22 July 2022
No. 10

ANAESTHESIA AND AUTISM SPECTRUM DISORDER

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INTRODUCTION

‘’I can remember the frustration of not being able to talk. I knew what I wanted to say, but I could not get the words out. So I would just scream.’- Dr. Temple Grandin Neurodiversity in education and the corporate world has largely been embraced in the early part of the 21st century. Science is comfortable with the notion that minds can function in vastly different ways, and this contributes to the progression of mankind as a whole. Albert Einstein, Elon Musk, Satoshi Tajiri, Jerry Seinfeld…these are just some of the well-known public personalities that have fallen somewhere along the Autism Spectrum.

However, the world can be a terrifying and chaotic kaleidoscope of stimulation and uncertainty for Autistics. With the diagnosis of autism increasing in prevalence, it is becoming increasingly common for children with the disorder to present for surgical intervention due to comorbidities related to their Autism or incidental pathology. This unique condition can present a challenge to the anaesthetist, and this brief review intends to serve as a guide to managing children with this disorder.

WHAT IS AUTISM?

In the early 1900's, Paul Eugen Bleuler, a psychiatrist in Switzerland, first used the term ''autism''. In this particular scenario, he was describing symptoms related to schizophrenia (1). It wasn't until several years later that a psychiatric colleague, Leo Kanner, described autism in a way that mirrors our current definitions – ''a person who has the inability to relate himself in the ordinary way to people and situations from the beginning of life (1).''

Autism is a heterogenous disorder, neurodevelopmental in nature, that affects the ability of a person to communicate socially and affects the manner in which one perceives their surroundings – places, people, sensations (1,2). It presents very early on in life with deficits in information processing, stress management and coping mechanisms (1,2). Children with autism have atypical cognition, fixed interests, and repetitive behaviours (1,2).

Historically, the variations in this condition have given rise to numerous syndromes and patterns that have each formed their own diagnostic entities, such as High-Functioning Autism, Asperger's Syndrome, Pervasive Developmental Disorder Not Otherwise Specified, and Atypical Autism (2). However, these entities have now fallen away, and modern definitions use the umbrella term, Autism Spectrum Disorder, that covers the variations within the spectrum from the most severe forms of the disorder to more functional variants (2).

EPIDEMIOLOGY

There appears to be a global increase in the incidence of Autism Spectrum Disorder. This may be the result of increased awareness, a wider and more detailed criterion for diagnosis, and the creation and implementation of better screening tools that have greater accuracy and sensitivity for identification of the disorder at an early age (1, 2).

There are various reports regarding the exact number of autistic individuals worldwide, with the current estimate being approximately 1% (2). The Center for Disease Control (CDC) reported a median prevalence of Autism Spectrum Disorder to be around 1 in 68 children, up to the age of 8 years old, although this may have changed since this report was released in 2010 (2).

There are also regional variations in prevalence, with countries like the United States and Sweden having higher than average rates of Autism compared to other countries worldwide. In the United States, 1 in 88 children is diagnosed as Autistic (2). Data from South Africa, and the African continent in general, is sparse. Research from the Western Cape has yielded a ballpark figure of 0.08% for the province, whereas the national estimate falls at around 2%, well above the worldwide average (3).

Males are five times more likely to be affected by Autism Spectrum Disorder than females (2). This male to female difference in clinical presentation and intelligence has puzzled

researchers for decades, and requires further investigation into the nature and cause of these differences. It appears that there seems to be a relationship between IQ and Autism. Males with higher IQ's are 4-9 times more affected than females, and 1.3-2.4 times more affected than females when at lower IQ's (2). There are also clinical differences in terms of symptomatology, as females seem to exhibit less repetitive stereotyped behaviours and possess greater dexterity in fine motor skill (2).

