

# Dental Care For The Patients With Childhood Cancer And Survivors – A Short Review

Dr. N. Aravindha Babu MDS, Dr. E.P. Sridevi Anjuga, Dr. E. Rajesh MDS, Dr. L. Malathy MDS

*Department of Oral Pathology & Microbiology,  
Sree Balaji Dental College & Hospital, Chennai, BIHER*

## **ABSTRACT-**

***Cancer occurs due to uncontrolled division of abnormal cells. Cancer cells may penetrate adjacent tissues and spread through the blood or lymphatic systems to other parts of the body. The most common childhood cancers are leukemias and brain or central nervous system tumors, which together account for the majority of the new childhood cases of cancer. Childhood cancer treatments usually include chemotherapy, radiation therapy, immunotherapy, and/or surgery, which can cause adverse effects in oral cavity for both short and long term treatment process. The pedodontist plays an important role in the prevention, stabilisation and care of oral and dental problems that can have an impact on the health and wellbeing of the child during and after cancer treatment. This article explains the various oral care need to be taken to maintain a good health and oral hygiene in Pediatric cancer survivors.***

***KEYWORDS: Childhood cancer, Survivors, Pediatric patients, Dental care***

## **INTRODUCTION:**

Childhood cancer is the world's 2<sup>nd</sup> most common cause of death among children<sup>1</sup>. Cancer occurs due to uncontrolled division of abnormal cells. There are many cancer types, usually categorised either by the type of cell from which the cancer originated or by the part of the body from which the abnormal cell originated<sup>2,3</sup>. These cancer cells can penetrate nearby tissues and can migrate to other parts of the body via the blood or lymph systems<sup>1</sup>.

Childhood cancer is rare compared to adult cancer, but still creates more deaths among children from infancy to 15 years of age than any factor other than injury<sup>2</sup>. In order to treat the underlying malignancy, these children can receive chemotherapy agents, radiation therapy, immunotherapy, surgery, and/or hematopoietic cell transplantation (HCT). Long-term survival is improving for children treated for malignancies, with more than 80% of children surviving for five years or more<sup>1</sup>. The yearly prevalence of childhood cancer has increased slightly over the last 30 years, but death rate has declined dramatically for many cancers, largely due to improved treatment<sup>1</sup>.

The oral cavity assessment and management of dental complications is important for all children but especially for children with cancer<sup>1</sup>. In these children, dental and oral care-related issues arise at various stages of cancer treatment and after cancer treatment is completed<sup>1</sup>. The paediatric patient undergoing oncology treatment, from a dental point of view, may:

1. Have pre-existing untreated dental caries, periodontal diseases and/or oral hard and soft tissue pathological lesions<sup>1</sup>;
2. Having cancer manifestation in oral cavity<sup>1</sup>;
3. Development of oral complications due to cancer therapies<sup>1</sup>;

4. Develop long-term dental and orofacial complications following the completion of cancer therapy<sup>1</sup>.

#### **CAUSES OF CANCER IN CHILDREN:**

The roots of childhood cancer are poorly investigated, although different forms of cancer are usually believed to have different causes<sup>2</sup>. These are some of the established risk factors for childhood cancer development, including<sup>2,3</sup>:

- Family history
- Genetic syndrome, for example, down syndrome
- Exposure to high levels of radiation and to chemotherapeutic medicines
- Environmental factors such as chemicals, solvents, toxic air contaminants, motor vehicle emissions, and cigarette smoke in the environment<sup>2,3</sup>.

#### **TYPES OF CANCER:**

Children at various ages are affected by various kinds of cancer<sup>2</sup>. This pattern may reflect the different types of exposures and vulnerability windows encountered by children as they grow older and the period between the initiation of cancer and its clinical presentation<sup>2</sup>. Recent research suggests that predisposition to certain cancers that occur later in adulthood can also be determined while in the womb<sup>2,3</sup>.

