

# Comparing adult height gain and menarcheal age between girls with central precocious puberty treated with gonadotropin-releasing hormone agonist alone and those treated with combined growth hormone therapy

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## Introduction and Objective

Patients who are diagnosed with idiopathic central precocious puberty (CPP) have developing pubertal sex characteristics and accelerating the maturation of bones, which may lead to a shorter adult height (AH). Administration of gonadotropin-releasing hormone agonist (GnRHa) leads to a inhibition of bone growth and suspend or decline development of the secondary sex characteristics<sup>1)</sup>. However, there is controversial question regarding older girl about the preservation of AH in patients who grow too slow under GnRHa treatment<sup>2,3,4)</sup>. If the reason why slow growth is the reduction in IGF-1 levels, addition growth hormone (GH) to the GnRHa treatment could be reasonable to compensate.<sup>4,5,6)</sup>.

The aim of this study is to define the final outcome for patients treated with GnRHa therapy combined with GH or not, and to investigate factors that could affect the outcome of the stature.

## Methods

Medical records of 166 girls diagnosed with CPP were retrospectively reviewed. They were treated with GnRHa for  $\geq 36$  months, from 2002 to 2017. We assessed the annual changes in height and expressed these as standard deviation score (SDS) for chronologic age (CA) and bone age (BA) using the 2017 Korean National Growth Charts<sup>7)</sup>. Annual changes in height SDS for BA (SDS<sub>b</sub>) and predicted adult height (PAH) SDS were assessed for three years. The final height gain ( $\Delta$ HG) was calculated as a difference between the initial PAH SDS and AH SDS; these were compared between the GnRHa-alone (Group A, n=135) and GnRHa combined GH group (Group B, n=31). Multiple linear regression analysis was used to determine correlations between multiple parameters and height outcome. Only the patients from Group A were used in this analysis, because GH treatment could be confounding factor.

## Reference

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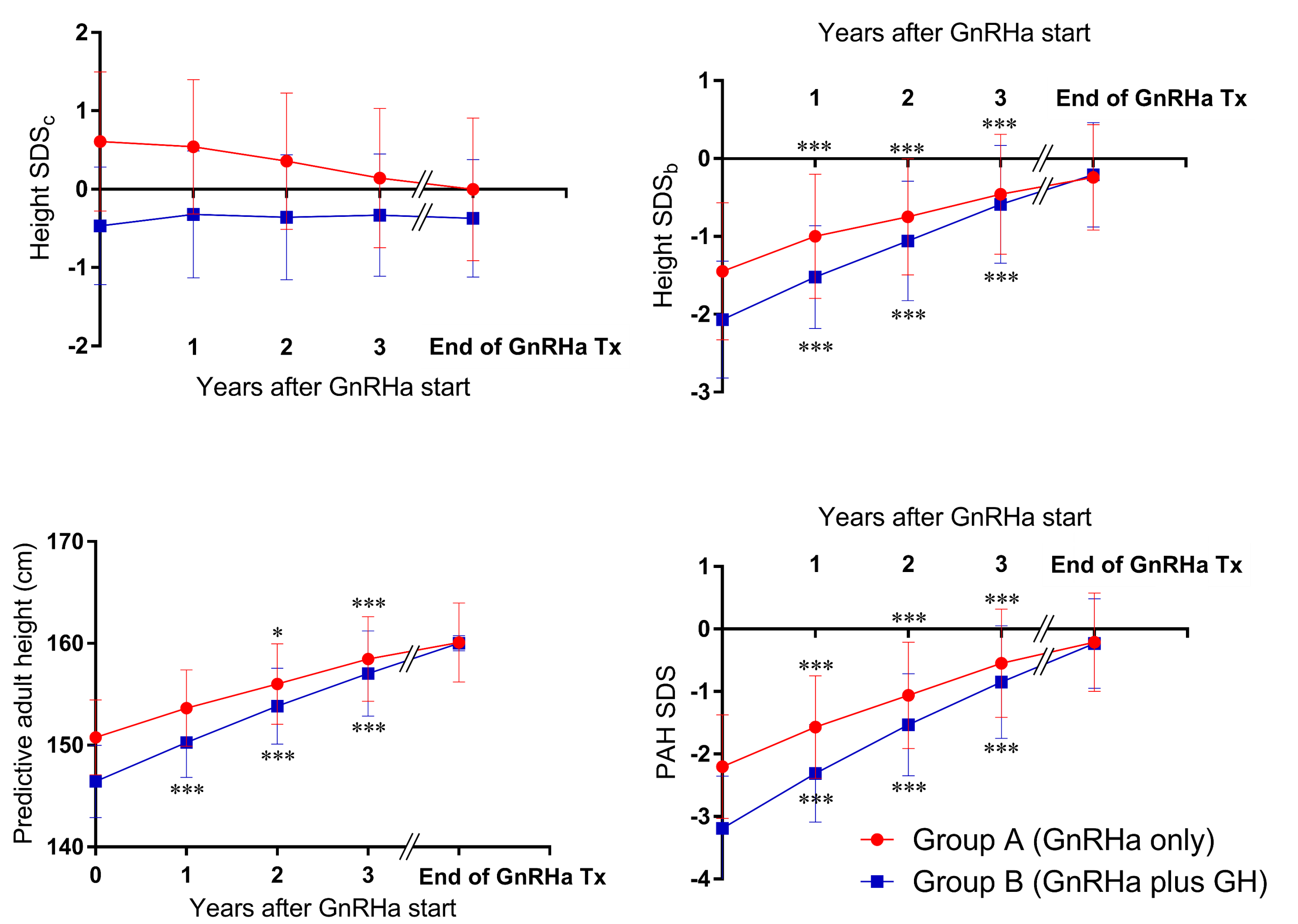
## Results and Conclusion

