

Management of ECC

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Introduction

Early Childhood Caries is a complex disease involving maxillary primary incisors within a month after eruption and spreads rapidly to involve other primary teeth¹. It is a serious socio-behavioural and dental problem that afflicts infants and toddlers². American Academy of Pediatric Dentistry (AAPD) in 2003 defined ECC as the presence of one or more decayed (non-cavitated or cavitated), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. The academy also specifies that, in children younger than 3 years of age, any sign of smooth surface caries is indicative of severe early childhood caries (S-ECC). From ages 3 through 5, 1 or more cavitated, missing (due to caries) or filled smooth surfaces in primary maxillary anterior teeth or a decayed, missing, or filled score of > or equal to 4 (age 3), > or equal to 5 (age 4), or > or equal to 6 (age 5) surfaces constitutes severe early childhood caries (S-ECC)³.

One of the most common chronic disease of childhood is early childhood caries. It is five times more prevalent than asthma⁴. Despite major advances in the field of caries prevention over the past few decades, there are reports of high nursing caries prevalence in young children.⁵ This is a challenge to the dental profession throughout the developing and developed world.

Early Childhood Caries is a multifactorial disease.² The factors include susceptible tooth and host, fermentable carbohydrates in the diet, cariogenic microorganisms and time.⁶ The biology of the mouth may be modified by several factors unique to young children related to the immaturity of the host defense system, as well as behavioral patterns associated with feeding and oral hygiene in early childhood. Early Childhood Caries is a health problem that warrants the attention and resources of the community. Efforts to increase awareness of the public on the prevalence, severity and

impact of ECC on overall health, growth and development of children should be undertaken. Awareness on the diagnosis, prevention and treatment of ECC should be increased among dentists, physicians, pediatricians, nurses, midwives and other community health workers involved in care of preschool children. Cooperation should be sought to integrate a strong oral health preventive component into existing pre- and ante-natal health programs for women who are pregnant, lactating, or have children reporting to the well-baby clinics.⁷

This is logical, ethical, appropriate and achievable. Treatment of ECC is a multifaceted, which includes multi-speciality approach involving pedodontist, pediatrician, dietician and a counselor.

The First Dental Visit

The most important ask for today's dentist is to identify the high caries-risk child before the clinical manifestations of the disease become apparent, and then to provide individualized protection to that child. The preventive process must begin early in infancy to ensure a child's oral health. The purpose of the first dental visit is to assess individual risk, and to educate the parent or caregiver about reducing such risk. A clinical examination is an essential part of a child's first dental visit, and as an important part of risk assessment. A correct and efficient diagnostic investigation must include the identification and evaluation of risk factors. An initial oral evaluation should occur within 6 months of the eruption of the first primary tooth, and no later than 12 months of age. The best way to accomplish a dental examination on an infant is the "knee-to-knee" method. The dentist and caregiver should sit knee-to-knee facing each other. The child's legs should be placed around the parent's waist, and the child's head is placed in the cradle formed by the dentist's lap. The dentist should look for early signs of dental caries. White spot lesions represent the early clinical manifestations of the caries process.

Anticipatory guidance is another

important element that must be incorporated into the child's first dental visit. Anticipatory guidance refers to sharing with parents or caregivers information about the child's current oral health status, as well as future needs. When preventive information is provided to parents, it must be easily understood and easily used. The information must as a clear as possible. Diet counseling is an integral part of anticipatory guidance. Bottle-fed infants should not be put to sleep with the bottle. Nocturnal breast-feeding should be discouraged after the first upper incisor erupts. Only 6 ounces of fruit juice should be consumed by infants each day. During the first dental visit, a variety of information needs to be gathered which will be used in the "non-exclusive contributory disease model" of dental caries. The required information falls into three categories: environmental factors, infectious agent and genetic factors.

Environmental Factors Are Noted

Existing dental caries, estimated sugar intake, estimated fluoride exposure, socioeconomic status, oral hygiene practices, and dietary habits are recorded.

