Review Article

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Patients with Autism Spectrum Disorders: Strategy for Orthodontic Care

Dentistry Section

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ABSTRACT

Autism Spectrum Disorders (ASD) are developmental behavioural defined neuropsychiatric disorders that start in early childhood involving social abnormalities, language-communication deficit play, and restricted behaviour. There has been an increasing appreciation that other fields or domains of neurologic and cognitive functioning beyond this diagnostic triad are associated in this syndrome. With the increased prevalence of children having these disorders, orthodontists have one or two autistic patients in their practice. Orthodontic requirements constitute only a small fraction of the overall need of these patients. This review focuses about ASD as an amnestic abnormality of memory, unique features of memory dysfunction with neurobiologic context, mechanisms and comprehensive knowledge pertaining to orthodontic treatment considerations in these patients.

Keywords: Developmental, Diagnostic, Neurobiologic

INTRODUCTION

Autism Spectrum Disorder (ASD)

ASD is commonly a heterogenous neurodevelopmental syndrome which is classified in the category of pervasive developmental disorder generally with an unknown aetiology. This spectrum consists of autism, Asperger Disorder (AD), Childhood Disintegrative Disorder (CID) and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS) [1,2].

Prevalence rate of ASD is 6 per 1000 children, with males being three times more often than females [3]. In a decade of surveillance, ASD is estimated at 11.3 per 1000 in children aged eight years. Male:female ratio of 3:1 has been reported on gender-specific epidemiology [4]. The aetiology of ASD is both genetic and environmental factors. Recent literature reflects the parameters involved in the pathophysiology of ASD like *CNTNAP2* gene, mitochondrial defects, de novo mutations, increased maternity derived intrauterine androgen concentrations and increased maternal age [3,4].

Evolution of ASD as a Diagnostic Concept

The original meaning of autism was evolved over time. Over the years, diagnostic concepts developed and least studied is the condition PDD-NOS (a category where some features of autism are present) [3,4]. The importance of early detection and intervention for improving long term results of ASD were explained by various authors [5]. The diagnosis of ASD in infants and toddlers is too complex [5].

Categorical approaches such as Diagnostic and Statistical Manual (DSM; Am Psychiatric Assoc. 1994) have increased advantage of official recognition, a history of improvising research with clinical work and even serve as a conceptual basis for dimensional approaches [5]. Kanner's approach was highly influential that appeared in DSM-III (Am Psychiatric Assoc. 1980), where autism was the first granted recognition as a disorder. Various modifications have been made over years in the DSM definitions of autism. Dimensional diagnostic approaches give potential advantages for infants and children. The above mentioned instruments have certain intrinsic limitations also [6,7].

ASD in Various Stages of Life

Various studies have reported the phenomenon of regression in 20% of cases [8,9]. In some cases, child progresses normally upto 3-4 years of age with good language and self care skills. Then, gradually the child loses these abilities and exhibits more classic and relevant features of autism [10]. So, in the first year of life, children who suffer from ASD show signs like limited eye contact and reduced overall social responsiveness [11]. They may also exhibit problems like unusual sensory responses. Infants with ASD are less interested in people, smile less frequently, have decreased visual attention to social stimuli, less engagement in exploration of objects and have difficulties in arousal regulation [12].

The quality and quantity of present research of ASD in toddlers has an increasing trend. In this period parents try to evaluate their unusual behaviours, developmental delays, stereotyped motor mannerisms and idiosyncratic material uses. Other relevant behavioural changes are turn taking, intensity of eye contact and anticipatory postures [13]. At 20 months attention towards behaviours like range of facial expression, pointing to show interest and use of traditional gesture should be marked by parents. Additional items to check by the parents are social reciprocity, seeking shared enjoyment, imaginative play and nodding.

Characteristics and Developmental features of ASD

Social Functioning

Social difficulties are the most significant predictor of diagnosis for older children with ASD [14]. Preschool children with autism fail to have social skills present in the initial months of life. Eye contact is limited as well as social engagement with responsivity [14]. Difficulties in areas of joint attention are very striking and these behaviours are central in development of social-cognitive abilities [15].

Communicative Development

The initial presenting complaints are the concerns about child's speech and communicative development [16]. Pattern of sound

production, deficit in intonation and vocal quality in children with autism are abnormal. The development and beginning of intentional communication are delayed and ASD children are more likely to use unconventional gestures. Children with ASD have problems with expression, range, frequency and production of affective responses [17,18].

Cognitive Development

As a child becomes older, delays become more evident that require language-based problem solving, social interaction and tasks that are less verbal. Attentional abnormalities are well documented with children having ASD. Infants with ASD attend less to people and more to objects. They have delayed controls and selective social attention is impaired [19].

Neurobehavioural Concerns for ASD

Various neurobehavioural models for ASD have been introduced ever since the neurologic origin has gained acceptance. The earliest ones have emerged in 1960s and 1970s. Current models reflect knowledge gained from years of research. Hence, these neurological models are temporary conceptual constructs that systematically organize previous findings into testable hypotheses [20].

