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# A&I

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## Alternating hemiplegia of childhood syndrome

## Williams syndrome

orphanaesthesia

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

SUPPLEMENT NR. 15 | 2021

## 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.

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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.

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orphanaesthesia

# Anaesthesia recommendations for

# Williams syndrome

**Disease name:** Williams syndrome

**ICD 10:** ./.

**Synonyms:** WS, Williams-Beuren syndrome

**Disease summary:** Williams syndrome (WS) results from the micro deletion of contiguous genes at chromosome 7q11.23 [1]. This genome part includes several genes [2] like ELN (ELastiN), encoding the tissue structural protein elastin [3], and Gtf2i (General Transcription Factor II-I), encoding a multifunctional phosphoprotein with roles in transcription and signal transduction [4]. This results in a multisystem disorder involving the cardiovascular [5], connective tissue and central nervous system. The incidence of typical forms is 1:20,000 people [6]. The clinical description associates a supravalvular aortic stenosis and/or a stenosis of the branches of pulmonary arteries, a psychomotor retardation and a facial dysmorphism [7,8]. An association with neonatal hypercalcaemia has also been reported [9]. The facial dysmorphism is characterised by an elfin facies syndrome: stellate pattern of the irises [10], broad forehead, periorbital fullness, high and rounded cheeks, pointed chin, flattened nasal bridge and upturned nose, long philtrum and wide and everted lower lip [11]. The most frequent orofacial alteration is malocclusion (94%) [12]. In addition to the psychomotor retardation, these patients have a disharmonious IQ (intelligence quotient) profile and are scoing better in verbal tests [13]; they are hypersocial and have major anxiety [14,15]. They also have musical abilities [16,17]. Cardiovascular abnormalities are common in WS [18]; most of them are arterial stenosis. Forty-five to 75% of WS patients suffer from supravalvular aortic stenosis and/or pulmonary arteries stenosis. Eighty percent of WS patients have cardiac abnormalities (aortic, mitral and/or tricuspid valve abnormalities, ventricular hypertrophy), they also have coronary artery abnormalities [19]. Systemic arteriopathy in other vessels of the body occur in 20% of cases, preferentially affecting the thoracic aorta (which can be associated with renal artery stenosis), but other sites are also possible (neck, limbs abdominal aorta…). Most of the cardiovascular abnormalities are found in the first year of life [11]. They also can suffer from endocrine dysfunction [20,21], pulmonary emphysema [2], ophthalmologic manifestation [22,23] or epilepsy [24].

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

Most of the surgical procedures in patients with WS occur during childhood [18]. Recent medical and surgical advancements have improved life expectancy and therefore both adult and paediatric patients with WS present for surgical procedures. Most common procedures include:

- Dental avulsion: hypoplasia of the email increase the prevalence of cavities [25],

- Scoliosis surgery [26,27],

- Strabismus surgery [22],

- MRI.

## Type of anaesthesia

Both sedation and general anaesthesia can be performed; it is necessary to favour sedation whenever possible [28]. The risk of an adverse cardiac event during general anaesthesia is high: 11% [29]. Depending on age and surgery, peripheral locoregional anaesthesia seems to be a good choice. Spinal anaesthesia can be performed depending on favourable cardiologist evaluation.

## Necessary additional pre-operative testing (beside standard care)

Evaluation by a cardiologist within one month of the procedure is recommended [28,30]. This evaluation should include [18]:

1. Physical examination with blood pressure taken in both arms and both legs. Echocardiography may not demonstrate a stenosis. Stenosis can be demonstrated with diminished pulses and measuring blood pressure in lower extremities [31].

2. ECG, in search of arrythmias and/or QTc prolongation [32,33], history of ischaemia [19]. Consultation of an electrophysiologist, if needed.

3. Echocardiography: looking for cardiac abnormalities [19].

4. Screening for thyroid dysfunction [20,34] and diabetic disorders [21] and, in early childhood, looking for an hypercalcaemia.

## Particular preparation for airway management

In the literature, WS facial abnormalities [12,28] are not associated with either difficult intubation or ventilation.



