

Adaptation and Development of Dental Procedure in Cerebral Palsy

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Abstract

Management of medically compromised patient often presents a challenge to dentists in all the specialties. The advent of early diagnostic procedure for better management of cerebral palsy is necessary for various medical and dental applications. It is important to realize that providing care for these patients should not produce any harm and diagnostic and mechanotherapeutic procedure may differ from those applied to healthy patients. This article describes effects of cerebral palsy conditions on diagnosis, treatment planning and mechanotherapy of patients along with effects of disease process on dental procedure.

Key words: *Medically compromised, cerebral palsy, mechanotherapy.*

Introduction

Gross disabilities involving neuromuscular and skeletal systems can present dentist with the problems in providing optimal oral care. Understanding the cause and effects of these conditions is essential in preparing clinician to provide for needs of the special patients. This segment of population often gets neglected service. Care of handicapped patients should not be considered as negative aspect of dentistry, rather it should be viewed as challenging area of practice. This article is describing etiology, major motor or skeletal problem and treatment related possibility.

Treatments related problem are those related to patients inability to cooperate sufficiently for successful treatment, mechanical problems fixed contracture of limbs of cerebral palsied patients, poor oral hygiene resulting from patients level of intellectual functioning or physical disabilities, history of dental neglect and difficulty in providing treatments because of parents attitude.

Cerebral Palsy

Cerebral palsy is descriptive term covering number of condition with various degree of severity and is the condition appears at birth or shortly thereafter birth although etiological agents responsible for the condition may be acting for a considerable time before the birth.[1,2]

Causes of cerebral palsy are many such as reduced supply of oxygen to the developing brain, infections, birth trauma, kernicterus and genetic cause. Cerebral palsy is highly associated with prematurity.[1,3]

Cerebral palsy is a permanent neuromuscular motor disorder that results from injury in developing brain during prenatal or post natal period. Lots of common functional & craniofacial problems related to cerebral palsy includes impaired swallowing, excessive salivation, impaired speech & chewing, narrow transverse dimension of maxilla, excessive anterior facial height, class III malocclusion.

Patients with cerebral palsy are reported to department of orthodontics many times. Patients with cerebral palsy shows features like skeletal class II malocclusion, maxillary transverse deficiency, forwardly placed maxillary anteriors & generalized spacing in both arches. Treatment modality includes surgical maxillary expansion in case of growth is ceased; closure of spaces, habit breaking appliance & retraction of forwardly placed teeth.

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What exactly is cerebral palsy : Cerebral palsy is defined as, a disorder of movement & posture caused by a defect or lesion in immature brain.

Classification of cerebral palsy – cerebral palsy is classified into four types in Europe, 1) spastic 2) ataxic 3) dyskinetic 4) mixed [4,5]

Spastic type : This is the most common type of cerebral palsy. It occurs in 50% of all cases. This type also accompanies nearly a third of other types of cerebral palsy as well. The features of this type of cerebral palsy include increased muscle tone resulting in stiff and awkward movements, inability to control voluntary movements. The damage is said to be in the corticospinal tract or the motor cortex. This part affects the areas that receive gamma amino butyric acid or GABA that is an inhibitory neurotransmitter.

Spastic cerebral palsy is further divided into types according to the areas of the body that it affects. For example:

1. In Spastic hemiplegia one side of the body is affected. It occurs when injury to muscle-nerves controlled by the brain's left side will cause a right body deficit, and vice versa. These patients have a fair amount of capability to move around.
2. In Spastic diplegia the lower limbs are affected with little to no upper-body spasticity. The most common form of the spastic forms is spastic diplegia. Most people with spastic diplegia are fully ambulatory and have a scissors gait. This means their legs cross over while they attempt to walk. They may also have other problems like hip problems, dislocations, crossed eyes or strabismus. The intelligence of a person with spastic diplegia is unaffected by the condition.
3. In Spastic tetraplegia all four limbs affected equally. These patients are least likely to be able to walk. This is because their muscles are too tight and they may also develop an uncontrollable shaking that affects the limbs on one side of the body that impairs normal movement.
4. Other forms include monoplegia (one limb affected), paraplegia (two limbs affected), triplegia (three limbs affected) etc.