- Leukemia (30% of all childhood cancer)
- Lymphomas (12% of childhood cancer)
- Brain tumors
- Solid tumors
- Bone tumors such as ewing's sarcoma and osteosarcoma accounts for about 6% of tumors
- Rhabdomyosarcoma (6% of childhood cancer)
- Neuroblastoma (5% of childhood cancer)
- Kidney tumors such as Wilm's tumor (10% of childhood cancer)
- Retinoblastoma
- Thyroid cancer and melanoma include other childhood cancers that have been linked with environmental exposures<sup>2</sup>.

#### **HOW CHILDHOOD CANCER DIFFERENT FROM ADULT CANCER:**

When compared to adults, cancer in children is unusual. Of all cancers, childhood cancers account for < 1%<sup>3</sup>. The cancer types that affect children are different from those in adults<sup>3</sup>. Leukemia and brain tumours are the most common cancers in children<sup>3</sup>. Prostate, breast, lung and colorectal cancers are the most frequent cancers in adults<sup>3</sup>. In kids, these are extremely rare<sup>3</sup>. Childhood cancers are more responsive to treatment in general and overall rates of cure are much higher<sup>3</sup>. About 75-80 percent of all cancer-diagnosed children are cured of their illness<sup>3</sup>. Children are at higher risk of developing long-term side effects after cancer therapy as a result of high cure rates and their younger age and must be monitored continuously<sup>3</sup>.

#### **ORAL CARE PRIOR TO CANCER THERAPY:**

A pre-treatment assessment facilitates the establishment of a dentist-child relationship prior to the onset of oral complications associated with cancer treatment<sup>1</sup>.

The initial oral and dental assessment includes:

1. Evaluating the children's medical records
2. Current Haematological Status Review

3. Evaluating the planned chemotherapy / radiation protocol,
4. Finalization of a comprehensive head , neck, and dental examination including panoramic and bitewing radiographs<sup>4</sup>.

The examination involves a clinical and radiographic evaluation of the oral cavity, helping the pedodontist to develop caries prevention strategies and to provide preventive advice based on the child's medical condition and possible treatments<sup>1</sup>. The dentist must report the dental and oral health status of the child to the oncology team<sup>1</sup>. This correspondence should cover the seriousness of dental caries, the invasiveness of the dental procedure suggested and, if any, the presence of pathological lesions<sup>1</sup>. Previous medical investigations includes illness / condition (type, degree, and prognosis), treatment procedure (conditioning routine, surgery, chemotherapy, radiation, and transplantation), medications (including bisphosphonates), allergies, surgery, supplementary medical diagnosis, haematological condition (complete blood count), coagulation condition, and immunosuppressive status<sup>1</sup>.

#### **HEMATOLOGICAL CONSIDERATIONS:**

##### **Absolute neutrophil count (ANC):**

1. 2,000 / mm: Antibiotic prophylaxis is not necessary.
2. 1000 to 2000 / mm: Take clinical move depending on patient's health condition and expected procedures<sup>1</sup>. Some authors say that when the ANC is between 1,000 and 2,000 / mm, antibiotic coverage can be prescribed<sup>1,5</sup>.
3. More intensive antibiotic treatment may be suggested if infection is present or uncertain and should be addressed with the medical team<sup>4,5</sup>.
4. < 1,000 / mm: Delay elective dental care. Discuss antibiotic coverage with the doctor prior to continuing with treatment in dental emergency situations. For dental management the patient may need hospitalisation<sup>4,5</sup>.

##### **Platelet Count:**

1. 75,000 / mm: No further support required;
2. 40,000 to 75,000 / mm: It is possible to suggest platelet transfusions before and after 24 hours of treatment. Sutures, haemostatic agents, pressure packs, and/or gelatin foams may be localised procedures for managing prolonged bleeding<sup>4,5</sup>.
3. < 40,000 / mm: Postpone treatment. In emergency situations, call the patient's doctor to take supportive steps before continuing (e.g., Transfusion of platelets, treatment for bleeding and inpatient care). Besides, specific procedure (e.g., microfibrillar collagen, topical thrombin) and furthermore medicines are suggested by the haematologist/oncologist (e.g., aminocaproic acid, tranexamic acid) can help to control bleeding<sup>4,5</sup>.

