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Prader-Willi syndrome

Proteus syndrome

orphanaesthesia

a project of the German Society
of Anaesthesiology and Intensive Care Medicine

SUPPLEMENT NR. 4 | 2018

OrphanAnesthesia –
ein krankheitsübergreifendes Projekt des Wissenschaftlichen Arbeitskreises Kinderanästhesie der Deutschen Gesellschaft für Anästhesiologie und Intensivmedizin e.V.

Ziel des Projektes ist die Veröffentlichung von Handlungsempfehlungen zur anästhesiologischen Betreuung von Patienten mit seltenen Erkrankungen. Damit will Orphan Anesthesia einen wichtigen Beitrag zur Erhöhung der Patientensicherheit leisten.

Patienten mit seltenen Erkrankungen benötigen für verschiedene diagnostische oder therapeutische Prozeduren eine anästhesiologische Betreuung, die mit einem erhöhten Risiko für anästhesieassoziierte Komplikationen einhergehen. Weil diese Erkrankungen selten auftreten, können Anästhesisten damit keine Erfahrungen gesammelt haben, so dass für die Planung der Narkose die Einholung weiterer Information unerlässlich ist. Durch vorhandene spezifische Informationen kann die Inzidenz von mit der Narkose assoziierten Komplikationen gesenkt werden. Zur Verfügung stehendes Wissen schafft Sicherheit im Prozess der Patientenversorgung.

Die Handlungsempfehlungen von OrphanAnesthesia sind standardisiert und durchlaufen nach ihrer Erstellung einen Peer-Review-Prozess, an dem ein Anästhesist sowie ein weiterer Krankheitsexperte (z.B. Pädiater oder Neurologe) beteiligt sind. Das Projekt ist international ausgerichtet, so dass die Handlungsempfehlungen grundsätzlich in englischer Sprache veröffentlicht werden.

Ab Heft 5/2014 werden im monatlichen Rhythmus je zwei Handlungsempfehlungen als Supplement der A&I unter www.ai-online.info veröffentlicht. Als Bestandteil der A&I sind die Handlungsempfehlungen damit auch zitierfähig. Sonderdrucke können gegen Entgelt bestellt werden.

Bisher in A&I publizierte Handlungsempfehlungen finden Sie unter:

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OrphanAnesthesia –
a common project of the Scientific Working Group of Paediatric Anaesthesia of the German Society of Anaesthesiology and Intensive Care Medicine

The target of OrphanAnesthesia is the publication of anaesthesia recommendations for patients suffering from rare diseases in order to improve patients' safety. When it comes to the management of patients with rare diseases, there are only sparse evidence-based facts and even far less knowledge in the anaesthetic outcome. OrphanAnesthesia would like to merge this knowledge based on scientific publications and proven experience of specialists making it available for physicians worldwide free of charge.

All OrphanAnesthesia recommendations are standardized and need to pass a peer review process. They are being reviewed by at least one anaesthesiologist and another disease expert (e.g. paediatrician or neurologist) involved in the treatment of this group of patients.

The project OrphanAnesthesia is internationally oriented. Thus all recommendations will be published in English.

Starting with issue 5/2014, we'll publish the OrphanAnesthesia recommenations as a monthly supplement of A&I (Anästhesiologie & Intensivmedizin). Thus they can be accessed and downloaded via www.ai-online.info. As being part of the journal, the recommendations will be quotable. Reprints can be ordered for payment.

A survey of until now in A&I published guidelines can be found on:

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Anaesthesia recommendations for patients suffering from

Prader-Willi syndrome

Disease name: Prader-Willi syndrome

ICD 10: Q87.1

Synonyms: Prader-Labhardt-Willi syndrome

Prader-Willi syndrome is a rare genetic disorder characterised by hypothalamic-pituitary abnormalities with severe hypotonia during the neonatal period and during the first two years of life, hyperphagia with a risk of morbid obesity during infancy and adulthood, learning difficulties and behavioural problems or severe psychiatric problems. The disease affects 1/25,000 births. The severe hypotonia at birth, which leads to sucking and swallowing problems and delayed psychomotor development, partially improves with age. Characteristic facial features (a narrow forehead, almond-shaped eyes, a thin upper lip and down-turned mouth), as well as very small hands and feet, are frequently observed. After this initial phase, the most striking signs appear, including hyperphagia and absence of satiety often leading to severe obesity in affected children as young as two years of age. The situation may deteriorate quickly without adequate outside controls and obesity is a major factor influencing morbidity and mortality in these patients. Other associated endocrine abnormalities contribute to the clinical picture of short stature due to a growth hormone (GH) deficiency and incomplete pubertal development. Regularly, a decreased bone mineral density can be found without changed metabolism of calcium, phosphate, vitamin D or parathyroid hormone. The degree of cognitive dysfunction varies widely from child to child. It is associated with learning disabilities, and impaired speech and language development that are further aggravated by psychological and behavioural troubles.

