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SICKLE CELL ANEMIA

Sickle cell anemia (SCA) is composed of sickle cell trait, which is benign and does not restrict medical or dental treatment, and sickle cell disease (SCD). Patients with SCD have an autosomal-recessive hemolytic disorder that occurs predominantly in persons of African descent but it also can be found among Italian, Arabian, Greek, and Indian people.

Patients with SCD produce hemoglobin S instead of the normal hemoglobin A. Hemoglobin S has a decreased oxygen-carrying capacity. Decreased oxygen tension causes sickling of cells. Those patients are susceptible to recurrent acute infections, which result in an "aplastic crisis" caused by decreased red blood cell production and in subsequent joint and abdominal pain with fever. Over time, there is a progressive deterioration of cardiac, pulmonary, and renal function.

Many factors can precipitate a sickle cell crisis, including acidosis, hypoxia, hypothermia, hypotension, stress, hypovolemia, dehydration, fever, and infection. Patients with SCD have hemoglobin levels of 6 to 9 g/dL (normal, 12 to 18 g/dL).

Dental appointments should be short to reduce potential stress on the patient. The preventive program should have the goal of maintaining excellent oral health and decreasing the possibility of oral infection. Dental treatment should not be initiated during a sickle cell crisis. If emergency treatment is necessary during a crisis, only treatment that will make the patient more comfortable should be provided. Patients with SCD may have skeletal changes that make orthodontic treatment beneficial. Special care must be taken to avoid tissue irritation, which may induce bacteremias, and the disease process may compromise the proposed treatment. Careful monitoring is a necessity when elective orthodontic treatment is proposed for patients with SCD.

The use of local anesthetics with a vasoconstrictor is not contraindicated in patients with SCD. In addition, the use of nitrous oxide is not contraindicated in these patients. Care must be taken in treating patients with SCD to avoid diffusion hypoxia at the completion of the dental procedure.

The restoration of teeth, including pulpotomies, is preferable to extraction. Pulpectomy in a non-vital tooth is reasonable if the practitioner is confident that the tooth can remain non- infected. If the tooth is likely to persist as a focus of infection, then extraction is indicated. The level of Hemoglobin S should investigated before extraction it should be less than 30%. Poor healing may occur after surgical dental treatment so prophylactic antibiotic may be needed.

The use of general anesthesia for dental procedures must be approached cautiously in consultation with the hematologist and anesthesiologist.

VIRAL HEPATITIS

Infection by the various strains of viral hepatitis causes inflammation of the liver parenchyma, which may lead to necrosis or cirrhosis. Acute hepatitis classically presents with lethargy, loss of appetite, nausea, vomiting, and abdominal pain, but may not be recognized until jaundice ultimately develops.

Acute viral hepatitis may be caused by any of the following:

Hepatitis A virus (HAV), HBV, hepatitis delta virus (HDV), HCV, or hepatitis E virus (HEV). HAV infection results in an acute febrile illness with jaundice, anorexia, nausea, and malaise. Most HAV infections in infants and children cause mild, nonspecific symptoms without jaundice. HAV is spread by the fecal-oral route and is endemic in developing areas. The risk for transmission in a dental setting is low. A two-dose vaccination series separated by 6 months can be given to anyone older than 1 year of age.

HBV transmission is of major concern to the dentist. Members of the dental profession assume a risk for acquiring HBV that may be 10 times greater than that of the general population. An additional concern is the potential of becoming an asymptomatic yet infectious carrier of HBV and of having the capability of transmitting the disease to patients and dental staff members and family.

HBV is transmitted from person to person by parenteral, percutaneous, or mucous membrane inoculation. It can be transmitted by the percutaneous introduction of blood, administration of certain blood products, or direct contact with secretions contaminated with blood containing HBV. Infection may also result from inoculation of mucous membranes, including sexual transmission.

Wound exudates contain HBV, and open-wound to open-wound contact can transmit infection. There can also be vertical transmission from an infected mother to her baby, which frequently leads to chronic infection.

A medical history is unreliable in identifying patients who have HBV infection, because approximately 80% of all HBV infections are undiagnosed. However, the medical history is useful in identifying groups of patients who are at higher risk of being undiagnosed carriers. Among populations at high risk for HBV infection are patients undergoing hemodialysis, patients requiring frequent large-volume blood transfusions or administration of clotting factor concentrates, residents of institutions for those with mental disabilities, and users of illicit injectable drugs.