The mean CA and BA of patients at the beginning of the GnRHa treatment were  $7.89 \pm 0.81$  and  $9.67 \pm 0.91$  years, respectively. All patients were treated with GnRHa for  $45.25 \pm 8.45$  months. The mean duration of the GH treatment was  $39.23 \pm 16.94$  months. After the GnRHa treatment started, it took a mean duration of 19.19 months before the GH treatment was started.

The PAH SDS at the start of GnRHa treatment and AH SDS were significantly lower in Group B than in Group A ( $-2.20 \pm 0.83$  vs.  $-3.19 \pm 0.84$ ,  $P < 0.001$ ;  $0.18 \pm 0.84$  vs.  $-0.30 \pm 0.66$ ,  $P = 0.021$ ). The annual increase in PAH SDS was higher in the Group B than in Group A for two years (first year,  $P = 0.02$ ; second year,  $P = 0.008$ ; and third year,  $P = 0.108$ ).  $\Delta$ HG was significantly higher in Group B than in Group A ( $2.5 \pm 0.75$  vs.  $2.92 \pm 1.02$ ,  $P = 0.048$ ). The mean menarcheal age was 13.12 years ( $13.1 \pm 0.99$  vs.  $13.18 \pm 0.58$  years,  $P = 0.755$ ).

The difference between BA and CA ( $\Delta$ BA-CA) at the beginning, greater differences between PAH SDS and height SDS for CA (SDS<sub>c</sub>) one year after the start of the GnRHa treatment were significantly positive effect to  $\Delta$ HG.

GnRHa plus GH therapy might be helpful to gain more additional final height than GnRHa-alone therapy. The increase in PAH SDS or height SDS<sub>c</sub> during the first year after the GnRHa treatment could be a predictive tool to estimate the effect of the therapy.



SDS<sub>c</sub> : Standard deviation score for chronologic age, SDS<sub>b</sub> : Standard deviation score for bone age, PAH SDS : predicted adult height standard deviation score

