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CASE REPORT

Spondylo-ocular syndrome: anaesthetic concerns and considerations for a novel genetic syndrome – a case report

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Spondylo-ocular syndrome is a novel Mendelian genetic disorder characterised by ocular manifestations and bone fragility. To date, only 24 cases have been reported worldwide.[1] The syndrome varies in presentation and can be associated with cardiac defects, facial deformities, intellectual disability, hearing impairment, genitourinary manifestations as well as osteoporosis with platyspondyly.[1] The anaesthetic considerations for children affected with spondylo-ocular syndrome have not yet been described. We report on the clinical manifestations and anaesthetic concerns surrounding the syndrome.

Keywords: anaesthesia, spondylo-ocular syndrome, genetic disorder

Case report

Most of the affected individuals were from consanguineous families, and the first case report published in 2001 described a family in which six of the seven siblings were affected.[2]

The syndrome seems to affect diverse racial groups without showing a predominance in either gender. This has been described as an autosomal recessive disorder, as is the case with the individual described in this case report. Both parents were found to be heterozygous in the defective XYLT2 gene, which encodes for xylosyltransferase II. This enzyme is involved in the production of glycosaminoglycans and proteoglycans.[3] Glycosaminoglycans and proteoglycans are involved in tissue homeostasis in various tissues. The various mutations, including nonsense, missense, frameshift duplications and frameshift deletions, result in premature transcription and defective xylosyltransferase II.[3] The individual discussed in this case report, is homozygous for a novel frameshift mutation in the XYLT2 gene.

This case report describes the clinical manifestations of this mutation in an eight-year-old South African girl with non-consanguineous parents. It further elaborates on the anaesthetic concerns related to this condition.

The mother of the patient has granted written consent.

An eight-year-old female weighing 25 kg, with skeletal and ocular abnormalities presented with a dense cataract of the left eye for a cataract lens washout and lens insertion under general anaesthesia.

The patient, who was verbal and orientated, could sit and walk unsupported. She has global neurodevelopmental delay noted from birth. She attends a neurodevelopmental clinic and regularly has follow-ups with physiotherapy, occupational therapy and speech therapy at our institution. The patient's mother reported an uneventful pregnancy with normal booking bloods. The patient was delivered at term via natural vaginal delivery with a birth weight of 2 800 g. The absence of fractures at birth suggest that bone fragility, much like the ocular manifestations, present later in life.[1] No significant birth history or neonatal ICU admissions were noted. Her immunizations are also up to date.

Figure 1: Image showing mild micrognathia in the patient

The optical abnormalities noted in the patient include bilateral cataracts, which were surgically corrected at ages one and eight under general anaesthesia; bilateral strabismus; bilateral leukocoria and bluish sclera. Other abnormalities noted include mild craniofacial dysmorphism and micrognathia (see Figure 1)

Her airway was assessed as a Mallampati score 1 and she had an incisor gap but no loose teeth. Range of movement of her

cervical spine was normal and mouth opening was more than three finger breadths. On respiratory assessment, she had a pectus excavatum with normal air entry bilaterally and no added sounds on auscultation. The cardiovascular examination was normal and she was neurovascularly intact.

A computed tomography (CT) scan of the brain and magnetic resonance imaging (MRI) revealed corpus callosum agenesis. She had sustained multiple fractures including a radio-ulnar fracture at old year old, left distal femur fractures at three years old, a right intertrochanteric fracture at five years old, a right forearm fracture at six years old and a left distal tibia fracture at seven years old. Metabolic bone disease with bone fragility and congenitally soft bones was diagnosed. The fractures have been managed both conservatively and surgically. Other skeletal abnormalities noted on imaging include vertebra plana in T6; abnormal thoracolumbar vertebrae with vertebral collapse in T4, T7, T9 and L1 with no focal neurology; pectus excavatum; kyphoscoliosis and metopic suture ridging.

An echocardiograph revealed a normal cardiac structure and function with no abnormalities. An abdominal ultrasound revealed no abnormalities or intra-abdominal pathology.

The child was accompanied to theatre by her mother, ambulating by herself. The theatre was prepared prior to her arrival, the anaesthetic machine was checked with a paediatric circuit and a 1 litre bag. A Jackson-Rees circuit was also available and two anaesthetists were present.