The availability of a safe, effective hepatitis B vaccine affords the dentist and staff additional protection against acquiring HBV infection. HBV vaccine is recommended for all health care personnel.

ACQUIRED IMMUNODEFICIENCY SYNDROME

Acquired immunodeficiency syndrome (AIDS) is a clinically defined condition caused by infection with HIV type 1 or, much less commonly, type 2.

The period of time from HIV infection to the appearance of symptoms consistent with AIDS can be approximately a decade in many adults. Consequently, HIV-infected individuals can unknowingly spread the virus to their sexual or needle-sharing partners or, in the case of infected mothers, to their children. Infants and children with AIDS have clinical findings similar to those in adults. Early manifestations of untreated HIV infection include weight loss and failure to thrive, hepatomegaly or splenomegaly, generalized lymphadenopathy, and chronic diarrhea. Unlike in adults, recurrent and severe bacterial infections are more common in pediatric patients with untreated HIV infection.

ORAL MANIFESTATIONS OF HIV INFECTION

The types of oral lesions seen in HIV infection may be caused by fungal, viral, or bacterial infections, as well as neoplastic and idiopathic processes.

Fungal Infection: the most common HIV-associated infection of the mouth is caused by the fungus Candida albicans. Oral candidiasis is frequently present and may lead to esophageal or disseminated candidiasis. There are four major types of oral candidiasis: (1) pseudomembranous, (2) hyperplastic, (3) erythematous (atrophic), and (4) angular cheilotic.

Viral Infection: can cause oral disease because of the immune dysfunction induced by HIV infection, several viruses can produce lesions in the mouth following colonization or reactivation. According to Greenspan, these include herpes group viruses and papillomaviruses.

Bacterial Infections, Gingivitis, and Periodontitis: Progressive and premature periodontal disease is seen relatively frequently in HIV-infected individuals and may even be the first sign of HIV infection. Unlike conventional periodontal disease, these lesions do not respond effectively to standard periodontal therapy. There may be a rapid progression from mild gingivitis to advanced, painful, spontaneously bleeding periodontal disease in a few months. Treatment includes aggressive curettage, Peridex (0.12% chlorhexidine digluconate) rinses 3 times daily, and possibly antibiotic treatment.

Bacteria causing oral lesions may include Mycobacterium avium- intracellulare and Klebsiella pneumonia, among others. Well-described conditions include linear gingival erythema (LGE) and necrotizing ulcerative periodontitis (NUP), which likely represent dysbiosis of the microflora. Many of the oral lesions seen in association with HIV infection are not new entities; rather, they are known as diseases that either follow an atypical course

or show an unusual response to treatment. This is frequently the case with neoplasms as well.

Neoplasms: Kaposi sarcoma, secondary to transformation induced by human herpes virus-8 infection, is the most common malignancy seen in AIDS, it occurs in 15% to 20% of adult patients with AIDS. Intraoral lesions may occur alone or along with skin, visceral, and lymph node lesions. The first lesions of Kaposi sarcoma often appear in the mouth. They may be red, blue, or purple, flat or raised, and solitary or multiple. The most common oral site is the hard palate, although lesions may be found on any part of the oral mucosa. Treatment for aggressive lesions involves radiation, laser surgery, or chemotherapy. Conventional surgery may be appropriate for small lesions.

Idiopathic Lesions: oral ulcers of unknown etiology that are being reported with increasing frequency in people with HIV infection. The ulcers resemble aphthous lesions, appearing as well-circumscribed ulcers with an erythematous margin. Patients sometimes exhibit extremely large and painful necrotic ulcers that may persist for several weeks.

Salivary gland swelling: has been seen in both adults and children with HIV infection. The cause of the swelling is unknown and may be combinational. It usually involves the parotid glands and is accompanied by xerostomia. These patients may be best evaluated with fine-needle aspiration, especially if there is a focal mass.

HIV-infected patients may develop oral manifestations of autoimmune disorders, including immune thrombocytopenic purpura. Oral lesions appear as small, blood filled purpuric lesions or petechial. Spontaneous gingival bleeding may also occur.

Preventive measures to be used:

1. Routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other body fluids of any patient is anticipated.
2. Proper sterilization, HIV is sensitive to autoclaving at 121˚C for 15 min at 1 atmospheric pressure.
   Dry heat of instruments up to 170˚C.
3. Disinfectants for innate objects:
   - Calcium hypochlorite.
   - 0.2% sodium hypochlorite.
   - 6% hydrogen peroxide for more than 30 min.
   - 2% glutaraldehyde and 6% hydrogen peroxide.

