

Oral health status and management of autistic patients in the dental setting



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Abstract

Aim Dental treatment of patients with Autism Spectrum Disorders (ASD) is challenging due to difficulties in social interactions, hypersensitivity to sensory stimuli, various degrees of cognitive and developmental issues, poor collaboration, limited capacity to manage emotions, stereotyped movements, hyperactivity, limited adaptation to new situations and environments. Data on the type of treatment required are scarce. This study investigates the oral health status of ASD patients, the possibilities of chair treatment and the need for dental treatments under general anaesthesia (GA).

Methods One hundred sixty-nine medical records, from 2005 to 2018, of patients with ASD were examined. Patients undergoing chair or general anaesthesia were assigned to two groups according age (younger or older than 14 years old). The level of cooperation was classified into four categories: none, poor, fair, good.

Results For most patients chair treatment was not sufficient. At the first appointment older patients were less cooperative than younger. Adults needed general anaesthesia more than younger persons for urgent dental procedures, already scheduled at the first visit.

Conclusions Primary prevention, setting up a routine oral hygiene at home and regular dental examinations, internalised like a habit by patients, are the main instruments to maintain oral health in ASD patients. When non-cooperative patients need urgent treatment, safe and high-level dental therapies should be performed under GA.

Introduction

Autism Spectrum Disorders' (ASDs) prevalence is rising worldwide [Sharma et al., 2018]. ASD indicates a group of disorders that appears in infancy and persists throughout life, very different from each other but all united by persistent deficits in social communication and social interaction, across multiple contexts. Also restricted and repetitive behaviour, interests, or activities are present [American Psychiatric Association, 2013].

KEYWORDS Autism Spectrum Disorder (ASD), oral health, general anaesthesia (GA), dental therapies

Sometimes, ASD is accompanied by and can be misdiagnosed for learning or intellectual disability, ADHD, social and communication disorder, attachment disorder, obsessive-compulsive disorder, vision, hearing and language disorders [American Psychiatric Association, 2013; Zwaigenbaum and Penner, 2018].

Conceivably, dentists will find an increasing number of ASD patients in their daily practice. However, oral hygiene and dental treatment of ASD patients are often very challenging because of problematic behaviours, such as self-injurious or aggressive behaviours, or escape attempts due to impairments in social communication and interaction. This framework may be complicated by various degrees of cognitive and developmental issues, poor collaboration, limited capacity to manage emotions, stereotyped movements, hyperactivity, hypersensitivity, need of repetition and continuity [Tidmarsh and Volkmar, 2003]. These behaviours can lead to difficulties in maintaining good oral hygiene at home and in performing dental visit and treatment of the pathologies resulting from a poor oral hygiene. ASD patients have a greater risk of caries, periodontal disease, alteration of the oral microbiota and oral traumas due to their hyperactivity, stereotypes, bruxism and self-harming habits [Ferrazzano et al., 2020]. Moreover, ASD patients may require medications to treat specific problematic behaviours that may have systemic side effects, orofacial and systemic reaction and adverse orofacial interactions with drugs used in dentistry [Friedlander et al., 2006].

ASD patients' deficit in verbal and non-verbal communication implies difficulties for caregivers and dentists to understand the presence and symptoms of oral diseases. These may be revealed by the patients refusing to eat or being more irritable.

In the long run, this leads to the impossibility for ASD patients to be treated in a dental practice and receive the necessary dental care, and to the need to undergo a dental treatment under general anaesthesia [Clausen et al., 2019].

However, general anaesthesia is not risk-free, and repeated treatment may induce adverse effects, in particular during brain development [O'Leary, 2019], with unpredictable effects in fragile psychological patterns. Furthermore, ASD patients show a higher incidence of adverse behavioural effects, especially difficulties in walking and nausea after treatments performed under general anaesthesia [Tran et al., 2021].

We analysed a sample of ASD patients treated at our hospital unit during 13 years, to provide basic information and clues for approaching these frail patients, with the long-term goal to develop an approach and treatment strategy for preventing oral pathologies in ASD patients, while promoting the chair treatment and reducing the use of general anaesthesia.

Methods

This study was approved by the Institutional Review Board (Ethical Committee for the clinical Experiments of Padova province, number 166727, 10/10/2018).

