment under GA. A previous dental GA experience may have an immediate impact on parents to promote healthy behaviours, but the challenges that they face may eventually prevent long-term maintenance of good oral health. A comprehensive and frequent preventive approach is required to reduce the relapse rate following dental surgery for ECC. Some of the reasons for retreatment under GA include: use of a nursing bottle, a child being responsible for brushing their own teeth, and lack of follow-up dental care [Amin et al., 2010].

The purpose of this paper is to report the case of a girl with ECC and present an alternative prosthetic treatment that involves a maxillary tooth-supported overdenture to provide aesthetic and functional oral rehabilitation, as well as to restore the patient’s former self-esteem.

**Case report**

A female child aged 4.1 years was referred to the Paediatric Dentistry Clinic of the Universitat Internacional de Catalunya (UIC), Barcelona (Spain) for treatment.

The mother reported that she thought that her daughter had “caries”. The general health status and past medical history of the patient were unremarkable. The mother also reported that bottle-feeding was the child’s major source of nutrition and that she was bottle-fed sugar-sweetened milk and beverages throughout the day. All primary teeth were present. Some teeth had extensive active carious lesions in the dentin and severely damaged crowns. Most of them presented irreversible pulpal involvement, such as extensive internal and external dentin resorption, as well as rupture of the pulp chamber floor, and therefore showed indications for extraction (Fig. 1).

The treatment plan was decided and explained to the mother, who signed an approved informed consent form that authorized the treatment.

Standard clinical and radiographic examination revealed the remains of roots in the maxillary and mandibular arches; the open bite showed interposition of the tongue, and there was loss of the vertical dimension. The mandibular incisors had no caries, and a normally functioning tongue covered the mandibular incisors, which protected them from the formation of caries [Horowitz, 1998, Kotlow, 2011]. The patient presented parafunctional habits and she had a height and weight well below the percentile established as normal for her age. The diagnosis of ECC was made on the basis of the clinical and radiographic features (Fig. 2).

The main therapeutic goals were to eliminate the pain and infection, reduce the load of the bacterium Streptococcus mutans in the oral environment, eliminate the carious lesions, and improve the aesthetic appearance of the teeth to reduce the likelihood of related psychological problems. Owing to the lack of cooperation shown by the patient, which was caused by a low level of cognition and lack of understanding of the language, and the extent of treatment required, the procedure was performed under GA. Consequently, the treatment plan was defined in two phases: an initial phase of restorative treatment under GA, and a second phase to establish the aesthetic appearance using a removable dental prosthesis.

For the initial phase, the intervention was scheduled after the necessary tests had been conducted. The child’s dentition was restored under GA using a combination of restorative approaches and techniques, which included placement of composite resins, pulp therapy, conventional stainless steel crown restorations (3M ESPE, St. Paul, Minnesota, USA), and extractions.
The crowns were cemented with glass ionomer cement (Ketac Cem®, 3M ESPE, St. Paul Minnesota, USA).

The patient was discharged from the hospital on the same day that tolerance for liquids was established, and was prescribed an antibiotic (amoxicillin 250 mg/5 ml during 7 days) and analgesic (Junifen®; 4% delivered at 1.3 ml/8 hours) for 7 days. The parents received information on oral health techniques and dietary practice. It was suggested that the teeth should be brushed with a soft brush after every meal, and that topical chlorhexidine (0.12%; Clorhexidina Lacer, Lacer S.A., Barcelona, Spain) be applied to the affected area with a cotton swab twice daily for 1 week.

In accordance with the CAMBRA protocol [Ramos-Gomez et al., 2007] and the protocol established by our Department, the patient was introduced to a preventive post-treatment programme, which was justified by the extreme risk of caries presented. It was recommended that her teeth should be brushed with toothpaste that contained more than 1100 ppm fluoride (Fluor kin Calcio®, Dentaid, Cerdanyola, Barcelona, Spain) twice daily. Chlorhexidine 0.12% (Clorhexidina Lacer, Lacer S.A., Barcelona, Spain) was applied every day for 1 week, followed by fluoride 0.05% every day for 3 weeks alternately, with quarterly check-up examinations.

Fifteen days after the treatment, the gum appearance was healthy, the crowns showed no signs of mobility and good adaptation. Good adaptation ensured that there were no signs of gingival inflammation (Fig. 3).

The second phase, to re-establish the aesthetic appearance of the patient by using a removable dental prosthesis, could not be carried out because of economic problems related to the family. At follow-up examination after 3 months, the restorations remained intact and no further caries were detected. At 12 months, the patient presented new cavities and “white spot lesions”. The primary mandibular incisors showed extensive active carious lesions in the dentin, which were restored. The patient had behavioural problems and disturbed relationship, which compromised her school performance, and also showed weight loss. The Department proposed prosthetic treatment to provide aesthetic and functional oral rehabilitation as well as to restore the patient’s self-esteem (Fig. 4).

In paediatric patients, the integrity of the teeth is intimately related to preservation of the occlusion, aesthetics, phonetics, and the psycho-emotional state [Rifkin, 1983, Judd et al., 1990]. Early loss of the temporary upper teeth can lead to psychological problems and/or can negatively affect the child’s self-esteem and their socialization at an important stage of development [Walsh, 1976, Paul et al., 1995].

The intermaxillary relationship and vertical dimension were determined using wax rims, to prevent shrinkage of the point of the chin and to preserve the smile line, and then the wax rims were mounted on a semi-adjustable articulated apparatus in the laboratory. The colour was selected as VITA A2 (Vitapan® classical, VITA Zahnfabrik, Bad Säckingen, Germany). After evaluation of phonetics and aesthetics, acrylisation was performed. With the objective of maintaining sufficient space for the mandibular arch, two metallic retainers were made in the clinic to reduce the cost of the treatment.

