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Gaucher's disease

Hereditary spastic paraplegia

orphanaesthesia

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

SUPPLEMENT NR. 17 | 2020

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 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.

Find a survey of the recommendations published until now on:

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Anaesthesia recommendations for

Hereditary spastic paraplegia

Disease name: Hereditary spastic paraplegia (HSP)

ICD 10: G11.4

Synonyms: Strumpell-Lorrain disease (designating one type of HSP called SPG4); familial spastic paraplegia

Disease summary: Strumpell-Lorrain disease or hereditary spastic paraplegia describes a group of rare and heterogeneous genetic neurological disorders [1]. In Europe, HSP is estimated to affect 1 to 9 per 100,000 individuals [2–6].

HSP is an inherited neurodegenerative group of disorders which affects primarily the corticospinal tract with a distal to proximal retrograde axonal degeneration. For this reason, in the so-called pure HSP cases, the clinical picture is characterised mainly by a progressive spasticity of the lower limbs leading to paraparesis or paraplegia affecting several members of the same family. Many patients experience only stiffness and weakening of the leg muscles; a few require the use of a wheelchair. The progression of the disease to the rest of the corticospinal tracts, to peripheral nerves, the cerebellum or the brain explains the other additional symptoms commonly found in complicated or complex HSP cases: cerebellar ataxia, dysarthria, extrapyramidal disorder, mental retardation, dementia, epilepsy, retinopathy, deafness, axonal or demyelinating neuropathy and eventually systemic signs. The clinical diagnosis is based on four criteria [7]: exclusion of differential diagnoses, compatible family history (although not obligatory), progressive disturbance of gait and corticospinal tract deficits in the lower limbs with hyperreflexia.

Spinal cord atrophy is a common finding in HSP [8]. Conventional brain magnetic resonance imaging findings are usually normal in patients with HSP, but multiple diffusion tensor indices can be disrupted [9]. It can disclose different findings in complicated or complex HSP, such as thin corpus callosum, leukoencephalopathy and hyperintensity sign in the corticospinal tract.

Diagnosis must be confirmed by DNA analysis. The most commonly involved genes are the SPG4 and SPG3A which encode for the proteins spastin and atlastin, respectively. Transmission of HSP can be autosomal dominant, autosomal recessive, X-linked or maternally inherited (mitochondrial inheritance) [10]. Mutations in more than 80 distinct loci and more than 50 mutated gene products have been identified in patients with HSP [11,12]. The main pathogenic mechanisms underlying the clinical phenotype include membrane trafficking disturbance, impairment of organelle transport, morphogenesis and distribution in neuronal cells, and mitochondrial dysfunction. Membrane trafficking and organelle morphogenesis and distribution are important for axonal development, maintenance and degeneration [1,13].

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There is no specific pharmacological treatment. Treatment is symptomatic and includes physical therapy, benzodiazepines, oral or intrathecal baclofen [14] and injections of botulinum toxin [15] to reduce spasticity. By blocking potassium channels, prolonging action potentials and thereby increasing neurotransmitter release at the neuromuscular junction, dalfampridine may be useful in the treatment of HSP [16,17].

Medicine is in progress

Perhaps new knowledge

Every patient is unique

Perhaps the diagnosis is wrong

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

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Typical surgery

Patients are frequently evaluated for surgeries related to spasticity control, including selective dorsal rhizotomy, tenotomy and other procedures.

Type of anaesthesia

There is no definite recommendation for either general or regional anaesthesia.

Six case reports involving the use of general anaesthesia have previously been published [18–22]. In all these case reports, no complications from hypnotic or opioid drugs were reported.

Some authors prefer regional spinal anaesthesia to general anaesthesia [23–25]. HSP is not known to increase local anaesthesia drug toxicity, and no complications have been reported.

Necessary additional pre-operative testing (beside standard care)

No specific diagnostic procedure is required pre-operatively.

Particular preparation for airway management

No specific preparation is required for airway management.

Particular preparation for transfusion or administration of blood products

No specific preparation is required for administration of blood products.

Particular preparation for anticoagulation

There is no evidence to support the need of particular anticoagulation. One exception is a case of impaired mobility of advanced-stage patients: it may suggest a higher risk of post-operative thrombosis [26].