ETIOLOGY

Another puzzle for researchers is the possible cause for the Autistic phenomenon. There have been various theories and postulations put forth by leading experts in the field. However, there has been no identifiable cause so far, and thus no preventative solution (1, 2). Some of the more plausible theories are as follows:

- Genetics
- Environmental factors – toxins, pollution, etc.
- Immunologic – antibodies to fetal brain, autoimmune disorders, etc.
- Pharmacological agents
- Metabolic
- Nutrition
- Maternal infections

Despite the uncertainty, experts agree that the initiation of Autism Spectrum Disorder would occur during neurodevelopment of the child in-utero, generally during vulnerable periods of pregnancy, such as organogenesis or early first and second trimester (1, 2).

DIAGNOSIS

A standardized definition of Autism has been challenging to achieve and, similar to conditions such as Sepsis, this definition has undergone many changes over various decades. The current definition used is based on the criteria set out in the Diagnostic and Statistical Manual of Mental Disorders V (DSM V) published in 2013 (1, 2). The International Classification of Diseases 11 (ICD 11) also defines Autism Spectrum Disorder in a similar manner as the DSM V, with the former classification amended as recently as 2017 (1, 2).

The DSM V differentiates Autism into two categories of symptomatology:

1.) Deficits in social communication and interaction
    - Inappropriate responses to conversations
    - Relationship difficulties – an inability to understand the abstract connections between people, and challenges forming these connections

2.) Repetitive behaviours, activities, or interests
    - Unusual speech, movement, play
    - Obsessions with certain objects or subjects – eg. fascination with doors, an overly enthusiastic interest in dinosaurs, etc.
    - Sensory processing issues and behaviours (1, 2)

A major change from the DSM IV definition is the inclusion of Asperger's Syndrome, Pervasive Developmental Disorder Not Otherwise Specified, and conventional Autism under the umbrella classification of Autism Spectrum Disorder (1, 2). The reason for this change is that although these conditions have unique attributes that make them special, the underlying management involves the same principles. Additionally, these older classifications emphasized IQ as a major differentiating factor and this has led to confusion regarding management, since the functionality of the patient could vary despite IQ, and classifying Autistic individuals as high functioning and low functioning did very little to address the needs of the patient themselves. A typical example is that a high IQ Autistic individual may require far more rehabilitation to manage his/her symptoms than a lower IQ individual, whereas the latter may be fully functional in society after very little intervention.

To address the above conundrum, the newer definitions have instead focussed on addressing the severity of Autism Spectrum Disorder by subdivision into 3 levels of support:

- Level 1: requiring support
- Level 2: requiring substantial support
- Level 3: requiring very substantial support (1, 2)

CLINICAL PRESENTATION

The current definitions of Autism are designed in such a way that children with the disorder can be identified early on, and thus interventions can be carried out to improve outcome for later life. Regardless, symptoms of Autism can be subtle at times and the diagnosis can be delayed till late childhood. This is primarily due to the fact that there is such a wide variety of presentations that identifying an Autistic can be extremely challenging even for highly experienced Developmental Paediatricians and Child Psychologists, who are often not the first to be consulted when querying the suspicion of Autism Spectrum Disorder.

Most children present at an early age to either their General Practitioner, Paediatrician, or even an allied health practitioner such as a Speech Therapist, Occupational Therapist, or Play Therapist. An educator in school may even be the first person to query the diagnosis and refer to an appropriate specialist.

Intellectual impairment is a common feature of Autism Spectrum Disorder (1). The incidence is reported as varying, with a study by Charmann et al claiming the at least 55% of Autistics have an IQ of less than 70, with 16% of these patients having moderate to severe intellectual impairment (1, 4).

Communication is often a key discriminator and one of the first noticeable signs of Autism, as these individuals present with deficits in both verbal and non-verbal communication (1). At times, this can be tricky to diagnose early on in life, as babies and toddlers learn by mimicking the speech of adults. However, as the child ages, parents recognise that although the child is able to mimic sounds and words, there is very little comprehension and constructive communication is either absent or impaired. The common term for this mimicry of speech is echolalia, whereby the Autistic individual will repeat certain words or phrases without context and occasionally without comprehension (1).