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## Particular preparation for transfusion or administration of blood products

No specific preparation is required for administration of blood products.

## Particular preparation for anticoagulation

No specific preparation is required regarding anticoagulation.

## Particular precautions for positioning, transportation and mobilisation

No specific precautions are required for positioning, transport or mobilisation.

## Interactions of chronic disease and anaesthesia medications

Betablocker therapy should not be stopped.

Antiepileptic therapy should not be stopped.

Angiotensin Converting Enzyme Inhibitor should be stopped.

## Anaesthetic procedure

Anaesthesia for patients with WS should be performed in a centre where a cardiologist and an intensivist and a (paediatric) cardiac intensive care unit are available. The risk of adverse cardiac events during general anaesthesia is high: 11% [29]. This risk may be reduced if the diagnosis is known before the surgery [35,36]. Patients at highest risk are those with supravalvular aortic stenosis.

Information on preprocedural management have already been published [28] and include: hospital admission the night before the procedure, limitation of the period without fluid intake to two hours or begin of maintenance intravenous fluid, especially in patients under five years of age. Scheduling the case to be the first case of the day, thus limiting NPO time, is recommended.

Anxiety [15] is a specific characteristic of WS, it can be accompanied by tachycardia and must be considered as such. Pharmacological and non-pharmacological techniques must be used to reduce anxiety. Premedication is recommended to decrease anxiety. If not possible, patients with WS should be comforted by the presence of family or familiar guardian until loss of conscience. Particular attention must be provided for noise, as these patients are extremely sensitive to it [17]. The operating room must be quiet at the induction of anaesthesia [28].

Intravenous induction should be preferred to facial mask induction with sevoflurane [28,29]. Topical anaesthesia for venous catheter placement should be considered before anaesthesia. Experts [28] avoid propofol because of its haemodynamic effects which can be catastrophic in WS patients with supravalvular aortic stenosis (hypotension, coronary ischaemia…). A combination of ketamine and midazolam seems to be a wise choice.



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Some experts recommend to avoid succinylcholine because there is a theoretical risk of a hyperkalaemic response [34], but no such case has been published so far. Titrating neuromuscular blockade is accomplished by intraoperative monitoring of train of four.

It is important to mention the Kounis syndrome [37] that might occur in these patients and cause sudden death. The coronary lesions in Williams syndrome may be responsible for the occurrence of sudden death and/or cardiac arrest during anaesthesia [38–40].

## Particular or additional monitoring

Monitoring of the electrocardiographic ST segment with a five lead electrocardiograph is recommended [28].

Four extremity blood pressure measurements should be done before and after anaesthesia/sedation; looking for an undiagnosed stenosis [28].

Haemodynamic goals: Maintenance of sinus rhythm at an age-appropriate heart rate, ensuring an adequate preload while avoiding rapid shifts in intravascular volumes, and aggressive treatment hypotension [41]. Invasive measurement of blood pressure can be considered depending on the patient's cardiac condition and type of surgical procedure. The target for blood pressure is the same as for patients without WS.

The anaesthesiologist should apply cardiovascular monitoring depending on the surgical procedure A transoesophageal echocardiography is recommended for cardiac surgical procedures. Near-infrared spectroscopy can be helpful to estimate the tissue oxygenation of brain and somatic areas for both cardiac and non-cardiac procedures.

When monitoring the depth of anaesthesia with a specific tool (bi-spectral index, entropy, density spectral array…) it is strongly recommended to have an adequate level of anaesthesia and prevent vascular effects of the anaesthetic.

In early childhood, the risk of hypercalcaemia imposes regular evaluation of the serum calcium [9,28].

## Possible complications

Patients with WS should be considered at risk for myocardial ischaemia [28].

WS patients have an increased risk of arrhythmias [32].

WS patients have an increased risk of cardiac arrest [29].

## Post-operative care

WS patients should stay in the recovery room and the monitoring should be continued until recovery of near baseline cognitive and cardiovascular function. The presence of a family or familiar guardian should be encouraged. In case of a heavier and/or complicated procedure post-operative care must be pursued in the intensive care unit.



