

CEREBRAL PALSY

A REVIEW FOR DENTAL PROFESSIONALS

Purpose of this Module

The information presented in this module is intended to provide the institutional dental staff with the appropriate knowledge needed to modify treatment and preventive procedures to best meet the needs of the person with cerebral palsy.

Learning Objectives

After reviewing the written and audio-visual materials, the participant will be able to:

1. Define cerebral palsy and state the incidence of this condition in the general population.
2. List two etiological causes of cerebral palsy in each of the following three categories: prenatal, neonatal and postnatal periods.
3. List and briefly describe the three major classification/descriptive systems of cerebral palsy.
4. Describe the association of mental retardation and cerebral palsy.
5. Describe three medical problems associated with cerebral palsy and their impact on dental care.
6. Describe the implications of cerebral palsy on issues of dental decay, periodontal disease and malocclusion.
7. List two procedures commonly employed to correct the salivary incontinence of individuals with cerebral palsy.
8. List three possible modifications of personal oral hygiene procedures for persons with cerebral palsy.
9. List two modifications in prosthetic design appropriate for some persons with cerebral palsy.
10. Discuss the advantages and limitations of periodontal surgery for patients with cerebral palsy.

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INTRODUCTION

Since 30-50% of the institutionalized population with mental retardation is likely to have cerebral palsy, it is appropriate that the institutional dental staff be familiar with the medical and dental impact of this condition. The following information is not an extensive review of cerebral palsy and the general management of this condition, but rather a review of the medical and dental conditions that may affect dental care. As with all similar conditions, generalizations are necessary, but each person is provided care based upon individual needs. Most of the information reviewed is gained from dental sources, not medical publications.

DEFINITION AND INCIDENCE

Cerebral palsy (CP) is a permanent non-progressive neuromuscular disorder caused by damage to the immature brain. The pathology produced at or near the time of birth involves the areas of the brain regulating voluntary muscle movement and posture, and significantly interferes with normal function. Thus, cerebral palsy does not refer to a specific disease, but rather describes the effects following a variety of insults to the motor areas of the brain. The incidence of CP is usually 0.15 to 0.3% of the general population (compared to a 3% incidence of mental retardation). Since the etiology occurs during the developing years, CP is one of several developmental disabilities (DD).

ETIOLOGY

All the conditions that can cause damage to the cognitive areas of the brain with resultant mental retardation (MR) can also

affect the motor areas of the brain and result in cerebral palsy. These include:

Prenatal - Prematurity, acute maternal infections (e.g. rubella), chronic maternal infections (e.g. syphilis, herpes), RH incompatibility, radiation, drugs (e.g. alcohol, cocaine), maternal dysfunctions (e.g. diabetes, hypertension).

Neonatal - Precipitate birth, apnea, hypoxia (most common), birth injury, prolonged/difficult labor.

Postnatal - Trauma, brain tumors, infections (e.g. encephalitis, meningitis), toxins (e.g. lead, hydrocarbons).

CLASSIFICATION AND DESCRIPTIVE SYSTEMS

Severity

-The severity of CP is equally separated into mild, moderate and severe categories. This is in contrast to MR where 75% are mild and 95% are in the mild/moderate categories.

Specific area of brain involved (and resultant posture/movement disorder)

- *Spasticity* (50-60%): Spasticity results from a lesion of the cortical motor area of the brain (the pyramidal system). One sees exaggerated movements, increase in muscle tone (hypertonicity), hyperreflexia, tendency toward contractures and Babinski's sign. Positioning or movement can increase or decrease spasticity (but not rigidity). Also loud noises or other stimuli can precipitate flexion/extension.
- *Athetosis* (20-35%): Athetosis results from lesions of the basal ganglia (the extrapyramidal system). It is characterized by writhing, wormlike, purposeless involuntary movements, involving the face, neck and trunk with variable

muscle tension. All limbs may be involved, but mostly upper.