She was induced with sevoflurane reaching an adequate depth of anaesthesia. The mother exited the theatre after induction and IV access was achieved uneventfully in the left hand with a 22 gauge intravenous catheter. Induction agents were given as follows: propofol 50 mg at a dose of 2 mg/kg and fentanyl 20 mcg at a dose of 0.8 mcg/kg. Dexmedetomidine was also given at a dose of 0.3 mcg/kg.

Once the child was apnoeic, intubation with a size 2 Macintosh blade was attempted with minimal force. However, the first attempt was unsuccessful as the epiglottis obscured the view of the vocal cords, corresponding to a Cormack-Lehane grade 3. Care was taken not to over-extend the patient's neck and her airway was kept in the neutral position. A video laryngoscope was used successfully with an introducer loaded into a cuffed size 5.5 endotracheal tube for the second attempt. Of note, bag mask ventilation was aided by the use of an oropharyngeal airway prior to and in between intubation attempts. Placement of the endotracheal tube was confirmed by visualisation, chest rise, misting of the tube, equal air entry bilaterally as well as the presence of capnography.

Adequate ventilation was achieved with pressure control ventilation, gaining tidal volumes of 200 ml and inspiratory pressures of 12 mmHg. Sevoflurane was used to maintain anaesthesia with an inhaled oxygen concentration of 60%. Subsequent medication given included: cefazolin 750 mg, dexamethasone 4 mg, paracetamol 500 mg and 200 ml of 2% dextrose solution as the finger-prick blood glucose test revealed a reading of 3.5 mmol/l.

Intraoperatively, the surgeon noted that the patient's eye was divergent at minimum alveolar concentration (MAC) of 1.2. The anaesthesia was deepened by increasing the sevoflurane concentration as well as giving propofol at 0.5 mg/kg, with a total of 5 doses. Expiratory concentrations of sevoflurane reached a maximum of 4.1 during the maintenance phase of the anaesthetic.

On emergence, the sevoflurane was turned off and the airway was gently suctioned. The patient was extubated once fully awake and emergence delirium was not present. She was transferred carefully to a stretcher and transferred to recovery for monitoring. The patient was discharged with no residual drowsiness later that day.

Discussion

Airway management for patients affected by spondylo-ocular syndrome needs to be done with care. The presence of platyspondyly may predispose them to dislocations of the occipito-atlantoaxial joints. In this patient's case, the platyspondyly was limited to her thoracic and lumbar spine, but care was taken nonetheless when the airway was manipulated. Facial dysmorphism are also of varied prevalence in this syndrome.[1] The patient had mild craniofacial dysmorphism with micrognathia and on direct laryngoscopy, her epiglottis was elongated and obscuring her larynx. Upper airway obstruction can also be anticipated in a child with micrognathia and the use of an oropharyngeal airway is recommended if needed during bag mask ventilation. The authors of this case report advise a thorough airway examination preoperatively and preparedness for a potential difficult airway in these cases.

Due to the presence of osteoporosis and bone fragility in this syndrome, special care is needed when positioning these patients. Pressure points need to be protected and it must be ensured that all limbs are accounted for at all times.[4] The use of a non-invasive blood pressure (BP) cuff may predispose to fractures if the inflation pressures are high.[4] Overinflation can be prevented by ensuring the use of an appropriately sized cuff and ensuring correct settings of the non-invasive BP auto-inflation limits. If there is a history of fractures caused by non-invasive BP monitoring, invasive monitoring needs to be considered.

Osteoporosis can be treated with pamidronate infusions (bisphosphonates) which have been shown to be effective, albeit only in patients with certain variants.[5] Fracture frequency can be reduced and bone mineral density can be improved. Normalisation of vertebral bodies have also been reported.[3,6] It is yet to be established if it will be effective in this specific variant of the syndrome. Length of treatment is also yet to be established. Bisphosphonate treatments may yet be a treatment that has the potential to optimise these patients prior to future elective procedures and in the prevention of fractures.

