The Interaction Between Dentistry and Otolaryngology

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The oral cavity, including the dentition, has a close anatomic and physiologic relationship with the pharynx, the maxillary sinus, major and minor salivary glands, the nasal cavity, and the ears. This relationship necessitates a great deal of interaction and cooperation between dentists and otolaryngologists. This article reviews major areas of interaction in an effort to enhance the overall quality of care of pediatric patients.

Otalgia Dentalis

The ear receives its sensory nerve supply from the trigeminal, vagus, and glossopharyngeal nerves, and from branches of the upper cervical roots. Therefore, in the absence of local signs of otitis media, the possibility of referred pain should be considered. Such pain can originate in the oral cavity or in the temporomandibular joint. Dental pain can be referred through the trigeminal nerve to the ear. The cause of referred pain may be a pulpitis or a periapical abscess or, in younger patients, teething that is accompanied by significant gingival irritation or pericoronitis. Conversely, true otitis media can present solely as dental pain. In the absence of oral signs of dental disease, the possibility of otalgia secondary to otitis media should be considered.

The Maxillary Sinus

The relationship of the maxillary sinus to the dentition changes significantly with age. During childhood, the maxillary sinus enlarges as the posterior teeth form and erupt. With the extension of the sinus floor downward, the apices of the maxillary teeth eventually intrude into the sinus cavity with only a very thin, bony lamella separating the teeth from the sinus. This "mature" relationship is reached at approximately 15 years of age. The presence of dental periapical infection may lead to the elimination of any bony barriers between the dentition and the sinus, possibly facilitating direct bacterial invasion of the sinus cavity. Necrotic tissues may be forced into the maxillary sinus during root canal treatment of maxillary posterior teeth. The extraction of maxillary posterior teeth with advanced periapical lesions can create an antral-oral fistula. Occasionally, root tips of maxillary teeth are forced either partially or completely into the maxillary sinus during dental surgery. Foreign bodies can also be forced into the maxillary sinus through an antral-oral fistula. Most sinusitis of dental origin occurs in patients over 15 years of age and is seldom seen in a preschool population. Killey and Kay reviewed a series of 362 antral-oral fistulae and found only nine in patients between birth and 15 years of age. True sinusitis can also present as pain in the premolars and molars. Multiple toothaches involving posterior maxillary teeth with little or no evidence of caries or large restorations should suggest a diagnosis of maxillary sinusitis.

Nasal Cavity

Oronasal Fistula

An oral fistula may occur as a complication of the surgical removal of an impacted tooth in the palate or the premaxilla, or following the improper removal of palatal tori. Such a fistula may also exist in patients with cleft palate and may persist following palatal closure. Surgical closure of such a defect is the treatment of choice.

Intranasal Teeth

Intranasal teeth may be single or multiple, primary, permanent, or supernumerary. The cause of this pattern of ectopic eruption is not clear. Intranasal teeth may be asymtomatic and thus be found only on routine clinical or radiographic examination. Symptoms that may be associated with intranasal teeth include midfacial pain, nasal congestion or obstruction, headache, rhinitis caseosa, fever, epistaxis, rhinorrhea, or oronasal fistula. Surgical removal of nasal teeth usually alleviates these related symptoms.

Emergency Care

The majority of pediatric dental and maxillofacial emergencies result from either trauma, infection, or burns.

Traumatic Injuries

Trauma to the dentition or other oral structures is often associated with facial injuries such as nasal fractures, midfacial fractures, and fractures of the anterior nasal spine or other adjacent structures. Conversely, all patients with facial trauma should receive a thorough oral evaluation, since the presence of an intraoral injury may complicate recovery or compromise the airway.

History and Examination

A concise history is the first and most important step in making an accurate diagnosis, and should include information concerning the circumstances of the accident (when, how, and where it occurred) as well as past medical history and the postinjury status of the patient. A careful clinical examination that determines the nature and extent of injury will help the physician to choose the necessary course of action and diagnostic procedures.

Careful examination of the dentition, gingiva, oral mucosa, and facial bones is extremely important in the presence of a perioral injury. Such an examination should include (1) the dentition, to rule out crown or root fractures, excessive mobility, alveolar fractures, lateral or vertical displacement, or avulsions. This is best achieved by a thorough visual inspection of all existing teeth and by palpation of suspicious areas; (2) the gingival and oral mucosa, to rule out any soft tissue injury, possible jaw fractures, or impactions of foreign bodies; (3) facial and jaw bones, to rule out possible fractures; and (4) dental occlusion, to determine any trauma-related abnormal relationships.