- *Ataxia* (7-15%): Ataxia results from a lesion of the cerebellum. It is characterized by a lack of coordination (hand to eye) and balance problems (gait).
- *Tremors*: Characteristics of tremor are quivering or shaking of parts of the body or the entire body.
- *Rigidity*: Resistance to passive movements, stiffness and inability to bend are symptoms of this condition (lead pipe, cogwheel). Rigidity is rarely seen in individuals with CP, but more commonly with other diseases like Parkinsons (cogwheel).
- *Mixed* (13%): especially spastic athetosis.

Limb involvement

- *Monoplegia*: one limb involved (rather rare)
- *Diplegia*: involvement of lower extremities with minimal involvement of arms
- *Hemiplegia*: involvement of half the body (arm/leg on same side)
- *Double hemiplegia (quadriplegia)*: all four extremities involved with arms more severely affected.
- *Paraplegia*: legs involved only
- *Triplegia*: Any three extremities involved

MENTAL RETARDATION

The incidence of mental retardation has been reported as high as 50-70% in individuals with CP. The retardation is mostly mild/moderate with the incidence of severe/profound retardation described at 25%. There remains approximately 30% of individuals with CP having normal or occasionally superior intelligence. Thus, it is inappropriate to assume an individual with CP has a learning disability. Also many persons with CP have perception problems which make learning difficult and valid IQ testing a problem. There is recent evidence, based upon modified IQ tests, that the incidence of MR in the CP population may be much lower than previously thought. Generally the greater the motor

involvement, the greater the degree of retardation. Persons with spastic CP seem to have more learning disabilities than other categories of cerebral palsy.

MEDICAL PROBLEMS

Epilepsy: (recurrent transient attacks of disturbed brain function which may or may not produce a seizure or convulsion). It is estimated that 30% of persons with cerebral palsy have epilepsy (the actual seizure disorder) compared with an incidence figure of 1.7- 2.5% for the general population. Anticonvulsant medications present problems in the provision of dental services. For example, Dilantin (phenytoin) often causes gingival hyperplasia and Depakane (valproic acid) can occasionally create a bleeding tendency. Note that hyperplasia due to Dilantin therapy is sometimes termed phenytoin induced gingival overgrowth (PIGO).

Visual Defects: A large number of individuals with CP also have visual defects including strabismus (15-60%) and significant refractive error (40-76%). These problems not only involve vision but also adversely affect development of visual motor skills.

Hearing Defects: In persons with CP, partial hearing loss is common, especially in the athetoid group. Incidence of hearing impairment has been reported at 10-41%. Apparently the brain damage which causes CP can also destroy the auditory mechanism.

Speech Defects: Dysarthria (inability to articulate clearly) is a common problem with persons with CP. The incidence of this disorder ranges from 31-88% and is due to inability to control muscles of speech and mastication. Persons with cerebral palsy and dysarthria may be of normal intelligence. Thus the stigma of unclear speech may be confusing to the clinician. Dysarthria differs significantly from aphasia. Expressive aphasia is the inability to express oneself through speech; receptive aphasia is the loss of verbal comprehen-

sion. These conditions are common to stroke patients, for example.

- # **Drooling (Salivary incontinence):** Severe drooling is seen in 10-37% of the CP population. Although related to the common incidence of anterior open bite and lack of lip closure, drooling is primarily due to a swallowing dysfunction. Hypersalivation is not considered the cause of drooling in these individuals, however the literature is confusing on the issue of whether hypersalivation is present in persons with CP. Drooling is a major stigma for many persons with cerebral palsy.
- # **Diet Issues:** Due to constant involuntary movement and resultant calorie consumption, many persons with CP are thin and underweight. Diet consistency may be altered to cope with an altered chewing capability; soft or chopped diets are common.
- # **Dysphagia/inadequate cough reflex:** Delayed cough reflex and abnormalities in swallowing (dysphagia) are commonly associated with cerebral palsy. As would be expected, more choking, coughing and aspiration problems are the result of this condition. Implications for dentists in airway management, especially when employing sedation, is obvious.
- # **Other Associated Conditions:** Although cerebral palsy itself is nonprogressive, other associated conditions may be degenerative in nature. These include chronic respiratory ailments, osteoarthritis and other orthopedic problems such as spinal deformities, especially scoliosis. The incidence of scoliosis in the CP population has been estimated at 4-64%. Other issues associated with cerebral palsy are: hyperactivity, decreased attention span, emotional instability and depression. Hyperactive gag reflexes and hyperactive bite reflexes are also a common finding.

