Symptomatic hyponatraemia due to inappropriate antidiuretic hormone secretion following minor surgery

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A rare case of the syndrome of inappropriate antidiuretic hormone secretion occuring after minor surgery is presented. A ten-year-old, previously healthy boy underwent general anaesthesia for detorsion and right orchiopexy. Throughout the operations, which lasted for one hour, he received 120 ml Ringer's lactate solution. The immediate postoperative period was uneventful. Twenty-two hours postoperatively he was found unconscious with generalized tonic-clonic seizures. Simultaneously obtained serum sodium concentration (121 mEq · L^{-1}) serum osmolarity (265 mEq · L^{-1}), urine sodium concentration (87 mEq · L^{-1}) and urine osmolarity (525 mEq · L^{-1}) suggested inappropriate antidiuretic hormone secretion which was confirmed by an elevated serum arginine-vasopresin (AVP) level of 14.5 pcg · ml^{-1} (normal 1–5 pcg · ml^{-1}) measured by radioimmune assay. He was treated with a single iv dose of 30 mg furosemide and fluid restriction, which produced a gradual increase of his serum sodium concentration to normal within two days. He was well during the remainder of his hospitalization.

On présente un rare cas d'un syndrome de sécrétion inappropriée d'hormone antidiurétique survenant après chirurgie mineure. Un enfant en bonne santé âgé de dix ans a subi l'anesthésie générale pour détorsion et orchiopexie droite. Durant l'opération qui a durée une heure, il a reçu 120 ml de lactate Ringer. La période postopératoire fut sans complication. Vingt-deux heures après l'opération, l'enfant fut trouvé inconscient avec des convulsions généralisées cloniques-toniques. La concentration simultanée de sodium sérique (121 mEq · L^{-1}), l'osmolarité sérique (265 mEq · L^{-1}), la concentration sodique d'urine (87 mEq · L^{-1}) et l'osmolarité urinaire (525 mEq · L^{-1}) ont suggéré le syndrome de sécrétion inappropriée d'hormone antidiurétique qui fut confirmé par l'élévation de la concentration sérique de l'arginine-vasopressine (AVP) de 14.5 pcg · ml^{-1} (normle 1–5 pcg · ml^{-1}) mesurée par radioimmunoessai. Il fut traité par une dose intraveineuse unique de 30 mg de furosémide et la restriction hydrique qui amena graduellement une augmentation de la concentration du sodium sérique à la normale en dedans de deux jours. Il se sentait bien durant de son hospitalisation.

Key words
COMPLICATIONS: hyponatraemia, convulsions;
HORMONES: antidiuretic;
IONS: sodium, hyponatraemia.

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Development of hyponatraemia and seizures due to inappropriate antidiuretic hormone (ADH) secretion on the day following surgery may be caused by the stress of surgery and/or the response to pain.[1,2] Although the syndrome of inappropriate antidiuretic hormone (SIADH) secretion is a frequent complication of major surgery ,[3–5] it has rarely been reported following minor surgery.

Case report

A ten-year-old, previously healthy Ethiopian Jewish boy, weighing 30 kg was admitted to the hospital with torsion of his right testis. Physical examination was otherwise normal, as were routine preoperative laboratory tests that included serum concentrations of sodium of 139 mEq · L^{-1}, potassium of 4.1 mEq · L^{-1}, blood urea nitrogen of 13 mg · dl, glucose of 98 mg · dl^{-1} and normal urinalysis. Anaesthesia was induced and maintained with halothane and 50% nitrous oxide in oxygen by mask, and incremental iv doses of fentanyl up to a total dose of 150 μg. He breathed spontaneously and was stable haemodynamically, while detorsion and orchiopexy were performed without complication. Throughout the operation which lasted for one hour he received 120 ml Ringer's lactate

solution. Within four hours he was drinking clear fluids, at which time he complained of pain at the operation site and received 30 mg meperidine (demerol) im. The period between the fourth and twenty-second postoperative hour was uneventful. Twenty-two hours postoperatively he was found unconscious with generalized tonic-clonic seizures that were treated with an iv bolus of diazepam (10 mg) and supplemental oxygen by mask. Simultaneously obtained serum sodium (121 $mEq \cdot L^{-1}$), serum osmolarity (265 $mosm \cdot L^{-1}$) urine sodium (87 $mEq \cdot L^{-1}$), and urine osmolarity (525 $mosm \cdot L^{-1}$) suggested inappropriate antidiuretic hormone secretion which was confirmed by an elevated serum arginine vasopresin (AVP) level of 14.5 $pg \cdot ml^{-1}$ (normal 1–5 $pg \cdot ml^{-1}$) measured by radioimmuno assay (Fluka, Chemika-Biochemika, Buchs, Switzerland). He was treated with a single iv dose of 30 mg furosemide and fluid restriction, with a gradual rise of his serum sodium concentration to normal within two days. Neurological examination was normal as was head CT scan. A chest radiograph and chest CT scan were also normal. He was well during the remainder of his hospitalization.