Infectious agents can be assessed using microbial sampling, such as the Dentocult SM Strip for assaying MS levels in the mouth.

Genetic factors can be evaluated, including Salivary flow, salivary buffering capacity, and tooth morphology disorders.

If obvious decay is present full coverage of the teeth with stainless steel crowns or veneered crowns is indicated. If decay reaches the pulp chamber pulp therapy or extractions will need to be considered. Space maintenance is in general not necessary (anterior primary teeth are usually spaced; space maintenance is a concern for posterior primary teeth). Young pre-cooperative children may need sedation or general anesthesia to accomplish treatment⁸.

Radiographs Recommended

Appropriate radiographs are needed for the treatment to be started. The radiographs of the involved teeth are taken prior to treatment

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and the treatment plan is made whether a restoration is required or a pulp therapy is to be done. Clinical signs and symptoms are important in treatment planning, radiographs are taken to confirm the clinical diagnosis and they also help during treatment.

Recording The Diet

When this is given to parents, it is explained that their help is needed to find the cause of the decay in their children's teeth. The cause is related to what their baby eat and drink over a four day period, together with the time of feeding. They are requested to keep the diet sheet with them whenever they are feeding their baby. Quantities of food consumed are not specifically requested, but it should be stressed that nothing should be changed only because a record is being kept. Dentist and parents are partners in the investigation and the objective of the exercise is to help, not to condemn. Although this strategy is useful for many patients, it may be inappropriate in others. Sometimes variable dietary habits will mean that the four day diet sheet is inappropriate or even misleading, a holiday should be included in the four day diet sheet. If the parents understand the purpose of the record, they may suggest how best it can be kept. Finally it must be appreciated that a parent may not always tell the truth, although if the patient knows what to lie about, progress has been made by the dentist in educating them⁹.

Analysis of The Diet Sheet

The dentist and the parents look at the sheet together and the parents help the dentist in analyzing it. A highlighter pen is useful to mark items containing sugar. The dentist also may encourage the mother to identify the sugar containing food items. The number of sugar attacks can be counted and this number is recorded on the top of each day. Special note is taken of on between meal snacks, whether the main meal is sufficient, any medication taken which contain sugar and any sugar containing sweets especially taken as pre-bed snacks or drinks⁹.

Biochemical & Microbiological Tests for Dental Caries

Determination of oral MS bacterial levels can be done using a laboratory facility, or a chairside-kit. When using a laboratory facility, the stimulated saliva is collected after chewing on paraffin for 5 minutes. It is then transported in a special medium to the laboratory. After incubation on selective medium agar plates, the MS colonies on the plates are counted. The results are expressed as colony forming units (CFU) per ml of saliva. When using a chairside kit for determining MS levels, the choices include an agar kit or a Strip Mutans test. One example of the agar kit is "Cariescreen." An example of the Strip Mutans test is the "Dentocult Strip Mutans." All of these kits need to be incubated for 48 hours before they can be read. Salivary flow and composition can also affect the health of oral soft and hard tissues. The clearance of acid metabolites by

saliva is an important defense mechanism against hard tissue demineralization. To measure the flow of saliva, the child is asked to chew a paraffin tablet for 1 to 2 minutes, and to swallow the saliva. The timer then starts. The child is then asked to chew the paraffin for 5 minutes, frequently spitting saliva into a graduated test tube. When the time is up, the amount of secretion is recorded in milliliters, and the flow rate is calculated in ml/min.

The salivary buffer systems act as regulator of oral pH and thereby act to control the remineralization-demineralization process. This capacity is based on the phosphate system, as well as the carbonic acid and bicarbonate systems⁸.

