Scientific Article

Cooperation Predictors for Dental Patients with Autism

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Abstract: ***Purpose:*** *This study evaluated potential predictors of cooperation during dental appointments for children with autism.* ***Methods:*** *Data were collected from 108 parent/child pairs and their dentists. Questions included: (1) medical/dental history; (2) functional language; (3) personal hygiene skills; (4) academic setting; and (5) achievements. Behavior was scored using the Frankl scale.* ***Results:*** *Subjects were 80 males and 28 females 2.7 to 19 years old with a mean age of 9.8 years. Frankl scores were 65% uncooperative (definitely negative or negative) and 35% cooperative (positive or definitely positive). Multiple factors predicted uncooperative behavior: (1) appointment type (P=.03); (2) concurrent medical diagnoses (P=.04); (3) nonverbal/minimal or echolalic language (P=.005); (4) inability to understand language appropriate for age (P=.02); (5) inability to follow multistep instructions (P=.04); (6) parents providing most/all tooth-brushing (P=.004); (7) partially or not toilet trained at 4+ years (P=.02); (8) inability to sit for a haircut (P=.01); (9) attending special education (P<.001); and (10) inability to read at 6+ years (P<.001).* ***Conclusions:*** *Five questions readily answered by a caregiver may indicate a child's cooperative potential. Preappointment inquiry about toilet training, tooth-brushing, haircuts, academic achievement and language can give the dentist insight into the child's ability to respond positively to behavior guidance techniques based on communication. (Pediatr Dent 2007;29:369-76) Received August 17, 2006 / Revision Accepted November 3, 2006.*

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The focus of behavior guidance techniques (**BGT**s), as recognized by the American Academy of Pediatric Dentistry, is on "the continuum of interaction involving the dentist and the dental team, the patient, and the parent directed toward communication and education."[1] Patients with special needs present complexity in selection and application of these techniques. Behavior that is not conducive to examination or treatment in a dental setting is more likely to be seen in children with autism than in nonaffected peers.[2]

Autistic disorder involves three key features: (1) impairments in social interaction (2) communication impairments; and (3) repetitive, stereotypical patterns of behavior, interests, or activity. Pervasive developmental disorders (**PDD**s), more commonly referred to as autism spectrum disorders, is an umbrella term for 5 disorders, including: (1) autistic disorder; (2) Rett's disorder; (3) childhood disintegrative disorder; (4) Asperger's disorder; and (5) PDD not otherwise specified. PDDs are defined by varying combinations of the 3 key features of autistic disorder.[3] Autism has a wide range of expression.[4] Children with autism are a heterogeneous group with variable ability to cooperate; some may be readily treated in a dental office, while others may be nearly impossible to examine thoroughly without deep sedation or general anesthesia.[5,6] Males are 4·3 times more likely than females to carry a diagnosis of autistic disorder.[7]

Characteristic features of autism that may impact a child's ability to cope with dental treatment are: (1) language and social limitations; (2) concurrent diagnoses; (3) medications used to treat behavioral symptoms; (4) learning disabilities/mental retardation; (5) heightened sensory perceptions; and (6) an inability to generalize previously learned behaviors.

Impaired receptive and expressive language limit the child's ability to develop appropriate social interactions. Approximately half of children with autism do not develop functional speech,[4,8] and 25% will remain nonverbal throughout their lives.[9,10] In addition, those who develop language may have impairments in interpretation of nonverbal communication and the integration of language and gestures. Many of the language deficits are the result of deviance, not delay.[4] Up to 75% of children with autism exhibit echolalia, the repetition of words previously spoken, which can be either pur-

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poseful or nonpurposeful communication.[10,11] Due to these social and communication impairments, autistic children are often less able to respond positively to communication-based BGTs used by dentists to shape behavior.

