Original Article

Treatment Role Of Recombinant Human Growth Hormone Combined With Calcium Lysine Phosphate Hydrogen Granule In Children Suffering From Idiopathic Short Stature

Asmaa Hassan Mohammed[1], Yasir Haider Al-Mawlah [2,*], Hadi Sajid Abdulabass[3]

[1] Department of Medical Laboratory Techniques, Al-Mustaqbal University College, Babylon, 51101, Iraq.
[2] DNA Research Centre, University of Babylon, Babylon, Hillah, 51001, Iraq.
[3] Continuous Education Department, Faculty of Dentistry, University of Al-Ameed, Karbala, 56001, Iraq.
Correspondence author: Yasir Haider Al-Mawlah. Email: Yasser.almawla@uobabylon.edu.iq.
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Abstract

Objective: to learn more about the therapeutic impact of treating children with idiopathic short stature with calcium lysine phosphate hydrogen calcium granules and recombinant human growth hormone. **Methods:** From May 2021 to May 2022, 114 children with idiopathic low stature received treatment at Marjan Teaching Hospital. They were split into a control group and a treatment group, each of which had 57 instances, depending on the pharmaceutical differences. The treatment group received oral lysine phosphate hydrogen calcium granules, 5 g/time, twice daily, while the children in the control group received subcutaneous injections of recombinant human growth hormone solution, 0.033-0.050 mg/kg, once daily. The two study groups have been received care for a full year. **Results:** Following treatment, the overall success ratio in the treatment group was meaningfully greater than that in the control group (95.21% vs 82.31%), (P value lower than 0.05). The two groups experienced much faster development rates in terms of height and weight, bone age, and growth. The serological parameters and bone metabolism indices in both groups significantly increased following therapy (P value lower than 0.05). **Conclusion**: In the treatment of children with idiopathic short stature, calcium lysine phosphate hydrogen granules and recombinant human growth hormone are successful in promoting the growth of height in these children. To encourage the improvement of bone metabolism indicators, it has some clinical application benefit.

KEYWORDS: Idiopathic dwarfism islet-like factor-1, 25-hydroxyvitamin D; bone-specific alkaline phosphatase; calcium lysine phosphate hydrogen granules; recombinant human growth hormone injection.

INTRODUCTION

Idiopathic short stature is the most common type of short stature in children, it accounts for 60% to 80% of all short children, and it shows a continuous upward trend [1]. These children not only have developmental and cognitive problems, but also have a serious impact on the self-confidence and respect of children in the future of life, and have a serious impact on the future development of life. At present, its clinical treatment mainly provides nutritional support and drug therapy [2], and the drug treatment is mainly given by recombinant human growth hormone injection, which has the function of promoting protein synthesis and muscle and skeletal muscle growth [3], Promoting bone calcium formation and maintain muscle contraction nerves Transfer and other effects[4]. As a result, this study used lysine phosphate hydrogen calcium granules along with recombinant human growth hormone for the treatment of children with idiopathic dwarfism, with satisfactory outcomes.

MATERIALS AND METHODS

Ethical Statement

Volunteers have provided written permission forms. The ethical committee at the university of Babylon has approved this study and permitted the collection of samples (Ethical approval No. ID: DSM-5342).

General clinical data

A total of 114 children with idiopathic short stature who were treated in Marjan Teaching Hospital in Al- Hilla city from May 2021 to May 2022 were selected as the research subjects [5]. The average age was 9.57 + 0.62 years, and there were 61 male and 53 female. The age ranged from 5 to 14 years.

Exclusion criteria

(1) Those with hypercalcemia, (2) those with mental disorders, (3) those who are allergic to drug components, (4) those with acute respiratory failure, (5) those with sarcoid, (6) those with complete closure of the epiphysis, (7) those with severe systemic symptoms, (8) those with active malignant tumor.

Drugs

Recombinant Human Growth Hormone Injection is produced by Chunjinsai Pharmaceutical Co., Ltd., the specification is 30 IU: 10 mg, with serial number is180621.