In addition, the interaction that children may have with others is different and unconventional, with Autistic individuals experiencing difficulties in understanding non-verbal cues, maintaining eye contact, and understanding abstract speech like metaphors and even jokes (2).

Stimming, or repetition in movements and rituals, is also a common presenting feature (1, 2). Examples include arm flapping or waving, spinning, tics, head banging, etc. It could also present as something more subtle, like repeatedly playing with a particular toy, or playing with a toy in the same way all the time, or arranging toys or objects in a certain way. The world is chaos for those with Autism Spectrum Disorder, and theories suggest that these behaviours are the result of Autistics trying to maintain a semblance of perceived order within the world (2). As a result, children with Autism Spectrum Disorder are slaves to repetition, like having their bath the same way each day, eating the same time or eating the same food in the same way, watching the same episode of a particular cartoon, etc.

Sensory processing and overload presents in almost all Autistic children, and this difficulty in the ability to regulate this constant sensory input is what results in these children being completely overwhelmed, often resulting in tantrums, meltdowns, and anxiety (1). This can manifest as a sensory under-reaction, whereby a particular activity or sensation will yield no output from the child, or the opposite, where it may evoke intense pleasure or stress (2). It for this reason that Autistics may not react to conventional activities and interactions in the same way that neurotypical children would, and thus management of these children perioperatively may differ depending on the child’s sensory profile.

COMORBIDITIES

Despite the challenging behaviours exhibited by Autistics, the most common reasons for admission to hospital are physical in nature (1). In a study by Guinchat et al, 28% of patients were admitted due to epilepsy or acute pain, with 48% admitted due to non-ASD psychiatric conditions (5). A strong association exists between Autism Spectrum Disorder and immunological dysregulation, mitochondrial dysfunction and toxin exposure (6).

Common comorbidities found in patients with Autism Spectrum Disorder is tabulated below:

System	Disorder
Gastro-intestinal Tract	Malabsorption Maldigestion Irritable Bowel Syndrome Coeliac disease Food intolerance Food allergies Vitamin deficiencies Malnutrition
Oral	Dental caries Gingivitis Xerostomia
Psychiatric	Social Anxiety Disorder Attention Deficit/Hyperactivity Disorder Oppositional Defiant Disorder Insomnia Self-injury and aggression
Central Nervous System	Epilepsy Intellectual Disability Co-ordination: fine motor, gross motor Hypotonia and toe-walking Motor apraxia
Metabolic	Mitochondrial Disease Folate Cerebral Metabolism Dysfunction Methylation Oxidative stress Lactic Acidosis
Immunological	Hypothyroidism Type 1 Diabetes Mellitus Rheumatoid Arthritis Psoriasis

Adapted from Vlassakova et. al (1)

MANAGEMENT

From the evidence provided, it is no surprise that the management of Autism Spectrum Disorder is individualized and challenging, with a multidisciplinary approach the only viable option, involving the paediatrician, speech therapist, occupational therapist, behavioural psychologists, etc. In broad terms, the management of these patients can be divided into two categories: pharmacological and non-pharmacological (1).

Non-pharmacological therapy could be argued to be more important and effective than medication. However, since this review is primarily aimed at perioperative anaesthetic management, these therapies will not be covered in detail. Major non-pharmacological management approaches include developmental, behavioural, psychological, or sensory-motor based therapies (2).

Another concern regarding non-pharmacological therapeutic options is the use of complementary and alternative therapies, which have gained traction in recent years due to the uncertainty with regard to a definitive, universal therapeutic option which just does not exist at this moment in time to manage patients across such a varied spectrum (2). These therapies, although initially classified as non-pharmacological, can further be subdivided into biological and non-biological (2). The evidence for these therapies is low quality in general, mainly a mix of case reports and expert opinion from alternative health practitioners. However, the National Institute for Health and Excellence (NICE) have issued a warning regarding alternative therapies such as secretin, chelation, or hyperbaric oxygen therapy, as harm outweighs benefit (2).