Particular precautions for positioning, transportation and mobilisation

No specific preparation is required for positioning, transport or mobilisation.

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Interactions of chronic disease and anaesthesia medications

Interferences are possible between baclofen and curare and general anaesthetics. They may be responsible for neuromuscular block augmentation, heart rhythm disorders, arterial hypotension or increased sedation, but weaning is much more dangerous [27–30]. To avoid the emergence of weaning complications, it is recommended not to interrupt intrathecal baclofen.

No interaction between anaesthetic agents and dalfampridine have been described in clinical practice. Dalfampridine (4-aminopyridine or 4-AP) selectively blocks voltage-gated potassium channels, prolongs the action potential, increases calcium influx, and subsequently enhances interneuronal and neuromuscular synaptic transmission. 4-AP is used in animal models to increase the release of GABA and to study the action of GABAergic antagonists. The minimal alveolar concentration (MAC) of halogens is often used as an endpoint. It is assumed that 4-AP does not modify the MAC in these models [31]. Clinical cases of poisoning reveal that its mechanism of action has cholinergic characteristics [32]; propofol sedation was then used without complication. The central cholinergic action produces antagonism to ketamine anaesthesia in rats [33,34]. This effect was also observed in paediatric anaesthesia [35]. 4-AP has been used as an antidote for a Rohypnol-induced coma [36]. It also reduces morphine-induced respiratory depression, but the antinociceptive activity of morphine is unaffected [37,38]. The antagonisation of anaesthetic drugs is described for doses higher (0.3 to 1.0 mg/kg IV) than that used in the treatment of the disease (a tablet of 10mg per twelve hours). By precautionary principle, dalfampridine should be interrupted on the morning of surgery.

An overdose may be observed in patients with post-operative acute renal failure [39]. Dalfampridine is contraindicated in pregnant or breastfeeding women [39].

Anaesthetic procedure

There are no data in the literature to support a recommendation of TIVA or inhalation anaesthesia. The problem is that HSP is a heterogeneous group of genetic diseases and there is no certainty that anaesthetic drugs will have the same action in all variants. Depth of anaesthesia monitoring may be the best approach in HSP patients.

The choice of neuromuscular blocking agents must be made with extreme care in HSP. The use of succinylcholine is contraindicated in HSP as it may induce hyperkalaemia due to upregulation of nicotinic acetylcholine receptors [40]. Non-depolarising muscle relaxants carry a risk of an exaggerated muscle relaxant response. The use of rocuronium has been described in most of cases [22,41,42] and sugammadex has been used in three cases due to the presence of moderate neuromuscular block at the end of surgery. After the use of sugammadex, no re-curarisation was observed. Rocuronium appears to be the best choice when muscle relaxation is indicated, due to the possibility of antagonising its effects with sugammadex. Long-acting neuromuscular blockers should be avoided and a train-of-four-ratio over 0.9 must be obtained before extubating. Recovery with neostigmine may expose to re-curarisation.

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Particular or additional monitoring

Monitoring of the neuromuscular blockade will be strictly recommended if any neuromuscular blocking agent is used: it is useful to obtain baseline values before injection of the non-depolarising neuromuscular blocking agent. The rocuronium–sugammadex association seems to be the most secure.

Monitoring the depth of anaesthesia is strongly recommended in case of general anaesthesia.

Possible complications

Patients with HSP are at risk for hyperkaliaemic cardiac arrest when succinylcholine is used.

The neuromuscular block duration is increased when neuromuscular blocking agents are used.

There is no evidence of an elevated risk of malignant hyperthermia.

Post-operative care

The degree of post-operative monitoring is depending on surgical procedure and pre-operative condition of the patient. Intensive care is not mandatory.

Disease-related acute problems and effect on anaesthesia and recovery

Disease triggered emergency-like situations are not common in HSP.

Ambulatory anaesthesia

Ambulatory anaesthesia (according to common guidelines) is probably possible in HSP patients with early stadium of disease and low risk surgery.

Obstetrical anaesthesia

Caesarean section under general anaesthesia or spinal anaesthesia has already been described without complication [19,23]. Childbirth or caesarean section have not been described under epidural analgesia/anaesthesia. HSP is not known to increase local anaesthesia drug toxicity, and no complications have been reported. The risk/benefit report should be evaluated with the neurologist's opinion.

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