DENTAL PROBLEMS

- # **Dental Decay:** Information on the incidence of dental decay in individuals with CP is conflicting, especially since many earlier studies utilized institutionalized subjects who had highly controlled diets. Most recent studies indicate that people with CP experience a somewhat higher degree of dental decay, primarily due to poor oral hygiene. This poor oral hygiene is the direct result of the inability of many with CP to physically cope with brushing and flossing activities. Many other factors contribute to the decay problem and include soft diet, enamel hypoplasia, mouth breathing, anti-drooling drugs and food retained in the mouth longer than usual due to dysphasia.
- # **Periodontal Disease:** There is extensive documentation of an increased incidence of periodontal disease and gingivitis in the CP population. The incidence of periodontal disease has been estimated as three times higher than in the general population. Poor oral hygiene and gingival hyperplasia due to Dilantin therapy are the major contributors to this problem. Surprisingly, most studies have reported no differences in the incidence of calculus.
- # **Malocclusion:** A dramatic increase in the incidence of class II malocclusion is a common finding in people with CP. Abnormal muscle and tongue movements are responsible for tongue thrust (primitive swallowing pattern) which then creates an anterior open bite so common to these clients. Most of the class II malocclusions represent a skeletal problem not merely the malalignment of teeth.

The anterior open bite with protruding splayed anterior teeth, together with abnormal muscle movement and posture problems, are responsible for much of the trauma to anterior teeth seen in this population. This anterior trauma, with resultant tooth fractures and avulsions, are a major problem for dental staff. There have been no differences reported in palatal vault height or intermolar width. Not surpris-

ingly, most studies report a longer anterior-posterior maxillary arch length and crowded lower anterior teeth. Dry lips due to mouth breathing is also a common finding.

Enamel Hypoplasia/Hypocalcification:

The incidence of enamel hypomineralization has been reported as high as 30-36% with persons with CP. No incidence of hypoplasia has been given, but is clearly higher in this group. Hypoplasia attracts calculus, increases staining and can exacerbate the enamel loss experienced with bruxism. Loss of enamel due to severe hypoplasia can cause pain during scaling and other dental procedures.

Eruption/supernumerary/congenitally missing teeth:

No differences in eruption times of primary or permanent teeth in individuals with CP when compared to the general population have been reported. This is surprising since there are often overall physical developmental delays experienced in this population. Also there has been no reported differences in number of supernumerary teeth, congenitally missing permanent teeth, tongue size or incidence of cleft lip/palate.

Bruxism: Bruxism is a common finding in persons with CP, especially those most severely affected. An incidence in 58% of the institutionalized CP population has been reported. The effects of this bruxism is aggravated by hypoplasia, previously cited. Although the bruxism seen in this population is much more clinically severe than the stress bruxism often seen in the general population, pulp exposures are rare. This is in contrast to pulp exposures commonly seen in rumination (regurgitation of stomach contents) which is reported in 8% of institutionalized MR clients. The severe wear seen in bruxism with many of these clients is apparent on the lingual cusps of the upper permanent molars and buccal cusps of the lower permanent molars which leads to loss of vertical dimension and may contribute to temporomandibular joint (TMJ) problems. Surprisingly, bruxism in persons with CP apparently does not contribute to increased

periodontal disease or tooth mobility. More bruxism is seen in those individuals with more severe CP and with more severe MR. Bruxism is only one of several self-injurious behaviors (SIB) seen in the institutionalized MR population (40% head bangers, 18% pica). Loss of crown height due to bruxism can cause restorative problems for the dentist.

Parotid gland secretion/composition:

Parotid flow rates in individuals with CP have been reported to be lower compared with the general population (0.16 vs 0.63), but salivary composition is within normal range. There are conflicting references as to hyposalivation in these individuals. Reduced salivary flow rates reduce the PH buffering capacity of saliva and may contribute to a higher decay rate.

