orphanaesthesia

Anaesthesia recommendations for patients suffering from

Autism spectrum disorder

Disease name: Autism Spectrum Disorder (ASD) according to DSM-5

ICD 10: F84: Pervasive developmental disorder

F84.0: Autistic Disorder

F84.2: Rett's syndrome (not part of ASD)

F84.3: Other childhood disintegrative disorder

F84.5: Asperger's syndrome

F84.8: Other pervasive developmental disorders

F84.9: Pervasive developmental disorder, unspecified

Synonyms: Autistic disorder, childhood autism, pervasive developmental disorder-not otherwise specified, atypical autism, Asperger syndrome, high-functioning autism

ASD is a neurodevelopmental disorder often identified at an early age and is characterised by functional impairment in social communication and restricted interests and repetitive behaviours. The term ASD, as defined in DSM-5, covers all the diagnostic terms that are previously used including Asperger syndrome, autistic disorder, pervasive developmental disorder-not otherwise specified (PDD-NOS).

Medicine in progress

Perhaps new knowledge

Every patient is unique

Perhaps the diagnostic is wrong

Find more information on the disease, its centres of reference and patient organisations on Orphanet: www.orpha.net

Disease summary

ASD affects 1 in 88 children in the United States, with 1 in 56 boys affected. It is associated with intellectual disability in 55%, with other mental health disorders including ADHD, anxiety and conduct disorder in 70% and epilepsy in 30%. Common and rare genetic variants as well as environmental factors likely contribute to ASD risk. Through integrated analysis of de novo copy number variants, Indels and single nucleotide variants, currently 71 genetic risk loci have been associated with ASD. Genes that regulate chromatin, transcription and synapse formation have been implicated in the pathogenesis of ASD. This complex genetic picture with wide variety of clinical presentations suggests that many different subtypes of ASD may be identified in the future.

Although “no two kids with autism are the same”, they all share some common features including abnormal sensory processing that can predispose them to sensory overload in an average hospital setting. Sensory sensitivities may affect 42-80% of individuals with ASD. They may over or under-react to it. These include auditory, visual, gustatory and tactile input.

Management is divided into pharmacological and non-pharmacological interventions. Pharmacological interventions includes atypical antipsychotics that are aimed at controlling challenging behaviours and aggression, antidepressants (SSRIs and SNRIs) to improve repetitive behaviours as well as anxiety/depression, alpha-2 agonists to improve irritability and sensory sensitivities as well as sleep disorders and stimulants to treat hyperactivity, impulsivity and inattention. Anticonvulsants are used to control co-morbid seizure disorders.

The non-pharmacological interventions include a diverse group of approaches such as applied behavioural analysis, use of social stories and visual strategies to facilitate understanding. In addition, Complementary and Alternative therapies (CAM) are used widely. By the time the child receives the formal diagnosis of ASD, nearly a third already have tried it. The National Institute for Health and Care Excellence guidelines recommend not to use secretin, chelation, or hyperbaric oxygen therapy to manage ASD in any context because there is no evidence it is effective and because there is potential harm associated with their use. It is important to inquire about the use of CAM.

While there may be unique anaesthetic concerns for each child with ASD, common anaesthetic issues are a combination of significant anxiety, lack of understanding of the surroundings, sensory hypersensitivities and sensory overload in a busy, noisy hospital, communication difficulties and change of routine that in combination can lead to behavioural challenges at induction and in the recovery room as well as the wards.

Traditionally, restraint and intramuscular ketamine has been used. Later, the use of oral ketamine or the combination of ketamine and midazolam have been reported. Also, case reports of the use of alpha-2 agonists have been emerging with 93% successfully completing EEG in Mehta study after oral clonidine, 98.7% success with MRI or EEG in Lubisch study after mostly intravenous dexmedetomidine and 84% adequate sedation for intravenous cannula placement or induction in Zub study after oral dexmedetomidine. In another retrospective study by Ray et al. oral dexmedetomidine was used for sedation during EEG in 18 patients. More recently a more systematic approach has been used. It involves preparation of hospital, staff and the child as well as the use of premedication if necessary.

Early identification and planning in advance and a quiet room for admission and recovery have been described. More attention to preparation of children at home with social stories and the use of premedication and personal computer/ games for distraction at induction are necessary and effective. Parents are the experts in their children and their views should be

valued. Many children with ASD can be very cooperative as long as they are prepared and understand what is expected of them.

Staff education and awareness of alternative communication methods, use of simple language with pictures, avoidance of triggers to challenging behaviour and ways to deal with aggressive behaviour are also important.