Concurrent diagnoses such as epilepsy may complicate autism.[4,7,10] Medications are used for approximately 50% of autistic children and may be prescribed for concurrent diagnoses or specifically for autistic symptoms.[8] Symptoms treated by medications include: (1) aggression; (2) anxiety; (3) hyperactivity and inattention; (4) sleep disorders; and (6) stereotypies/perseveration. Medications do not increase a child's ability to empathize or communicate.[12]

Seventy-five percent of children with autism have some form of learning disability/mental retardation,[4,13] and 50% have an IQ less than 50.[8] Due to recent increases in the number of patients diagnosed at the higher and lower-functioning ends of the autism spectrum, an accurate picture of IQ distribution is unknown.[4,14] Children who are higher-functioning have a better medical prognosis[8] and are better candidates for in-office BGTs. Children with poor language skills or a low IQ may not be good candidates for strategies that require some level of understanding and interaction.[1]

Children with autism may have somatosensory differences that result in heightened perceptions of: touch; smell; sound; and visual stimuli. They may be able to learn a task, but have difficulty generalizing it to another situation. Emotional difficulties may escalate to: aggression; hyperactivity; and inattention.[4,15]

Children with autism have stereotypical behaviors that result in resistance to change in their routine and environment.[4,8] This resistance to change in daily routines may make it difficult for the autistic child to respond positively in settings such as the dental office that are not part of their routine. Difficulty with imitation and inability to focus on a joint endeavor with another person may make BGTs such as tell-show-do unproductive.[13,16]

Previous publications regarding dental treatment for children with autism include: opinion papers[17,18]; sedation regimens[5,19,20,21]; experience with general anesthesia[5,16,22]; case control studies or case studies using repeated rehearsal, positive reinforcement and tell-show-do[23-25]; and retrospective chart review.[26]

Dental case reports regarding children with autism describe self-injurious behaviors[27-29] and their management.[30]

As dentistry moves towards an evidence-based model, evaluation of current practices is needed. It is not known whether there are specific questions that could predict cooperation/non cooperation by pediatric dental patients with autism.

The purpose of this prospective, descriptive study was to identify and evaluate predictors of cooperation for dental appointments by pediatric dental patients with autism.

Methods

Children with autism (age range=2.7-19 years) presenting for dental examination and/or treatment and their parents/legal guardian were invited to participate in this study approved by the Institutional Review Board of Children's Hospital and Regional Medical Center (**CHRMC**). Subjects were recruited from the CHRMC Department of Dental Medicine, the University of Washington Pediatric Dental Clinic (**UW**), and 9 private pediatric dental practices in Western Washington. Subjects had a diagnosis of autism from the DSM-IV[31] or equivalent assigned by a pediatrician, medical specialist, and/or a psychologist. Those carrying a diagnosis of PDD, other than autistic disorder, were not included. Participating dentists and staff were calibrated for consistency in understanding and executing the research instruments via a 2-hour training session given by the lead investigator.

All parents or legal guardians of autistic children were invited by the dentist to participate on the day of their child's dental appointment. Legal guardians had to have authorization to give written consent and be the child's primary caregiver. No incentives were given for participation in the study.

Twenty-six possible predictors of cooperation were evaluated and placed into the following categories: (1) demographic characteristics; (2) appointment description; (3) life skills; (4) personal hygiene skills; or (5) medical history. Data were collected using: parent surveys; direct questioning of the parents by a dentist or dental team member; and dentist treatment notes.

Parent-written survey questions included:

1. past and current medical interventions;
2. assessment of the child's level of receptive language via comprehension skills and ability to follow instructions;
3. expressive language categorized as:
   a. nonverbal to minimal use of language;
   b. echolalic; or
   c. moderate to normal use of language;
4. toilet training;
5. reading ability for patients 6 years and older;
6. ease of tooth-brushing; and
7. reaction to haircuts and shampooing.

Questions about the parents included: (1) education level; and (2) fear assessed by Corah's dental anxiety scale.[32]

Data collected by a dentist or dental team member via parent interviews included:

1. patient demographics, including:
   a. age;
   b. ethnicity;
   c. gender;
   d. payer;
2. appointment type;

3. treatment location:
   a. CHRMC;
   b. UW Clinic; and
   c. 9 private pediatric dental practices in western Washington;
4. living situation, including:
   a. home;
   b. care facility;
   c. foster care; and
   d. special school;
5. oral hygiene details;
6. school setting, including:
   a. regular class;
   b. integrated school;
   c. special education; and
   d. other;
7. who made the diagnosis of autism; and
8. previous history of dental or medical treatment under general anesthesia.

Dentists recorded information on: (1) medications; (2) diagnosis of developmental delay/mental retardation (**DD/MR**); and (3) concurrent diagnoses. The Frankl behavior rating scale was used to quantify patient behavior.[33] Although no part of the study was blinded, training on the use of the Frankl behavior rating scale and the use of parent surveys reduced bias by the dentist.