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## Disease-related acute problems and effect on anaesthesia and recovery

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

## Ambulatory anaesthesia

Ambulatory anaesthesia should not be considered.

## Obstetrical anaesthesia

No data have been found in literature.



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## References

1. Adams GN, Schmaier AH. The Williams-Beuren Syndrome-a window into genetic variants leading to the development of cardiovascular disease. PLoS Genet;2012;8 e1002479
2. Pober BR. Williams-Beuren syndrome. N Engl J Med 2010;362:239–252
3. Pober BR, Johnson M, Urban Z. Mechanisms and treatment of cardiovascular disease in Williams-Beuren syndrome. J Clin Invest 2008;118:1606–1615
4. Grueneberg DA, et al. A multifunctional DNA-binding protein that promotes the formation of serum response factor/homeodomain complexes: identity to TFII-I. Genes Dev 1997;11:2482–2493
5. Collins RT. Cardiovascular disease in Williams syndrome. Curr Opin Pediatr 2018;30:609–615
6. Morris CA, Demsey SA, Leonard CO, Dilts C, Blackburn BL. Natural history of Williams syndrome: physical characteristics. J Pediatr 1988;113:318–326
7. Williams JC, Barratt-Boyes BG, Lowe JB. Supravalvular aortic stenosis. Circulation 1961;24:1311–1318
8. Beuren AJ, Apitz J, Harmjanz D. Supravalvular aortic stenosis in association with mental retardation and a certain facial appearance. Circulation 1962;26:1235–1240
9. Gupta V, Pandita A, Panghal A, Kallem VR. Williams syndrome with severe hypercalcaemia. BMJ Case Rep 2018;9: DOI: 10.1136/bcr-2018-224513
10. Holmström G, Almond G, Temple K, Taylor D, Baraitser M. The iris in Williams syndrome. Arch Dis Child 1990;65:987–989
11. Committee on Genetics. American Academy of Pediatrics: Health care supervision for children with Williams syndrome. Pediatrics 2001;107:1192–1204
12. Ferreira SBP, et al. Oral findings in Williams-Beuren syndrome. Med Oral Patol. Oral Cirugia Bucal 2018;23:e1–e6
13. Martens MA., Wilson SJ, Reutens DC. Research Review: Williams syndrome: a critical review of the cognitive, behavioral, and neuroanatomical phenotype. J Child Psychol Psychiatry 2008;49:576–608
14. Barak B, et al. Neuronal deletion of Gtf2i, associated with Williams syndrome, causes behavioral and myelin alterations rescuable by a remyelinating drug. Nat Neurosci 2019;22:700–708
15. Glod M, Riby DM, Rodgers J. Short report: Relationships between sensory processing, repetitive behaviors, anxiety, and intolerance of uncertainty in autism spectrum disorder and Williams syndrome. Autism Res Off J Int So 2019;12:759–765
16. Martens MA., Reutens DC, Wilson SJ. Auditory cortical volumes and musical ability in Williams syndrome. Neuropsychologia 2010;48:2602–2609
17. Ng R, Lai P, Levitin DJ, Bellugi U. Musicality Correlates With Sociability and Emotionality in Williams Syndrome. J Ment Health Res Intellect Disabil 2013;6:268–279
18. Collins RT. Cardiovascular disease in Williams syndrome. Circulation 2013;127:2125–2134
19. Collins RT, Kaplan P, Somes GW, Rome JJ. Long-term outcomes of patients with cardiovascular abnormalities and Williams syndrome. Am J Cardiol 2010;105:874–878
20. Cambiaso P, et al. Thyroid morphology and subclinical hypothyroidism in children and adolescents with Williams syndrome. J Pediatr 2007;150:62–65
21. Stagi S, et al. Williams-Beuren syndrome is a genetic disorder associated with impaired glucose tolerance and diabetes in childhood and adolescence: new insights from a longitudinal study. Horm Res Paediatr 2014;82:8–43
22. Weber SLP, Souza RB, Ribeiro LG, Tavares MF, Goldchmit M. Williams syndrome: ophthalmological examination and review of systemic manifestations. J Pediat. Ophthalmol Strabismus 2014;51:209–213
23. Todorova MG, Grieshaber MC, Cámara RJA., Miny P, Palmowski-Wolfe AM. Anterior segment dysgenesis associated with Williams-Beuren syndrome: a case report and review of the literature. BMC Ophthalmol 2014;14:70
24. Nicita F, et al. Epilepsy is a possible feature in Williams-Beuren syndrome patients harboring typical deletions of the 7q11.23 critical region. Am J Med Genet A 2016;170A,148–155
25. Axelsson S, Bjørnland T, Kjaer I, Heiberg A, Storhaug K. Dental characteristics in Williams syndrome: a clinical and radiographic evaluation. Acta Odontol Scand 2003;61:129–136
26. Metcalfe K. Williams syndrome: an update on clinical and molecular aspects. Arch Dis Child 1999;81:198–200