Intramuscular ketamine and significant restraint should be used rarely and only in extreme circumstances.

Typical surgery

Children with ASD have an increased rate of hospital contact for multiple reasons. Dental restoration, MRI and EEG are some of the more common procedures, requiring general anaesthesia and sedation. In the Van Der Walt and Moran study from 2011, 57% of cases required dental or ENT procedures and another 25% were anaesthetized for investigations (CT in 9, MRI in 6, endoscopies in 4, cardiac catheter in 2, brain stem evoked response in 2).

As previously mentioned, Zub, Lubisch, Mehta and Ray were all reported in patients having MRI or EEG under sedation and Arnold study involved dental procedures. There has been case report of 1 child and 1 young adult requiring anaesthetic for cancer operation. Another study reported that children with ASD were 20% more likely to be hospitalised for injuries than neurotypical children.

Type of anaesthesia

Inductions by the way of inhalational and intravenous anaesthesia are both described. It depends on individual preference. Either may be possible in the sedated child, but a cooperative, prepared child may feel empowered in being able to choose, where appropriate. A child with ASD can be distracted by a toy or mobile phone during cannulation, but will be unlikely to benefit from guided imagery or magical stories during an inhalational induction. Explanations must be straightforward and honest.

Some children may dislike the facemask or the smell of volatile agents; others may not tolerate local anaesthetic cream or intravenous cannula. Steal induction has been described in neurotypical children using oral clonidine or melatonin premedication and can potentially be very useful in this group of patients. Further studies are recommended.

Necessary additional diagnostic procedures (preoperative)

“It has been known that many rare medical or genetic conditions are associated with autism. Dozens of genetic syndromes including Joubert Syndrome, Smith-Lemil-Opitz syndrome, Tuberous Sclerosis and Fragile X are known to cause autism, some with less than 50% penetrance. However, these syndromic forms are considered the exceptional cases, none accounts for more than 1% of ASD cases.”

Most children with ASD undergo genetic testing with chromosomal microarray and Fragile X testing. Certainly if a well-known genetic syndrome with anaesthetic risk is diagnosed then that has to be considered first and foremost but for their behaviour the diagnosis of ASD

should also inform actions. For example, Tuberous sclerosis is associated with seizures, mental retardation and facial angiofibromas. It can be associated with cardiac rhabdomyomas, giant cell astrocytomas renal involvement and oral lesions [20]. People with autism because of a 22q11 deletion (DiGeorge Syndrome) have congenital thymic hypoplasia with the resultant hypocalcaemia and defect in cell-mediated immunity predisposing to infection. Patients with Smith-Lemli-Opitz syndrome maybe susceptible to malignant hyperthermia and have generally a poor prognosis. Likewise, people with autism because of 17p11.2 deletions (Smith Magenis Syndrome) or TCF4 mutations (Pitt Hopkins Syndrome) have breathing and sleep problems that would be highly relevant for procedures performed under anaesthesia. If the initial presenting phenotype of any of these disorders is autism first, these patients might be clustered together under the autism umbrella term, missing the important implications of knowing their specific genetic diagnosis. Chromosomal Microarray testing is the standard of care for people with autism and would be able to identify many of these genetic conditions.

No particular preoperative investigations are mandated for ASD, however it may be preferable to undertake basic investigations required for surgical or diagnostic purposes, such as routine blood tests, once the patient is anaesthetised. In addition, it may be possible to undertake routine health checks, such as dental examination, opportunistically during an anaesthetic, which is required for another reason (such as an MRI scan).

Particular psychological preparation

Children with ASD may have a wide range of intellectual and communication abilities. High-functioning children may respond very well to detailed explanations of the procedures involved from a patient professional who is prepared to answer all their questions. They may not benefit from storybooks about fictional characters, but can learn how to navigate the admission to hospital and treatment with the use of sequenced time-lines, social stories that model appropriate behaviour and rehearsal of some of the unfamiliar aspects of care, such as the application of local anaesthetic cream, or the introduction of an anaesthetic facemask. If prepared in advance, such children can cooperate well with medical care, without the need for sedative premedication, but a sensitive, patient and flexible approach is required. A favourite toy or game may provide a useful comfort and distraction.