Certain symptoms, such as tenderness, trismus, hemorrhage from the nose or the ear, deviation on opening or closing the mouth, gingival tears, or the presence of cloudy sinuses, necessitate further detailed evaluation.

Soft Tissue Injuries

A variety of soft tissue injuries, including lacerations, abrasions, contusions, puncture wounds, and avulsions, can occur. Degloving injuries may also occur with or without associated bony fractures. The first step is usually to cleanse the injured area of blood clots and debris in order to determine the extent, depth, and degree of vascular involvement. Some intraoral lacerations do not require suturing. Bleeding usually subsides spontaneously, and healing proceeds satisfactorily. Small lacerations with well approximated margins belong to this group.

Large lacerations, through-and-through lacerations, and lacerations associated with extensive, recurrent, or uncontrolled bleeding require careful assessment. Soft palate lacerations require a thorough pharyngeal inspection. The possibility of foreign body entrapment, immediate or delayed vascular injury, or formation of pharyngeal abscesses should be seriously considered.

Lacerations involving the labial frenum of infants are quite common and usually cause parents a great degree of alarm. Under normal conditions, these lacerations should not be sutured. Restriction of manipulation and a carefully planned soft diet for 24 hours should suffice.

Management of bites and avulsion wounds requires appropriate wound care, followed by careful debridement and primary closure whenever possible. Intraoral avulsions are best treated with either gingival grafts, if necessary, or left to heal by secondary intention. The administration of antibiotics and tetanus prophylaxis are indicated whatever course of action is taken.

Injuries to the Teeth

It has been reported that close to 50 per cent of children sustain some type of injury to their teeth. Occasionally, dental injuries are overlooked in the presence of the more obvious extraoral soft tissue injury.

Crown Fractures. The dentin or the pulp becomes exposed in crown fractures. The treatment of choice involves the application of calcium hydroxide to the exposed surface in order to promote pulpal healing, and should be performed as soon as possible. Occasionally, dental fragments become embedded into adjacent tissues, or may be swallowed or aspirated. Appropriate examination of adjacent tissues, particularly the lips, and an x-ray examination of the chest may be required.

Root Fractures. Involved teeth may exhibit increased mobility. The final diagnosis can only be determined with dental radiographs. Differential diagnosis should include alveolar fractures. Neither alveolar nor root fractures are usually visible on skull films. Alveolar

fractures should be suspected whenever gingival tears exist and several teeth exhibit synchronized mobility.

Displaced Teeth. Early treatment of displaced teeth tends to improve the prognosis significantly. Therefore, it is recommended that an attempt be made to reposition laterally displaced teeth with gentle thumb-index finger-gauze pressure as early as possible. In most instances, splinting is required for a period of 4 to 8 weeks after the displaced teeth have been repositioned.

Avulstion (Total Loss). Avulsion of primary teeth only requires proper care of the resulting soft tissue injury. An avulsion of a permanent tooth may require reimplantation. The prognosis of reimplantation is directly related to the length of time the tooth remains outside the socket. Therefore, it is recommended that an attempt be made to replace the avulsed tooth into the socket after careful cleansing of the area. Gentle pressure can be maintained on the tooth with gauze until the patient is ready for splinting. If immediate reimplantation is impossible, the tooth should be placed in normal saline or a moist towel and transported to the nearest qualified dentist or emergency room. Regular follow-up care and root canal therapy are usually required.

Burns

Burns involving the oral cavity usually heal with contracture and scarring. Mucous membranes are more susceptible to burns because of their low resistance. Available dental techniques using special splints to keep anatomic structures in proper relationship before scar formation occurs can prevent or greatly minimize the formation of contractures.

Facial Bone Fractures

The incidence of such fractures in pediatric populations is relatively low. The most common are nasal fractures, followed by fractures of the mandible. Most of these injuries result from trauma; however, other factors, such as child abuse or delivery by forceps, should be considered.

