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Bloom Syndrome

orphan anesthesia

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

SUPPLEMENT NR. 5 | 2026

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 Patientinnen und Patienten mit seltenen Erkrankungen. Damit will OrphanAnesthesia einen wichtigen Beitrag zur Erhöhung der Patientensicherheit leisten.

Patientinnen und 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 Anästhesistinnen und Anästhesisten damit keine Erfahrungen gesammelt haben, sodass 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 eine Anästhesistin bzw. ein Anästhesist sowie eine weitere Krankheitsexpertin bzw. ein weiterer Krankheitsexperte (z. B. Pädiaterin bzw. Pädiater oder Neurologin bzw. Neurologe) beteiligt sind. Das Projekt ist international ausgerichtet, sodass 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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Anesthesia recommendations for

Bloom Syndrome

Disease name: Bloom Syndrome

ICD 10: -

ORPHAcode: 125

Synonyms: Bloom's Syndrome, Bloom-Torre-Machacek Syndrome, BSyn, Congenital Telangiectatic Erythema

Disease summary: Bloom Syndrome (BSyn) is a very rare genetic disorder that belongs to the group of chromosome breakage syndromes [1] and leads to a marked genomic instability. The main clinical characteristics are an increased sensitivity to sunlight that often causes a typical butterfly-shaped facial erythema, pre- and postnatal growth deficiency leading to proportionate microsomia and predisposition to malignancies at an unusual early age limiting life expectancy. Anesthesiologic care may be complicated by associated characteristic facial dysmorphic features that may contribute to significant difficulties during airway access as well as chronic pulmonary disease, endocrinological pathologies and a mild immunodeficiency. Pediatric patients are also particularly prone to gastroesophageal reflux, vomiting and severe dehydration during infancy [2].

BSyn is caused by an autosomal recessive inheritance of loss-of-function mutations in the BLM gene, which encodes for a RecQ helicase involved in DNA replication and repair. Its exact prevalence is unknown but due to a founder mutation it is most common in people with Ashkenazi Jewish descent, where it is estimated to affect 1:48.000 people and the carrier frequency is about 1:100. However, BSyn has been found in individuals of many ethnic groups and up to now only 25% of affected patients can be explained by founder effects [2,3]. In the West European population, the incidence is estimated to be at least about 1:500.000 live births but could be underestimated due to lack of information [1].

Nonetheless, because of its rarity there is only limited literature available and much of the knowledge has been obtained from data of approximately 300 patients enrolled in the BSyn registry as well as by a few case reports [3].

A phenotype of proportionate microsomia in combination with some of the following characteristic features should alert clinicians and patients need to be referred to a genetic specialist for further diagnosis [3].

The facial appearance often comprises a combination of dysmorphic features like microcephaly, flat malar region and small mandible with hypo- and/or retrognathia as well as prominence of the ears and nose [4].

During early childhood increased UV sensitivity leads to a typical butterfly-shaped facial erythema of nose and cheeks after exposure to sunlight. As severity of erythematous lesions

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is highly variable and the common facial lesions can be completely absent, diagnosis can be delayed [4,5].

The most striking clinical burden in patients with BSyn is their predisposition to various types of cancer at an unusual early age. During the first two decades leukemias and lymphomas are observed most frequently, followed by solid cancers especially of colon, breast, skin and neck in early adulthood [2]. According to recent data from the BSyn registry, 53% of all patients suffer from at least one type of cancer and chemotherapeutic approaches are challenging because of the patients' increased sensitivity. Although life expectancy has increased during the last decades due to improvements in surveillance programs and cancer treatment, the median age at death is 30.5 years [1,6].

Additional symptoms are associated with BSyn and need further attention:

A major and sometimes life-limiting complication is an early onset of chronic obstructive lung disease that can progress to respiratory failure [7].

Several endocrinological pathologies have been assigned to BSyn. These most commonly include an early onset of insulin resistance and type 2 diabetes as well as hypothyroidism and dyslipidemia, which are usually treated following standard protocols [8]. Microsomia is caused by pre- and postnatal growth deficiency and besides being of small stature many patients are underweight for their size and subcutaneous adipose tissue is reduced [9]. Malnutrition is especially a problem in infancy and may often improve during childhood. Due to feeding problems and a high frequency of gastroesophageal reflux as well as pronounced episodes of vomiting and diarrhea, infants are prone to severe dehydration [2].