The medical records of adult and paediatric ASD patients treated in the "Community Dentistry" Unit of the hospital "Immacolata Concezione" (Piove di Sacco, Italy) from 2005 to 2018 have been analysed during January-February 2019. Diagnoses were made by official neuropsychiatrists for the purpose of obtaining school support. All patients diagnosed with ASDs and all the other categories used in the past (autistic disorder, Asperger's disorder, childhood disintegrative disorder, pervasive developmental disorder not otherwise specified) have been included in this study. All the disorders previously differentiated from autism by the American Psychiatric Association and later merged into ASD in DSM5 were labeled as 'ASD', without distinction about the level [American Psychiatric Association, 2013]. Rett's syndrome has been excluded, since it is no more included in ASDs. Also, the medical records of patients who came only for the first visit were excluded.

A total of 169 medical records could be labeled 'ASD' and has been taken into consideration for the study.

Patients were then clustered in two groups: younger than 14 years old (106 paediatric patients) and older than 14 years old (63 patients, herein called adults). We chose the age of 14 to split our patients in two groups as at this age the majority of the population has attained puberty [Brix et al., 2019].

The data acquired from the records are: gender, age, age at the time of the first visit in our hospital, level of cooperation during the first dental visit, oral diagnosis during the first visit, if the patient was scheduled for a dental treatment under general anaesthesia or not, if not in the first visit, when general anaesthesia was scheduled, the number of dental treatments under general anaesthesia and the period between each narcosis, the type of treatment performed in narcosis, if the grade of collaboration improved over time.

The level of cooperation has been classified into four categories, according to Frankl's scale [Frankl et al., 1962]: 1) definitely negative (impossible examination, the patient does not sit or enter the dental room); 2) negative (the patient sits with difficulty and dental examination is carried out with difficulty); 3) good (the patient sits down in the dental chair and undergoes dental examination but it is not possible to perform brushing/hygiene); 4) definitely good (the patient sits down in the dental chair and undergoes the dental examination; it is possible for the dentist to perform teeth brushing or dental hygiene).

If appropriate the data were analyzed using the χ^2 test, with Yates correction if necessary, using SPSS version 27.0.1.0.

Results

Patients' demographic data are shown in Table 1.

In some cases, the patients' complete lack of collaboration prevented a proper oral examination, in others oral examination was carried out, often superficially, due to the poor collaboration, not allowing the formulation of a precise and complete diagnosis of the oral condition. At the first appointment, when considering the percentage of patients for each collaboration degree (Fig. 1), older patients were differently distributed compared to the younger ($\chi^2=20.335$, $P\text{-value}=0.000145$). By comparing the distribution of subjects in the two degrees of collaboration that prevent the possibility of dental cure (levels 1 and 2), it appears that 65.51% of older patients fall within level 1 and 17.24% within level 2, while young patients are clustered 41.93% in level 1 and 45.96% in level 2 (χ^2 with Yates correction= 17.211, $P\text{-value}=0.000033$). Hence, more adult than young patients fall within a very negative collaboration degree. No difference is apparent in the two age groups between the levels 3 and 4 of collaboration, that allow dental treatment (χ^2 with Yates correction= 0.256, $P\text{-value}=0.612833$).

At the first examination, dental caries was the most prevalent condition for both paediatric and adult patients (Fig. 2). Paediatric patients showed caries of the primary dentition ($n=50$ patients, 36.76%), caries of the permanent dentition (19, 13.97%), and caries non-otherwise specified (4 patients, 2.94%). The two groups are not different concerning the percentage of patients with good oral health, those reporting pain and those who cannot be visited ($\chi^2=3.861$, $P\text{-value}=0.148355$). On the other hand, the diagnoses were different between the two groups ($\chi^2=33.044$, $p<0.00001$), with calculus, gingivitis and residual root presence more often found in adult than in paediatric patients.

From 2005, 122 dental treatments under general anaesthesia have been performed in ASD patients at our hospital, while two more patients did it elsewhere (Table 2).

Overall, no difference in the number of patients requiring anaesthesia was apparent between paediatric and adult patients (Table 2) compared to those not requiring it (χ^2 with Yates correction=0.4951, $P\text{-value}=0.481661$). At the first visit, a higher percentage of adults required GA prescription compared to children (χ^2 with Yates correction= 6.6292, $P\text{-value}=0.010032$). Between the two groups of patients, no difference could be detected in the number of patients requiring one or more GA interventions (Table 3), $\chi^2=0.7017$, $P\text{-value}=0.872802$.