Pharmacological Management

The aim of pharmacotherapy for Autism Spectrum Disorder is to reduce the consequences related to emotional and behavioural problems, such as self-injury and regression (1). Pharmacological therapy alone will not help manage severe symptoms as the primary management is geared towards rehabilitation via non-pharmacological measures. Due to the types of medications often prescribed to these patients, it is necessary for the anaesthesiologist to have an idea of the various drug interactions and side effects that may present with pharmacotherapy, which is a general concern with any disease.

Tabulated below are common classes of drugs that an individual with Autism Spectrum Disorder may be using and the various concerns related to each type of drug.

Class	Examples	Use in ASD	Side-effects
Antipsychotics	Haloperidol Risperidone Aripriprazole Clozapine Olanzapine	Aggression Irritability Self-injury Hyperactivity Inattention Stereotypical/ repetitive behaviours	Extrapyramidal symptoms Weight gain Somnolence Insomnia Hyperactivity Mood changes **Hypotension** **Arrhythmias** Agranulocytosis **Hyperthermia**
Anticonvulsants	Sodium valproate	Aggression Irritability Self-injury	Liver disease Coagulation abnormalities
Sedatives	Melatonin	Insomnia	No recorded side-effects
Stimulants	Methylphenidate Amphetamines	Hyperactivity Inattention	Weight reduction Insomnia ↓ Anaesthetic efficacy Hypertension Arrhythmias Seizures
Antidepressants	SSRI's – Fluoxetine, Citalopram	Stereotypical/ repetitive behaviours	Activation symptoms Increased energy distribution Reduced platelet aggregation
Alpha-agonists	Clonidine Guanfacine	Insomnia Hyperactivity Inattention	Weight gain Abdominal pain Irritability Headache

Adapted from Vlassakova et al (1).

Perioperative Management Guidelines

International guidelines from major anaesthetic societies regarding the perioperative management of Autistic individuals is lacking. Literature from Sweden, which has an approximate prevalence of 1%, still lacks national guidelines (7). However, at an institutional level, a small contingent of Anaesthetic departments have provided protocols and guidelines, although this is far from standardized throughout the country (7).

It is due to the nature of the disease that patients with Autism Spectrum Disorder will at some point be managed in a hospital environment. There is an associated increase in the risk of adverse events secondary to hospitalizations and procedures in Autistic individuals (1, 2). Reasons for this increase are multifactorial, related to the child's general routines, sensory profile, cognitive and intellectual function (1, 2). Preparation and education have always been at the forefront of paediatric perioperative management, and this is of greater significance in children with Autism Spectrum Disorder (1, 2).

Simple measures are best and can yield a decrease in adverse events, such as avoiding changing into a hospital gown prior to surgery, avoiding topical local anaesthetic and other preoperative interventions should they lead to distress in the child, being flexible in terms of taking vitals and anthropometric measurements, and allowing the child to pursue their special interests while in theatre if that's possible, like playing a videogame or watching a cartoon (1, 2, 8).

The spectrum and issues that may need to be dealt with can be variable and complex, thus making it improbable to predict all concerns that could be present prior to the induction of anaesthesia. It is imperative that the most important predispositions be identified and dealt with. Parents, multidisciplinary caregivers and therapists can be excellent sources of information. The more common issues are tabulated below with tips on how to deal with them (1, 2).