Mandibular Fractures

The vast majority of mandibular fractures occur in the weakest parts of the mandible, which are the condylar necks and the areas of intrabony, developing permanent tooth buds. The presence of a mandibular fracture is signalled by signs such as ecchymosis, swelling, chin or facial lacerations or abrasions, limitation of jaw movements, deviations, or malocclusion. A final diagnosis is made after radiographic examination. Special techniques that utilize dental films or tomography are indicated in certain areas.

Midface Fractures

This type of fracture is not very common in children. In 1901, LeFort divided midfacial fractures into three groups: LeFort I, which primarily involves the maxilla; LeFort II, which primarily involves the maxilla and the nasal complex; and LeFort III, which involves the whole midface, separating it from the cranium. Most of these fractures require

a cooperative effort and a thorough and detailed examination to ensure proper care; diagnosis can be challenging and frequently requires tomography. Such fractures should be suspected with the presence of malocclusion, swelling, ecchymosis, cloudy sinuses, or segmental mobility of the maxilla. Ophthalmologists, otolaryngologists, and dentists should work jointly to avoid the problems which could otherwise complicate these fractures.

Neck Masses of Dental Origin

Acute Localized Adenopathy

These are swellings of various sizes usually associated with the regional lymph nodes. Although the majority of such cases are idiopathic, a dental cause should be ruled out. The primary site can be a dental infection from advanced caries, trauma, gingivitis, or pericoronitis. In infants and school children, pericoronitis that is associated with the eruption of teeth should be carefully considered. Most of these swellings appear to occur between the ages of 10 and 12 years. Typically, the swellings occur near the angle of the mandible, in the submental or submandibular spaces. Most of the reported cases have been caused by streptococci or staphylococci. Early diagnosis and prompt treatment may help to avoid the need for incision and drainage.

Acute Odontogenic Infections

These enlarging masses are often associated with trismus, tenderness, fever, and malaise. When superficial, the abscesses may be fluctuant; if they are deeper to the cervical fascia or beneath the periosteum of the mandible, they will be firmer. The spread of infection is determined by gravity and anatomic barriers. An enlarging submental, sublingual, or submandibular abscess may cause an airway obstruction or may extend into the mediastinum. Such odontogenic infections are relatively common in children because of the high incidence of caries and the wide marrow spaces that allow the rapid spread of infection. The majority of upper neck abscesses are dental in origin; therefore, it is essential to identify the primary site. The offending tooth is usually very tender to percussion, and the surrounding gingival tissues are edematous and tender to palpation. Failure to identify the primary site can result in recurrence and the possible development of an extraoral sinus tract. Again, this phenomenon is more frequently seen in children.

Other uncommon infections of the head and neck, such as osteomyelitis, actinomycosis, or acid fast infections, can present clinically as a swelling that is similar to the more common odontogenic abscess.

Osteomyelitis of the Mandible

Osteomyelitis of the mandible in children is relatively rare. One such case of odontogenic etiology has been reported in which *Bacteroides fusiformis* was recovered. Garré's osteomyelitis, a focal growth thickening of the periosteum with a peripheral reactive bone formation, may occur in the mandible of children. The most common cause is a mandibular first permanent molar that is abscessed. In most cases of osteomyelitis, the erythrocyte sedimentation rate (ESR) is elevated. The radiographic features of a lytic process

and periosteal elevation may be present, although severe acute osteomyelitis is not always associated with the radiographic stage of bone scans.

Treatment is dependent on the results of a culture and sensitivity tests. The prognosis is dependent on the onset of treatment. Purulent infection should be treated surgically, and nonpurulent infection should be treated with antibiotics that are administered parenterally. After a reduction in clinical signs and a decrease in the ESR, oral antibiotics can be administered for three weeks or longer until all the clinical signs have disappeared and the ESR is less than 20 mm per hr. For chronic osteomyelitis, the minimal regimen for oral antibiotic treatment is six months.

Actinomycosis

Actinomycosis is a chronic granulomatous disease caused by a group of actinomyces. The most common of these organisms in humans are *A. israelii* and *A. bovis.* Actinomycotic infection advanced by contiguous spread, disregarding tissue planes. Cervicofacial actinomycosis is the most common form of this disease. The organisms are normally present in the oral cavity and may enter through gingivae, necrotic teeth, extraction sites, or trauma. They spread into adjacent tissues and cause abscesses and the formation of fistulae and fibrous scar tissue. An interesting feature is the presence of the typical yellow spicules of sulfur granules in the pus. The prognosis associated with cervicofacial actinomycosis is generally good. The treatment of choice is penicillin given in high doses intravenously for up to six weeks, followed by oral penicillin for three to six months.