#### **DENTAL PROCEDURES:**

As such, in addition to surgery and radiotherapy, most oncology / haematology protocols (excluding HCT, to be discussed later) are divided into phases of chemotherapy<sup>5</sup>. The blood counts of the patient usually begin to drop five to seven days after the start of every phase, remaining lesser for about 14 to 21 days, before continuing to rise to normal levels again for a few days before the next phase begins<sup>5</sup>. Optimally, all dental care should be completed before cancer treatment is initiated<sup>5</sup>. If this is not practicable, temporary restorations can be put in place and non-acute dental care postponed until the patient's haematological state is stable<sup>5</sup>.

#### **PRIORITIZING PROCEDURES:**

Attention should be given to infections, surgical removal of teeth, periodontal care (e.g., scaling, prophylaxis) and causes of tissue pain prior to management of carious teeth, endodontic therapy for permanent teeth, and alteration and newly placement of damaged restorations if all dental needs cannot be met prior to initiation of cancer therapy<sup>5</sup>. Infection in pulp and pain severity will decide which carious lesions should be treated first. Fluoride and/or sealants can be handled incipient to tiny carious lesions before conclusive treatment can be achieved<sup>5</sup>.

#### **DENTAL CARIES:**

Simple carious lesions can be treated conservatively because of advancements in adhesive dentistry. To avoid carious lesions on sound tooth surfaces, vulnerable grooves and fissures should be sealed<sup>1</sup>.

#### **ENDODONTIC MANAGEMENT IN PERMANENT TEETH :**

In order to allow ample time to determine the efficacy of treatment prior to chemotherapy, indicative non-vital permanent teeth should be treated with root canal therapy at least one week before initiation of cancer treatment<sup>5</sup>. Extraction is recommended if this is not feasible<sup>5</sup>. Endodontic management of asymptomatic non-vital permanent teeth may be delayed till the haematological state of the patient is stable<sup>5</sup>.

#### **ORTHODONTIC TREATMENT:**

Poorly fitted appliances will strip oral mucosa and raise the risk of microbial invasion into deeper tissues<sup>5</sup>. If the patient has poor oral hygiene, devices should be removed and/or the treatment procedure or HCT conditioning regimen brings a risk of developing moderate to severe mucositis<sup>5</sup>. In patients with good oral hygiene, non-irritating simple devices like fixed lower lingual arches, band and loops can be left in place<sup>5</sup>. As long as patient who maintains good oral care, removable appliances and retainers that fits can be worn<sup>5</sup>. Patients should be recommended to clean their appliances by using antimicrobial solution regularly and thoroughly to avoid contamination and reduces the risk of oral infections associated with the appliance<sup>5</sup>. If withdrawal of the band is not advisable, vinyl mouth guards or orthodontic wax can be used to reduce tissue trauma<sup>5</sup>.

#### **EXTRACTION:**

No specific guidelines are issued for the use of prophylactic antibiotics in extraction<sup>5</sup>. Operating procedures must be as atraumatic as possible, with no residual pointed bony edges and adequate wound closure<sup>5</sup>.

#### **PERIODONTAL THERAPY**

Partially erupted molars will become a source of infection for pericoronitis<sup>5</sup>. If haematological status allows excision of superior gingival tissue covering, if the dentist thinks it to be a significant risk, it should be done<sup>5</sup>. Prior to receiving bisphosphonates as part of cancer treatment, patients should have a periodontal assessment and appropriate therapy<sup>5</sup>.

