

Conditioning strategies in the dental care of patients with autism spectrum disorders

Victor Santos Andrade Cruz,¹ Thiago Augusto Araújo Andrade Cruz,² Márjory Alves Santos Bandeira,² Deyse Danielly Rodrigues Gomes,² Larissa Tinô de Carvalho Silva,² Vanessa de Carla Batista dos Santos³

¹Radiology Master Degree Program, School of Dentistry, São Leopoldo Mandic, University, Campinas, SP, Brazil

²School of Dentistry, University Center CESMAC, Maceió, AL, Brazil

³Department of Pathology, School of Dentistry, University Center CESMAC, Maceio, AL, Brazil

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ABSTRACT

Objective: to address the findings in the literature regarding behavioral management strategies used by dentists in the dental care of patients with Autism Spectrum Disorders (ASD). **Material and Methods:** the study was carried out at the Craveiro Costa Central Library, where scientific publications from 2000 to 2016 were reviewed. The search was carried out in the main databases, PubMed, Bireme, MedLine, EBSCO and SciELO, using the following key words: dentistry; autism; embracing; behavioral management; management. **Results:** 43 papers published in English, Portuguese and Spanish were retrieved. Based on the techniques used in the studies, it cannot be concluded which one would be the best and most effective because the choice for a technique depends on multiple factors. **Conclusion:** studies in dentistry related to behavioral management in patients with ASD are scarce, and further research in this area is necessary.

Keywords: Dentistry; Autism; Embracing; Behavior; Management.

Introduction

Autism Spectrum Disorders (ASD) are a group of neurodevelopmental disorders characterized by a behavioral development disturbance, affecting the patient's social skills due to limitations on the use of interactive language, both verbal and non-verbal communication, as well as sensor-motor impairment. The etiology of ASD is still unknown, although some researchers state that it is a multifactorial disorder that depends on genetic, environmental and psychoneurological factors.¹ There is no specific cure for ASD, but some behavioral and drug therapies may improve the condition of these patients.¹

In addition to the core symptoms, children with ASD often have severe behavioral disturbances, such as self-injurious behavior, aggressiveness, hyperactivity and hysterical crises in response to routine environmental demands.² Children with ASD also lack manual dexterity and usually require assistance in brushing their teeth.³ Since they do not express clearly the threshold of discomfort during dental treatment sessions, these individuals are often not receptive to oral instructions and application of behavioral strategies by the dentist and usually have poor oral health.⁴ Thus, patients with ASD clearly must have a special attention in Dentistry, and the dentist must be aware of the several characteristics of this condition, always seeking the best form to embrace and improve the behavior of these patients.⁵

In addition to discuss the best care and the need for a comprehensive approach in health attention, this study aimed to address the findings in the literature regarding behavioral control strategies used by dentists to treat patients with ASD.

Material and Methods

The study was conducted at Cesmac University Center's Craveiro Costa Central Library by reviewing bibliographic contents from books, papers published in scientific dental journals, monographs, dissertations and theses. The work was designed based on a literature review between 2000 and 2016 aiming at gathering information that correlated ASD to dental care.

The search was carried out in the main databases, PubMed, Bireme, MedLine, EBSCO and SciELO, using the following key words: dentistry; autism; embracing; behavioral management; management.

The first review of the literature retrieved 150 papers written in English, Portuguese and Spanish. After an exploratory reading of the abstracts, information referring to authors, year, method, results and conclusion was obtained and summarized in a worksheet. This process resulted in 43 papers that were fully read and analyzed.

Data analysis was performed considering the information provided in each paper regarding authorship, year and origin of the publication, study sample, type of analysis, and data collection tools.