- HIV is inactivated by treatment for 10 min at room temperature with 10% household bleach, 50% ethanol and 3% hydrogen peroxide.

4. Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands should be washed immediately after gloves are removed.

To prevent needle stick injuries, needles should not be recapped, purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. After they are used, disposable syringes and needles, scalpel blades, and other sharp items should be placed in puncture-resistant containers for disposal; the puncture-resistant containers should be located as close as practical to the use area. Large-bore reusable needles should be placed in a puncture-resistance container for transport to the processing area.

Leukemia

They are hematopoietic malignancies in which abnormal leukocytes (blast cells) proliferate in the bone marrow, replacing normal cells, and disseminate into the peripheral blood, accumulating in other tissues and organs of the body.

Leukemia is classified according to the morphology of the predominant abnormal leukocytes in the bone marrow. These types are further categorized as acute or chronic, depending on the clinical course and the degree of differentiation, or maturation, of the predominant abnormal cells.

Although the cause of leukemia is unknown, ionizing radiation, certain chemical agents, and genetic factors have been implicated. For example, children with chromosomal abnormalities (Down syndrome and Bloom syndrome), children with an identical twin who has leukemia, and children with immunologic disorders have an increased risk for leukemia. In the United States, leukemia rates for white children are about 1.5 times those for black children.

ORAL MANIFESTATIONS OF LEUKEMIA

Abnormalities in or around the oral cavity occur in all types of leukemia and in all age groups. However, oral pathologies are more commonly observed in acute leukemia than in chronic leukemia.

The most frequently reported oral abnormalities attributed to the leukemic process include:

1. Regional lymphadenopathy.
2. Mucous membrane petechiae and ecchymosis,
3. Gingival bleeding, gingival hypertrophy.

4. Pallor, and nonspecific ulcerations.

Manifestations seen occasionally are:

Cranial nerve palsies, chin and lip paresthesias, odontalgia, jaw pain, loose teeth, extruded teeth, and gangrenous stomatitis. Each of these findings has been reported in all types of leukemia.

Like the systemic manifestations of leukemia, oral changes can be attributed to anemia, granulocytopenia, and thrombocytopenia, all of which result from the replacement of normal bone marrow elements by undifferentiated blast cells or direct invasion of tissue by these leukemic cells. Very high circulating white blood cell numbers in the peripheral blood can lead to stasis in small vascular channels. The subsequent tissue anoxia results in areas of necrosis and ulceration that can readily become infected by opportunistic oral microorganisms in patients with neutropenia. A person with severe thrombocytopenia, having lost the capacity to maintain vascular integrity, is likely to bleed spontaneously. Clinical manifestations are petechiae or ecchymosis of the oral mucosa or frank bleeding from the gingival sulcus. The propensity for gingival bleeding is greatly increased in persons with deficient oral hygiene because accumulated plaque and debris are significant local irritants. Direct invasion of tissue by an infiltrate of leukemic cells can produce gingival hypertrophy. Such gingival changes can occur despite excellent oral hygiene. Infiltration of leukemic cells along vascular channels can result in strangulation of pulpal tissue and spontaneous abscess formation because of infection or focal areas of liquefaction necrosis in the dental pulp of clinically and radiographically sound teeth. In a similar fashion the teeth may rapidly loosen as a result of necrosis of PDL.

Skeletal lesions caused by leukemic infiltration of bone are common in childhood leukemia. The most common finding is a generalized osteoporosis caused by enlargement of the Haversian and Volkmann canals. Osteolytic lesions resulting from focal areas of hemorrhage and necrosis and leading to loss of trabecular bone are also common. Evidence of skeletal lesions is visible on dental radiographs in up to 63% of children with acute leukemia.

Manifestations in the jaws include generalized loss of trabeculation, destruction of the crypts of developing teeth, loss of lamina dura, widening of the PDL space, and displacement of teeth and tooth buds. Because none of the oral changes is a pathognomonic sign of leukemia and all can be associated with numerous local or systemic disease processes, a diagnosis of leukemia cannot be based on oral findings alone. Such changes should be, however, alert the clinician to the possibility of malignancy as the underlying cause.

Candidiasis is common in children with leukemia. They are especially susceptible to this fungal infection because of:

(1) General physical debilitation,
(2) Immunosuppression,
(3) Prolonged antibiotic therapy,

(4) Chemotherapy,
(5) Poor oral hygiene.