There are several immune abnormalities described, which are highly variable but usually not severe. Therefore, most patients show an increased susceptibility for common infections especially of the upper respiratory tract and middle ear, but some have low levels of one or more classes of plasma immunoglobulins that can rarely also impair vaccine response [10,11].

Cognitive ability varies from normal to limited [2] but is usually within the normal range [7]. However, some patients experience learning difficulties, attention related issues or psychological consequences of their unusual appearance and clinical complications [4].

Impaired fertility is common in BSyn. Unlike affected males who are mostly infertile [10], female patients are subfertile but often experience premature ovarian failure. There are few reports of pregnancies in women with BSyn [3] giving birth to healthy offspring who are obligate carriers of the BLM mutation. However, more detailed references coincidently describe preterm delivery of babies small for gestational age [12,13].

Heterozygous carriers of BLM mutations are asymptomatic. Although pathophysiology suggests an increased tumor risk for unaffected carries in chromosome instability syndromes, this has not been consistently confirmed for BLM mutations and contradictory data needs further investigation [1,14].

As there is no causative therapeutic option, treatment of BSyn mainly relies on restriction of exposure to DNA-damaging agents including sunlight, ionizing radiation and alkylating substances as well as early screening for neoplasia and endocrinological problems. Recurrent infections need appropriate treatment to avoid complications and sometimes immunoglobulin substitution is required. Concerning growth deficiency and feeding problems during (early) childhood, tube feeding and growth hormone treatment have not proven to be beneficial and are generally not recommended, the latter because of the possibility of increasing the risks for malignancies [9].

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Diagnosis may be incorrect; if uncertainty exists, the diagnosis should be re-evaluated.

Every patient is unique; individual circumstances must always guide clinical care.

Medicine is in progress; new clinical knowledge may not be yet reflected in this recommendation.

Recommendations are not rules or laws; they provide a framework to support clinical decision-making. Although this recommendation has passed a structured review process, it does not meet the formal criteria of a guideline.

Translations may not always reflect the most recent updates of the English version.

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

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Emergency information

A	**AIRWAY / ANESTHETIC TECHNIQUE**	Significant difficulties in airway management described due to facial features, particularly a small mandible and microsomia. High frequency of gastroesophageal reflux reported in infants. Early onset of chronic lung disease possible. (Neuraxial) RA may be feasible as a primary choice if applicable, but urgent conversion to GA should be avoided.
B	**BLOOD PRODUCTS (COAGULATION)**	No specific considerations.
C	**CIRCULATION**	Infants are prone to severe dehydration.
D	**DRUGS**	Any DNA damaging substances have to be avoided and exposure to ionizing radiation needs to be minimized. Concomitant (cardio)myopathy is very rare. No specific recommendations regarding succinylcholine or volatile anesthetics are available. TIVA with non-depolarizing relaxants well tolerated.
E	**EQUIPMENT**	Equipment for difficult airway needs to be prepared in advance and positioned in direct proximity. Careful padding to prevent positioning injuries due to reduced subcutaneous adipose tissue. Monitoring of depth of anesthesia can be helpful because of small stature and low BMI. Alternatives to radiography (e.g., ultrasound or intravascular ECG) should be used for central venous catheter placement whenever possible.

Typical surgery and procedures

Surgery for oncological or infectious complications and otolaryngology surgery. Sedation might be necessary for diagnostic procedures in young patients.

Type of anesthesia

Based on the limited data available there is no definite recommendation for either general or regional anesthesia. Based on the authors' experience with one young adult female patient, total intravenous anesthesia for several surgical procedures was always well tolerated but also balanced anesthesia [15] and successful spinal anesthesia have been described [16].

Adapted to the comorbidities of the patient regional anesthesia or/and (analgo-)sedation and neuraxial anesthesia or peripheral nerve blocks should be considered whenever surgical procedures and patient safety allow. However, caution should be taken concerning the risk of a potentially difficult airway especially if an urgent intraoperative conversion to general anesthesia is needed.