Results

Patients with Special Needs

The designation "Patients with Special Needs" has changed over the years. Several terminologies have previously been used, such as exceptional, special, handicapped and disabled, in the search for the best definition for people with a vast number of alterations and conditions that affect their physical, mental/intellectual and/or social skills.⁶

In 2015, it was estimated that about 1 billion of the world population had some kind of disability, 80% of these people living in developing countries.⁷

ASD

Overall, ASD is a neurological disorder, characterized by social, verbal and behavioral development impairment and presence of restricted patterns of interest and repetitive movements, which may manifest up to 3 years of age.^{8,9} Autism was first described in 1943 by Leo Kanner¹⁰ in a study with 11 children who shared common characteristics like lack of social and verbal interaction, and stereotyped patterns of movements. In view of these characteristics, the syndrome was nominated Childhood Autism.¹⁰

Since it is a global disorder, the epidemiology of ASD depends on the study population and methodology. According to an overall estimate published by Christensen *et al.*¹¹ in 2016, 1 every 68 children would have ASD, with a higher prevalence in males (4:1 male-to-female ratio). In Brazil, epidemiological studies on ASD are scarce, and scientific data are based only on regional studies, which do not offer support for a nationwide estimate.⁷

The etiology of ASD has not yet been established, but genetic, neurobiological and environmental etiologic hypotheses seem to be associated with the disorder.^{1,12} Pin-Lopez and Romero-Ayuso¹³ concluded that there is a significant relationship between parents exposed to environmental hazards and their children with ASD. However, the hypothesis that ASD is a neurobiological disorder has been raised because there are important brain alterations in the affected individuals, such as changes in gray matter

and white matter volumes, brain chemical concentrations in the neural networks, brain lateralization and cognitive processing.¹⁴ It is likely that the etiology remains uncertain because it is a high complexity disorder characterized by an abnormal neuronal development.^{12,15}

Over the years, autism has been presented as a condition with a very complex diagnosis and different associated terminologies have been proposed including classic autism, Asperger syndrome, atypical autism, childhood autism, childhood disintegrative disorder and Kanner autism. Due to the variability of manifestations, which depend on the severity of the disorder, chronological age and autistic condition, in 2013, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5®) classified all these disorders as ASD.¹⁶

People with ASD usually have difficulty establishing and maintaining social relationships because of limitations on the use of language, lack of verbal communication and social interaction, as well as restricted behaviors, such as interest limited to specific activities and stereotyped movements. These characteristics may be accompanied by neuropsychomotor developmental delay.¹⁵

The diagnosis of ASD may start from 9 to 18 and from 24 to 30 months of age. Patients undergo a comprehensive evaluation of the overall development of their learning skills, language, and individual and group behavior.¹⁷ The Modified Checklist for Autism in Toddlers (M-CHAT) is one of the methods for diagnosis of ASD, consisting of 23 questions with yes/no answers.¹⁸

ASD severity is related to its impairments on social interaction and to the presence of restricted, repetitive patterns of behavior and interests, being classified in 3 levels that may change with time,¹⁹ as described in Table 1.

Table 1. Severity levels for autism spectrum disorder

Severity level	Social Communication	Restricted and repetitive behaviors
Level 1 - Need support	In absence of support, deficits in the communication cause notable losses. Difficulty starting social interactions and clear examples of atypical or unsuccessful responses to social interactions that come from other people. May have little interest in social interactions. For example, a person who can speak full sentences and get involved in communication, even though he or she may experience shortcomings in the conversation.	Inflexibility of behavior causes significant interference in functioning in one or more contexts. Difficulty for changing activities. Problems with organization and planning are obstacles that hamper independence.
Level 2 - Requires considerable support	Severe deficits in verbal and nonverbal communication skills; apparent social losses even in the presence of support; limitation for starting social interactions and reduced or abnormal response to social interactions that come from others. For example, a person who speaks simple sentences, whose interaction is limited to special interests and has markedly strange nonverbal communication.	Inflexibility in behavior, difficulty in dealing with change, or other restricted/repetitive behaviors appear often enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Suffering and/or difficulty of changing focus or actions.
Level 3 - Requires great support	Serious deficits in verbal and non-verbal social communication skills causing serious loss of functioning; great barrier to start social interactions and minimal response to social interactions that come from others. For example, a person with communication of few words who rarely starts the dialogue and, when starts, he or she has unusual approaches only to fulfill obligations, and reacts only to very direct social interactions.	Inflexibility in behavior, extreme difficulty in dealing with change, or other restricted/repetitive behaviors that interfere with functioning at all levels. Great stress/difficulty of changing focus or action

Source: DSM-V 2013

There is no specific cause nor a cure for ASD, but psychological, therapeutic and drug treatments have great importance for patients with ASD be able to have a better social life.²⁰