Ataxic type : This type of cerebral palsy occurs due to damage to the cerebellum or lower part of the brain at the back of the head. This condition is characterized by uncoordination during planned or purposeful movements. This area normally deals with movement, gait and

coordination. This is one the less common types of cerebral palsy forming around 30 to 40 % of all cases. There may be additional tremors or shaking. These children have problems with other motor skills like writing, typing, using their fingers for fine movements as well as have balance problems while walking. They may also have trouble with visual and/or auditory processing.

Dyskinetic type : Here the muscle tone is mixed. At times it may be too lax or hypotonic and at times it may be too tight or hypertonic. Hypotonia will usually occur before 1 year old. The muscle tone increases with age and progress to Hypertonia. The damage occurs to the extrapyramidal motor system and/or pyramidal tract and to the basal ganglia. It occurs in 10% to 20% percent of all cases. Athetosis cerebral palsy may be seen in newborns who have had severe jaundice and kernicterus. These patients have trouble holding themselves in an upright, steady position for sitting or walking, and often show involuntary motions. For these patients it is difficult to bring their hands or limbs together for any form of concentrated work. This could be something simple such as picking up a glass to drink water.

Mixed type : There may be a combination of several forms. The most common type of mixed cerebral palsy is spastic-dyskinetic cerebral palsy.

Etiology : There are several causes of cerebral palsy which includes; Premature birth , oxygen reduction in developing brain , pre-ventricular leukomalacia , infection to brain , toxemia during pregnancy , drug poisoning , metal poisoning , trauma or injury to head. Generally cerebral palsy reported to class II malocclusion patients.[1-3, 5]

Oral conditions : Investigators sampled cerebral palsied population to determine relationship between basic conditions and various oral findings including developmental dental defects, malocclusions, dental caries and periodontal disease. The results of these studies indicate an increased frequency of enamel hypoplasia among cerebral palsied as compared to overall population.

Enamel defects are associated with positive neuralgic signs and history of prenatal, neonatal or post natal insult. Studies dealing with hypoplastic effects in primary dentition indicates usefulness of these findings as a diagnostic tool in assessing early development of lesion.[2,6,7] Prevalence of periodontal disease associated with inadequate oral hygiene is high amongst cerebral palsied patients.[8,9] Periodontal complication is because

of interrelationship between physical effects which impedes the mechanical process of brushing, intake of phenytoin for epilepsy and inadequate personal care as a result of poor self image.[10,11]

Two other oral conditions common to cerebral palsied are bruxism and tooth clenching related to neurogenic problem causing frequent fractures and avulsions of anterior teeth. Prevalence of dental caries is more in cerebral palsied patient because of predisposing factors like inadequate oral hygiene, hypoplastic defects and possibly poor diet.[8]

Hydrocephalus is a condition indicating lack of balance between the formation and absorption of cerebrospinal fluid. Mental retardation may or may not be associated with condition either directly or as a result of the operations used to correct it. There are no other dental conditions peculiar to hydrocephalus other than those concurrent with another condition.[12]

In short poor oral hygiene, periodontal disease, bruxism, dental caries, protrusion of maxillary anteriors, trauma, excessive overjet, excessive overbite, open bite, cross bite, lip incompetency, facial muscle impairment, tongue & lip movement results in sucking, chewing, swallowing, & speech problems, tongue thrust, drooling of saliva, TMJ disorders are the conditions associated with cerebral palsied patients.

Patient Management

History taking : An accurate and complete history is important aspect of patient management. Advantages in conducting history taking outside of dental operatory in an atmosphere that is less anxiety provoking.[13,14] Nutritional background is important to the consideration of overall health and relationship between patients diet and production of caries and other oral problems. Oral examination finds maxillary transverse deficiency, forwardly placed maxillary incisors, and generalized spacing in both arches, drooling of saliva, malocclusion with increased overjet & overbite.