Concern	Consequence	Strategies
Communication difficulties	Can't understand what is happening around them, and an inability to allay fears and concerns	Simple, clear language Visual aids Social stories
Repetitive behaviours, activities and interests	Anxiety, irritability, and meltdowns if routines change	Make this work for you → use this to comfort and motivate the patient
Touch sensitivity	Hospital gowns, EMLA → these interventions are perceived as extremely unpleasant	Avoid if possible
Taste sensitivity	Premedication may not be tolerated, like midazolam or ketamine	Clonidine → tasteless and can be mixed with water, thus allowing other premedications to be given 15-30 minutes later
Light sensitivity	Results in meltdowns due to visual overstimulation	Avoid fluorescent lights Semi-dark environment for induction and recovery
Noise sensitivity	Results in meltdowns due to auditory stimulation	Quiet environment for induction and recovery
Anxiety	Can be related to virtually anything and everything	Anxiolytic Preparation via visual stories Relaxation and distraction techniques
Anger	Agitation and disruption	Antipsychotic Preparation
Intellectual disability	Communication and comprehension deficits	Simple language Visual aids Repetition
Epilepsy	Seizures, status epilepticus	Anticonvulsants Control

Adapted from Vlassakova et al (1)

PREOPERATIVE MANAGEMENT AND PREPARATION

Autistic children can be prepared for theatre in three major ways: behavioural techniques, establishing rapport using communication techniques, and pharmacological options. (1, 2)

Behavioural Techniques

These techniques are individualized according to the specific behavioural deficits and abnormalities that the Autistic individual may possess. A wide variety of techniques exist, including social stories, distraction techniques, symbol timelines, and scheduling (1). Due to the visual appeal of the Autistic mind, electronic media in the form of tablets or screens has been shown to be extremely useful (9).
Many children with Autism Spectrum Disorder are accustomed to the use of visual aids at home, and these visual symbols can be immensely helpful in explaining the perioperative process to the child (1, 2). In a similar manner, symbol timelines and social stories can be used to model specific behaviours in theatre (1). Once again, videos and visual media are the go-to medium of choice to enhance the success of these techniques.

Establishing Rapport using Communication Techniques

Rapport should be attempted in the initial preoperative visit in order to enhance the child's perioperative experience. Attention should be paid to the patient's behaviour, likes, dislikes, special interests, factors that cause agitation, modelling and coping techniques (1).

While the development of rapport can be challenging in neurotypical paediatric patients, the process is exponentially more difficult in the Autistic child. Regardless, the general process is described as follows:

- Identify the Autistic child early on – the more time one has to work with, the better the outcome
- Identify the major behavioural concerns – What is the child's baseline behaviour? What can trigger a meltdown? How does the child display anxiety?
- Speak to the family and develop rapport
- Advise family to bring along the child's favourite toy, comfort items, or even electronic devices
- Council surgeons – plan and workflow
- Flexibility during admission and prior to induction
- Having a clear postanaesthetic plan and getting all stakeholders involved (1, 2)

Pharmacological

There is no difference in premedication than what would be experienced by any other child, bearing in mind the specific aversions to tastes and textures that children with Autism Spectrum Disorder may display (1, 2, 8). There are many different options for premedication, and many different strategies of convincing the child to take their

premedication. One of the more useful suggestions is to give the child their premedication via their favourite drink (1). However, one must keep in mind starvation guidelines when using this method.

Common oral premedication that has been explored in the literature include dexmedetomidine, ketamine, midazolam and combinations of these drugs (1, 2, 8, 10).

While midazolam and ketamine have been given exclusively as premedication prior to anaesthesia and surgery, the use of dexmedetomidine is described as adjunctive, with its use extending throughout the perioperative period (8, 11).

Severity of the disorder has also influenced choice of premedication, although the evidence for this is mainly via case reports and observation (1, 10, 12). Midazolam has seen good results in patients with milder forms of Autism Spectrum Disorder, with Ketamine being more suitable in severe cases (2, 13). Combination therapy is more suited to situations in which the child's behaviour is rapidly worsening or where past premedication with single agents has been ineffective (1).

