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# Central Precocious Puberty: Case Report of a 6-Year-Old Girl

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**ABSTRACT**

***Background:*** Central precocious puberty (CPP) is a condition characterized by the early appearance of secondary puberty signs before the expected age, caused by premature activation of the hypothalamic-pituitary-gonadal axis. This condition can impact the child's physical growth, psychosocial development, and long-term health, requiring a comprehensive diagnostic approach. ***Case:*** A 6-year-old girl presented with a lump in the left breast without pain or other signs of inflammation. Physical examination showed Tanner stage M2P1 puberty status. Laboratory results indicated LH levels of 0.31 mIU/mL, FSH 5.52 mIU/mL, and Estradiol 10.99 pg/mL. Radiological bone age assessment showed consistency with an age of 5 years and 9 months. The diagnosis of CPP was established based on anamnesis, physical examination, and hormonal profile, although bone age did not show significant advancement. The patient received intramuscular Medroxyprogesterone therapy. ***Conclusion:*** The diagnosis of CPP is not always accompanied by accelerated bone age. A comprehensive evaluation, including anamnesis, pubertal status, and hormonal profiling, remains the key to establishing the diagnosis. Early detection and intervention are important to prevent long-term impacts on the child's growth and psychosocial development.

***Keywords:*** precocious puberty; bone age; gonadotropin hormones; Tanner stage; diagnosis; early.

## INTRODUCTION

Precocious puberty is a condition characterized by the early appearance of secondary sexual characteristics in children, with girls showing these characteristics before the age of 8 or menstruation before age 10, and boys showing secondary sexual characteristics before the age of 9. The main clinical signs of secondary sexual characteristics in girls include breast development, pubic and axillary hair growth, and pelvic enlargement. In boys, the main clinical signs include testicular enlargement, penile growth, axillary hair, and development of the seminal vesicles and prostate [1,2,3].

Based on pathogenesis and clinical manifestations, precocious puberty can be classified as central (Gonadotropin-Releasing Hormone dependent) or peripheral (Non-Gonadotropin-Releasing Hormone dependent). Recent studies have shown an increasing incidence of precocious puberty in children year by year, with a tendency to occur in younger children [1,4].

Precocious puberty in children is associated with increased hormone secretion, which affects psychology, height, and may increase the risk of nervous system tumors, potentially seriously harming the child's physical and mental health. It can also influence bone maturation, resulting in a tendency for shorter stature. Additionally, precocious puberty may increase the risk of hypertension, diabetes, obesity, and infertility in adulthood [1,5].

The prevalence of precocious puberty in Indonesia is estimated to range between 1:5,000 and 1:10,000, with a higher probability in females than males. However, recent reports from pediatric endocrinology clinics indicate that cases of precocious puberty have increased by 1.5 to 2 times compared to reports from 20 to 30 years ago, with variations in causes and clinical signs that require different management strategies according to the cause and clinical form [6].

## CASE REPORT

A 6-year-old girl was brought by her parents to the Endocrinology Clinic at Wangaya Regional General Hospital Denpasar, referred from Mangusada Hospital with a diagnosis of Suspected Precocious Puberty. The patient presented with a lump on her left breast for one week before coming to the hospital. The lump was reported to be painless, non-enlarging, without redness or warmth around the breast. The right breast showed no similar complaints, and neither breast was reported to have increased in size.

There were no complaints of pubic or axillary hair growth, and the patient was reported to have not experienced menstruation. The mother denied any

significant recent increase in the child's height. There were no complaints of acne growth, and the mother also denied that the child's face appeared increasingly rounded (no moon face). The parents said the child enjoyed consuming nuggets, fried chicken, and eggs.

During pregnancy, the mother had regular prenatal check-ups without abnormalities. The child was born spontaneously at term, delivered by a midwife, with a birth weight of 3280 grams, and cried immediately after birth. The patient was breastfed exclusively until 1 year old, with complementary foods introduced at 6 months. Immunization status was reported complete according to the child's health book.

The child lives with her father, mother, and younger sibling. The mother is a housewife, and the father works as a government employee. There is no family history of hormonal disorders, delayed puberty, or precocious puberty.

Anthropometric measurements showed a weight of 21 kg and height of 114 cm, with a body mass index (BMI) of 16.2 kg/m2, interpreted as good nutritional status. The Genetic Potential Test (GPT) calculated from the parents' heights, father 177 cm and mother 155 cm yielded a predicted height range of 151 to 168 cm, with a Mid Parental Height (MPH) of 159.5 cm.

Physical examination showed general condition within normal limits. Local examination of the left breast region revealed a mass approximately 2 cm in diameter, non-tender, not warm, and without redness. According to Tanner pubertal staging, the patient was assessed as M2P1 (Breast Development Stage 2, Pubic Hair Stage 1), corresponding to Tanner Stage 2.

Laboratory tests showed LH at 0.31 mIU/mL, FSH at 5.52 mIU/mL, and Estradiol at 10.99 pg/mL. A radiological examination to assess bone age was also performed, which indicated a bone age corresponding to that of a 5-year and 9-month-old girl.