<b>Treatment before chemotherapy<sup>4</sup>:</b>	<b>Treatment during chemotherapy<sup>4</sup>:</b>	<b>Treatment after chemotherapy<sup>4</sup>:</b>
In order to assess the patient's current condition and the type of treatment expected, the dentist can contact the oncologist <sup>4</sup> .	In order to understand the patient's immunosuppression level the dentist should consult oncologist before starting any procedure.	To assess immune competence, the dentist should consult the oncologist <sup>4</sup> .
<p>1. Exhaustive oral cavity examination: discarding periapical lesions and/or changes in the bone and determining periodontal fitness<sup>4</sup>.</p> <p>2. The fitting of the dentures should be tested for the readjustment or removal of such trauma-proofing prostheses<sup>4</sup>.</p> <p>3. Radiological studies includes Intraoral (periapical and bitewing) and panoramic<sup>4</sup>.</p>	Management of the complications of chemotherapy (mucositis, xerostomia) <sup>4</sup> .	<p>(i) Insist on the need for regular systematic oral hygiene<sup>4</sup>.</p> <p>(ii) Use of chlorhexidine rinses and fluorization<sup>4</sup>.</p>
General prophylactic measures: Elimination of tartars, dental fluoridation and 0.12 percent chlorhexidine rinse <sup>4</sup> .	Through the additional usage of chlorhexidine rinses and fluorization, ongoing patient reminders of the demand to uphold strict oral hygiene are suggested <sup>4</sup> .	
The risks of treatment should be reported to the patient <sup>4</sup> .	<p>I) Analgesics: Metamizol / paracetamol.</p> <p>(ii) No NSAID.</p> <p>(iii) Antibiotics: Alteration of the dose according to the values of creatinine clearance observed in patients with renal problems is required<sup>4</sup>.</p>	
<p>It is important to remove teeth that are nonviable or have a bad prognosis:</p> <p>1) minor surgery: Two weeks before chemotherapy. 2) main operation: 4-6 weeks prior to chemotherapy<sup>4</sup>.</p>	No dental elective care should be done. Emergency dental procedures only <sup>4</sup> .	Elective dental treatment <sup>4</sup> .

#### **ORAL COMPLICATIONS RELATED TO CANCER TREATMENT:**

Children typically undergo chemotherapy in cycles or phases<sup>3</sup>. Acute oral complications, referring to the reduction in blood counts, occur 5-7 days from the beginning of each cycle<sup>3</sup>. After 21 days, blood counts increase to normal levels and remain so until the next cycle of chemotherapy starts<sup>3</sup>. During

periods of thrombocytopenia and neutropenia, effective oral hygiene regimens, such as teeth brushing, should proceed<sup>1</sup>.

#### **MUCOSITIS:**

Oral mucositis is likely to result in 40 % of young people undergoing regular chemotherapy and 80 % of patients seeking radiation therapy for cancers of the head and neck<sup>1</sup>. Oral mucositis can be a very painful disease that can have a serious effect on food intake, mouth care, wellbeing of children who affected with leukemia<sup>1</sup>. Patient who undergoes bone marrow transplantation in results in oral mucositis (75%)<sup>1</sup>. Oral mucositis initially occurs as oral mucosal erythema, which then progresses to degradation and ulceration<sup>1</sup>. Ulcerations and lesions are usually surrounded by a white fibrinous pseudo-membrane within about 2-4 weeks following the last dose of stomato-toxic chemotherapy or radiation therapy. Oral mucositis is categorised as mild, moderate, or severe depending on the symptoms and clinical appearance of the patient<sup>1</sup>. Lesions are typically constricted to non-keratinized surfaces (i.e., lateral and ventral tongue, buccal mucosa and soft palate) in chemotherapy-induced oral mucositis<sup>4</sup>. In radiation-induced oral mucositis, lesions are confined to tissues more commonly affected by non-keratinized tissues in the area of radiation<sup>4</sup>. The clinical intensity is equal to the radiation of dose administrated<sup>4</sup>. Careful monitoring of the oral cavity makes it possible to identify and treat fungal, infectious, and bacterial infections in a timely manner<sup>5</sup>. For the prevention and/or treatment of fungal infections, prophylactic nystatin is not sufficient.<sup>5</sup> Oral cultures and/or biopsies of all suspected lesions should be performed and prophylactic drugs should be started before more specific treatment can be prescribed<sup>5</sup>.

