The difference of body mass index (BMI) score before and after gonadotropin-releasing hormone agonist (GnRHa) treatment in central precocious puberty girls

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* No conflicts of interest to we solve.

Purpose
We investigated the difference of body mass index (BMI) score before and after gonadotropin-releasing hormone agonist (GnRHa) treatment in central precocious puberty girls (CPP).

Methods
Medical records of 188 girls with CPP treated with GnRHa were reviewed. All patients completed the therapy. The patients were categorized into two groups according to initial BMI: normal weight group (BMI < 85 percentile) and overweight/obesity group (BMI ≥ 85 percentile). We analyzed chronologic age (CA), bone age (BA), BA advancement (BA-CA), height (Ht), Ht-standard deviation score (Ht SDS), BMI, BMI SDS, predicted adult height (PAH) before treatment initiation and after treatment completion.

Results
Initial BA, Ht SDS, PAH, mid-parental height and the total durations of treatment showed no differences between two groups. But initial CA of the overweight/obesity group was lower than that of normal group and BA-CA of the overweight/obesity group was higher than that of the normal group. When comparing the height outcomes of two groups, ΔPAH showed no differences between two groups.

BMI SDS increased only in the normal weight group. On multiple regression analysis, ΔBMI SDS was negatively correlated with initial BMI SDS (r = -0.32, P < 0.001), and it showed no correlation with CA, BA, BA-CA, height SDS. When the group of patients with increased BMI after the therapy was compared with the group of decreased BMI, no difference in ΔBA-CA and ΔPAH was found.

Conclusion
BMI SDS increased after GnRHa treatment in CPP girl whose initial BMI SDS was normal. The lower the pre-treatment BMI SDS, the more the post-treatment BMI SDS increased.

Table 1. Auxological characteristics of the study subjects stratified by body mass index before treatment

|                       | Total (N = 188) | Normal (n = 155) | Overweight/Obese (n = 33) | P value*
|-----------------------|-----------------|------------------|--------------------------|--------
| Chronological age (yrs) | 8.36 ± 0.49     | 8.40 ± 0.46      | 8.17 ± 0.57              | 0.016*
| Bone age (yrs)         | 10.32 ± 0.83    | 10.30 ± 0.83     | 10.40 ± 0.87             | 0.521
| BA-CA (yrs)            | 1.96 ± 0.78     | 1.90 ± 0.75      | 2.23 ± 0.86              | 0.028*
| Height SDS             | 0.92 ± 0.87     | 0.87 ± 0.80      | 1.18 ± 1.14              | 0.007
| BMI SDS                | 0.31 ± 0.85     | 0.03 ± 0.58      | 1.66 ± 0.58              | <0.001*
| Mid-parental height (cm)| 160.28 ± 3.80   | 160.71 ± 3.71    | 160.35 ± 4.25            | 0.915
| Predicted adult height (cm) | 157.33 ± 6.03 | 157.50 ± 5.40 | 156.50 ± 4.44 | 0.388
| Duration of treatment (yrs) | 1.63 ± 0.68 | 1.65 ± 0.70 | 1.50 ± 0.57 | 0.246

Table 2. Changes in the difference between bone age and chronological age and predicted adult height

|                       | Normal (n = 155) | Overweight/Obese (n = 33) | P value*
|-----------------------|------------------|--------------------------|--------
| Δ BA-CA (yrs)         | -0.20 ± 0.61     | -0.08 ± 0.88             | 0.352
| Δ Predicted adult height (cm) | 0.87 ± 4.07 | 0.73 ± 6.92 | 0.875

Table 3. Auxological characteristics of the study subjects before and after the treatment

|                       | Normal (n = 155) | Overweight/Obese (n = 33) | P value*
|-----------------------|------------------|--------------------------|--------
| Age (yrs)             | 8.40 ± 0.46      | 8.17 ± 0.57              | <0.001*
| Bone age (yrs)        | 10.30 ± 0.83     | 10.40 ± 0.87             | <0.001*
| Height SDS            | 0.87 ± 0.80      | 1.18 ± 1.14              | <0.001*
| BMI SDS               | 0.02 ± 0.58      | 1.66 ± 0.58              | <0.001*

Table 4. Percentage of the patients with increased body mass index standard deviation score

|                   | Decreased | Increased | Total | χ²(p) *
|-------------------|-----------|-----------|-------|--------
| Normal weight     | 51(32.9)  | 104(67.1) | 155   | 5.485  |
| Overweight/Obese  | 18(54.5)  | 15(45.5)  | 33    | 0.019  |

Table 5. Multiple linear regression analysis of the factors that affected the changes in body mass index standard deviation score after the treatment

| Covariate          | β        | ΔBMI SDS | P value*
|--------------------|----------|----------|--------
| Chronological age  | -0.03    | 0.642    | 0.642  |
| Bone age           | 0.1      | 0.147    | 0.147  |
| BA-CA (yrs)        | 0.064    | 0.064    | 0.064  |
| Height SDS         | 0.09     | 0.208    | 0.208  |
| BMI SDS            | -0.32    | 0.04     | <0.001*|
| Duration of treatment (yrs) | -0.11 | 0.121 | 0.121 |
| Δ BA-CA (yrs)      | 0.82     | 0.242    | 0.242  |
| Δ Predicted adult height (cm) | -0.48 | 0.497 | 0.497 |

Table 6. Changes in the difference between bone age and chronological age and predicted adult height according to the changes in body mass index standard deviation score

|                   | Δ BMI SDS < 0 (n = 69) | Δ BMI SDS > 0 (n = 119) | P value*
|--------------------|------------------------|-------------------------|--------
| Δ BA-CA (yrs)      | -0.21 ± 0.83           | -0.16 ± 0.56            | 0.672  |
| Δ Predicted adult height (cm) | 0.90 ± 5.53 | 0.81 ± 4.12 | 0.894 |