Temporomandibular joint (TMJ) problems:

There is an increased incidence of TMJ problems with the CP population including tenderness upon palpation, pain on opening/chewing, restricted or deviated mandibular movement, crepitation, luxation of condyles, and hearing problems. There apparently are fewer TMJ symptoms in CP clients who have a normal occlusion (no class II).

MEDICAL TREATMENT OPTIONS

Cerebral palsy is a permanent disorder and no treatment is possible. Although some procedures have been tried to alleviate the abnormal voluntary muscle stimulation (e.g., temporal pacemaker, spinal rhizotomy) little positive long-term effect has been reported. The strategies for the general management of the physical disabilities resulting from cerebral palsy (e.g., adaptive equipment, positioning, wheelchair transfer techniques, speech therapy, etc.) are too extensive to cover in this review, and are not directly germane to the dental management of the person with cerebral palsy.

One medical problem that is directly related to dental care is the management of

drooling. Both behavior modification techniques (e.g. rewarding more efficient swallowing efforts) and oral motor therapy (re-training of muscle movement) have been employed with limited success, especially with the more disabled institutionalized individuals. Surgical procedures such as parotid gland duct ligation and submandibular gland excision have been shown to be effective in controlling drooling with some of these individuals. Also medication, especially transdermal scopolamine (Scopoderm), has successfully addressed this problem. Any attempt to control drooling with surgery or medication can have the unwanted side effect of dry mouth and resultant loss of the buffering capacity of saliva. Rampant caries and subsequent loss of the entire dentition can occur.

DENTAL TREATMENT OPTIONS

There is a paucity of information on treatment options for patients with CP in the current dental literature. The clinician should develop innovative approaches based upon the information presented in the previous section entitled "Dental problems." The following information combines recommendations from the literature with suggestions as to new approaches by the authors.

Periodontal disease and oral hygiene problems: Since individuals with CP, due to their physical limitations, have difficulty carrying out oral hygiene procedures, modification of the usual methods are often indicated. Modification of regular toothbrushes to cope with grip or arm extension problems are usually easily done. The recommendation for use of an automatic brush has proven helpful and more efficient in many cases, especially when the parent/guardian carries out brushing for a dependent child. Many specially designed manual toothbrushes are commercially available. One, the Collis Curve®, has been reported as more efficient but no more effective than regular brushes. An oral irrigation device (e.g. Waterpik®) has usually proven of little value for most per-

sons with CP. The recommendation of home use mouth props has often been a concern. Commercially available mouth props (e.g. Open Wide®) can be of help to parents/guardians brushing these individuals. Further information, including purchasing sources of commercially available oral hygiene aids can be found in Module 11.

The use of antimicrobial mouth washes (e.g. Peridex®, Listerine®) have proven problematical for those individuals with MR/CP who cannot rinse and expectorate. Alternative methods of delivery, such as a spray or gel, have proven helpful. Staining from Peridex® use may be more of a problem with those patients who have enamel hypoplasia. The use of floss holders have proven very helpful, especially with patients who bite down suddenly. A floss holder with a longer handle (e.g. Dr. Flosser®) is helpful in this regard. Disclosing tablets and solutions are messy and have proven of little help with most of these patients. Diet counseling is important especially in patients with CP who have a significant decay problem. Issues of diet consistency and sugar content of liquid medications are of particular concern. More frequent recalls also may be indicated if the decay rate is high.

A major issue is the problem of oral hygiene for adults with CP who live in the community. If clients cannot meet their own brushing/flossing needs, help is required of others. This help is rarely available if the individual lives in a group home or has independent/semi-independent living arrangements. It is also difficult to motivate parents to carry out oral hygiene procedures for an adult son or daughter.