The procedures performed during GA were dental hygiene, sealant application on fissures and pits, conservative treatments on primary and permanent teeth, primary and permanent teeth extractions, endodontic treatments. The performed treatments have been more conservative on permanent teeth than on deciduous. Primary and permanent teeth were treated in a significantly different way (χ^2 with Yates correction= 65.2148, $P\text{-value}<0.00001$): 76% of treated primary teeth were extracted and 24% were conservatively treated, whereas only 18% of permanent teeth were extracted, being 66% conservatively treated and 15% prophylactically sealed. The most treated teeth are the primary and permanent first and second molars, possibly because of their more complex occlusal anatomy and their position, more difficult for the patient to brush.

Discussion

Most of the health care institutions agree upon recommending early dental visits among the paediatric population

	Sex % (n)			Age at data collection		Age at 1st appointment	
	Males	Females	Total	<14 62.72% (106)	>14 37.28% (63)	<14 80.47% (136)	>14 19.53% (33)
	85.2% (144)	14.8% (25)	100% (169)				
Age at data collection (mean±SD)			14.87±8.69	9.52±2.99	23.87±7.66	11.69±5.09	28.00±8.99
Age at 1st visit (mean±SD)			11.39±7.99	7.55±2.59	17.86±9.69	8.03±2.82	25.24±7.47

TABLE 1 Data on patients. SD: standard deviation.

	% patients requiring GA (n)	% patients not requiring GA (n)	Total number of interventions	GA prescription at the first visit	GA prescription later
Paediatric patients	58.1 (79*)	41.9 (57)	93	33.09 (45)	22.06 (30)
Adult patients	66.7 (22#)	33.3 (11)	29	51.52 (17)	15.15 (5)
Total n	101	68	122	62	35

TABLE 2 Number of interventions in general anaesthesia (GA) in patients whose first examination was in their paediatric (n=136) or adult (n=33) age. *: including 5 patients with indications for GA (not yet performed at the moment of the study) and one who was treated at another site. #: including one patient that received GA treatment at another site.

Number of GA	1	2	3	4
Paediatric patients	64	9	4	4
Adult patients	19	4	2	0

TABLE 3 Number of patients (younger or older than 14 yo at their first appointment) requiring one or more GA interventions.

[European Academy of Paediatric Dentistry 2008, American Academy of Paediatric Dentistry, 2020], which become even more urgent among children with special needs, which are at an increased risk for oral diseases throughout their lifetime [Anders and Davis, 2010; Lewis, 2009].

Nevertheless, families of children diagnosed with ASD tend to underestimate or delay the dental care. Our data support the view that delayed dental care induces more oppositional behaviour, since older patients displayed a very negative attitude, that prompted for general anaesthesia more often than in paediatric patients. The role of paediatricians and family dentists is essential to stress on the importance of oral health and prevention of oral pathologies, addressing patients to dentists who are expert in treating children needing special care for periodic visits, so they can get familiar with the environment and oral prevention to decrease the incidence of oral pathologies, as stated also by the American Society of Anesthesiologists, 2014.

Children diagnosed with ASD tend to have medical and behavioural problems which can make oral treatments very difficult. Understanding the effect of autism on their behaviour helps the dentist to deliver oral treatments in an empathetic and appropriate manner [Jaber, 2011].

One limit of this study is that it was not possible to collect a sample of patients balanced for age and sex. The sample of persons with ASD taken into consideration shows more males than females with a ratio of almost 5.75:1, way higher than the ratios showed in other similar studies [Tidmarsh and Volkmar, 2003; Elsabbagh et al., 2012; Lai et al., 2014; Loo et al., 2008; Taghizadeh et al., 2015].

In the present study, the caries prevalence at the first visit is 63% for children and 60% for adults. The caries prevalence in the adult population is similar to the only other study on adult

patients with ASD, which reports caries in 60% of subjects [Orellana et al., 2012].

Regarding the paediatric population, conflicting results are present in the literature. Unfortunately, in this work it was not possible to calculate decay-missing-filled teeth in permanent and primary dentition (DMF/dmf) because data in the medical records were not always precise and because it was not always possible to perform a complete visit on non-cooperative patients.