Behavioral Control : Behavior control influences eventual outcome of patient care which relate patient as well as operator, assistant and other dental environment. Behavior control can be from simple verbal control, mild physical restraints, mouth props, restraining straps, full body control, sedation, analgesia and finally general anesthesia. Positive approach is important prerequisite for successful completion of treatment. The first appointment procedure includes taking thorough medical and dental history and

consultation with other health person. The definitive plan of action include establishing communication with parent, thorough clinical examination, obtaining radiographs and study models and initiation of program of prevention.

Role of dental assistant : Patient management is never a single person's effort. The dentist must define the assistant's role sufficiently so that dentists can act with assurance in carrying out ordinary and extra ordinary procedures which may be required. Some duties dentist may assign to assistant such as obtaining preliminary information, instructing patient and parents regarding oral hygiene, assisting in use of restraints and other method of patient behavior control, anticipating problems, preparing for emergencies and advising dentist of any noteworthy patient and family.

Wheelchair transfer is the principal means of mobility for severely physically disabled patients. Transferring most of individuals from this chair to dental chair need not to be difficult procedure. Patient can be partially assisted in which patient requires assistance in moving part of their bodies generally lower half and fully assisted in which patients take passive role an transfer is by others.[16] Generally wheel chair should be positioned beside dental chair with its wheels locked. The height of the dental chair should be adjusted so that patient will not have to be lifted too high to clear the arms of chair. When patient is seated, chair can be adjusted so that patient assumes more horizontal position.

Physical restraints : Physical restraints is condemned by some, tolerated by others and felt to be useful for both operator and patients. Restraints can be used, did not feel they were sufficiently effective because they went against proprioceptive mechanism.[17] Other authors like Davis and Wessels are more tolerant of the use of restraining devices and feel that they should be used when indicated[8,11]. Weyman felt that such devices should never be used for restraining but only for retaining and support.² Feasby and Wright stated that, it is not unusual to find cerebral palsied children who welcome the security provided by benevolent application of restraining device¹⁸. The arms and legs can be restrained through use of canvas straps equipped with Velcro fasteners which encircles the limbs and arms and foot portion of the dental chair. To protect the skin of the patients towel can be placed over the arms or legs prior to taping. Wrapping sheet around patient is effective method of immobilization.

Cerebral palsied patient often have difficulty in controlling muscles of mastication and deglutition. It manifests unexpected opening and closing of mouth, grimacing and tongue movements. Mechanical means of in reducing adverse effect of such movements are rubber door wedges, bite blocks and mouth props which are commercially available. Padded tongue blade and rubber bottle stoppers used effectively to keep mouth open. Rubber dam can also be thought of as a means of physical restraints. One of the best means to obtain control over unwanted physical movements is the use of operators own body. The stabilizing hand can hold a mouth prop. The thumb, index and middle finger holds mirror. Left forearm controls unusual movements.

Preventive programs: Preventive approach should be a team effort involving cooperative efforts between dentists, hygienist, assistant, patient, family and other person having impact on patient's life. Efforts included by dental office are tooth brushing with necessary adaptation to make manipulation of brush either manual or electrical a feasible procedure. Flossing if patient or another care giving person can accomplish it. Use of dietary fluorides if water supply is non fluoridated, use of fluoride rinses an elimination of highly cariogenic foods from diet with substitution of non cariogenic food.

Emergency procedure: Good patient management also means being prepared for the unexpected. Emergencies can occur at any time and with any patient. Emergency procedure for individuals having severe physical disabilities are generally related to problems arising from mechanical difficulties such as actual aspiration of foreign bodies, unexpected seizure and problems associated with sedatives anesthetics. Precaution includes suitable length of dental floss to the rubber dam clamp to aid in retrieval, having telephone number of nearest emergency services and dental equipment functioning satisfactorily. Dental office must be equipped with good suction so that foreign bodies, mucus or fluid can be removed from mouth and throat. Selection of airways in various sizes should be available. Oxygen delivery system must be available ranging from oxygen tank, a bag, a regulator and a mask. Padded tongue blade and commercially available large diameter needle suitable as emergency tracheotomy measure should also be kept on hand.