Many studies provided very less neuropsychologic evidence mentioning the status of sensory perception and memory abilities in ASD [20,21]. A major contribution to neurobehavioural conceptualization of ASD is the recognition of 'theory of mind'. This truly is a main cognitive mechanism underlying the unusual and abnormal social behaviour in ASD [21]. The identification of cognitive ability and its impairment in ASD brought into reality the realm of cognitive psychology [22]. Hence, the impairment in the capacity for making conclusions about mental beliefs is functionally linked to deficits in the social use of eye contact. Some authors even have the belief that newly characterized neurologic function contributes to social functioning [23].

Autistic Behavioural and Clinical Characteristics Related to Orthodontic Visits

In-depth understanding of the behavioural patterns of a patient is one of the salient features of a child with ASD at an orthodontic office. Thorough review of dental and medical history, behavioural management problems, oral motor sensory issues like toleration to certain appliances in mouth, fine motor issues like unable to brush with orthodontic appliance and improper retainer placements, speech problems during orthodontic treatment, airway examination like enlargement of tonsils and adenoids, hypertonic or hypotonic muscle tone, sensory issues like external stimulants, chronological age and cognitive age, social and parental interaction needs to be done. Indications like spoken language, eye contact and gestures needs to be marked. Impaired sensory perception has been illustrated by several authors [24,25]. Malfunction during interpretation of stimuli results in aberrant responses like visual, tactile, auditory and gustatory signals. Procedures like tell-show-do; positive reinforcement and voice control are very effective with children. These procedures do not necessarily address the behavioural pattern of ASD patients [26]. Restraining technique is the most important and effective method during orthodontic procedures [27,28]. Orthodontist during examination should have in mind that ASD patients show wide variation in intelligence, abilities and performance. Poor motor coordination like inability to cleanse the tongue naturally, inefficient to brush or floss around teeth and brackets is seen in these patients. Class II malocclusions with mostly increased percentage of missing teeth, anterior cross bites, diastemas and open bites are the common orthodontic concerns. The clinical manifestations of orthodontic interest in ASD are mostly anterior open bite and crowding in some studies [29,30]. Spacing, open bite, reverse overjet and Class II molar relationship tendencies are higher in ASD patients [30]. Bruxism, tongue thrusting, mouth breathing, pocketing food in cheeks and lip biting also are prevalent in ASD patients [31,32]. Developmental defects are seen commonly like under-mineralised enamel [33,34]. Due to multifaceted symptoms of ASD, orthodontists may need to target therapeutic approaches to unique characteristics of ASD children.

Barriers to Orthodontic Care Access

A child with ASD may have difficulties in consenting towards orthodontic treatment. Moreover, parents consider it to be a burden to treat these children because of expenditure for the treatment that depends on the health care system of that particular location. Even limited orthodontists who are trained to treat ASD patients are available; hence access of this population to orthodontic treatment is considered a complication [35]. There are lots of recent distance learning internet modes which may compensate the cognitive perception of orthodontists about ASD interventions using internet delivered programs [36]. Medications and special diets for these group of patients are serious orthodontic concerns like pureed foods, anti-seizure medications which interfere with orthodontic tooth movement, sweetened medications cause caries and moreover sedative drugs decrease the salivary flow [36]. The additional challenges include bonded expanders for retention, difficulties in keeping bonded retainers clean, less durability of essix retainers and oral motor sensory issues in wrap around and hawleys retainers. In finished orthodontic cases, pre and post phase 1 treatment sometimes require expander only, brackets only, brackets with maxillary frenectomy and surgical exposure of impacted tooth. Challenges during wear of orthopedic and functional appliances, frenectomy and surgical approaches leads to compromised finished orthodontic results [36]. Certain decisions by the orthodontist are usually declined by parents.

Orthodontic Treatment Strategies

The main challenge to any orthodontic team may be the decreased ability of ASD patients to communicate and convey to others. Inadequate compensation, prolonged duration of treatment and extensive paper work are few concerns for the orthodontic professional. Pre-visits may include certain behavioural management ideas like pictures taken of orthodontic office, orthodontist, staffs with office tour and introduction. The next few visits are directed towards increasing the patient's confidence and evaluating the maximum level of compliance. Basic behavioural guidance approaches have been recommended to start orthodontic therapy of ASD patients in the presence of parents [37]. Use of visual pedagogy, sensory adaptation and reinforcement can help these patients to undergo orthodontic examination. The use of reward statements will not often work for these patients since they have restricted receptive skills and lack joint attention.

Variable identification that arouses aversive behaviour may help in establishing good conditions for ASD patients to cooperate at orthodontic office. This process is called as functional behavioural assessment [38,39]. Orthodontist can organize preparations like familiarization with orthodontic instruments, teaching of phrases like 'open your mouth' and custom made books to help the patient to get acquainted with operatory room. Pictures definitely speak more than words [40,41]. Other adaptive techniques include descriptive photocards, parental assistance, papoose board, velcro restraints, bands than brackets, mouth props and cements [42]. Modifying treatment plan with placement of braces in small steps (series of appointments) and having realistic orthodontic goals rather than ideal finished results it best suited [42].