Considering the caries prevalence in the general paediatric population reported in the guidelines from Italian Ministry of Health (2013), which is estimated around 22% at four yo and 44% at 12 yo, the percentage found in the present work appears higher for children with ASD. This increased prevalence can be explained considering the poor oral hygiene due to the difficult oral care at home [Loo et al., 2008; Gandhi and Klein, 2014; Lowe and Lindemann, 1985], the specific dietary habits [Udhya et al., 2014; Marshall et al., 2010; Klein and Novak, 1999], the assumption of psychotropic and/or antiseizures medication, which can possibly cause xerostomia and/or gingival overgrowth, making plaque control even more difficult [Robert and Rada, 2010]. In addition, caregivers of ASD persons are usually reluctant to bring them in a relatively hostile environment, like the dentist room within a hospital, thus delaying non-necessary or non-urgent treatments, resulting in an increase of oral disease prevalence in the sample we examined.

Considering patients' cooperation at the first visit, 38% of paediatric patients were judged uncooperative, 40% had poor collaboration, 8% fair collaboration and 3% good collaboration. Concerning adults, 66% were uncooperative, 17% had poor collaboration, 10% had fair collaboration and 7% good collaboration. The percentages of non- or poorly cooperative

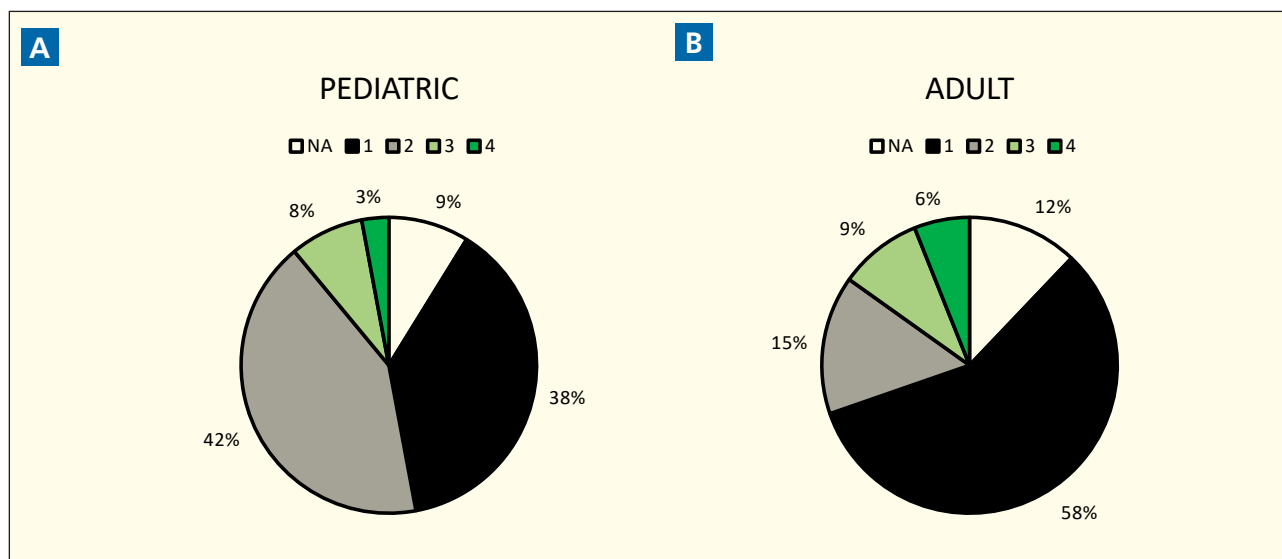


FIG. 1 Degree of collaboration at the first appointment in 136 patients younger than 14 yo at the first appointment (A) and in 33 patients who were older than 14 yo at the first appointment (B). NA: data not available (white), 1: no collaboration (black), 2: scarce (gray); 3: good (pale green); 4: definitely good (green). Degrees 3 and 4 allow the visit to take place.

patients are slightly higher than in other studies which report 44.8% and 35% cooperative patients [Loo et al., 2008; Taghizadeh et al., 2015]. However, the results of an interview conducted among parents of children with ASD show that 77% children are scared and uncooperative at their first dental visit [Baio et al., 2018].

Persons with ASD are often challenging for their inability to cooperate, due to interaction and communication difficulties. Different behaviour guidance techniques (BGT) can be used to gain patients' confidence and cooperation. The real challenge is finding the right approach and techniques for every single patient, because of the extreme variability of manifestations of ASD, different levels of physical and cognitive disability, different behavioural pattern and preferences. It becomes therefore essential for the doctors and their staff to have a complete picture of the situation of each single patient, in order to personalize the approach and the therapy plan [Gandhi and Klein, 2014].