Necessary additional preoperative testing (beside standard care)

According to the main clinical features of BSyn preoperative assessment should pay particular attention to airway examination evaluating the degree of hypo- and/ or retrognathia, restricted mouth opening and reduced neck mobility. Despite limited data Mallampati scores of 3 and above have been documented [16,17] and two cases of difficult airway have been reported, including fatal outcome in one patient where several subsequent approaches failed and the airway could not be secured in time [5,15]. Considerations on airway management should also take into account the high incidence of gastroesophageal reflux especially in children with BSyn.

As many patients develop malignancies relatively early during their life, the proportion of patients that either need to undergo or have received chemotherapy and suffer from harmful common side effects is increased.

Frequent comorbidities include chronic pulmonary disease, premature onset of noninsulin-dependent diabetes mellitus and hypothyroidism. Therefore, respiratory dysfunction and endocrinological pathologies as well as their complications should be considered, and medical history should cover signs of immunodeficiency.

Although myopathy and cardiomyopathy are not frequently associated with BSyn, these comorbidities have been found in a minority of patients and do not necessarily lead to elevated creatine kinase levels [18-20].

Continuative diagnostics should therefore be implemented on an individual basis if medical history or clinical presentation is suggestive for the presence of comorbidities and therapy should be optimized before surgery as appropriate to the urgency and type of the procedure.

Whenever possible diagnostics relying on ionizing radiation should be avoided and alternative imaging techniques should be employed.

Particular preparation for airway management

Difficult airway and airway associated complications are of major concern for patients with BSyn.

Despite the limited data available there is significant evidence for an increased risk of substantial difficulties at different levels of airway management, including failure of awake intubation and a CICV situation with fatal outcome [5,15].

Airway access can be impaired by dysmorphic features especially of the jaw as well as an unexpected stiffness of the neck uncommon for age and can be further complicated by comorbidities and reflux in patients with BSyn.

Therefore, preemptive patient-tailored preparation is essential and needs to include backup strategies. A primary strategy of awake (or mild sedated) fiberoptic/bronchoscopic intubation should be discussed for patients with features of difficult airway especially in patients with the combination of reduced pulmonary function.

All equipment needs to be immediately available for induction and emergence of anesthesia according to difficult airway algorithms. If the airway cannot be established conventionally and sufficient ventilation cannot be secured emergency invasive airway access needs to be initiated in due time.

Special emphasis should be put on preoxygenation as patients are at risk of desaturation due to a varying extent of chronic respiratory impairment. Furthermore, difficulties should also be anticipated during emergence of anesthesia and extubation, especially if airway access has been difficult and/ or could have worsened during the procedure.

Particular preparation for transfusion or administration of blood products

No special considerations reported. However, the higher frequency of hematologic malignancies especially during the first two decades can complicate transfusion and administration of blood products in some patients.

Particular preparation for anticoagulation

No special considerations reported.

Particular precautions for positioning, transportation and mobilization

Positioning and especially padding of pressure-prone areas should be undertaken carefully to avoid positioning injury, because subcutaneous adipose tissue is markedly reduced in patients with BSyn.

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Interactions of chronic disease and anesthesia medications

There is no specific pharmacological treatment available. Perioperative handling of concomitant long-term medication for endocrinological disorders and chronic lung disease should be carried out according to standard anesthesiology guidelines.

Anesthetists should be aware of the high sensitivity to ionizing radiation further increasing the risk for malignancies in patients with BSyn. Therefore, exposure needs to be minimized, and alternative techniques should be used whenever possible.

Even if the anesthetic and surgical team is usually not directly involved in treatment with chemotherapeutic substances, they should keep in mind that standard weight adapted doses of chemotherapeutics exhibit increased and severe toxicity and can have fatal side-effects for this cohort of patients. Due to their increased sensitivity to DNA damaging agents an individualized approach with significantly dose reduction has to be applied that needs to be carefully planned by interdisciplinary specialists [7].

Anesthetic procedure

For preoperative evaluation see details above. Premedication can be administered individually after consideration of the potential benefits and risk.

Preparation for difficult airway ensuring appropriate expertise and equipment is of significant importance and should be planned ahead carefully.