Medicine in progress

Perhaps new knowledge

Every patient is unique

Perhaps the diagnosis is wrong

▶ **Citation:** Rakow H: Prader-Willi Syndrome. Anästh Intensivmed 2018;59:S77-S84.
DOI: 10.19224/ai2018.S077

Disease summary

The disease is clinically and genetically heterogeneous. It is caused by anomalies involving the critical region of chromosome 15 (15q11-q13). The expert consensus is that diagnosis should be based on clinical criteria (Holm's criteria of 1993, revised in 2001), with confirmation by genetic analysis. Most cases are sporadic and familial recurrence is rare information that should be provided by genetic counselling. Management should be global and multidisciplinary. Early diagnosis, early multidisciplinary care and GH treatment have greatly improved the quality of life of affected children. There are currently no long-term data on the effect of GH treatment in adults, particularly concerning its effect on the behavioural problems and the degree of autonomy obtained. In adults, complications linked to obesity and the issue of autonomy continue to pose important problems.

Typical surgery

Orthopaedic surgery (e.g. spinal surgery for scoliosis); squint correction; cleft lip and palatal repair; dental treatment due to tooth decay; orchidopexy (cryptorchism).

Type of anaesthesia

Both general and regional anaesthesia are challenging: using general anaesthesia may result in difficult airway management, landmarks for regional anaesthesia may be obscured due to morbid obesity.

Anaesthetic concerns of PWS include morbid obesity and sleep apnoea, difficult intravenous access, the potential for difficulties with airway management, risk for perioperative respiratory failure, primary myocardial involvement, aggressive and at times violent behaviour, convulsions, and disturbances in thermoregulation as well as glucose intolerance.

Necessary additional diagnostic procedures (preoperative)

Appropriate preoperative evaluation may depend on the presence of co-morbid conditions include in obesity-related complications - cardiovascular problems, diabetes mellitus, hypertension, sleep apnoea (**NOTE**: predisposition to cardiac-vascular complications independent of obesity).

- state of nutrition and hydration
- body mass index, neck circumference
- dental issues
- salivary composition

Take care of a thorough evaluation of the patient´s past and current respiratory status including polysomnography as a part of an individualised preoperative workup in order to establish a baseline and identify those with severe OSA (as well as postoperative admission to the ICU for monitoring of respiratory status). The recordings include thoracic and abdominal breathing movements, nasal airflow, TC-PO_2, TC-CO_2, oxygen saturation, EEG, EOG (Electrooculography) and ECG.

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Children with PWS frequently suffer from restrictive lung disease because of hypotonia, obesity and kyphoscoliosis. Preoperative evaluation with 12- lead ECG and echocardiography may be indicated in selected patients).

Particular preparation for airway management

In the perioperative management of a patient with Prader-Willi syndrome, special attention must be paid to the abnormalities in the upper and lower respiratory systems. Airway management may be complicated by the frequent association of poor dentition, micrognathia, palatal abnormalities, and limited neck mobility. The appropriate equipment to deal with the ”cannot intubate/cannot ventilate” scenario should be available. Also in patients in whom regional anaesthesia will be performed, there should be ready access to such equipment.

Intraoperative and postoperative respiratory compromise has also been a frequent perioperative problem in patients with PWS. These may include stridor, oxygen desaturation, hypercapnia, and intermittent bronchospasm with the need to use high peak inspiratory pressure.

Particular preparation for transfusion or administration of blood products

Not reported.

Particular preparation for anticoagulation

Not reported.

Particular precautions for positioning, transport or mobilisation

Features that may have an impact on perioperative care include mental retardation with the propensity for aggressive behaviour.

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

There are no particular interactions, because there is no specific medication. Interactions depend on the presence of comorbid conditions and drug therapy.

Anaesthesiologic procedure

Patients with PWS are presenting with muscular hypotonia and are therefore predisposed to gastric aspiration. The decreased motility of the gastrointestinal tract further heightens the risk of perioperative aspiration, and the sequel of aspiration may be more severe due to limited pulmonary reserves. The physiological set-point of vomiting in PWS is abnormal, and these patients have a reduced tendency to vomit. Certainly the obese body habitus may be

associated with a higher than normal incidence of hiatal hernia and increased intra-abdominal pressure. The perioperative aspiration risk is further exacerbated by a high incidence of rumination and lowered oesophageal sphincter tone. Rumination may contribute to the development of dental caries. Efforts should be made to reduce gastric acid secretion, increase intestinal motility, neutralise stomach contents, use body position to utilise gravity to reduce the tendency for passive regurgitation, secure the airway rapidly, decompress the stomach, and extubate the trachea cautiously. By these means, surgical morbidity and mortality related to aspiration of gastric contents may be reduced.