Both the mother and child received instructions regarding how to wear, clean, and maintain the overdenture. After one week, the child demonstrated improved self-esteem.
and socialisation. The patient has been followed for 24 months since the initial treatment, and visits the clinic every 3 months. On each visit, intraoral clinical examination is performed to check the status of exfoliation of the primary teeth, eruption of permanent teeth, aspects of the soft tissues underneath the denture, the health status of the periodontal tissues, quality of the tooth remnants, and compliance with control measures for caries (plaque control, diet, and rational use of fluoride). In addition, the need for denture replacement or repair is assessed, as well as the presence of worn areas in the prosthesis (Fig. 5).

Discussion

Various studies [Leagault and Auger, 1972; Enger and Mourino, 1985; Vermeulen et al., 1991] have shown that the combination of ECC and problems with behaviour management is the most common indication for dental treatment under GA. Especially given the complex aetiology of ECC, a holistic approach is obviously needed to fight this serious public health problem. An early dental visit can reduce the risk of ECC. The AAPD [AAPD 2006-07; AADP 2007] and the American Dental Association [ADA, 2004] recommend that this first visit should occur within six months of the eruption of the first tooth and no later than 12 months of age. The visit should include: oral examination and assessment of the risk of caries in the child and the parents, with guidelines about how to prevent caries and maintain good oral health [AAPD 2010/11; Soxman, 2002]. Early education of parents and the use of interventions can improve health and reduce costs. Some studies [Nair, 1998; Savage et al., 2004] have shown that an early start to dental visits results in fewer cavities, and consequently, a reduced expense.

The prevention of caries should be a priority amongst dentists and other health professionals that can contribute to oral health in children. Paediatricians and nurses see children from a very early age, with great frequency and regularity during critical periods of development, and such professionals could be very effective in promoting oral health.

Preventive strategies should be individualised to each patient according to the risk of caries. Such measures include: daily brushing with fluoride toothpaste, topical applications of fluoride, and the placement of sealants in high-risk areas. It is necessary to train and educate health professionals who are responsible for advising and promoting the acceptance of preventive dental guidelines [Lewis et al., 2000; Prakash et al., 2006].

A combination of sociodemographic factors, dietary habits, and the presence of Streptococcus mutans are predictive factors for caries in children between 1 and 3.5 years of age. As described in previous studies [Berkowitz et al., 1997; O’Sullivan and Curzon, 1991; Leagault and Auger, 1972], the case presented herein showed the appearance of new cavities or relapses on follow-up examination. Thus, the present case reflects the importance of establishing and implementing a preventive protocol following GA. Repeated dental surgery to deal with new carious lesions is commonly necessary among children with ECC. Factors associated with the need for a second dental treatment under GA include: factors related to the child, which include extensive caries of maxillary central incisors, bottle-feeding at the time of GA, and lack of attendance at follow-up appointments, and parental factors, which include not brushing the child’s teeth, a dysfunctional social situation, and failure to return for follow-up examinations [Sheller et al., 2003]. As a result of the above-mentioned findings, one of the strategies recommended to improve the long-term dental health of high-risk children is aggressive treatment of existing caries at the time of GA, active postoperative follow-up, and education of caregivers [Sheller et al., 2003]. Almeida et al. [2000] reported that a group of children with ECC who were treated under GA demonstrated significantly higher subsequent rates of caries than a control group who were initially untreated. Leagault and Auger [1972] found that 39% of all children who underwent treatment under GA required subsequent dental treatment, and 11% of these patients needed retreatment under GA. They concluded that a more aggressive approach of dental treatment might be necessary for children with ECC who require treatment under GA because they found that 17% of children with ECC treated under GA required further treatment within 2 years. Berkowitz et al. [1997] and Worthen and Mueller [2000] found that more than 50% of children treated under GA who presented with caries required further treatment at the 6-month recall visit. Chase et al. [2004] found a high correlation between the presence of S. mutans and ECC. This is one of the reasons for recommending the use of toothpastes, chewing gums that contain xylitol, chlorhexidine varnishes, and gels. Such practices can reduce the number of microorganisms and the risk of development of new caries. As described previously [Leagault and Auger, 1972; Berkowitz et al., 1997; Worthen and Mueller, 2000], it appears that the risk of occurrence of new cavities is greatest between 6 and 38 months after the completion of dental treatment under GA. Further research needs to be done on the education and motivation of parents of paediatric dental patients. Dental caries is a truly preventable disease. However, most of the paediatric population does not have the manual dexterity required to maintain proper oral hygiene, and thus parental assistance is necessary. Many parents do not see the need for oral hygiene and are too busy to take an active role in meeting their child’s dental needs. These attitudes towards oral hygiene and primary teeth must be addressed more effectively to prevent the most susceptible children from developing caries. Bullen et al. [1988] found that parents are a key element in preventive dentistry, and highlighted the importance of the relationship between the dentist, the child, the parents, and society. In contrast, Roberts [1990] noted that after treatment under GA,
parents did not see the importance of preventative home care and failed to keep appointments, because they did not perceive a need for retreatment.

The need for treatment under GA can be prevented by a change in the attitudes of parents, patients, medical practitioners, and dentists regarding oral hygiene and the prevention of caries.

Conclusion

The motivation to treat a patient with ECC should not be restricted to aesthetic and functional oral rehabilitation, but should also include effective measures to control caries activity, in such a way that the treatment may ensure permanent dentition that is free of caries.

The present case reflects the need to provide adequate support to high-risk children and their families by developing more acceptable and effective biological and behavioural interventions, in order to reduce the relapse of caries after oral rehabilitation under GA.

References