For children with cognitive impairment and language and communication disorders, time-lines can also be helpful, particularly if accompanied by symbols or pictures, which are presented in a form familiar to the child. They may aid in helping the child to cooperate with necessary procedures such as meeting new people, being weighed and examined, and taking a sedative premedication to facilitate a smooth anaesthetic induction. Parental presence at induction may also be helpful, as the parent may be skilled in the gentle holding required to assist their child to manage basic activities at home or to keep them safe when distressed. Intramuscular ketamine and significant restraint should be used rarely and only in extreme circumstances. If restraint is likely to be required, the team involved should be briefed and ready to intervene as necessary, with the help of the parent or carer, and in as gentle a way as possible.

Particular preparation for anticoagulation

Not reported.

Particular precautions for positioning, transport or mobilisation

Not reported.

Probable interaction between anaesthetic agents and patient's long-term medication

The antipsychotics may cause hypotension with general anaesthesia and may have pro-arrhythmic properties. It is recommended to be used cautiously. Clozapine can cause agranulocytosis and hyperthermia, cardiac conduction problems and hypotension. Psychiatric consultation is recommended as its discontinuation may predispose to dystonia, dyskinesia, delirium and psychosis.

The psycho-stimulants may increase the sedative dose requirement and may increase the risk of hypertension and arrhythmias, lower the seizure threshold and interact with vasopressors. There is a risk of significant and sudden hypertension when methylphenidate and halogenated agents are used concurrently. The drug label recommends the stimulants should be withheld on the day of operation.

The selective serotonin reuptake inhibitors (SSRIs) should continue except in patients having major central nervous system procedures, as they may increase the risk of transfusion due to their effect on platelet aggression specially if used with non-steroidal anti-inflammatory agents.

Carbamazepine and valproate are commonly used in the treatment of epilepsy. Valproate has the potential to increase bleeding from platelet dysfunction, its side effects can range from minor gastrointestinal disturbances and platelet dysfunction to major idiosyncratic reactions. Carbamazepine induces the liver enzymes and can shorten the duration of effect of other drugs in particular non-depolarising amino-steroid neuromuscular blockers such as vecuronium. Its side effects include syndrome of inappropriate ADH, hepatitis and blood dyscrasias.

Anaesthesiologic procedure

It is recommended for anti emetic, analgesia and intravenous hydration to be given intra-operatively. Many children with ASD may refuse medications in different forms due to hypersensitivity to taste and it can be difficult for parents to administer these medications. Pre or intraoperative medications that reduce the risk of emergence agitation is also recommended. These drugs include: alpha-2 agonists, propofol maintenance or bolus and/or the use of opioids, ketamine or midazolam toward the end of procedure.

Particular or additional monitoring

Not reported.

Possible complications

Not reported.

Postoperative care

Children with ASD can become agitated at the time of regaining consciousness. It can be hard to distinguish between pain, nausea, anxiety or emergence delirium, and the use of formal pain scoring systems can be very challenging. For day-surgery patients, consider early removal of intravenous cannula and recovering the patient in a quiet room with parents and comfort items present. Plan for early discharge to familial surrounding of their home if possible. It is not necessary to mandate eating and drinking prior to discharge if parents feel their child would be more comfortable to eat at home.

Intravenous lines and other invasive devices (NG tubes, urinary catheters, etc.) must be very well secured in children undergoing more complex surgery, as they may be easily dislodged by an agitated child if they are uncomfortable. Where intensive monitoring may be required postoperatively, for instance after major scoliosis surgery, a short period of postoperative sedation and ventilation may be necessary until the child is physiologically stable.

Information about emergency-like situations / Differential diagnostics

caused by the illness to give a tool to distinguish between a side effect of the anaesthetic procedure and a manifestation of the diseases, e.g.:

Not reported.

Ambulatory anaesthesia

Ambulatory anaesthesia is highly recommended. The sooner the child returns to his/her home, the likelihood of post-operative major behavioural issues will decrease.

Obstetrical anaesthesia

Not reported.

Literature and internet links

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Last date of modification: July 2016

This guideline has been prepared by:

Author
Neda Taghizadeh, Anaesthesiologist, Murdoch Children's Research Institute, Victoria, Australia
nedat@optusnet.com.au

Peer revision 1
Judith Short, Anaesthesiologist, Sheffield Children's NHS Foundation Trust, Western Bank, Sheffield, United Kingdom
judith.short@sch.nhs.uk

Peer revision 2
Daniel Moreno de Luca, Department of Psychiatry, Yale University, New Haven CT, USA
daniel.morenodeluca@yale.edu

Aaron Besterman, Research, Department of Psychiatry, University of California, San Francisco, USA
aaron.besterman@ucsf.edu