Noteworthy, the so-called "problematic" behaviours shown by ASD patients may be a way to communicate and express feelings or needs for the person which cannot express itself in other ways. We cannot forbid a person to communicate, yet we can teach alternative ways of communication through the BGTs. These should be used not only from the dentist and the staff in the dental office but also synergistically at home and in the other places attended by the patient, in order to achieve better and consistent results.

In autistic patients with cooperation problems, conservative dental treatments can be successfully performed under nitrous oxide/oxygen inhalation, especially during childhood, while adolescents and especially adults often required nitrous oxide/oxygen inhalation with oral premedication [Mangione et al., 2019].

If patient compliance is still an issue and if general anaesthesia is contraindicated, also sedative drugs can be used to perform invasive dental procedures. In particular, a recent review showed that midazolam might be preferred to diazepam in children with ASD, even if diazepam has a longer duration. However, further studies are needed to define the type of drugs, their dosages, and the most appropriate techniques for conscious sedation for

dental care in autistic children [Vallogini et al., 2022].

Dental treatment under general anaesthesia was required in 65% of patients (specifically in 45% of children and in 75% of adults). In other studies, this percentage is lower: Jaber [2011] reports 30%, Loo et al. [2008] report 37.2%, Klein and Novak [1999] 37%.

In the present work, 33% of paediatric patients and 52% of adults were scheduled for therapies under GA already during their first visit. This was due to painful symptomatology or need of long and complex treatments associated with the impossibility to perform visit or therapies in the dental practice for lack of collaboration from the patient, suggesting that access to our practice was delayed as much as possible. The lower percentage of paediatric patients requiring GA, compared to adults, strongly advice on the need for early management of ASD children. The higher compliance with requirements of the dental setting, displayed by younger patients, further highlights the benefits of early intervention.

When patients required no GA, they were visited always by the same doctor, in the same quiet room, which had been improved for these special need patients with low lights and drawings on the wall. The visits had a short duration because these patients often have short-term attention [Klein and Novak, 1998; Chandrashekar and Bommangoudar, 2018].

We used some behaviour guidance techniques (BGT) to help the patient to feel comfortable, communicate and recognize the appropriate or inappropriate behaviours in order to perform safe and effective treatments [De Castro et al., 2013; Clinical Affairs Committee-Behaviour Management Subcommittee and American Academy of Paediatric Dentistry 2015]. The basic techniques used in paediatric dentistry (such as the tell-show-do and ask-tell-ask techniques, the positive reinforcement, distraction) should be adapted to each patient with the cooperation of caregivers. For example, patients with limited speaking skills could benefit by using the Picture Exchange Communication System (PECS), which consists of a frame where the patient organises pictures representing people, actions, objects to communicate with other people [Chandrashekar and Bommangoudar, 2018]. A useful approach may be the ABA method