Dental Care for the Immunosuppressed Patient

The survival of patients with neoplasms during childhood has shown a steady improvement over the past 25 years largely because of chemotherapy. Many chemotherapeutic agents are now available, and new ones are being introduced rapidly. These drugs exhibit various degrees of toxicity. Patients often exhibit leukopenia, thrombocytopenia, anemia, or other symptoms. Major complications associated with the use of immunosuppressant drugs include the following.

Infection. Infection is a serious problem in immunosuppressed patients, as the host defenses are impaired and the antibody responses are inhibited. The oral cavity is particularly vulnerable because several drugs can cause disruption of intact integument or the everpresent array of oral flora, and the possible disruption of oral mucosa by mechanical means. Such breaks can open pathways for localized invasion by bacteria, viruses, or fungi. This invasion may become life-threatening unless it is treated early and aggressively. Careful and frequent monitoring of the oral status is recommended. Early dental evaluation that includes radiographs, assessment of oral hygiene, and elimination of all foci of infection is very important. Gentle manipulation of oral mucosa during routine oral hygiene is advised. The emphasis should be placed on prevention and thorough, regular evaluation. Most dental care can be safely provided during stages of remission. The use of prophylactic antibiotics should be carefully considered, especially if the procedures that are planned can cause bacteremia.

Hemorrhage. In most instances, spontaneous gingival or postsurgical bleeding results from the effects of the disease process itself or the chemotherapeutic agents on the number

and function of platelets. Therefore, thrombocytopenia should be suspected in such patients, and the bleeding tendencies of the patient must be evaluated befrore any dental surgical procedure is planned. A complete blood count, prothrombin time, partial thromboplastin time, and a platelet count should be obtained. Platelet transfusion should be ordered before dental extractions or an oral surgical procedure is performed. Elective procedures should be delayed until the patient is in remission.

Local Irritation. Several drugs currently in use can cause variable degrees of ulceration within the oral cavity. Such ulcers must be distinguished from surface changes by infection. Symptomatic treatment, such as frequent warm saline rinses, chloroseptic mouthwashes, or topical anesthetic lotions, are indicated to make the patient comfortable. Some degree of diet control may be required in severe cases.

Dental Care of Patients Receiving Radiation Therapy

Therapeutic doses of radiation to the head and neck have several major side effects, which include the following.

Xerostomia. Xerostomia can be demonstrated within two weeks following the initiation of radiation therapy. This condition is progressive and can lead to complete xerostomia in severe cases. The saliva may become more viscous. With the reduction in flow of saliva and its increased viscosity, the ability of saliva to lubricate and to act as an efficient buffer solution is drastically impaired. As a result, patients develop heavy dental plaque, which in turn initiates a rapid destruction of the dentition.

Vigorous oral hygiene, dietary restriction of frequent carbohydrate consumption, daily rinsing with a fluoride mouthwash, weekly application of neutral sodium fluoride gel, and a monthly professional evaluation may prevent radiation-related caries in most instances.

Infections. Certain changes in the bacterial and fungal oral flora develop as a result of xerostomia in patients who receive radiation therapy. Such changes lead to the overgrowth of opportunistic organisms such as *Candida albicans.* Should such an infection occur, culture and sensitivity tests should be obtained and appropriate treatment administered.

Osteoradionecrosis. This is the most serious complication of radiation therapy. Osteonecrosis is the result of a reduced blood supply and the decreased healing capacity of the irradiated tissues. The probability of developing radionecrosis is directly related to the dose of radiation given. If extractions are required, they should be performed prior to the initiation of radiation therapy. If postradiation caries cause dental infection and teeth must be extracted, an aggressive intravenous antibiotic prophylaxis for the duration of hospitalization, which is followed by high doses of oral antibiotics, may prevent most complications.

Loss of Taste. This complication is usually self-limiting, and taste sensation returns within one year. Most complications can either be prevented or can be reduced to a reasonable level. All patients who are scheduled for radiation therapy of the head and neck should receive a dental examination, have all necessary dental care completed, and should begin a strict oral hygiene program prior to the initiation of radiotherapy. Shielding of the

salivary glands and other bony structures should be attempted, if this would not interfere with the primary objectives of radiation therapy.