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## Clinical Reports

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### Orbital mass in a child causing somnolence, nausea and bradycardia

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**Purpose:** To highlight the need for referral and prompt intervention when signs of increased intraorbital pressure are present.

**Clinical features:** A four year old child presented to hospital with orbital swelling of recent onset, nausea and somnolence. Computed tomography and brain scan demonstrated a normal brain with a mass in the left orbit. She was referred for ophthalmic surgery the following day, when she had lost responsiveness of her left pupil to light. Anaesthetic management was highlighted by the presence of preoperative signs and symptoms of increased intraocular pressure - somnolence, nausea and vomiting, and bradycardia. These signs and symptoms were alleviated postoperatively.

**Conclusion:** Rapid onset of orbital swelling with physiological signs of increased orbital pressure necessitate urgent surgical intervention. It is possible that early referral and surgery could have preserved some functional vision in a situation where the light reflex remained in the affected eye. Alleviation of preoperative nausea and vomiting, bradycardia, and somnolence indicates that the preoperative symptomatology was related to vagal stimulation from increased intraocular pressure, usually identified as an oculocardiac reflex.

**Objectif :** Souligner la nécessité d'une intervention spécialisée et rapide lorsque des signes d'accroissement de la pression intra-orbitaire sont présents.

**Aspects cliniques :** Une enfant de quatre ans s'est présentée à l'hôpital souffrant d'un oedème orbitaire d'apparition récente, de nausées et de somnolence. La tomодensitométrie et la scintigraphie cérébrale ont montré un cerveau normal, mais une masse dans l'orbite gauche. La fillette a été dirigée en chirurgie ophtalmique le lendemain, alors que sa pupille gauche ne réagissait plus à la lumière. Les modalités de l'anesthésie ont été dictées par la présence des signes et des symptômes préopératoires de l'accroissement de la pression intraoculaire : somnolence, nausées, vomissements et bradycardie. Ces signes et symptômes se sont atténués après l'intervention.

**Conclusion :** Le début rapide de l'oedème orbitaire accompagné des signes physiologiques de l'augmentation de pression intraoculaire nécessitent une chirurgie d'urgence. Il est possible que l'examen spécialisé et la chirurgie précoces aient pu préserver, en partie, la vision fonctionnelle dans des circonstances où le réflexe pupillaire était conservé dans l'oeil touché. Le soulagement des nausées, des vomissements, de la bradycardie et de la somnolence préopératoires indique que la symptomatologie était reliée à une stimulation vagale provenant de la pression intraoculaire accrue, habituellement identifiée comme étant un réflexe oculocardiaque.

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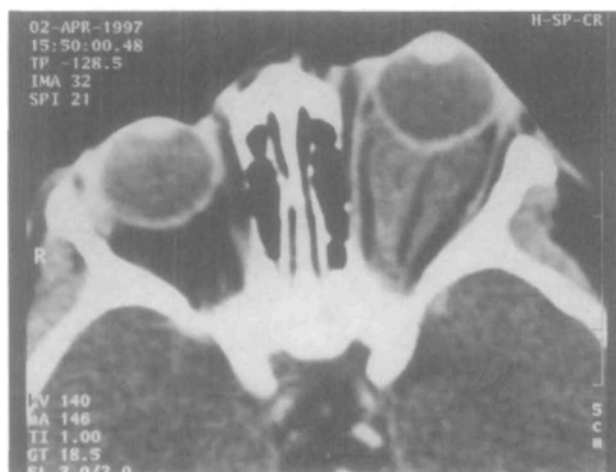
**T**HE oculocardiac reflex (OCR) is commonly defined as bradyarrhythmias caused by ocular stimuli.<sup>1,2</sup> Although often associated with paediatric strabismus surgery,<sup>3,4</sup> the OCR may be triggered by traction of eye muscles during any type of eye surgery.<sup>5</sup> Increased orbital pressure<sup>6,7</sup> may also elicit the OCR. We describe a case of prolonged OCR in a four year old child presenting for emergency evacuation of an orbital mass. The symptoms in the child included not only bradycardia, but also nausea and profound sedation.

### Case report

A previously healthy four year old girl presented for emergency evacuation of an orbital mass. Her previous medical record revealed no abnormalities and she had received no medications. There was no history of trauma and no indication of coagulation disorder in the patient or in her family. According to the parents, the patient's left eye had always been somewhat larger than the right eye.