The significance of environmental factors like comfort level of these adolescents during medical events has been described by authors [43,44]. ASD patients may insist to wrap their eyes or squint under light exposures. Patients with ASD may feel hypersensitivity in intraoral

and perioral regions. They have frustration by the touch of light and move back during orthodontic examination. Attempt to fight back is generally expected from these patients due to aggravated sensory processing [45]. Hence, experimental introduction of soothing lights, avoiding noise disturbances while treating ASD patients in a separate room and rhythmic music may add to an increased comfort zone for treating these group of orthodontic patients.

Applied Behavioural Analysis (ABA) is a different branch of psychology through which the analysis of behavioural relationships and environment alter behavioural patterns to achieve desired goals. Pain management and nursing are two important features in this branch to sustain clinical examination and therapeutic extractions. A child can be taught to sit by himself on the dental chair in an orthodontic office by reinforcement. Apraise adds to a positive reinforcement.

Advanced behaviour guidance measures are significant. The spectrum of methods which are used for pain and anxiety control during orthodontic treatment of ASD adolescents may be divided into conscious methods (oral, intramuscular, inhalation by nitrous oxide and oxygen, intravenous sedation) and unconscious methods comprises of intravenous/inhalation deep sedation and GA with endotracheal intubation [46].

Oral care needs to be explained by the orthodontic therapist (or by dental nurse/oral health care adviser/appropriately trained personnel). Brushing modalities like sonicare kids toothbrush (low mode for 4+ and high mode for 7+) are friendly because they provide gentlecleaning of teeth and gingiva appropriate for all ages. The kid timer helps to reach the recommended two minutes brushing time by progressively increasing the duration of treatment time over 90 days. The two brush head sizes are specifically designed to gently clean the teeth at key developmental phases. Preventive measures should be recommended to the patients as well as their caregivers like use of sealants and fluorides, frequent water intake, sugar free medications and rinsing oral cavity after medicines [46]. Alternatives to cariogenic foods and beverages as incentives, encouragement of independence in their daily oral hygiene, performance of hands-on demonstration showing best ways to keep teeth clean and modified floss holder to make oral hygiene easier also can be recommended [46]. Stressing the importance of consistent approach to oral hygiene, daily use of antimicrobial agent like chlorhexidine, importance of conscientious oral hygiene and frequent oral prophylaxis are necessary for a good periodontium. Phenytoin can be recommended in ASD patients since their tooth eruption is delayed. Scheduling appointments for a longer duration in ASD patients and in the non-busy hours with several shorter appointments may be necessary [42]. If mouth guard can be well tolerated, then prescribing them for the patients who have problems with self injurious bruxism is necessary. Coloured expanders, retainers and elastic modules make orthodontic treatment fun.

The Complexities of Legal Framework in ASD Patients

Child abuses in ASD patients are common, hence state laws require assistance by child protective services agency. These reasons contraindicate orthodontic treatment in severely affected ASD patients. Hence obtaining valid consent from patients (their parents/caregivers) can be challenging. In clinical practice, many orthodontists face problems with the parents and caregivers of ASD patients demanding unrealistic treatment outcomes. The patients struggle to comply with treatment and the lack of good communication makes it difficult to assess if patient consent is still valid. Therefore, obtaining valid treatment consents are necessary before starting orthodontic treatment in ASD patients. There are many cases where parents' request for orthodontic treatment was overruled by the legal profession and sometimes their own children.

The Disability, Discrimination and Equality act [47] prohibits discrimination against persons with ASD seeking access to orthodontic services. The equality act also outlines the major principles of direct and indirect discriminations along with harassment related to age. The Mental Capacity Act [48] is designed to protect and empower individuals who lack mental capacity to have their own decisions about care as well as treatment. Since ASD patients lack decision making, a trusted person is appointed to make decision on their behalf. Capacities of an ASD patient can fluctuate with time, hence wherever appropriate individuals can make their decisions. Consulting with others is a very important aspect in decision making. Any close relatives, friends or someone engaged in caring for ASD patients, any attorney appointed under lasting power of attorney and any deputy appointed by Court of Protection can make decisions for that person. The restrictions placed upon an individual who lacks capacity to agree to the arrangements of care may amount to deprivation of liberty which can be judged from case to case. Certain advance written statements that sets down patient's preferences, beliefs, wishes and values regarding future orthodontic care are legally binding. The decisions which refuse life threatening procedures should be hand written, signed and witnessed. Patients who make an advance decision may convey to their family, friends and caregivers. The Commission of Dental Accreditation (CODA) [49] adopted fresh standards for education programs to ensure opportunities to prepare dental and orthodontic professionals when treating these group of patients.

CONCLUSION

An orthodontist needs to assess various medical conditions and their impact on orthodontic treatment procedures. Making a diagnosis of ASD is sometimes challenging. Treatment should be postponed appropriately until the medical problem is in remission and the drawbacks of the drug therapy are reduced. Comprehensive treatment may not always benefit such patients with ASD. Orthodontic treatment plans and procedures should be modified according to requirement.

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