Data analysis. Descriptive statistics were calculated for all variables, including the mean and standard deviation (±SD) for quantitative variables and frequencies and percentages for categorical variables such as demographic characteristics. To assess for predictors of child behavior, the Frankl behavior scores were dichotomized into: (a) cooperative (1=definitely negative; or 2=negative); and (b) uncooperative behavior (3=positive; or 4=definitely positive). Several variables were analyzed as possible predictors of child behavior, which were grouped into the following categories: (1) demographic characteristics; (2) appointment description; (3) life skills; (4) personal hygiene skills; or (5) medical history. Chi-square tests using exact methods to compute the statistical significance (*P*-value) were used to compare possible predictors and uncooperative behavior.

To assess the associations between multiple risk factors and child behavior, 5 factors were chosen that could be easily assessed prior to a child's dental appointment: (1) age (4-7 vs >7 years old); (2) reading (yes vs no); (3) toilet trained (yes vs no or partially trained); (4) language (normal/moderate vs nonverbal/echolalia); and (5) concurrent diagnoses (yes vs no). The frequency of uncooperative behavior was then compared to the number of risk factors (0 to 5). A 2-tailed significance level of 0.05 was used for all statistical tests.

Results

Over a period of 6 months, 108 autistic children and their parents/guardians participated in this study. The mean age (±SD) of the children was 9.8 years (±3.7) with a range of 2.7 to 19 years. There were 80 males and 28 females.

Children were seen in 3 settings: (a) 60% of the patients were treated by 7 dentists at CHRMC; (b) 23% by 4 dentists at UW; and (c) 17% by 9 private practice pediatric dentists. Of the appointments: (a) 53% of appointments were for preventive recall examination; (b) 26% for initial examination; (c) 10% for emergency care; (d) 6% for operative treatment; and (e) 5% for other treatment. Eight children (7%) received local anesthetic, 3 during operative care and 5 during emergency examination requiring immediate treatment. Some children seen for emergency care were also first-time pa-

Table 1. POSSIBLE DEMOGRAPHIC PREDICTORS FOR UNCOOPERATIVE BEHAVIOR IN AUTISTIC CHILDREN

Demographic characteristics	% (N)	Uncooperative behavior (%)	*P*-value*
Gender			
Males	74 (80)	63	.49
Females	26 (28)	71	
Ethnicity			
Caucasian	73 (79)	63	.06
Asian	17 (18)	72	
Black	8 (9)	56	
Native American	2 (2)	100	
Insurance			
Medicaid	58 (64)	72	.14
Dental insurance	39 (41)	54	
Self-pay	3 (3)	67	
Lives			
Home	91 (99)	64	1.0
Foster care	4 (4)	75	
Special school	4 (4)	75	
Care facility	1 (1)	100	
Age (yrs)			
< 4	5 (5)	100	.06
4-7	20 (22)	77	
> 7	75 (81)	59	

* Chi-square test

tients for the dentist. Overall, 30% of the children were seen for an initial visit and 70% were returning patients.

Predictors for cooperation/noncooperation. Frankl behavior ratings for the subjects were: (a) 9% (1); (b) 26% (2); (c) 26% (3); and (d) 39% (4). Therefore, 35% of this study's children were considered cooperative and 65% of children were considered uncooperative for the dentist.

There were no demographic characteristics that predicted behavior ($P>.05$). There was a trend for younger children, however, to be less cooperative than older children ($P=.06$). Among children older than 7 years, 59% were uncooperative for the dentist, whereas 77% of children 4 to 7 years old and 100% of children younger than 4 were uncooperative (Table 1).

The appointment type was significantly predictive of behavior. Among autistic children being seen for an emergency care, 100% were uncooperative. On the other hand, 68%, 62%, and 33% of autistic children were uncooperative for their initial examination, recall examination, and operative care, respectively (Table 2).

Table 2. POSSIBLE APPOINTMENT DESCRIPTION PREDICTORS FOR UNCOOPERATIVE BEHAVIOR IN AUTISTIC CHILDREN

Appointment description	% (N)	Uncooperative behavior (%)	*P*-value*
Where seen			
Children's hospital	60 (65)	72	.12
Dental school	23 (25)	56	
Private practice	17 (18)	50	
Appointment type			
Recall exam	53 (58)	62	.03
Initial exam	26 (28)	68	
Emergency care	10 (11)	100	
Operative care	6 (6)	33	
Other †	5 (5)	40	
Local anesthetic			
Yes	7 (8)	88	.26
No	93 (100)	63	
Patients			
New	30 (32)	72	.38
Returning	70 (76)	62	

* Chi-square test

† "Other" included treatment such as follow-up evaluations after general anesthesia and space maintenance.