Operative technique : Dental operative technique that forms typical dental practices are same as employed for patients with gross motor or skeletal problems. There are some modifications applicable to specific situations.

Begin treatment if possible by cleaning the teeth with rubber cup and pumice or commercially prepared prophylaxis paste. The first advantage of this is to remove soft debris and it will aid in visualization of tooth surface during examination or scaling. The second advantage is that it introduces treatment in a benign and pleasant way and helps to establish bond of trust and confidence between operator and patient.

Hypoplastic anterior teeth associated with cerebral palsy can be brought to more esthetic condition by application of composite restorative material. Posterior teeth exhibiting hypoplasia can be restored through use of chrome alloy crowns. Replacement of crown is necessary since habit causes rapid wear. Mouth guards can be used selectively to reduce amount of attrition on teeth due to bruxism. Amalgam restoration in patients who exhibit bruxism should not have deep grooves as it reduce strength and make fracture.

Often patient with cerebral palsy exhibit some forms of malocclusion. Before intervention is attempted a thorough study of factors involved should be made. Open bite conditions associated with primitive swallow that is part of overall neurogenic problem are considered by some in correctable. Therefore use of habit breaking appliances may be unsuccessful or their use problematical at best. The degree of abnormal muscular habits, mental level of patients, occurrence of seizures, use of phenytoin and overall manageability of patient must be additional factors to be considered before any intervention is attempted. Consultation referral to orthodontist is also often advisable.

Cerebral palsy and Others (other medical diagnoses), and severely mentally retarded children with or without a physical handicap, including the subgroups Down's syndrome, Cerebral palsy and Others. Totally 115 children (3-17 years) were studied with respect to occlusion, space conditions, hypodontia and received orthodontic treatment, and compared to matched control groups of healthy children. The severely mentally retarded children in all of the handicap groups had the highest prevalence of, and often the most severe, malocclusions compared to their controls. The results indicate that the mental status is more important for the orthodontic status than the medical diagnosis.[19] The prevalence of malocclusion in children with cerebral palsy was studied by comparison with a normal control group. The prevalence of drooling and prematurity was also assessed as well as the degree of mental handicap. Results showed an increased

prevalence of malocclusion in children with cerebral palsy but there maybe a tendency towards the more handicapped group having a Class II malocclusion.[20]

Periodontal disease is common in people with cerebral palsy due to poor oral hygiene and complications of oral habits, physical abilities, and malocclusion. Another factor is the gingival hyperplasia caused by medications. Encourage independence in daily oral hygiene. Ask patients to show you how they brush, and follow up with specific recommendations on brushing methods or toothbrush adaptations. Involve your patients in hands-on demonstrations of brushing and flossing.

Some patients cannot brush and floss independently because of impaired physical coordination or cognitive skills. Talk to caregivers about daily oral hygiene. Do not assume that all caregivers know the basics; demonstrate proper brushing and flossing techniques. A power toothbrush or a floss holder can simplify oral care. Also, use your experiences with each patient to demonstrate sitting or standing positions for the caregiver. Emphasize that a consistent approach to oral hygiene is important-caregivers should try to use the same location, timing, and positioning. Explain that some patients benefit from the daily use of an antimicrobial agent such as chlorhexidine. Recommend an appropriate delivery method based on your patient's abilities. Rinsing, for example, may not work for a patient with swallowing difficulties or one who cannot expectorate. Chlorhexidine applied using a spray bottle or toothbrush is equally efficacious. If use of particular medications has led to gingival hyperplasia, monitor for possible delayed tooth eruption and emphasize the importance of daily oral hygiene and frequent professional cleanings.