TEACCH

TEACCH (Treatment and Education of Autistic and Related Communication-Handicapped Children) is a behavioral management method for patients with ASD developed in 1966 at the University of North Carolina, USA.²¹

This method consists in the organization of the environment and routine by visual stimuli or set of signals that indicate what activities will occur and the sequence to be followed. Visual organization helps to keep the individuals focused, allowing them to be aware of upcoming activities and reducing their level of stress and anxiety. For this purpose, illustrations can be used to create a playful routine. Body stimuli and sound stimuli (words and sounds) can also be used in this method, which is aimed mainly to patients with poor verbal communication.^{22,23}

Tsang *et al.*²³ concluded that children subjected to treatment with TEACCH showed a significant improvement of their motor skills and perception capacity.

ABA

ABA is the acronym for Applied Behavior Analysis. According to Locatelli and Santos,²⁴ ABA is an evidence-based treatment with different applications, especially for autistic children. This method consists in teaching new skills to the patient with ASD, and should be applied in stages, always respecting the patient's evolution, emphasizing, rewarding and reinforcing positive behaviors.^{22,23}

In a comparative study between ABA and TEACCH, Calhahan *et al.*²² concluded that there is no clear preference for either of the methods, but rather a significant level of social validity for the components of both approaches.

PECS

The Picture Exchange Communication System (PECS) is an alternative communication method developed in 1985 by Lori Frost and Andy Bondy.²⁵⁻²⁷

The goal of the PECS is to enable patients with ASD to communicate in a functional manner and, using visual stimuli or verbal antecedents, express their reactions to other individuals that are familiar with this method.^{27,28} The method consists in establishing a more dynamic communication through which the patients can express themselves by using a notebook with pictures or photographs of items/activities present in their daily routine, and showing the image of a desired item/activity to a person in exchange for that item/activity.²²

According to Oliveira *et al.*²⁹ the PECS training occurs

in six stages: 1) Asking for a desired item in exchange for a figure; 2) Picking an image from the communication board and handing it over to an adult; 3) Discriminating the figures; 4) Asking for items/activities using several words in simple sentences present in the communication board; 5) Answering the question: What do you want?; 6) Making usual comments in response to questions.

Pereira²⁵ found an improvement in the levels of communication, with an increase in the number of spontaneous demands and social interaction, resulting in an improvement of social life.

Son Rise

The Son Rise program was developed in the 1970's at the Autism Treatment Center of America, in the United States.³⁰

According to Schmidt,³¹ the objective of methods like Son Rise is to enhance the functional communication skills and language development by reinforcing the typical primitive development in a way to increase as much as possible the child's intentional, social and emotional conducts.

The procedures are intended to establish an individual relationship between an adult and a child with ASD, and the adult is requested to prioritize the interests of the child in order to gain his confidence in a first moment and then actually perform the activity.³²

Oral Manifestations

Patients with ASD do not have specific oral manifestations. Salivary flow, pH level and buffering capacity are the same as for a person without this disorder, although the medications commonly used by patients with ASD may affect these variables.³³

Medications commonly prescribed to treat ADS symptoms, such as antidepressants, antipsychotics, anticonvulsants and drugs that produce central nervous system (CNS) stimulation, may have both systemic and oral side effects, and thus the dentist must be familiar with these drugs and their possible oral alterations.¹

A great part of the drugs used by patients with ASD may cause oral manifestations. Antipsychotics like risperidone and olanzapine, used by 55% of patients with ASD may cause oral alterations like xerostomia, stomatitis, angioedema of oral cavity, drooling, dysgeusia, dysphagia and tongue discoloration. In addition to xerostomia and dysgeusia, CNS stimulants like amphetamine and dextroamphetamine, may also cause bruxism. Anticonvulsants like carbamazepine and valproate may cause xerostomia, dysgeusia and oral petechiae.^{1,34}

Patients with ASD can present severe symptoms, such as aggressiveness, hyperactivity and self-mutilation. In the mouth, there may be ulcerations in the tongue and lips and even cases of tooth self-extractions have been reported.^{2,22}