Life skills significantly predictive of uncooperative behavior were: (1) nonverbal or minimal use of language; (2) echolalic language; (3) inability to understand language at an age-appropriate level; (4) inability to follow multistep instructions; (5) inability to read at 6+ years old; (6) attending special education; and (7) attending a specialized classroom (Table 3).

Child participation with tooth-brushing was significantly predictive of cooperation ($P=.004$; Table 4). The mean age (±SD) of the 47 children whose parents were the only tooth-brushers was 9.1 years (±4.0). The mean age of the 29 children who brushed their teeth without assistance was 10.3 years (±3.6). Parents of 70% of children either brushed their child's teeth or assisted with brushing. Tooth-brushing at school was done by 14 children (mean age=10.6 years) and was not predictive of behavior. This survey did not distinguish those children who brushed their own teeth at school vs those who had assistance.

Among the children 4 years or older, 29 (32%) were partially or not toilet trained and were more likely to exhibit uncooperative behavior (83%) than children who were toilet trained (56%; $P=.02$; Table 4).

Ability to sit still during a haircut was associated with behavior, and all 14 children unable to sit still for a haircut were uncooperative for the dentist ($P=.01$). Parent comments regarding haircuts included: (1) age 6.1: "we cut his hair while he sleeps"; (2) age 10: "I cut his hair and its pretty much touch and go"; and (3) age 13.8: "I cut his hair—he used to get hysterical. By me cutting, I can quit at the end of his tolerance and begin again later or a day or two later…I choose the time and day he'll most be able to tolerate a cut". Shampooing was done "very often" to "often" for 83 children (88%), with no association with cooperation at the dental visit (Table 4).

Fifty-eight had a diagnosis of DD/MR, and 43 (74%) were uncooperative ($P=.04$). Children with concurrent diagnoses included: DD/MR (58); seizure disorder (10); attention deficit/hyperactivity disorder (4); fragile X syndrome (2); obsessive-compulsive disorder (2); sensory defensiveness disorder (2); cerebral palsy (1); and oppositional defiant disorder (1).

Of the 69 children with concurrent diagnoses (including DD/MR), 50 (73%) were uncooperative for dental care ($P=.04$; Table 5).

Five independent variables were identified as potential "risk factors" for uncooperative behavior. Variables were: (1) age (4-7 vs >7); (2) reading (no vs yes); (3) toilet training (no vs yes); (4) concurrent diagnoses (yes vs no); and (5) expressive language

(no vs yes). Eighty-seven subjects had complete information and were included in this analysis (Table 6). Having 2 or more of these "risk factors" was strongly associated with uncooperative behavior ($P<.001$).

Table 3. POSSIBLE LIFE SKILLS PREDICTORS FOR UNCOOPERATIVE BEHAVIOR IN CHILDREN WITH AUTISM

Skills	% (N)	Uncooperative behavior (%)	*P*-value *
Expressive language			
Nonverbal/echolalia	75 (70)	74	.005
Normal/moderate	25 (23)	39	
Understand language at age-appropriate level			
Yes	36 (34)	50	.02
No	64 (60)	75	
Simple-step instructions			
Yes	95 (89)	65	.66
No	5 (5)	80	
Multistep instructions			
Yes	36 (32)	50	.04
No	64 (56)	73	
Can child read (6 + ys) †			
Yes	50 (39)	39	<.001
No	50 (39)	85	
Classroom setting			
Regular class	8 (8)	0	<.001
Integrated	10 (11)	46	
Special education	59 (62)	76	
Specialized classroom	21 (22)	68	
Home-schooled	2 (2)	50	

* Chi-square test.

† Excludes children < 6 years old.

Discussion

A prevalence of 7.1/10,000 for autistic disorder and 20/10,000 for autism spectrum disorder in the general population was recently reported.[34] Over the last several decades, the diagnostic criteria for autism have changed, along with its prevalence as a primary diagnosis. Due to the agreement of the DSM-IV[31] and the ICD-10,[35] diagnosis of autistic disorder has become more standardized.[15] There has been speculation regarding the apparent large increase in numbers of children diagnosed with autism, but reasons for this increase are still unclear.[34,36] As the number of children diagnosed with autism increases, the number diagnosed with DD/MR has decreased.[14] The number of children with autism presenting to dental offices is increasing, whether the rise in prevalence is due to: (1) improved and consistent diagnosis; (2) a genuine rise in numbers; or (3) other factors.