Newer reports have provided insight into the use of Midazolam as the primary sedative over oral Ketamine. This is mainly due to the associated side effects of Ketamine as compared to Midazolam. Although Midazolam causes degrees of respiratory depression, most case reports have not reported significant side effects when appropriate doses and monitoring facilities are used (2) Thus, expert opinion dealing with these children proposes a move away from midazolam and ketamine and an increase in the use of oral dexmedetomidine as a first line sedative in the preoperative arena, as results so far have been positive (2). Dexmedetomidine is not as freely available in public sector South Africa, thus the alternative recommendation of using a combination of ketamine and midazolam at lower oral doses may be more appropriate (2).

There are also suggestions of using risperidone or haloperidol in more aggressive patients. However, further research is required (2).

Preoperative Tips

Other helpful strategies that may make induction and management of these patients more pleasant would be to schedule cases as early as possible in the day, arrange the workflow of theatre as to reduce waiting times, ensure a calm and quiet environment, be aware of the number of personnel in theatre as too many may agitate the child, use previously discussed distraction techniques, and try to avoid any triggers that may result in negative behaviours (1, 8, 14).

INTRAOPERATIVE MANAGEMENT

There is no preferred, evidence-based anaesthetic technique of choice. Procedures in children with Autism Spectrum Disorder have been conducted under local anaesthesia, sedation, regional anaesthesia, and under general anaesthetic (1, 2, 8, 11, 13, 15). Despite this, the literature on Autism Spectrum Disorder and anaesthesia alludes to surgery mainly being conducted under local anaesthesia with or without sedation, sedation alone, or general anaesthesia, with very little exploration via regional anaesthesia alone, which makes sense considering the propensity for children with Autism Spectrum Disorder to be easily agitated.

Patient selection is key, and treatment should be individualized based on type of surgery, severity of autism, and patient preferences and comorbidities. Anaesthetic technique should be adjusted to achieve appropriate goals such as adequate pain management using multimodal analgesic strategies, including regional and peripheral nerve techniques, optimizing postoperative recovery with the use of postoperative nausea and vomiting prophylaxis and additional sedation if needed, avoiding drugs that may contribute to emergence delirium, and ensuring adequate hydration of patients with early removal of intravenous cannula so as to avoid agitation in recovery room and wards (1, 2).
It is of utmost importance to ensure that the theatre environment is comfortable for the child prior to induction, keeping in mind a quiet, non-stimulating environment with limited number of personnel, and ensuring good communication between the caregiver, theatre staff, and patient (1). A smooth induction and emergence is helpful. The method of extubation, whether awake or deep, is at the discretion of the anaesthetist and recent evidence does not suggest a preference of one over the other.

The current predicament on emergence is agitation and delirium, hence the suggestion that focus should be placed on avoiding this using pharmacological strategies such as intraoperative dexmedetomidine, clonidine, ketamine, or propofol (1, 2). Emergence delirium and agitation has an associated increased incidence in children with Autism Spectrum Disorder (1).

Sedation is a commonly used anaesthetic technique for minor surgeries and procedures, such as radiographic imaging and neurophysiological studies. Various methods have been discussed in the literature. Combinations of chloral hydrate, dexmedetomidine, and ketamine have been used for electroencephalographic studies, while intravenous infusions of demedetomidine have been sufficient for magnetic-resonance imaging (16, 17). However, some institutions and cohort studies have shown that sedation may be insufficient as a sole anaesthetic technique. Dental procedures, like tooth extractions, have been extremely challenging to perform under sedation and local anaesthetic alone.

It has been found that general anaesthesia seems to be the preferred method for these types of patients (18). Evidence from Japan showed that even when intravenous propofol infusions have been used, dosage requirements have been increased in autistic individuals due to possible deficiencies in the GABA inhibitory system as part of their

neurodevelopmental disorder (19). This has possible implications for target-controlled sedation, intravenous anaesthesia, and induction of general anaesthesia (19).

Whatever technique is chosen, the goal should be to have the patient as comfortable as possible and to optimize the postoperative course.