#### **ORAL INFECTIONS:**

Children undergoing cancer treatment develop oral infections that are opportunistic (fungal, bacterial and viral)<sup>1</sup>. Neutropenia can cause atypical clinical demonstrations of these infections. Oral candidiasis and herpes infections are usually seen in youngsters. Nystatin is the first line of treatment to be attempted when oral candidiasis is diagnosed in kids undergoing cancer therapy, but it does not always resolve the infection<sup>1</sup>. It can require systemic antifungal agents, such as amphotericin B<sup>1</sup>. If nystatin is used, clinicians should aware of oral suspension. In Oral suspension sugar content is high and may increase the sensitivity of caries<sup>1</sup>.

#### **PAIN:**

Neuropathic pain can occur in children receiving chemotherapy agents such as vincristine and vinblastine from plant alkaloids, usually affecting the mandibular teeth<sup>1</sup>. These children complain of profound pain in the jaw and teeth in the absence of an odontogenic source of pain<sup>1</sup>. In children, such neuropathic pain is typically intermittent and reduces or improves after completion of chemotherapy<sup>1</sup>. Normally, the pain is sporadic and usually subsides soon after the dose reduction and/or termination of chemotherapy<sup>5</sup>.s

#### **XEROSTROMIA:**

Children undergoing cancer chemotherapy and/or head and neck radiation therapy have xerostomia during and after the treatment phase<sup>1</sup>. Xerostomia increases the risk of decay and increases mucositis<sup>1</sup>. Recommended are sugar-free chewing gum or candy, sucking tablets, special oral dryness dentifrices, saliva substitutes, regular drinking of water, oral creams, alcohol-free oral rinses and/or oral moisturizers<sup>5,6</sup>.

#### **TRISMUS:**

Regular oral stretching exercises / physical therapy can be carried out during radiation therapy<sup>4,5</sup>. Trismus therapy may include prosthetic aids to minimise fibrosis severity, trigger point injections, analgesics, muscle relaxants, and other pain treatment techniques<sup>4,5</sup>.

#### **ORAL BLEEDING:**

Oral bleeding is caused by thrombocytopenia, impairment of coagulation factors, and/or impaired vascular integrity<sup>5</sup>. Management should include local methods (e.g. pressure packages, clot retracting rinses or topical agents, gelatin sponges) and institutional interventions (e.g. platelet transfusions, aminocaproic acid)<sup>5</sup>.

#### **LIP CARE:**

Children who are receiving chemotherapy and/or radiation treatment often develop dry lips and angular cheilitis. Lanolin-based creams and ointments are more beneficial than petroleum-based products in moisturising the lips of these patients<sup>1</sup>.

#### **ORAL CONCERNS RELATED TO HEMATOPOIETIC CELL TRANSPLANTATION:**

- Both chemotherapy and/or complete body irradiation is given to children treated with HCT just a few days before the transplant<sup>1</sup>.
- They have a prolonged immunosuppressed process and it is not possible to perform elective dental care during this immunosuppressed period<sup>1</sup>.
- Immunological recovery typically occurs at least 100 days after HCT; if graft-vs-host disease (GVHD) or other complications arise, recovery time may be longer<sup>1</sup>.
- It is also important to complete dental care prior to HCT initiation. Mucositis occurs 7-10 days after initiation of conditioning in these children receiving HCT and lasts up to 2 weeks after the end of conditioning<sup>1</sup>.
- 3-4 weeks after completion of transplantation, the severity of oral problems are start to reduce. Phase III (hematopoietic recovery) corresponds to this time, and acute GVHD, xerostomia, haemorrhage, neurotoxicity, temporomandibular dysfunction and exophytic oral lesions (e.g. granulomas, papilloma) are the primary oral concerns throughout this point<sup>1</sup>.
- Approximately 100 days after HCT, step IV (immune reconstitution) starts. Oral issues relate to the persistent effects of the conditioning regimen during this process and include dry mouth, anomalies of craniofacial development, viral infections, persistent GVHD, and predisposition to oral squamous cell carcinoma<sup>1</sup>.