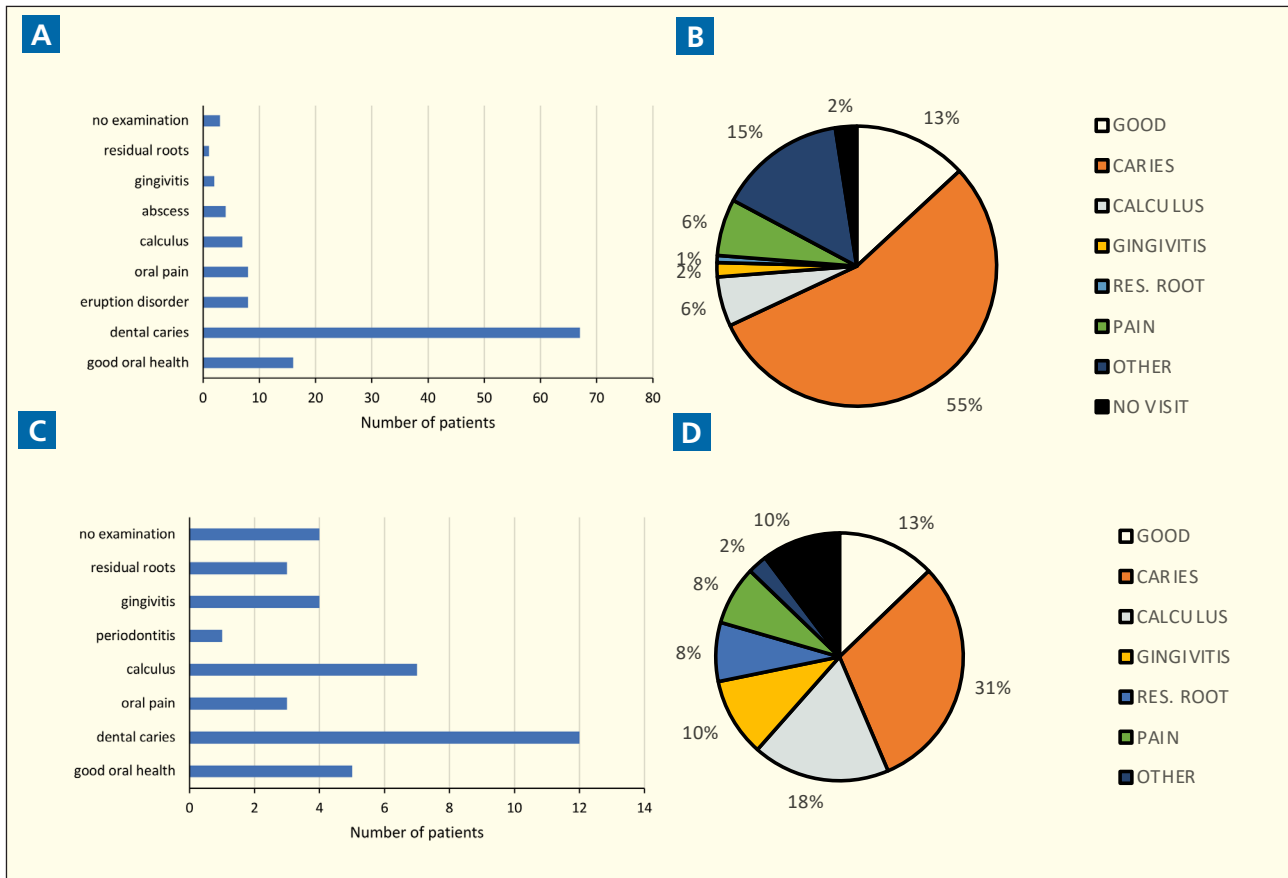


FIG. 2 Number of patients for each diagnosis made during the first visit in paediatric age (A) and in adult age (C), and the relative percentages (B and D).

(Applied Behaviour Analysis), which helps to change patients' behaviour by teaching specific competences. The patient is desensitised to the dental procedures by dividing them in specific and less difficult tasks, which are taught individually to gain a positive reinforcement at the end of every stage [Faulks et al., 2007]. Also, it is useful to prepare the patient in advance of the appointment by using pictures, videos or social stories, for example pictures with sentences explaining the sequence of a dental procedure, in order to reduce anxiety and improve collaboration [Gandhi and Klein, 2014].

Personalised digital supports with video modelling and sequencing games can help the patients to learn about the dental environment before the first visit itself, to facilitate the doctor-patient relationship, to desensitise the patient to the visit and dental treatment outlining the order of execution of the various actions and also as a positive reinforcement for the following sessions [Carli et al., 2022][Pagano et al., 2022].

Complications related to dental procedures performed under GA in patients with autism are generally similar to those for any individuals undergoing the same procedures. However, there may be adverse events specifically related to ASD, like significant disruptive behaviours after the awakening or post-operative bleeding due to the patient's manipulation of surgical sites [Rada, 2013].

Even when recurring to GA, it is mandatory to personalise the approach, including a flexible admission procedure, minimal preoperative waiting, and a quiet room for both pre-and postoperative care, in order to minimise the risk of

patient's negative reactions and adverse effects [Taghizadeh et al., 2015].

Conclusion

In conclusion, when working with ASD patients, the most important goal should be the primary prevention in order to maintain them free from oral diseases. The daily oral hygiene operations need to be internalised by the patient at a young age like a habit and stereotypy, taking advantage of the tendency of these patients towards repetition and continuity. Patients need to get used to undergo regular dental visits and simple preventive treatment, to avoid or intercept as soon as possible any oral problem that may show up. Gaining the patient's cooperation may be hard and the practitioner needs to adjust the approach to patient's habits and preferences, by using behavioural techniques which must be personalised to the single patient. When the need of dental treatment is urgent, the patient's cooperation is poor and the attempts to perform dental treatment in the dental practice failed, general anaesthesia remains the only effective option to perform safe and high-level dental therapies in patients with ASD, by warranting no rush movements or reflexes which can result also in iatrogenic damages.

Therefore, dentists aiming at treating ASD patients should have the possibility to collaborate with a dedicated anaesthesiologist to perform general anaesthesia in those patients who cannot be treated in the dental office.

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