Professional Dental Measures

Professional dental measures are conducted mostly at a dental office. The goal of primary prevention is to decrease or postpone the transmission of Mutans streptococci from mother to child. Chemotherapeutic treatment of caries is based on the use of two well-known agents (fluoride and chlorhexidine) to achieve selective antimicrobial control of carious microflora. Fluoride and chlorhexidine have an antimicrobial action against the systemic and topical use of fluoride is the most effective measure to prevent dental caries. Fluoride, the key agent in battling caries, works primarily by topical action: inhibition of demineralization and enhancement of remineralization. Twice daily exposure to topical fluoride via fluoridated toothpaste is a major component of caries prevention therapy. Fluoride varnish may be applied with a soft brush, and reapplication is recommended every 3 to 6 months. The anticaries action of fluoride results from two different mechanisms¹⁰.

The differential sensitivity of MS to chlorhexidine makes selective chemotherapeutic treatment of caries possible. When chlorhexidine is used in high risk subjects, significant reduction (50%) in children of new lesion development can be obtained. Chlorhexidine varnish seems promising, because the concentration of chlorhexidine, and the frequency of chemotherapeutic treatment are the most important factors to prolong MS suppression. EC40 and Chlorzoin are two European varnishes used⁸.

There is one other chemotherapeutic agent for caries which is currently being researched: providine-iodine. Ten percent providine-iodine solution may be applied to the teeth of infants at high risk for ECC. Iodine may be appropriate as long as the infant is not allergic to it. Iodine kills all of the bad dental bacteria for three to four months.

The Focus on Fluoride Varnish

It is now realized that the most important action mechanism of fluoride takes place on the enamel surface of the tooth. Fluoride inhibits the loss of minerals and promotes the remineralization process. Apart from water fluoridation, fluoride varnish seems to be the

most suitable and documented fluoride regimen for the infant.

Fluoride varnish contains 2.26% fluoride ion. The actual amount of fluoride used per treatment is 5-11 mg. The volume of fluoride varnish per treatment (0.2-0.5 ml) is significantly less than the probable toxic value for a 10 kg child (2.0 ml). Fluoride varnish is available under the trade names Durafluor and Duraphat. Fluoride varnish is recommended for use in preschool age children because of its ease of application, and its equivalency to APF gel systems. The varnish is applied with a small soft brush, and reapplication is recommended every 3 to 6 months¹⁰.

Restorative Treatment

Considering the age of the child and the ability to co-operate, the treatment can be planned either in dental office by using different pharmacological interventions or by using general anaesthesia as a last resort for complete rehabilitation of the oral cavity of an un-cooperative child.

In dental office, active lesions on free smooth surfaces can be managed by plaque control alone. Gradually after good plaque control by professional and partly by parents, the lesion becomes harder which is assisted by the deposition of mineral from saliva. A white or brown spot lesion should never be attacked with a bur under the guise of treating caries. A disclosing agent can help the mother in removing the plaque. If removal is not possible then a restoration may be essential so that plaque control can be re-established.

Modern adhesive materials have revolutionized cavity preparation and restoration. For anterior maxillary teeth cavities acid-etch composite restoration can be used. Pado-strip crowns and poly carbonate crowns can be used for extensive coronal destruction due to caries in the anterior teeth. They are more esthetic, functional and durable. Alternatively, glass ionomer restorations, which adhere to teeth as well as release fluoride can also be used in the anterior maxillary teeth, however they are esthetically less pleasing compared to composites¹¹.

For unco-operative patients who cannot stand the long time treatment procedures, the Atraumatic restorative treatment method can be used^{8,12}. In this technique the carious enamel and the infected dentin are excavated with a spoon excavator or a slow speed bur and restored with glass ionomer cement. It has great advantages like minimal use of hand instruments, the glass ionomers release fluorides and are well retained. It can be used to avoid the need for either local or general anesthesia for young children.

Restorative strategies are as follows

- I) Early caries with minimal loss of enamel weekly professionally applied fluoride therapy.
- II) Extensive cavitation with no pulpal involvement:

A) Anterior teeth

- i) Acid etched composite resin restoration.
- ii) Pedo strip crowns.
- iii) Glass ionomer cement restoration.