In a study using pulp vitality test, Tarelho *et al.*³⁵ observed a higher pain threshold in patients with autism, which could indicate a lower response to pain and would corroborate the hypothesis of hypoalgesia or analgesia among autistics. In some cases, researchers believe that hypoalgesia or analgesia actually result from the fact that patients with ASD have impaired verbal and social expression.²²

Discussion

Due the high ASD prevalence rate, the possibility of treating patients with this condition at daily dental practice is increasing. The dentist should be prepared to embrace these patients and manage their actions and reactions, maintaining an empathic approach, since the lack of social interaction and verbal communication pose difficulties to the establishment of a pleasant social relationship. Non-verbalization also impairs the dentist's perception of the patient's actual threshold of discomfort during the clinical treatment.^{4,12,17}

Because of their difficulty of performing coordinated movements and their impaired motor skills, patients with ASD require assistance to brush their teeth.³ Furthermore, studies suggest that children with ASD have worse oral hygiene compared with patients who do not have any disorder.^{2,36} Poor oral hygiene results in plaque retention and increase in the incidence of caries and periodontal disease.^{2,3}

Some studies have shown that oral hygiene efficiency of autistic patients is directly related to parental supervision, since the parents must be motivated to help their children.^{2,37}

Dental procedures should be performed without difference in patients with ASD, but the treatment is usually more difficult because of their uncooperative behavior due to the typical symptoms of this disorder.³⁸ It is important to establish a friendly relationship with the patient as well a sense of trust and harmony between the parents and dental staff.³⁹

Campos *et al.*⁶ underscored important conducts that should be adopted, such as making a comprehensive clinical interview, in order to obtain the complete medical history on the patient's health status, addressing previous dental experiences, sedation experience and complications during previous dental procedures.

Patients with ASD are usually attached to routines, so it is important that the same professional perform the treatment in the same dental office and with a pre-established routine. Changes of place and routine should occur only if extremely necessary.²²

Behavioral management techniques used in Pediatric Dentistry can be applied to patients with ASD. These techniques are divided in two groups, basic and advanced techniques, according to the same contraindications considered for children without ASD.³⁸ Techniques such as "tell-show-do", voice control, positive reinforcement and distraction

methods have been proven effective in patients with normal cognitive development.¹²

The "tell-show-do" technique is used to explain to the patient the procedures that will be performed, using an interactive language in a clear and objective way; to demonstrate by visual, auditory and tactile stimuli the step-by-step sequence of each procedure; and finally to perform which has already been explained and demonstrated. This technique aims to reduce anxiety and make the patient familiar with the dental setting. However, children with ASD usually present difficulties in verbal communication and cognitive deficits, so it is important to combine the "tell-show-do" with visual stimuli of the procedures to be done to make them more understandable for autistic patients.⁴⁰

Desensitization is another very effective technique for patients with ASD. As these patients usually do not respond well to routine changes, this technique consists in exposing the patient gradually to the dental setting in order to allow them bond with the dentist and establish a routine of care. Application of this technique requires several sessions and can be combined with positive reinforcement, based on smiles, compliments and physical demonstration of affection in response for good behavior during the dental appointment.³⁸

Distraction is a technique with significant efficacy and is used when the patients should undergo more invasive procedures, due to their hypersensitivity. This technique aims to distract the patient so that he does not present unsatisfactory behaviors.¹²

Some methodologies applied in Psychology have been adapted for dental care. Zink,³⁹ in a case report, considered the Son Rise program as an innovative method for treating autistic patients. It uses toys and objects that provide distraction and/or eye contact in such a way that the patient can bond with the dentist, which is very important for dental care. After 5 behavioral management sessions, always respecting the time of consultation and the patient's emotional condition, Zink³⁹ succeeded in controlling the behavior of a patient with low functioning autism.

ABA is another method used to teach new skills to patients with ASD. It can also be used in dentistry, engaging the parents to teach their children to brush their teeth. The technique should be introduced in stages, always rewarding the patient after completing the tasks properly in a way to reinforce prevention against oral pathologies.