POSTOPERATIVE MANAGEMENT

Challenges in postoperative care stem from the development of emergence delirium, inadequate analgesic management, poor fluid management, hypothermia, and over-stimulation. If appropriate goals are adhered to intraoperatively, the bulk of these issues would be resolved (1, 2). Prevention is better than cure. The modern recovery room is ideal for monitoring of patients after anaesthesia and surgery, but can be a source of immense agitation to a child with Autism Spectrum Disorder (13). Bearing in mind the multiple sensory sensitivities that these patients possess, the recovery area is a frighteningly stimulating environment – bright fluorescent lights, alarms, people, unfamiliar sounds…this can be a recipe for an autistic meltdown.

A quiet, isolated, dimmed area in the post-anaesthesia care unit for the recovery of these children may avoid this issue. Yet this is not always practical in the South African setting. In centres where a large population of these patients will be coming in for surgery and anaesthesia, this provision should be made (1, 7, 13).

Basic principles of paediatric anaesthesia can be useful here, such as having the parents in recovery before the child fully awakens. This can lessen the risk of negative behaviours (1). This suggestion does not necessarily imply a deep extubation and wake up in recovery, as it is still possible to achieve this with a fully awake extubation since children do have the propensity to fall back asleep immediately post-extubation should analgesia and hydration be optimized. Other factors that may be of aid in optimizing postoperative recovery would be early removal of IV lines should this be possible, reducing the amount of vital sign checks, and lowering the duration of recovery room stay should there be no concerns regarding the airway, ventilation and haemodynamics (1, 2, 13). Of course, this is not always possible, especially in children who have undergone major surgeries or who have suffered an anaesthetic or surgical complication. In these cases, caution should be taken regarding the clinical condition of the child, with common sense measures to maintain a calm, comfortable stay in recovery, such as ensuring an intravenous cannula is adequate strapped down and hidden from the child's sight (1).

As with most children, assessing pain can be extremely challenging in this particular group of patients. Depending on the severity of Autism Spectrum Disorder, pain assessments can be done using conventional pain scales, repeated objective measurements such as blood pressure and heart rate, or using simple words and terms that the child can understand, visual media, and the assistance of parents (1, 2, 8). The FLACC scale has been shown to be the more effective of the paediatric pain scales according to the literature (1, 2).

GOALS OF ANAESTHESIA FOR CHILDREN WITH AUTISM SPECTRUM DISORDER: A SUMMARY

Preoperative Goals	Schedule case early in the morning ↓ waiting period Quiet environment ↓ personnel Distraction techniques: toys, activities, electronic media and devices Communication aids Avoid triggers Multidisciplinary approach – therapist involvement
Intraoperative Goals	Quiet environment Communicate – parents, child Smooth induction PONV prophylaxis Optimize analgesia Optimize hydration Consider sedation towards end of anaesthesia Measures to reduce emergence delirium and agitation
Postoperative Goals	Quiet environment Early parental involvement ↓ recovery room stay ↓ vital sign checks Remove/camouflage IV line

CONCLUSION

Autism Spectrum Disorder is complex, encompassing a rainbow of behavioural, sensory, social, and communication deficits that vary from person to person. This makes perioperative management of these patients quite challenging.

A major point to remember is that there is no single, perfect approach to a child on the spectrum, and treatment needs to be individualized accordingly. Knowledge of the patient's unique traits is at the core of management, since this sets the foundation for strategies to improve and enhance the patient's experience.

Currently, despite the increased prevalence of the disorder worldwide, there are still no standardized guidelines. This is most likely due to the lack of good evidence and paucity of research. It is possible that children with Autism Spectrum Disorder are packaged into other guidelines, and treated according to protocols designed for the intellectually impaired or psychiatric population. This is incorrect as the condition may share similar traits but is a completely separate entity. It is clear that further research is needed to identify the best anaesthetic management strategies to reduce adverse events.

The Autistic mind perceives a different world and it is important to acknowledge this. Dr. Stephen Shore once said, "If you have met one person with Autism, you've met ONE person with Autism.'' This once again highlights the need for an individualized and personal approach.