Based on anamnesis, physical examination, and supporting examinations, the doctor diagnosed the patient with central precocious puberty. The patient should have been treated with monthly Leuprorelin injections of 2.1 mg until the age of 10–12 years. However, due to the patient's financial limitations, she was given an intramuscular injection of Medroxyprogesterone 0.7 ml (35 mg).

**FIGURE 1:** Patient Condition Upon Arrival at the Pediatric Endocrinology Clinic.

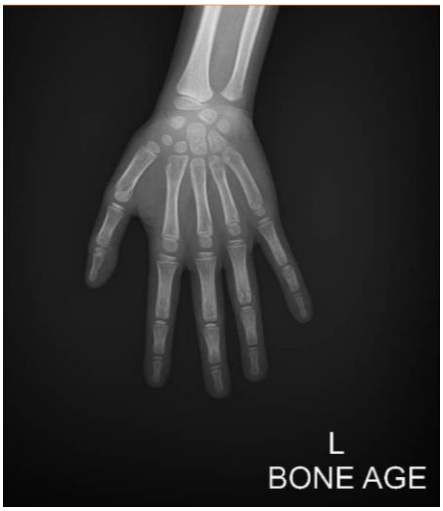


**FIGURE 2:** Radiological Examination of Patient's Bone Age.

## DISCUSSION

Puberty is a developmental stage marked by physical and psychosocial maturation. The timing of pubertal growth, when occurring inappropriately, such as in precocious puberty, can impact both the physical and psychosocial condition of the child. Anxiety may arise due to breast growth and other body features differing from peers of the same age [7,8,9].

Central precocious puberty can be inherited genetically with autosomal dominant transmission. However, in this patient, there was no family history of similar complaints. Improved nutrition is also considered one of the primary causes for the gradual decrease in the age of pubertal onset, and girls who are overweight tend to experience menarche earlier. Therefore, it is important to measure Body Mass Index (BMI) in girls with precocious puberty [7,10]
In managing precocious puberty, clinicians must obtain anamnesis and family history, including birth weight, the age of onset of puberty, and the speed of physical changes, as well as the development of secondary sexual characteristics. An important anamnesis element is the child's height compared to peers. In this case, based on birth weight and height in comparison to peers, results were within normal and appropriate ranges. However, for age at onset of puberty and development of secondary sexual characteristics, there was a discrepancy where anamnesis suggested the child experienced precocious puberty [6].

Physical examination revealed good nutritional anthropometric status, with standing height in the range of 151–168 cm, and Mid Parental Height (MPH) of 159.5 cm. Adjusted for pubertal status according to the Tanner scale, findings showed M2P1 (Breast development stage 2, pubic hair stage 1) corresponding to Tanner stage 2, indicating secondary sexual development in this case [6].

Supportive examinations include hormone profile testing, where the biochemical gold standard diagnosis is based on gonadotropin assessment, especially LH, after stimulation with GnRH; however, due to limited availability, a GnRH agonist can be used as a substitute to exploit the initial stimulatory effect on the hypothalamic-pituitary-gonadal axis following a single dose of the agonist. Blood specimens tested include LH, FSH, and Estradiol. In this case, LH was 0.31 mIU/mL (female basal LH ≥ 0.2 mIU/mL), FSH 5.52 mIU/mL, and Estradiol 10.99 pg/mL (female > 13.6 pg/mL). With the LH cutoff referencing research by Chitopankornkul et al, which determined basal LH ≥ 0.2 mIU/mL as diagnostic for central precocious puberty in girls with Tanner breast stage 2, the significant LH elevation supports the diagnosis of central precocious puberty in this case [1,6,11].

Radiological examination is necessary as an adjunct to hormonal profiling. Radiology showed bone age corresponding to a 5-year and 9-month-old child. Typically, bone age ≥ 2 years or ≥ 2.5 SD above chronological age supports precocious puberty diagnosis. However, a study by Latronico et al stated that the lack of significant bone age advancement is not a reason to halt monitoring when anamnesis, physical exam, and hormone profile support the diagnosis. Bone age is more frequently used as a predictor for adult height estimation. In females, pelvic ultrasonography is better used for differential diagnosis to detect possible ovarian tumors or cysts, especially when estradiol levels are elevated [6,12]. For treatment, the patient should ideally receive Leuprorelin injections of 2.1 mg until age 10–12 years. However, due to patient limitations, Medroxyprogesterone acetate injections 0.7 ml (35 mg) intramuscular were administered instead. According to Brito et al (2016), Medroxyprogesterone Acetate (MPA) and Cyproterone Acetate (CPA) are therapy options useful for inhibiting pubertal progression, although they do not have a positive impact on final height. MPA inhibits central gonadotropin release by acting on the hypothalamus [13].

## CONCLUSION

Central precocious puberty has been a common case in recent times. Establishing the diagnosis requires anamnesis, physical examination including pubertal status, and supportive tests including hormonal profile and radiology. Early detection can prevent long-term effects for the patient. Strict periodic evaluation and monitoring of secondary sexual growth are necessary to prevent adverse long-term consequences.

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