Discussion

Inappropriate ADH secretion is a disorder characterized by ADH release in spite of the inhibitory influence of hypoosmolality. The diagnosis is suggested upon presentation with typical symptoms of weight gain, weakness, lethargy and mental confusion which ultimately progress to convulsions and coma. The labaratory findings that confirm the diagnosis include urine osmolality hypertonic to serum, urine sodium concentration more than 20 $mEq \cdot L^{-1}$, low levels of blood urea nitrogen, serum sodium concentration less than 130 $mEq \cdot L^{-1}$, and serum osmolality below 270 $mosmol \cdot kg^{-1}$. The definitive diagnosis of SIADH secretion should be made with demonstration of elevated serum ADH as measured by sensitive radioimmunoassay,[6] as not all postoperative hyponatraemia can be ascribed to the SIADH secretion. Our patient clearly fulfils these criteria.

Inappropriate ADH secretion is a well-recognized cause of hyponatraemia following major surgery and has been reported in adult patients following abdominal and open-heart surgery[3–5] and in children following spinal fusion.[2] Minor surgery rarely results in inappropriate ADH secretion; however, it has been reported following cataract extraction performed under local anaesthesia.[8] Moran *et al.*[9] suggested that prior to skin incision, serum ADH concentration is mildly elevated due to overnight dehydration and the anaesthetic agents received. Surgical stress is responsible for increased ADH secretion until skin closure, while in the postoperative period ADH secretion gradually decreases to normal values by the fifth postoperative day. Anaesthetic agents such as halothane, thiopentone, diethyl ether, cyclopropane and methoxyflurane were thought to be associated with inappropriate ADH secretion.[2,10] However, more recent reviews state that the anaesthetic agents now commonly used generally have little or no effect on ADH secretion during anaesthesia, and that the increase in serum ADH is part of a generalized stress response to surgery and pain.[1,11]

To the best of our knowledge our case is the second case of SIADH secretion following minor surgery to be described in the English literature.

References

1 *Kehlet H.* The stress response to anesthesia and surgery: Release mechanisms and modifying factors. Clinical Anesthesia 1984; 2: 315–39.

2 *Mazze RI, Scwartz FQ, Glocum HC et al.* Renal function during anesthesia and surgery. The effect of halothane anesthesia. Anesthesiology 1966; 24: 279–84.

3 *Ukai M, Moran WH, Zimmermann B.* The role of visceral afferent pathways on vasopressin secretion and urinary excretory patterns during surgical stress. Ann Surg 1968; 168: 16–28.

4 *Policastro AM.* Syndrome of inappropriate antidiuretic hormone following appendectomy: case report. Milit Med 1983; 148: 271–2.

5 *Ting S, Eshaghpoor E.* Inappropriate secretion of antidiuretic hormone after open-heart surgery. Am J Dis Child 1980; 134: 873–4.

6 *Robertson GL, Shelton RL, Athar S.* The osmoregulation of vasopressin. Kidney Int 1976; 10: 25–37.

7 *Burrows FA, Shutack JC, Crone RK.* Inappropriate secretion of antidiuretic hormone in a postsurgical pediatric population. Crit Care Med 1983; 11: 527–31.

8 *Tichy ST, Dougal MA, Evans LS.* Inappropriate antidiuretic hormone secretion after cataract extraction under local anesthesia. Ann Ophthalmol 1985; 18: 231–2.

9 *Moran WH, Miltenberger FW, Shuayb WA, Zimmermann B.* The relationship of antidiuretic hormone to surgical stress. Surgery 1964; 56: 99–108.

10 *Oyama T, Sato K.* Plasma levels of ADH in man during methoxyflurane anesthesia and surgery. Anaesthesia 1970; 25: 500–7.

11 *Oyama T.* The influence of anesthesia on the endocrine system. *In*: Stoeckel H, Oyama T. (Eds.). Endocrinology in Anesthesia and Surgery. Heidelberg: Springer Verlag, 1980; 39.