27. Damasceno ML, Cristante AF, Marcon RM, Barros Filho TE. Prevalence of scoliosis in Williams-Beuren syndrome patients treated at a regional reference center. Clin Sao Paulo Braz 2014;69:452–456
28. Collins Ii RT, Collins MG, Schmitz ML, Hamrick JT. Peri-procedural risk stratification and management of patients with Williams syndrome. Congenit Heart Dis 2017;12:133–142
29. Olsen M, Fahy CJ, Costi DA, Kelly AJ, Burgoyne LL. Anaesthesia-related haemodynamic complications in Williams syndrome patients: a review of one institution's experience. Anaesth Intensive Care 2014;42:619–624
30. Matisoff AJ, Olivieri L, Schwartz JM, Deutsch N. Risk assessment and anesthetic management of patients with Williams syndrome: a comprehensive review. Paediatr Anaesth 2015;25:1207–1215
31. Collins RT, Kaplan P, Rome JJ. Stenosis of the thoracic aorta in Williams syndrome. Pediatr Cardiol 2010;31:829–833
32. Collins RT, Aziz PF, Swearingen CJ, Kaplan PB. Relation of ventricular ectopic complexes to QTc interval on ambulatory electrocardiograms in Williams syndrome. Am J Cardiol 2012;109:1671–1676
33. Collins RT, Aziz PF, Gleason MM, Kaplan PB, Shah MJ. Abnormalities of cardiac repolarization in Williams syndrome. Am J Cardiol 2010;106:1029–1033
34. Medley J, Russo P, Tobias JD. Perioperative care of the patient with Williams syndrome. Paediatr Anaesth 2005;15:243–247
35. Dunlap JD, Green MC, Shah AM, Kibby BT, Billmire DF. Cardiac arrest after induction of anesthesia in a 2-month-old infant with undiagnosed Williams syndrome. Ann Card Anaesth 2019;22:210–212
36. Brown ML, Nasr VG, Toohey R, DiNardo JA. Williams Syndrome and Anesthesia for Non-cardiac Surgery: High Risk Can Be Mitigated with Appropriate Planning. Pediatr Cardiol 2018;39:1123–1128
37. Kounis NG, Tsigkas G, Almpanis G, Mazarakis A, Kounis GN. Kounis syndrome – the killer for Williams syndrome? Ann Card Anaesth 2010;13:265–266
38. Suárez-Mier MP, Morentin B. Supravalvular aortic stenosis, Williams syndrome and sudden death. A case report. Forensic Sci Int 1999;106:45–53
39. Bird LM, et al. Sudden death in Williams syndrome: report of ten cases. J Pediatr 1996;129:926–931
40. Conway EE, Noonan J, Marion RW, Steeg CN. Myocardial infarction leading to sudden death in the Williams syndrome: report of three cases. J Pediatr 1990;117:593–595
41. Burch TM, McGowan FX, Kussman BD, Powell AJ, DiNardo JA. Congenital supravalvular aortic stenosis and sudden death associated with anesthesia: what's the mystery? Anesth Analg 2008;107:1848–1854.

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