JOGECA Journal of Obstetrics and Gynaecology of Eastern and Central Africa

CASE REPORT

Adolescent health & Sexuality

Central precocious puberty secondary to pituitary microadenoma: A case report

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Received: 3 June 2021; Revised: 13 August 2021; Accepted: 28 September 2021; Available online: October 2021

Abstract

Background: Precocious puberty is early pubertal development that results in future short stature and psychosocial problems.

Case presentation: A four-and-a-half-year-old presented to the gynecology clinic with a history of two menstrual cycles. She had pubic hair growth and adult body odor six months prior to the occurrence of menses. She complained of on and off headaches with blurry vision. The wrist radiograph for age assessment revealed that her age corresponded to the female standard number 18; the skeletal age was 10. The magnetic resonance imaging (MRI) of the brain (pituitary protocol) revealed a pituitary microadenoma. A diagnosis of central precocious puberty secondary to pituitary microadenoma was made. She was put on leuprolide 11.25 mg administered intramuscularly every three months with repeat investigations at six months. Her dose of leuprolide was changed to 15 mg three-monthly. Brain MRI two years since the initiation of treatment revealed that the microadenoma had completely resolved.

Conclusion: Central precocious puberty is rare and therefore requires a high index of suspicion. Thorough workup and a multidisciplinary team are essential for its diagnosis and management.

Keywords: pituitary microadenoma, precocious puberty, hypothalamic-pituitary-gonadal axis, leuprolide, Tanner staging

Introduction

Precocious puberty is the early onset of puberty, arising from an early abnormal secretion of growth and sex hormones, leading to the development of secondary sexual characteristics before eight and nine years in girls and boys, respectively (1). Central precocious puberty (CPP) and peripheral precocious puberty (PPP) are the two types of precocious puberty (2). Central precocious puberty is gonadotrophin-releasing hormone (GnRH-) dependent caused by early activation of the hypothalamic-pituitary-gonadal (HPG) axis (1-2). The incidence of central precocious puberty in girls is 1 in 5 000–10 000 (3). The causes of CPP are primarily of the central nervous system origin and are identical in both genders, although idiopathic CPP occurs more often in females (2).

Case presentation

A four-and-a-half-year-old presented to the gynecology clinic at the Kenyatta National Hospital (KNH) with a history of two menstrual cycles at age four. The first episode lasted two-and-half days and was asymptomatic. The second episode occurred

one month later, lasted three days, and was associated with lower abdominal pains, mood swings, and loss of appetite. At six months, her breasts were enlarged for her age, and at one year, she developed pubic hair. At three years, she developed axillary hair with vaginal discharge and body odor. She also had an associated history of blurred vision and headaches. She otherwise reported normal milestones and good performance in school.

On physical examination, she was 117.6 cm tall, weighed 24 kilograms, and had a body mass index (BMI) of 17.4. She had a sweaty body odor, axillary hair, and white vaginal discharge. She was Tanner stage 4 and 3 for breast and pubic hair, respectively. Her endocrinology profile included follicle-stimulating hormone (FSH) 10 IU/L (normal range 0.03-3.9), luteinizing hormone (LH) 17 IU/L (normal range 0.7-6.7), estradiol 343 pmol/L (normal range <75pmol/l), progesterone 0.4 nmol/L (normal range 1-5), growth hormone (GH) 0.34 ng/ml (normal range 0.0023-1.8), prolactin 10.02 ng/ml (normal range 3.8-21.5 ng/ml). The elevated FSH, LH, and estradiol levels depicted a hypothalamic-pituitary-gonadal axis dysfunction. The pelvic ultrasound revealed an enlarged uterus for her age, and the volume was 18 cc. A wrist X-ray for age assessment revealed that the patient's age corresponded to the female standard number 18; the skeletal age was 10 (Figure 1). Magnetic resonance imaging (MRI) of the brain (pituitary protocol) revealed a pituitary microadenoma (Figure 2). A diagnosis of central precocious puberty secondary to pituitary microadenoma was made.

She was put on leuprolide 11.25 mg intramuscularly (IM) every three months with repeat investigations at six months since the risks of tumor resection outweighed the benefits. She did not have menses since the start of the medication. Bone age assessment 17 months following treatment initiation found that she had advanced in age and increased height and weight. Her dose of leuprolide was changed to 15 mg three-monthly. Brain MRI two years since the initiation of treatment revealed that the microadenoma had completely resolved. She is currently on follow-up through the gynecological clinic.