Two days before emergency admission, the parents had noted a swelling of her left eyeball. The patient was tired and felt warm. Somnolence, nausea and orbital swelling made the parents take the child to hospital the next day and she was hospitalised in a paediatric ward.

A computed tomography scan of the orbits and of the brain was performed the same day. The contents of the left orbit were increased either due to a tumour or bleeding (Figure), whereas the scan of the brain was normal. Due to the patient's fatigue, no visual examination was performed that day, since active participation might have been required of the young child.



**FIGURE** Computed tomography scan of the orbits of a four year old child presenting for emergency evacuation of an orbital mass of the left orbit.

Both pupils were responding normally to light. Next morning, the left pupil was unresponsive to light, and she was immediately referred to the ophthalmologic department and presented for emergency evacuation of the mass. On arrival, the girl was unresponsive to speech, to stimuli such as light touch and gentle handling. She responded faintly to pain. Her mother reported that her daughter had vomited several times during the night. The heart rate was regular at 68 bpm. She was receiving an infusion of balanced glucose 2.5% *iv*. Her body temperature was normal. Oxygen saturation ( $SpO_2$ ) measured with a finger probe (Oxycap 4700, Ohmeda, Louisville, Colorado) was 98%.

No premedication was given. As the child was taken into the operating room her heart rate was 72 bpm and was continuously registered by ECG (Hewlett Packard, Germany). Further monitoring consisted of non-invasive blood pressure using a mechanically inflated cuff (Colin Pressmate, Colin Corporation, Japan),  $SAO_2$ , concentrations of inspired and end-tidal  $O_2$ ,  $N_2O$  and isoflurane (Oxycap 4700 and Agent Monitor 5330, Ohmeda, Louisville, Colorado). Neuromuscular function was monitored by train of four stimulation (Micro Stim Plus P/N 7106, Neurotechnology Inc, Houston, Texas).

Following 8  $\mu g \cdot kg^{-1}$  glycopyrrolate *iv*, which did not initially affect heart rate, anaesthesia was introduced by a modified rapid sequence induction with 6  $mg \cdot kg^{-1}$  thiopentone after 2  $\mu g \cdot kg^{-1}$  fentanyl. Cricoid pressure was applied and tracheal intubation was facilitated with 0.6  $mg \cdot kg^{-1}$  rocuronium. The lungs were ventilated mechanically with a mixture of  $O_2$  (35%),  $N_2O$  and isoflurane (1.6%, inspired concentration). Following the induction in the unresponsive patient, a supraventricular tachycardia of 180-200 bpm was recorded. Arterial blood pressure remained unaffected. Although the level of anaesthesia was judged as satisfactory at that time, a further increment of 1  $\mu g \cdot kg^{-1}$  fentanyl was given and the inspired concentration of isoflurane was increased. The heart rate gradually decreased during surgery to 110-120 bpm. Anaesthesia was otherwise uneventful.

A lateral epicantomy was performed and a haematoma and vessel-rich tumour were evacuated and excised. Haemostasis was obtained and the wound was closed, leaving a small rubber drain.

Following reversal of the neuromuscular block with glycopyrrolate and neostigmine the trachea was extubated as soon as spontaneous regular breathing and laryngeal reflexes returned. The patient was taken to the recovery room and, within one hour of extubation, was awake, hungry and responding normally to stimuli. She emptied her bladder and was given 15

mg·kg<sup>-1</sup> acetaminophen for postoperative pain. Observation of SpO<sub>2</sub> and pulse rate by pulse oximetry was continued until next morning. Her general condition was then excellent and there were no signs of nausea, bradycardia or somnolence. There was no bleeding from the surgical field. She was discharged to the hospital close to her home two days later and to her home one week after the operation.

Follow up examinations has later revealed that although decompression of the orbital haemorrhage was carried out after due investigation (CT of brain and orbits), the vision of the affected eye has been lost. The microscopic pathological examination diagnosed the tumour as a lymphangioma.