DENTAL MANAGEMENT OF PATIENTS WITH LEUKEMIA

Before any dental treatment is administered to a child with leukemia, the child's hematologist/oncologist or primary care physician should be consulted. The following information should be ascertained:

1. Primary medical diagnosis
2. Anticipated clinical course and prognosis
3. Present and future therapeutic modalities
4. Present general state of health
5. Present hematologic status

It is also important to establish, by consultation with the patient's physician, when dental treatment may be most propitious and to schedule the patient's treatment accordingly. The proposed procedures should be discussed to determine if they are appropriate. For a child whose first remission has not yet been attained or one who is in relapse, all elective dental procedures should be deferred. However, it is essential that potential sources of systemic infection within the oral cavity be controlled or eradicated whenever they are recognized (e.g., immediate extraction of carious primary teeth with pulpal involvement). Routine preventive, restorative, and surgical procedures can usually be provided for a patient who is in complete remission yet is undergoing chemotherapy. The time when such procedures may be completed without complications will depend on the specific agents administered and the time of administration.

- Before the appointment—preferably the same day—a blood cell profile (complete blood count) and platelet count should be obtained
- Pulp therapy on primary teeth is contraindicated in any patient with a history of leukemia.
- Endodontic treatment for permanent teeth is not recommended for any patient with leukemia who may have a chronic, intermittent suppression of granulocytes. Even with the most exacting technique, an area of chronic inflammatory tissue may remain in the periapical region of endodontically treated teeth. An area of low-grade, chronic inflammation in a healthy patient is generally well tolerated, but in an immunosuppressed, neutropenic patient the same area can act as an anachoretic focus with devastating sequelae.
- A platelet level of 100,000/mm3 is adequate for most dental procedures
- Routine preventive and restorative treatment, including non-block injections, may be considered when the platelet count is at least 50,000/mm3.
- If the platelet count is lower than 20,000/mm3, all the intraoral mucosal tissues may show clinical evidence of spontaneous hemorrhaging (e.g., petechiae, ecchymosis, or frank hemorrhage). No dental treatment should be performed at such a time

without a preceding prophylactic platelet transfusion. Good oral hygiene must be maintained while the platelet count is at this level, but it may be necessary to discontinue the use of a toothbrush and to substitute
cleaning with moist gauze wipes, supplemented by frequent saline rinses.

- The use of a soft nylon toothbrush for the removal of plaque is recommended

Infection and hemorrhage are the primary causes of death other than resistant disease or relapse in children with leukemia. Therefore the primary objective of dental treatment in a child with leukemia should be the prevention, control, and eradication of oral inflammation, hemorrhage, and infection.

It is important that significant local irritants, including orthodontic appliances, be removed. Scaling and subgingival curettage should not necessarily be perceived as elective dental treatment in all patients. This is especially true if the anticipated clinical course may place the patient at high risk for hemorrhage and infection. Patients with classic leukemic gingivitis experience various degrees of discomfort. The use of warm saline rinses several times each day may assist in the relief of symptoms. Erosive or ulcerative lesions are common in children with leukemia. These lesions are often associated with the use of certain chemotherapeutic agents.

HEMATOPOIETIC STEM CELL TRANSPLANTATION

The transplantation of hematopoietic stem cells can be curative for a variety of disorders, including aplastic anemia, thalassemia, and severe combined immunodeficiency.

ORAL COMPLICATIONS OF BONE MARROW TRANSPLANTATION

The oral complications of bone marrow transplantation differ from those seen during conventional therapy for malignant disease only in degree and duration. Oral ulceration, mucositis, and transient salivary gland dysfunction are frequent consequences of stomatotoxic chemotherapy and total-body irradiation. Minor trauma to atrophic mucous membranes often results in self-induced ulceration of the buccal mucosa, lips, and tongue. Thrombocytopenic gingival bleeding and bleeding from oral ulcerations are also frequently encountered. Oral ulceration and mucositis are common sequelae of cancer treatment, and they resolve with the return of bone marrow function and rising absolute neutrophil counts.

SOLID TUMORS

Solid tumors account for approximately half of the cases of childhood malignancy. The most common tumors include brain tumors, lymphoma, neuroblastoma, Wilms' tumor, osteosarcoma, and rhabdomyosarcoma. Because many of the malignancies can involve bone marrow and their treatment with chemotherapy and radiation can

suppress marrow function, many of the complications seen in acute leukemia are also seen with these patients. Bleeding diatheses and the propensity to infection are the most notable medical complications seen. In general, the dental management of patients with solid tumors is similar to that of patients with acute leukemia.