Establishing rapport between the child and dentist has been shown to influence cooperation and compliance with preventive advice.[37] Children with autism have communication and social interaction deficits, however, and are usually rigid in their behavior patterns. If acceptable behaviors are not established early, they will not likely be acquired later.[8] This study attempted to identify possible predictors for uncooperative behavior. Certain key questions asked prior to the dental appointment may be helpful in assessing cooperative ability and, therefore, identifying appropriate behavior guidance strategies for each autistic child. Based on this study, predictors for uncooperative behavior in the child with autism were identified.

The appointment type was predictive of uncooperative behavior. Children with autism being seen for emergency care were uncooperative 100% of the time. The use of local anesthetic was not predictive of behavior, nor was new vs returning patients or where the child was seen for dental care. These children may have been to the dentist in the past, but were first-time patients to a particular clinic. It may be that those children with autism who exhibit difficult behaviors may only visit the dental office when emergencies arise and that more time and staff should be available for care of these patients. Even with repeated dental visits, returning patients were not significantly more cooperative than new patients. It is important to understand that repeated familiarity (generally 2x/year) with the office and staff may not provide increased cooperation for autistic children. Cooperation was evaluated by treatment setting: (1) children's hospital; (2) dental school; and (3) private practice. No significant differences were found.

Children who exhibited nonverbal to minimal use of language or echolalia were more uncooperative. Those who could not understand language comparable to a child of the same age nor could not follow multistep instructions were uncooperative. Children 6 years and older who could not read were also more uncooperative as well as those enrolled in special education classes and specialized classrooms.

In this study population, a high percentage of parents

assisted with tooth-brushing, even into the teenage years. Children of parents who assisted with toothbrushing—especially those children whose parents were the only toothbrusher—were more uncooperative for the dentist. In a study of children referred to a dental specialist for uncooperative behavior, 28% of parents of children age 7.5 to 13 assisted with toothbrushing.[38] Nearly half the parents of children in this study assisted with tooth-brushing for the same age group.

Table 4. POSSIBLE PERSONAL HYGIENE SKILLS PREDICTORS FOR UNCOOPERATIVE BEHAVIOR IN AUTISTIC CHILDREN

Personal hygiene skills	% (N)	Uncooperative behavior (%)	*P*-value*
Tooth-brushing at home			
Only parent	45 (48)	83	.004
Only child	28 (30)	40	
Parent with child	25 (27)	59	
Neither parent or child	2 (2)	100	
Toilet trained (4+ ys)†			
Yes	68 (61)	56	.02
No/partially	32 (29)	83	
Haircut			
Sits still	38 (35)	57	.01
Coaxed or restrained	47 (43)	63	
Unable to sit for	15 (14)	100	
Shampoo			
Very often/often	88 (83)	68	.25
Sometimes	10 (9)	44	
Not often/never	2 (2)	100	

* Chi-square test.

† Excludes children < 4 years old.

Children 4 years of age or older who were not toilet-trained or are partially toilet-trained were more likely to be uncooperative for a dentist. Children who were unable to sit for a haircut or who required coaxing or restraint were more uncooperative for the dentist. Both dentistry and haircuts involve manipulation of the head by an adult with instrumentation that is foreign to a child's daily activities.

Approximately 50% of children in this study were taking medication to treat behavioral symptoms associated with autism. Taking medication for autism was not associated with uncooperative behavior. Fifty-four percent of children had a diagnosis of developmental delay/mental retardation, and 64% had a concurrent diagnosis with autism. Having a concurrent diagnosis was significant for uncooperative behavior.

In a healthy child, a parent's dental fear has been shown to have a significant influence on the child's dental fear and subsequent behavior.[38] In this study, the parent's dental anxiety was similar for cooperative and uncooperative autistic children and not predictive of their child's behavior.

No single assessment method or tool is completely accurate in predicting a child's behavior response to dental treatment.[1] This study identified 5 "risk factors" or questions that are readily answered by a caregiver and that may indicate a child's cooperative potential. This model could be tested on other healthy children as well as other groups of children with special health care needs.