Another significant issue is the surgical management of periodontal disease in these patients, especially gingival overgrowth due to Dilantin therapy. Most dentists have become very conservative in recommending surgery, especially in conditions of poor oral hygiene, due to the common outcome of rapid regrowth. Surgery is usually reserved for patients who have severe overgrowth of the occlusal

surfaces of posterior teeth that ulcerate upon mastication or for primarily aesthetic reasons involving the anterior teeth. The choice of surgical procedure will vary. Many dentists prefer a modified flap procedure to gingivectomy, especially since maintenance of a periodontal pack is impossible with many patients with MR/CP. Laser surgery has promise for future use.

Caries: The approach to dealing with dental decay in persons with CP differs little from the general population. The increased use of sealants and professional and/or home-use fluoride preparations is helpful. Stainless steel crowns are often an option on permanent posterior teeth where patient cooperation precludes a cast restoration. These crowns are surprisingly resistant to wear-through, even if bruxism is present. Where composite restorations are the usual choice, but bruxism is a problem, the selection of a posterior composite (e.g. P50®) or amalgam may be a superior choice. Although glass ionomer restorations are often recommended when caries is a problem, the difficulties of maintaining a dry field with many patients with CP sometimes precludes the choice of this technique sensitive material.

Malocclusion: The correction of the typical class II malocclusion and tongue thrust associated with persons with cerebral palsy and mental retardation is usually impossible. The orthodontic/surgical procedures indicated for this skeletal deficiency are usually not tolerated by these individuals. Even simple fixed orthodontic procedures are usually contraindicated due to a high caries rate and enamel hypoplasia. Removable orthodontic procedures are also contraindicated, in most cases, but with careful case selection may be helpful in some instances. Selected extraction of severely malposed teeth may often be the only treatment option available. The major deterrent to successful orthodontic treatment is the high degree of expected relapse due to the inability to connect the causative motor dysfunction (e.g. tongue thrust).

Patient cooperation and movement:

Procedures for managing the maladaptive behaviors of persons with MR, with or without cerebral palsy, are similar. One issue is the increased need for restraints or stabilizing/protective devices due to uncontrollable body movement. There is a greater need for body wraps, seat belts, mouth props, positioning bags/cushions and other devices with this group. If the person with CP presents with swallowing dysfunction and has problems with aspiration, positioning the patient upright in the dental chair may be indicated. Also, if sedation is employed, a drug choice with a muscle relaxant component would be logical. Extensive discussion on the use of sedation and restraints is presented in Modules 5 and 6.

The dentist should be aware that tablets/capsules are often better managed than liquid medications by many of these patients. Rapid set impression materials are also an advantage with this population.

Prosthetics: There is considerable disagreement among dentists about prosthetic services for these individuals. There is a particular reluctance on the part of dentists to provide fixed partial dentures (FPD) to a population with a history of seizure disorders. Assuming other prosthetic criteria are met, and if the danger of fracture and possible subsequent aspiration is no greater than with the natural dentition, provision of cast restorations and fixed bridges should be provided to these patients. It is important to these individuals' self-esteem to have missing teeth replaced, if possible.

If continued trauma is a realistic expectation, design changes in cast restorations (e.g., acrylic facings vs. porcelain fused-to-metal) should be considered. The problem of replacing missing anterior teeth in the presence of multiple diastemas poses a dilemma and demands a creative approach to bridge design by the dentist. If short crowns due to bruxism are a problem, more attention to intracoronal retention is important. Complications posed by Dilantin hyperplasia must also be coped with

in embrasure design. Bonded bridges offer advantages and disadvantages in this population. The expectation of further anterior trauma would be a disadvantage and usually a direct contraindication. The lack of interfering occlusion seen in anterior open bites may be an advantage. Removable partial dentures (RPD) also pose a dilemma for the dentist. The inability of many persons with MR/CP to remove, clean and reinsert the RPD is often a contraindication of this treatment choice. Conscientious and reliable caretaker support in this area could be a major help in this regard. If removable partial dentures are indicated, design changes (e.g. all metal or reinforced acrylic) may increase the success of this treatment choice. Although there are exceptions, the athetosis and spasticity seen in most individuals with CP usually preclude complete dentures. Likewise the prognosis of implants and implant retained prosthesis is poor with this population.