REFERENCES

1. Vlassakova BG, Emmanouil DE. Perioperative considerations in children with autism spectrum disorder. Curr Opin Anaesthesiol. 2016;29(3):359-66.
2. Taghizadeh N, Davidson A, Williams K, Story D. Autism spectrum disorder (ASD) and its perioperative management. Paediatr Anaesth. 2015;25(11):1076-84.
3. Pillay S, Duncan M, de Vries PJ. Autism in the Western Cape province of South Africa: Rates, socio-demographics, disability and educational characteristics in one million school children. Autism. 2020;25(4):1076-89.
4. Charman T. Autism spectrum disorders. Psychiatry. 2008;7(8):331-4.
5. Guinchat V, Cravero C, Diaz L, Périsse D, Xavier J, Amiet C, et al. Acute behavioral crises in psychiatric inpatients with autism spectrum disorder (ASD): Recognition of concomitant medical or non-ASD psychiatric conditions predicts enhanced improvement. Research in Developmental Disabilities. 2015;38:242-55.
6. Rossignol DA, Frye RE. Mitochondrial dysfunction in autism spectrum disorders: a systematic review and meta-analysis. Molecular Psychiatry. 2012;17(3):290-314.
7. Gimbler Berglund I, Huus K, Enskär K, Faresjö M, Björkman B. Perioperative and Anesthesia Guidelines for Children with Autism: A Nationwide Survey from Sweden. J Dev Behav Pediatr. 2016;37(6):457-64.
8. Bagshaw M. Anaesthesia and the autistic child. J Perioper Pract. 2011;21(9):313-7.
9. Isong IA, Rao SR, Holifield C, Iannuzzi D, Hanson E, Ware J, et al. Addressing Dental Fear in Children With Autism Spectrum Disorders: A Randomized Controlled Pilot Study Using Electronic Screen Media. Clinical Pediatrics. 2014;53(3):230-7.
10. Braff MH, Nealon L. Sedation of the autistic patient for dental procedures. ASDC J Dent Child. 1979;46(5):404-7.
11. Brown JJ, Gray JM, Roback MG, Sethuraman U, Farooqi A, Kannikeswaran N. Procedural sedation in children with autism spectrum disorders in the emergency department. Am J Emerg Med. 2019;37(8):1404-8.
12. Christiansen E, Chambers N. Induction of anesthesia in a combative child; management and issues. Paediatr Anaesth. 2005;15(5):421-5.
13. Berglund IG, Björkman B, Enskär K, Faresjö M, Huus K. Management of Children with Autism Spectrum Disorder in the Anesthesia and Radiographic Context. J Dev Behav Pediatr. 2017;38(3):187-96.
14. Sacoor S. Anaesthesia and Sedation for the Autistic Patient. SAAD Dig. 2017;33:40-3.
15. Kamat PP, Bryan LN, McCracken CE, Simon HK, Berkenbosch JW, Grunwell JR. Procedural sedation in children with autism spectrum disorders: A survey of current practice patterns of the society for pediatric sedation members. Paediatr Anaesth. 2018;28(6):552-7.
16. Keidan I, Ben-Menachem E, Tzadok M, Ben-Zeev B, Berkenstadt H. Electroencephalography for children with autistic spectrum disorder: a sedation protocol. Paediatr Anaesth. 2015;25(2):200-5.
17. Ahmed SS, Unland T, Slaven JE, Nitu ME, Rigby MR. Successful use of intravenous dexmedetomidine for magnetic resonance imaging sedation in autistic children. South Med J. 2014;107(9):559-64.
18. Mangione F, Bdeoui F, Monnier-Da Costa A, Dursun E. Autistic patients: a retrospective study on their dental needs and the behavioural approach. Clin Oral Investig. 2020;24(5):1677-85.
19. Asahi Y, Kubota K, Omichi S. Dose requirements for propofol anaesthesia for dental treatment for autistic patients compared with intellectually impaired patients. Anaesth Intensive Care. 2009;37(1):70-3.