Practical application for this study may include asking these 5 questions during a new patient phone conversation. This would allow for more appropriate: (1) scheduling of time of day; (2) time allotted; (3) staff; and (4) alterations in the dental environment. These questions could also be asked of returning patients to aid in assessing the autistic child's behavioral progression.

Limitations. Parents reported the frequency of oral hygiene measures; actual numbers are likely lower. Comprehensive medical records were not available for all subjects; concurrent diagnoses were likely higher. Although most parents agreed to participate, reasons given for declining were the: (1) child needing constant supervision; (2) language barrier; and (3) caregiver was not the legal guardian. Therefore, this study's results may not be inclusive of the children with the lowest functional levels. Some survey questions were omitted by the caregiver or surveyor. Reasons for this may be: (1) length of survey; (2) overlooking a question; or (3) choosing to leave a question blank. The 2-hour calibration session included training on understanding and executing the research instruments, but no formal reliability measures were computed. Further investigation would, however, warrant increased calibration measures.

Conclusions

Based on this study's results, the following conclusions can be made:

1. Having multiple "risk factors" for uncooperative behavior predicted uncooperative behavior in the dental setting.

2. Assessment of the autistic child's ability to cooperate may be achieved by asking key questions prior to the appointment, such as: (a) ability to read; (b) age; (c) toilet training; (d) expressive language; and (e) concurrent diagnosis.

Table 5. POSSIBLE MEDICAL HISTORY PREDICTORS FOR UNCOOPERATIVE BEHAVIOR IN CHILDREN WITH AUTISM

Medical history	% (N)	Uncooperative behavior (%)	*P*-value*
Medications for autism			
Only parent	48 (52)	73	.11
Only child	52 (56)	57	
Developmental delay/mental retardation			
Yes	54 (58)	74	.04
No	46 (50)	54	
Concurrent diagnosis (includes developmental delay/mental retardation)			
Sits still	64 (69)	73	.04
Coaxed or restrained	36 (39)	51	
Previous general anesthesia (dental)			
Yes	40 (43)	67	.68
No	60 (64)	63	
Previous general anesthesia (all)			
Yes	51 (57)	67	.83
No	49 (54)	64	

* Chi-square test.

Table 6. ASSOCIATION BETWEEN RISK FACTORS AND UNCOOPERATIVE BEHAVIOR

No. of risk factors	No. of patients (N)	Uncooperative behavior % (N)
0	7	14% (1)
1	20	40% (8)
2	15	60% (9)
3	21	76% (16)
4	18	83% (15)
5	6	100% (6)
	87	**63% (55)**

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Abstract of Science of Literature

Evaluation of Nd:YAG laser pulpotomies for primary teeth

The aim of this study was to evaluate the effects of Nd:YAG laser pulpotomy compared with 1:5 diluted formocresol pulpotomy. This study involved 30 healthy participants with a mean age of 7.9 years who had a minimum of 2 vital primary molar teeth requiring pulpotomy treatment due to caries exposure. All teeth undergoing pulpotomy treatment had the coronal pulp removed with a sterile spoon excavator followed by sterile saline on a cotton pellet to control hemorrhage. For those teeth in the laser group, pulp treatment was then attained by inserting a fiber optic cable of the Nd:YAG laser while those in the formocresol group were treated with 1:5 formocresol. Following the procedure, IRM paste was placed over the pulp stumps and teeth were restored with either stainless steel crowns or amalgam. Assessments were made at 1, 3, 6, 9, and 12 months post treatment. No significant differences in success rates were noted either clinically (86% vs. 91%) or radiographically (71.% vs. 91%) between the Nd:YAG laser or control groups, respectively, at 12 months. There was a significant difference with respect to inflammatory cell responses among the laser group between the 7 and 60 day observation periods. The use of Nd:YAG laser for pulpotomies in primary teeth shows promise as a pulpotomy modality.
Comments: *This study suggests that the Nd:YAG laser technique may produce success rates similar to the gold standard, formocresol. However, optimal laser guidelines are still not known. Until more information on the long term success and safety of this procedure are demonstrated via randomized controlled trials, practitioners should continue with the traditional 1:5 formocresol pulpotomy technique.* ***RJS***

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Odaba ME, Bodur H, Bari E, Demir C. Clinical, radiographic, and histopathologic evaluation of Nd:YAG laser pulpotomy on human primary teeth. J Endod. 2007;33:415-21.

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