The presence of platyspondyly may render neuraxial anaesthesia challenging. The spread of local anaesthetic agents may be unpredictable. However, it is unlikely that a child will tolerate a neuraxial anaesthetic awake. As these children reach adulthood, it is still advised to proceed with caution when planning a neuraxial anaesthetic due to the potential difficult spinal anatomy and the unpredictable spread of the local anaesthetic. These children do reach adulthood, and their life expectancy appears to be within normal ranges for their respective population groups.[1] It has to be noted that epidural anaesthesia has been successfully utilised in a patient suffering from spondyloepiphyseal dysplasia, despite the presence of platyspondyly.[7]

Emergence delirium needs to be managed pre-emptively as this can predispose them to self-injury. Children with spondylo-ocular syndrome usually present to theatre multiple times and frequently at pre-school age for multiple fractures or lens washouts for cataracts. This age group is at a high risk of emergence delirium.[8]

Cardiac and genitourinary abnormalities were also found in 8 of 24 and 4 of 24 cases, respectively. Cardiac lesions are an anaesthetic concern and further investigation and cardiac testing is recommended. A nonsense mutation was found in a patient with severe cardiac lesions, but it is thought that cardiac lesions are absent in missense mutations. Cardiac lesions vary and include atrial and ventricular septal defects, mitral valve prolapse and insufficiency and dysplastic aortic valves. A patent foramen ovale was also found in a singular case.[1]

The child described in this case report was found to have higher anaesthetic requirements than similar patients without this syndrome undergoing the same procedure; whether this is significant to the syndrome, is unclear.

Conflict of interest

The authors declare no conflict of interest.

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Ethical approval

Prior to commencement of the case report, ethical approval was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (reference number: R14/49). This submission is in accordance with the principles laid down by the Responsible Research Publication Position Statements as developed at the 2nd World Conference on Research Integrity in Singapore, 2010.

Informed written consent was obtained from the caregiver of the patient discussed in this case report. Consent was also obtained from the CEO and Clinical Manager of Rahima Moosa Mother and Child Hospital.

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References

1. Chouery E, Karam R, Mrad YN, et al. Spondyloocular syndrome: a report of an additional family and phenotypic spectrum delineation. Genes (Basel). 2023;14(2):497. https://doi.org/10.3390/genes14020497.
2. Schmidt H, Rudolph G, Hergersberg M, et al. Retinal detachment and cataract, facial dysmorphism, generalized osteoporosis, immobile spine and platyspondyly in a consanguinous kindred-a possible new syndrome. Clin Genet. 2001;59(2):99-105. https://doi.org/10.1034/j.1399-0004.2001.590206.x.
3. Munns CF, Fahiminiya S, Poudel N, et al. Homozygosity for frameshift mutations in XYLT2 result in a spondylo-ocular syndrome with bone fragility, cataracts, and hearing defects. Am J Hum Genet. 2015;96(6):971-8. https://doi.org/10.1016/j.ajhg.2015.04.017.
4. Gupta D, Purohit A. Anesthetic management in a patient with osteogenesis imperfecta for rush nail removal in femur. Anesth Essays Res. 2016;10(3):677-9. https://doi.org/10.4103/0259-1162.184612.
5. Taylan F, Yavaş Abalı Z, Jäntti N, et al. Two novel mutations in XYLT2 cause spondyloocular syndrome. Am J Med Genet A. 2017;173(12):3195-200. https://doi.org/10.1002/ajmg.a.38470.
6. Buyukyilmaz G, Adiguzel KT, Kılıc E. Bisphosphonate treatment at spondylo-ocular syndrome due to a novel compound heterozygote variant in XYLT2 and review of the literature. Am J Med Genet A. 2023;191(6):1581-5. https://doi.org/10.1002/ajmg.a.63163.
7. De Boer HD, Hemelaar A, Van Dongen R, Gielen MJ. Successful epidural anaesthesia for Caesarean section in a patient with spondyloepiphyseal dysplasia. Br J Anaesth. 2001;86(1):133-4. https://doi.org/10.1093/bja/86.1.133.
8. Dahmani S, Delivet H, Hilly J. Emergence delirium in children: an update. Curr Opin Anaesthesiol. 2014;27(3):309-15. https://doi.org/10.1097/ACO.0000000000000076.