TEACCH is a method that seeks to elaborate a routine, to create acquaintance and to organize the physical space. This method has shown efficiency when applied to dental sessions. Van Bourgondiën and Coonrod,⁴¹ in a study with 34 adults (19-41 years) and 38 children (4-9 years) with ASD, evaluated the efficacy of TEACCH 5-session training in order to facilitate oral evaluation of 10 different criteria. The

sessions lasted 20 minutes and the criteria adopted were as follows: entering the room, sitting in the chair, sitting again in the chair, tolerating light straight to the face, opening the mouth, tolerating handling with gloves, examination with odontoscope, examination with explorer, examination with odontoscope and explorer, and occlusion. The method was proven very efficient for adults and children; 70% of the individuals managed to complete all the steps and 90% managed to reach the penultimate step. The TEACCH aims to improve the physical and social well being of patients with ASD in order to reduce anxiety and ensure that patients with special needs have equal access to dental treatment.

Still addressing techniques used in Psychology, the PECS method can also be used to aid in behavioral management of autistic patients during dental treatment. Zink *et al.*⁴² evaluated the use of PECS to facilitate communication between patient and dentist during the dental session. The study sample consisted of 26 patients with ASD aged between 5 and 19 years. The initial approach followed the principles of the Son Rise program and the PECS system was implemented later in the form of 7 figures showing the routine of dental treatment. Zink *et al.*⁴² underscored the fact that patients with no previous dental care took more time to accept the PECS than those who had already visited a dentist. The results obtained in the study showed an increase in the visual contact and social interaction with the dentist, but the sample size was small and a long time was needed for patients to accept the method.

When basic behavioral management techniques do not produce positive effects on the behavior of patients with ASD, the dentist must use more advanced techniques, such as protective stabilization, oral sedation, Inhalation sedation and general anesthesia, to perform the procedures in a safe and effective manner. It is important to mention that such measures should only be used if the parents agree and sign an informed consent form.^{12, 22}

Protective stabilization can be achieved with sheets or velcro straps and is indicated when the patient is uncoop-

erative or when his actions may be a risk to himself, to the professional or to his parents. It is contraindicated when a safe immobilization is not possible due to unfavorable medical or physical conditions, and for patients who had suffered any psychological trauma in previous dental experiences.^{38,43}

Conscious sedation with drugs such as midazolam, diazepam and nitrous oxide may also be used to treat patients with ASD. For inhaled sedation with nitrous oxide, the dentist must receive a specific training. Conscious sedation alone does not improve patient cooperation, but they help decreasing symptoms like anxiety and fear, which facilitate behavioral management during the dental session.¹²

General anesthesia should only be used when none of the other techniques mentioned above was effective, or when the patient's parents do not consent protective stabilization.¹² It must be performed in a hospital with a specialized medical team, and the dentist must inform the mean duration of the treatment and always plan in advance how to execute the procedures.³⁸ Among patients with special needs, autistics present the highest frequency of indication for treatment under general anesthesia. The reason is that parents usually seek specialized dental care for their children too late, when extensive treatment is required, allied to the fact that the difficult and uncooperative behavior of these patients can make it unfeasible to provide adequate dental care in outpatient settings.^{22,38}

Conclusion

Based on the techniques described in the studies, no conclusion can be drawn on which one would be the best and most effective technique, because the choice for a technique depends on multiple factors, such as the different manifestations, considering the individual characteristics of each person with ASD and the lack of specific methods for each manifestation. Studies in dentistry related to behavioral management in patients with ASD are scarce, and further research in this area is necessary.

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Mini Curriculum and Author's Contribution

1. Victor Santos Andrade Cruz - DDS and MSc. Contribution: research, selection of papers and preparation of the review, writing and preparation of the manuscript.
 2. Thiago Augusto Araujo Andrade Cruz - DDS. Contribution: research, selection of papers and preparation of the review, writing of the manuscript.
 3. Marjory Alves Santos Flag - Undergraduate Dental Student. Contribution: writing and review of the manuscript.
 4. Deyse Danielly Rodrigues Gomes - Undergraduate Dental Student. Contribution: writing and review of the manuscript.
 5. Larissa Tino de Carvalho Silva - Undergraduate Dental Student. Contribution: writing and review of the manuscript.
 6. Vanessa Carla Batista dos Santos - DDS and PhD. Contribution: effective scientific and intellectual contribution to the study; study concept and design; critical review; final approval.
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Corresponding Author

Vanessa de Carla Batista dos Santos

E-mail: nessadecarla@yahoo.com.br