#### **UNIQUE ORAL CARE CHALLENGES OF CANCER SURVIVORS:**

1. Children undergoing cancer treatment have dental and craniofacial issues that arise later in life<sup>1</sup>. Higher risk for dental decay, dry mouth, Agenesis of tooth, microdontia, enamel hypoplasia, and dilaceration are several particular oral and dental manifestations of childhood cancer care, one case showed microdontia of all his permanent teeth with blunting and tapering of roots, agenesis of permanent third molars<sup>1</sup>.
2. Children undergoing cancer treatment before the age of 3 years can be expected to experience a higher rate of dental abnormalities and developmental dental defects<sup>1</sup>.
3. Due to salivary gland hypofunction, childhood cancer survivors often develop dry mouth<sup>1</sup>. Periodic dental examinations are critical for assessing and treating dental caries<sup>1</sup> due to the increased risk of caries<sup>1</sup>.
4. For these patients, oral cancer screenings are important. Suspicious lesions of soft tissue should be given to oral and maxillofacial pathologists and surgeons for biopsy<sup>1</sup>.

5. The growing craniofacial complex will show malocclusion with skeletal aetiology due to exposure to ionising radiation<sup>1</sup>. Dental abnormalities (tooth agenesis, microdontia) can worsen orthodontic issues<sup>1</sup>.
6. Sometimes, these patients and their parents may want orthodontic care in their adolescent years. However, due to xerostomia and enamel hypoplasia, the risk of caries can prevent the application of a proper treatment plan for orthodontics. If the teeth have blunted roots, orthodontic care is more restricted because the orthodontic movement of the teeth will further reduce the length of the root and contribute to unfavourable crown-root ratios<sup>1</sup>.
7. These limitations should be taken into account in orthodontic care plans for childhood cancer survivors<sup>1</sup>.

#### **PREVENTIVE MEASURES:**

- Dental caries is a preventable disease and caries prevention is the most important aspect of oral care for children undergoing cancer therapy<sup>1</sup>.
- The teeth and tongue should be brushed at least twice each day with a soft-bristled nylon toothbrush<sup>1</sup>. Fluoridated toothpaste should be recommended<sup>1</sup>.
- Fluoridated toothpaste and mouth rinses can be used over-the-counter at home with a reduced fluoride concentration (900-1,100 ppm)<sup>1</sup>.
- Professional fluoride application in the form of fluoride varnish, fluoride gel or fluoride foam delivers significantly higher fluoride concentrations (12,300-22,600 ppm) and is administered in the dental clinic<sup>1</sup>.
- Patients who may reliably expectorate toothpaste<sup>1</sup> should be prescribed prescription high-strength fluoride toothpastes containing 5,000 ppm of fluoride<sup>1</sup>.
- For children who show the requisite dexterity, flossing is recommended. For children with clinical decay and/or demineralization of enamel, fluoridated mouth rinses can be recommended. Chlorhexidine mouth rinse should be administered to children who have plaque-induced gingivitis or periodontal disease<sup>1</sup>.

#### **CONCLUSION:**

The biggest challenge in maintaining a good oral health throughout cancer therapy is early treatment. It is necessary to educate the caregiver, parents and child about the significance of oral care in order to alleviate pain and improve the chances of a good outcome of oncology treatment. The role of a pedodontist in an oncology team helps to decrease problems in children before, during and after cancer treatment.

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