B) Posterior teeth

- i) Posterior composite resin restoration.
 - ii) Glass ionomer cement restoration.
 - iii) Stainless steel crowns.
- III) Extensive cavitation with pulpal involvement:
- A) Pulpotomy or pulpectomy
 - B) Extraction.
 - C) Space maintainers.
 - D) Partial or complete dentures.

The modern approach to caries management is the “medical model.” The medical model treats the underlying caries process, and has 4 steps:

- 1) Gaining control of the bacterial infection.
- 2) Reduction of risk levels.
- 3) Remineralization of teeth.
- 4) Long term follow-up.(Ravel, 2004)¹³

1) Gaining Control of The Bacterial Infection

The control of *S. mutans* is accomplished in two phases: Caries control, followed by chemotherapeutic medication. We will start with caries control treating the cavitated lesions with glass ionomer cements.

Caries Control

The goal of caries control is to reduce the bacterial burden in the mouth of the child. Minimally invasive caries control, also called Atraumatic Restorative Treatment, reduces both the current and future treatment expenses. This mechanical measure will enable the subsequent chemotherapy to be more effective. At caries control visits, the teeth are excavated with spoon excavators and glass ionomer cement is used to seal the teeth. The dentist can be confident that the caries control process has been successfully managed when caries excavation is complete and parents are engaged in managing their child's disease.

Chemotherapeutic Medication

The second phase of gaining control of the oral bacteria involves chemotherapeutic antibacterial therapy. A combination of fluoride varnish and chlorhexidine application is used to lower the *Mutans streptococci* count. Fluoride varnish can be used alone, or in combination with other antimicrobial agents. The varnishes contain 5% sodium fluoride (NaF) at 22,600 ppm of

fluoride. There is a mean caries reduction of 38% when fluoride varnish is used in caries prevention. In an aggressive preventive program, varnish can be applied 3 times within a 10 day period. This is followed by another varnish application every 3 months for the first year. The NIH consensus statement on caries notes that only fluorides and chlorhexidine gluconate are proven antimicrobial treatments for dental caries. Another successful antibacterial therapy against cariogenic bacteria is treatment with a chlorhexidine gluconate rinse or gel. The 0.12% chlorhexidine gluconate can be applied to toddlers' teeth twice a day for 14 days. It is applied at least 30 minutes after the use of toothpaste because the sodium lauryl sulfate contained in most toothpaste will neutralize chlorhexidine gluconate. It has a long history of safety. If the bacterial challenge is extremely high, only chlorhexidine can successfully deal with the infection.

2) Reduction of Risk Levels

Step two in the medical model is reduction of the risk levels for patients. First, sugar intake must be reduced. A dietary assessment can identify when sugar consumption needs to be decreased. Increasing fluoride use at home will also reduce the risk of dental caries.

3) Remineralization of Teeth

Step three in the medical model of caries management is the reversal of active caries site by remineralization. There are four parts to this step:

- a) Fluoride varnish is applied 3 times in a 10 day period.
- b) Fluoride is applied at home. A fluoridated dentifrice is used twice daily. Application of 1.1% NaF gel by toothbrush is recommended for very high risk children with dentin caries.
- c) Xylitol gum is recommended.
- d) A source of calcium, such as cheese, is also recommended.

4) Long Term Follow-up

The last step in the medical model is long term follow-up at home and in the dental office. The office recall frequency should be every 3 months for high risk patients and every six months for low risk cases. Caries activity and risk are re-evaluated at the dental recall visits⁹.

Hence, it can be concluded that the

biological mechanism of ECC is similar to other forms of dental caries and is due to bacteria that take dietary carbohydrate as a substrate and produce acid, causing demineralization of tooth structure.

Treatment of early childhood caries is extremely costly to, particularly when general anaesthesia is required as is frequently the case for severely carious teeth or for very young children who are unable to cooperate when receiving restorative care. Hence prevention rather than treatment is the best allocation.

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