So far application of propofol, opioids (fentanyl, remifentanil) and non-depolarizing muscle relaxants (vecuronium, rocuronium) as well as spinal anesthesia using bupivacaine or ropivacaine have been described without any adverse effects [15-17]. To date no reports on the use of depolarizing muscle relaxants have been published for patients with BSyn and therefore a general recommendation cannot be given. Although the coincidence of myopathies seems to be rare and no muscle-related complications have been described, Succinylcholine should, if at all, not be administered indiscriminately. The use of other anesthetic substances that could potentially trigger MH has only once been described in one case report for the volatile anesthetic enflurane which has been used without adverse effects [15]. On this basis no general recommendation for the application of volatile anesthetics can be given whereas the use of propofol so far seems to be a safe alternative for patients with Bsyn.

Because patients with BSyn are usually of proportionate short stature dosing of common anesthesiologic drugs can be associated with uncertainties and general recommendations are lacking. Therefore, individual dose titration as well as monitoring of the depth of consciousness and neuromuscular relaxation seem to be advisable during anesthesia. If neuraxial anesthesia is performed propagation should be followed up closely. Due to the risk of difficult airway complications and the pulmonary risks, peripheral regional anesthesia or neuraxial blockades should be taken into consideration as first choice whenever possible.

During general anesthesia with the need for mechanical ventilation lung protective ventilation strategies should be applied whenever possible as chronic lung disease is one of the leading comorbidities.

Because of the scarcity of subcutaneous adipose tissue, intravenous cannulation can be challenging and can be facilitated by ultrasonic guidance. Furthermore, special attention needs to be paid in padding pressure-exposed skin areas to avoid pressure-induced

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positioning injury. Body temperature should be monitored and effective (pre)warming strategies should be applied early to prevent hypothermia.

There are no reports on pediatric anesthesia. The high frequency of reflux, feeding problems and or vomiting in infants may lead to an increased risk of aspiration during induction and are therefore of concern for diagnostic procedures in (analgo-)sedation. Small infants with BSyn also seem to be especially prone to severe dehydration. As in adults, strategies for difficult airway management should be planned ahead for every procedure and the required equipment needs to be prepared in advance in an appropriate individual size. Therefore, anesthesiologic management in an environment experienced in treatment of small infants with comorbidities is strongly recommended.

Depending on the need for a central venous access clinicians should refrain from a routine chest X-ray inspection after placement. The use of ultrasound imaging to guide insertion and screen for pulmonary complications in combination with an intracardiac ECG for verification of correct insertion depth provide valuable alternatives that should be preferred whenever available.

Particular or additional monitoring

None specific; depending on comorbidities and degree of respiratory impairment. Monitoring of the depth of anesthesia is advisable and complete recovery of neuromuscular relaxation should be ensured.

Possible complications

As mentioned above major complications affect the airway. Of note gastroesophageal reflux, pregnancy or comorbidities like oropharyngeal malignancies can further complicate an already potentially difficult airway in these patients.

Postoperative care

Postoperative care should be adjusted to the degree of comorbidities as well as surgical and anesthesiologic procedure.

Disease-related acute problems and effect on anesthesia and recovery

As mentioned above.

Ambulatory anesthesia

Not reported in literature. Depending on individual risk factors and surgical and anesthesiologic procedure ambulatory anesthesia should be evaluated particularly carefully. It might be performed if at all in a setting with adequate resources and expertise as well as a possibility for overnight admission.

Obstetrical anesthesia

Despite reduced fertility and the risk of preterm ovarian failure, there are a few pregnancies known of female patients with BSyn [3,4] and two reported in more detail. Both deliveries were spontaneous but preterm occurring in the 35th week of gestation. The infants were small, with birth weights below the 10th percentile for gestational age [12,13]. In one case delivery had to be facilitated by episiotomy [13] but both infants were well and there seemed to be no evidence for postnatal adaptation problems or developmental delay.

Based on these findings and the increased risk for diabetes and pulmonary complications, which may aggravate during pregnancy and the peripartal period, early multidisciplinary support should be pursued. Furthermore, maternal microsomia and intrauterine growth deficiency are risk factors that hamper adaption of the newborn [21]. Therefore, it seems advisable to plan delivery in a setting experienced in care of small neonates and in a team consisting of obstetricians, neonatologists and anesthesiologists. The overall goal should be to avoid an unexpected emergency preterm delivery as pregnancy may further impair an already potentially difficult airway, which bears substantial risks for mother and infant.

No cesarean section has been documented in this patient cohort so far but neuraxial anesthesia can be considered and has been described for other surgical procedures [16]. Epidural anesthesia could also be beneficial reducing maternal respiratory efforts.

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