SUMMARY

The provision of dental care to individuals with mental retardation and cerebral palsy poses a particular challenge to the dental practitioner. A detailed knowledge of the dental implications of this disorder, together with an innovative and problem solving approach to providing treatment options will do much to further the oral health of these individuals. The limitations to treatment choices must be carefully explained to parents/guardians if inappropriate expectations are to be avoided.

BIBLIOGRAPHY

1. Kavanaugh, J., The dental treatment of the cerebral palsied patient. *Jour Dent Quebec* 82:47-52, March 1982.
2. Wicliffe, T., Dental treatment of cerebral palsied patients. *Alumni Bull Indiana Univ Sci Dent*, Spring, 1977, 25-8: 76-77.
3. Lindquist, B and Heijbel, J., Bruxism in children with brain damage. *Acta Odontol Scandinavian* 32(5): 313-19, 1974
4. Davis, M. J., Parotid salivary secretion and composition in cerebral palsy. *Jour Dent Res* 58(8):1808, Aug 1979.
5. Dummett, C.O., Palatal vault form and maxillary arch dimension in cerebral palsy children: A cross-sectional study. *Jour Dent Child* 42(3):201-9, May-June 1975.
6. Rocco, B. B., A comparison of temporomandibular joint function in cerebral palsy and non-cerebral palsy children. *Jour Dent Guid Counc Handi* 15(1): 7-11, Spring 1976.
7. Hylin, D. L., Positioning of the cerebral palsy patient to facilitate dental treatment. *Tex Dent Jour* 1984 Dec:101(12):4-5.
8. Mulligan, R., et al, Design characteristics of floss-holding devices for persons with upper extremity disabilities. *Spec Care Dent* 1984, July-Aug; 4(4):168-72.
9. Sroda, R., et al, Oral hygiene devices for special patients. *Spec Care Dent* 1984 Nov/Dec 4(6):264-6.
10. Brown, A. S., et al, A team approach to drool control in cerebral palsy. *Ann Plast Surg.*, 1985 Nov, 15(5):423-30.
11. Rucker, L. M., Prosthetic treatment for the patient with uncontrolled grand mal epileptic seizures. *Spec Care Dent*, Sept-Oct 1985, 5(5):206-7.
12. Dunn, K. W., et al, Self control and reinforcement in the management of a cerebral-palsied adolescent's drooling. *Dev Med Child Neurol* 1987 June, 29(3): 305-10.
13. Fischer-Brandies, H., et al, Therapy of orofacial dysfunction in cerebral palsy according to Castillo-Morales: first re-

- sults in a new treatment concept, *Eur Jour Orthod* 1987 May 9(2):139-43.
14. Koheil, R., et al., Biofeedback techniques and behavior modification in the conservative remediation of drooling by children with cerebral palsy, *Dev Med Child Neurol* 1987 Feb;29(1):19-26.
15. Orelan, A., et al, Malocclusions in physically and/or mentally handicapped children. *Swed Dent Jour* 1987:11(3): 103-19.
16. Strodel, B. J., The effects of spastic cerebral palsy on occlusion. *ASDC Jour Dent Child* 1987 Jul-Aug;-54(4):255-60.
17. Spencer, P. R., Techniques for transporting the handicapped patient in the dental setting, *Dent Assist* 1988, Jan-Feb; 57(1):16-8.
18. Felder, R., et al, Wheelchair transfer techniques for the dental office, *Spec Care Dent* 1988, Nov-Dec; 256-9.
19. Harris S and Purdy, A, Drooling and its management in cerebral palsy, *Dev Med and Child Neurol* 29:807-11, 1987

An outstanding reference for the practitioner is the cerebral palsy portion of the self-instructional series in Rehabilitation Dentistry provided by the DECOD Program in Seattle. Title: Module II. Dental Treatment of the Patient with a Developmental Disability; Unit D: cerebral palsy. Also, Module I, Unit D: Wheelchair Transfers in the Dental Office. Order from: Dental Education in Care of the Disabled (DECOD), School of Dentistry, SC-63, University of Washington, Seattle, WA 98195, Tel.(206)543-1546.

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