Dental caries is prevalent among people with cerebral palsy, primarily because of inadequate oral hygiene. Other risk factors include mouth breathing, the effects of medication, enamel hypoplasia, and food pouching. Caution patients or their caregivers about medicines that reduce saliva or contain sugar. Suggest that patients drink water often, take sugar-free medicines when available, and rinse with water after taking any medicine. Advise caregivers to offer alternatives to cariogenic foods and beverages as incentives or rewards. For people who pouch food, talk to caregivers about inspecting the mouth after each meal or dose of medicine. Remove food or medicine from the mouth by rinsing with water, sweeping the mouth with a finger wrapped in gauze, or using a disposable foam applicator swab. Recommend preventive measures such as fluorides and sealants.

Malocclusion in people with cerebral palsy usually involves more than just misaligned teeth—it is also a musculoskeletal problem. An open bite with protruding anterior teeth is common and is typically associated with tongue thrusting. The inability to close the lips because of an open bite also contributes to excessive drooling. Unfortunately, correcting malocclusion is almost impossible in people with moderate or severe cerebral palsy. Orthodontic treatment may not be an option because of the risk of caries and enamel hypoplasia. However, a developmental disability in and of itself should not be perceived as a barrier to orthodontic treatment.

The ability of the patient or the caregiver to maintain good daily oral hygiene is critical to the feasibility and success of orthodontic treatment. Inform caregivers of emergency procedures for accidents involving oral trauma, since protruding anterior teeth are more likely to be displaced, fractured, or avulsed.

Dysphagia, difficulty with swallowing, is often a problem in people with cerebral palsy. Food may stay in the mouth longer than usual, increasing the risk for caries. Additionally, the semi-soft foods caregivers may prepare for people with this problem tend to adhere to the teeth. Coughing, gagging, choking, and aspiration are other related concerns. Keep the breathing passages open by placing your patient in a slightly upright position with the head turned to one side during oral care. Use suction frequently or as tolerated by the patient. Use a rubber dam when indicated, but make sure you introduce it slowly, perhaps over a few appointments. Advise the caregiver to inspect the patient's mouth after eating and remove any residual food.

Bruxism is common in people with cerebral palsy, especially those with severe forms of the disorder. Bruxism can be intense and persistent and cause the teeth to wear prematurely. Before recommending mouth guards or bite splints, consider that gagging or swallowing problems may make them uncomfortable or unwearable. Drooling affects daily oral care as well as social interaction. Hypotonia contributes to drooling, as does an open bite and the inability to close the lips. Hyperactive bite and gag reflexes call for introducing instruments gently into the mouth. Consider using a mouth prop. A patient with a gagging problem benefits from an early morning appointment, before eating or drinking. Help minimize the gag reflex by placing your patient's chin in a neutral or downward position.

Trauma and injury to the mouth from falls or accidents occur in people with cerebral palsy. Suggest a tooth-saving

kit for group homes. Emphasize to caregivers that traumas require immediate professional attention and explain the procedures to follow if a permanent tooth is knocked out. Also, instruct caregivers to locate any missing pieces of a fractured tooth, and explain that radiographs of the patient's chest may be necessary to determine whether any fragments have been aspirated. Physical abuse often presents as oral trauma. Abuse is reported more frequently in people with developmental disabilities than in the general population. If you suspect that a child is being abused or neglected, State laws require that you call your Child Protective Services agency.

Summary

Most people with a severe physical disability can be treated in normal dental office setting. The basic skills acquired in dental school can be applied to the treatment of individuals having such disabilities. There are techniques and equipment which can greatly assist the operator in performance of therapeutic interventions. The most important aspect for successful treatment is attitude and skills of dentists and dental team. A proper attitude is necessary for initiation of treatment. Confidence resulting from successful experience is essential to sustain treatment of patients with major disabilities.

Making a difference in the oral health of a person with cerebral palsy may go slowly at first, but determination can bring positive results and invaluable rewards. By adopting the strategies discussed in this booklet, you can have a significant impact not only on your patients' oral health, but on their quality of life as well.

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