### Discussion

The OCR was first described in 1908 by Dagnini,<sup>8</sup> as cited by Bailey.<sup>6</sup> Four months later in the same year, Aschner<sup>9</sup> reported slowing of heart rate in animals and humans following pressure on the eyeball. Aschner suggested the vagus nerve as the efferent pathway and the trigeminal nerve as the afferent limb of the OCR and demonstrated that the trigeminal tract had to be intact in order to elicit bradycardia.<sup>9</sup> The description of OCR given in textbooks<sup>1, 10</sup> and in a review by Wong<sup>7</sup> also focuses on sinus bradycardia and other bradyarrhythmias.<sup>2</sup> The bradycardia resulting of the OCR is well-known and may be regarded as a conspicuous phenomenon in ophthalmic surgery.<sup>11</sup> However, the OCR may lead to fatal cardiac arrest.<sup>12</sup>

We describe a child with an orbital mass causing bradycardia, but also profound sedation and a history of vomiting. Sedation, nausea and vomiting are not commonly described in conjunction with the OCR, possibly because most descriptions and studies of the OCR concern patients under general anaesthesia<sup>1,3,5</sup> so that these symptoms, if present, are unnoticed. However, faintness and nausea were given as typical signs and general symptoms of the OCR by Bailey<sup>6</sup> and Anderson.<sup>13</sup> Also, an oculo-emetic reflex has been suggested due to the high incidence of nausea and vomiting following squint surgery.<sup>14</sup> Vomiting was reported in 10 out of 17 patients with spontaneous orbital haemorrhage,<sup>15</sup> but the authors do not mention mental state in their patients aged 2-80 yrs.

The profound, preoperative sedation in our patient may have been an effect of the relative bradycardia. However, prolonged OCR with a heart rate of 30 bpm occurred in a young adult without loss of consciousness.<sup>16</sup> In a case of massive orbital haemorrhage<sup>6</sup> prolonged OCR in association with fainting, dizziness and nausea was described. The author claimed that increased orbital pressure causes "increased intracra-

nial pressure due to the cerebrospinal fluid's being forced back into the brain as a result of pressing the fluid out of the sheath of the optic nerve".<sup>6</sup>

The level of sedation in our patient when presented for emergency surgery was suggestive of increased intracranial pressure, however, the computed tomography scan of the brain was normal. General anaesthesia of our initially unresponsive patient was uneventful, except for a brief period of a supraventricular arrhythmia following induction. The tachyarrhythmia was probably facilitated by the glycopyrrolate administered, but may have been caused by the suggested counter-regulatory, adrenergic effect of the OCR.<sup>3</sup> Following evacuation of the haemorrhage and the orbital tumour, the child's heart rate was 100-120 bpm and she was fully responsive and alert, in spite of given anaesthetics.

Spontaneous orbital bleeding has been reported in pregnant women treated with heparin<sup>17</sup> and recently in an infant following extracorporeal membrane oxygenation.<sup>18</sup> Spontaneous orbital haemorrhage without the presence of coagulation disorders, hypertension or other precipitating factors is uncommon.<sup>15</sup>

The therapeutic options given in the literature for the treatment of retrobulbar haemorrhages are several and sometimes conflicting. In children, orbital haemorrhage may simulate an orbital tumour and visual acuity may be difficult to obtain in young patients.<sup>15</sup> Following proper diagnostic procedures, prompt evacuation by orbital decompression may prevent permanent visual impairment caused by ischemic injury to the optic nerve and/or retina.<sup>15,17,20</sup> However, even emergency surgery of a retrobulbar haemorrhage diagnosed immediately after injection of local anaesthetic did not reverse visual impairment and thus resulted in blindness of the affected eye.<sup>21</sup> On the other hand, conservative treatment was reported as sufficient and satisfactory in a case of orbital haemorrhage in an infant.<sup>18</sup> Furthermore, limited retrobulbar haemorrhage was not considered to contraindicate or delay small-incision cataract surgery.<sup>22</sup>

We would like to emphasise the unusual symptomatology of our patient. The somnolence and nausea accompanying bradycardia in the present case were initially not regarded as a consequence of the increase in orbital pressure. Instead, these symptoms delayed the visual examination and surgical intervention until the light reflex of the affected eye was lost. We would also like to highlight the presence of sedation and nausea as important findings and diagnostic symptoms indicative of an unacceptable high intraorbital pressure necessitating prompt alleviation. Urgent evacuation of the mass when the patient's left light reflex remained intact, may have preserved some vision. The differences of opinion,

reflected in the cited publications,<sup>15,17,18,20,22</sup> if and when surgery for orbital haemorrhage should be performed, and the unusual presentation of our patient may have contributed to the delay of surgical intervention.

In conclusion, rapid onset of orbital swelling with physiological signs of increased orbital pressure necessitate urgent ophthalmologic evaluation for prompt surgery. During this evaluation and also during transfer of patients with rapidly increasing orbital pressure, continuous observation of mental state, heart rate and SpO<sub>2</sub> is suggested.

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