Discussion

The causes of central precocious puberty include premature activation of the hypothalamic-pituitary-ovarian axis, intracranial lesions, and primary hypothyroidism (4). In contrast, the causes of peripheral precocious puberty include excess estrogen or androgens that could be from the ovaries (granulosa cell tumor, Leydig cell tumor, chorionic epithelioma, androblastoma), adrenals

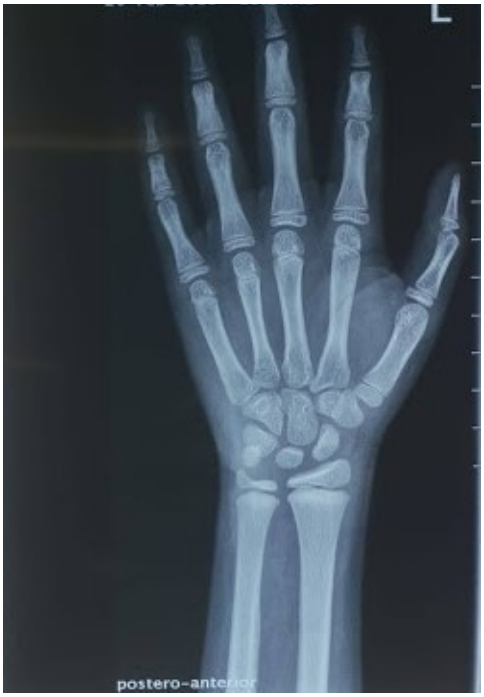

Figure 1: Wrist radiograph for bone age assessment revealed an age bracket of 10 years.

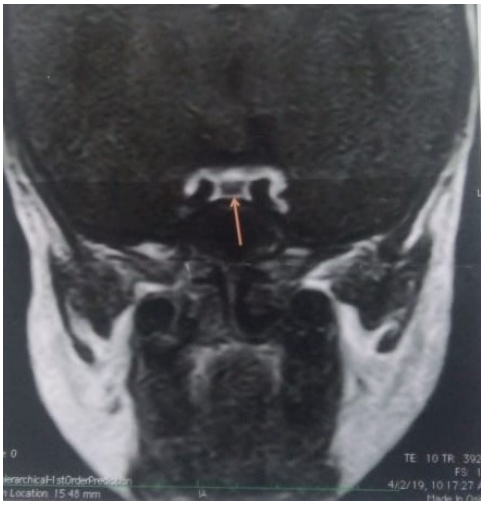

Figure 2: Magnetic resonance imaging (MRI) of the brain with the pointer showing the pituitary microadenoma.

(hyperplasia tumor), liver (hepatoblastoma), or iatrogenic (estrogen, androgen or combined oral contraceptives) (2-3). Risk factors for precocious puberty include African descent, obese girls, and genetic factors such as a previously diagnosed close relative (5-6). The race was the only risk factor in this case. The diagnosis of CPP is based on patient history, physical examination, laboratory and radiological investigations (6). Abdominal pelvic imaging is done to rule out pathologies of the ovaries, uterus, and adrenals (7). Brain imaging and x-ray of the hand and the wrist are done to

exclude intracranial lesions and bone age assessment, respectively (2). Positive brain MRI and x-ray imaging findings were reported in the presented case. A GnRH stimulation test should be done to distinguish between the two forms of precocious puberty; 100 mcg of GnRH given subcutaneously and serum LH measured. A reading of more than 15 mIU/mL is positive for CPP (8).

Precocious puberty among females initially presents with breast development. This may begin before 8, 6.8, and 6.6 years in White, Hispanic, and Black girls, respectively (9). The long-term effects of precocious puberty include short adult stature, early sexual debut, behavioral problems, and psychological stress (6). These outcomes should be discussed with the patient or guardian when administering treatment to ensure adherence. Gonadotropin-releasing hormone agonist therapy is the treatment of choice in GnRH-dependent precocious puberty cases (10). The agonists suppress premature activation of the hypothalamic-pituitary-ovarian axis by down-regulation, subsequently diminishing estrogen. This suppresses FSH and LH secretion, reverses the ovarian cycle, causes regression of breast, pubic hair changes, and other sexual secondary characteristics (10), as in this case. Therapy should be continued till the median age of puberty to allow development to the maximum adult height.

Conclusion

Central precocious puberty is rare and therefore requires a high index of suspicion. Thorough workup and a multidisciplinary team are essential for its diagnosis and management.

Consent for publication

Informed consent for publication was obtained from the patient's parent.

Acknowledgement

The authors wish to acknowledge the patient's mother for consenting to the publication of this case report.

Declarations

Conflict of interests

The authors declare no conflicts of interest.

Funding

None

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