- nil per os for 6 hours
- peripheral intravenous cannula, topical anaesthetic cream should be used

before • ranitidine and metoclopramide intravenously, 1hour prior to anaesthesia

- careful premedication with a sedative
- routine monitoring
- rapid sequence induction

Regional anaesthetic techniques play a role in such patients by eliminating the need for general anaesthesia and its perioperative risks. Regional anaesthesia can be helpful to provide intraoperative anaesthetic care and postoperative analgesia as a means of limiting the need for opioids and general anaesthetic agents. Both neuraxial techniques (epidural or spinal anaesthesia) and peripheral nerve blockade may be considered in these patients. Nevertheless, landmarks for regional anaesthesia may be obscured due to morbid obesity and the use of ultrasound is recommended to facilitate placement of the block and limit the incidence of complications.

A risk-benefit ratio has to be considered when using regional anaesthesia plus sedation in patients with PWS who may be at higher risk of aspiration than the general paediatric population. Sedation will likely be required not only for block placement, but also to ensure a cooperative patient during the surgical procedure.

Moreover, the syndrome may result in a prolonged and exaggerated response to every sedative and analgesic agent. It has been suggested that regional techniques and NSAIDs are beneficial as a means of limiting opioid use in the immediate postoperative period.

The use of non-depolarising neuromuscular blocking agents for muscle relaxation should be restricted because of potential for long-lasting neuromuscular blockade. Hypotonia has prompted some authors to caution against the use of neuromuscular blocking agents. However, several reports have demonstrated the safe use of various non-depolarizing neuromuscular blocking agents including pancuronium, atracurium, vecuronium, and rocuronium without evidence of prolonged effects. Neuromuscular monitoring is necessary and a residual neuromuscular blockade should be promptly antagonized with neostigmine and glycopyrrolate. Although they would suggest caution with the use of succinylcholine in the presence of hypotonia, given the theoretical risk of an exaggerated hyperkalemic response, several of the reports have also demonstrated the safe use of succinylcholine in patients with PWS.

Some authors chose ketamine for its limited effects on respiratory function as well as its ability to provide both sedation and analgesia. Especially in older children, ketamine should be co-administered with either propofol or a benzodiazepine to limit the potential of emergence phenomena. Ketamine can be used with caution as its effects on the seizure threshold are controversial.

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Propofol, isoflurane, sevoflurane and N_2O have been used for the maintenance of anaesthesia.

Other common problems include difficult venous puncture, food-seeking, behaviour, disturbances in thermoregulation, diabetes mellitus, arrhythmia, and pulmonary heart disease (cor pulmonale) .

Particular or additional monitoring

Monitoring of the neuromuscular blockade is recommended.

Blood glucose and body temperature should be monitored carefully.

Additional monitoring depends on the identification of elevated risk for intraoperative or postoperative problems due to comorbidity.

Possible complications

PWS patients tend to develop severe respiratory infections as a result of aspiration due to hypotonia, leading to poor pharyngeal coordination, chronic aspiration and a weak cough.

Strategy for the prevention of perioperative complications in PWS patients:

- elective surgery should be postponed until complete recovery from a URI
- special attention must be paid to those patients complicated with severe OSA
- the increased risk of aspiration and postoperative apnoea should be considered.

Postoperative care

For close observation and therapy postoperative intensive care medicine is highly recommended to prevent sleep-related respiratory complications–even if neither narcotics nor intermediate or long-lasting neuromuscular blocking agents are administered.

Postoperatively, emergence is often slow and accompanied by upper airway obstruction and snoring. Complications may include an increased number of apnoeic episodes, higher hypercapnic thresholds, obstructive episodes, bronchospasm and oxygen requirement.

Wound healing and mobilisation can be slow.

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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.:

The accompanying morbid obesity, OSA, pathologic central control of ventilation and excessive daytime sleepiness seems to be characteristic for PWS, and may be related to problems with the sleep-wake rhythm and hypothalamic dysfunction.

Patients with PWS present with mental retardation associated with the propensity for aggressive behaviour, psychological disturbances, and obsessive behavioural problems.

In later childhood and adolescence, neurologic manifestations, endocrine signs and dysmetabolic abnormalities can occur.

Additional psychological disturbances, mental retardation and obsessive behavioural problems are frequent findings.

Cardiac conduction defects and primary myocardial involvement have been noted and convulsions are common.

Ambulatory anaesthesia

Ambulatory anaesthesia is not recommended.

Obstetrical anaesthesia

Not reported.

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