Grouping and treatment methods

According to the difference in medication, they were divided into control group and treatment group, each with 57 cases. The control group included 36 males and 21 females, aged 5-14 years, with an average age of (9.23 ± 0.38) years. There were 22 women and 35 men in the treatment group. The average age was 9.58 + 0.64 years, ranging from 5 to 14 years old. The general data did not differ statistically significantly between the groups, which was plausible. A once-daily subcutaneous injection of heavy human growth hormone solution, 0.033 to 0.050 mg/kg, was given to the control group. On the basis of the control group, oral lysine phosphate hydrogen calcium granules were administered to the treatment group at a rate of 5 g twice daily. After 12 months of therapy, the two patient groups were contrasted [6].

Efficacy evaluation criteria

Markedly effective: The treated children increased their height by more than 6 cm in one year and continue to grow; Effective: The height of the children after treatment is 4-6 cm in one year; Efficacy: Height increase less than 3 cm after one year of treatment, [Effective rate = (display +) / total].

Biochemical and Bone Metabolism parameters.

Serological markers: Patients' early-morning venous blood was drawn before and after treatment, respectively. Venous blood was centrifuged at a low temperature and high speed, and the supernatant was taken to determine the serum insulin-like growth factor-1 (IGF) and feeding inhibitory factor 1 (Nesfatin-1) using corresponding detection kits. Insulin-like growth factor binding protein growth factor binding protein 3 (IGFBP-3), 25-hydroxyvitamin [25-(OH)D], growth hormone releasing peptide (Ghrelin), osteocalcin (OC), bone-specific alkaline phosphatase (BAP) level was detected by enzyme-linked immunosorbent assay, which was carried out in strict accordance with the instructions of the kit. Bone Signs of Metabolism In order to measure the levels of type I collagen cross-linked carboxy-terminal peptide (ICTP) and type I procollagen amino-terminal peptide (PINP), morning venous blood was drawn from patients before and after therapy. The supernatant was then collected and subjected to radioimmunoassay.

Statistical analysis

Two groups' measurements of height, weight, growth rate, bone age, serum IGF-1, Nesfatin-1, IGFBP-3, 25-(OH) D, Ghrelin levels, serum OC, ICTP, BAP, and PINP levels were made using the statistical analysis program SPSS 21.0. The measurement data were expressed as x-samples, and the effective rate was compared using the t test and the 2 test.

RESULTS

Comparison of the two groups' clinical effectiveness

Following treatment, the total effective rate in the treatment group was 95.21 percent, much higher than the control group's rate of 82.31%. This difference between the two groups was statistically significant (P value lower than 0.05, note Table 1).

Table 1: Comparison of the two groups' clinical effectiveness.

Cases	Control group N = 57	Treatment group N = 57
Significant effect	41	52
Valid	8	4
invalid	7	2
total efficiency %	82.31%	95.21%*

Comparison of the physical characteristics of the two groups, including height, weight, development rate, and bone age

The height, weight, growth rate, and bone ages of two children's groups were significantly higher after treatment than they were before (P value lower than 0.05), likewise, the treatment group outperformed the control group by a large margin (P value lower than 0.05), as shown in Table 2.

Table 2: Comparison of the physical characteristics of the two groups, including height, weight, development rate, and bone age

Cases	Control group N = 57		Treatment group N = 57	
Observed period	Before Treatment (M±SD)	After Treatment (M±SD)	Before Treatment (M±SD)	After Treatment (M±SD)
Height (cm)	113.48±2.67	122.52±2.74*	113.37±2.63	127.15±2.69**
Weigh (kg)	20.44±3.21	22.97±3.43*	20.41±3.25	24.69±3.36**
Bone age / year	3.46±0.16	6.25±0.23*	3.51±0.23	8.35±0.29**
Growth rate/(cm *year−1)	4.03±0.20	6.52±0.26*	4.05±0.26	8.72±0.32**

*P value lower than 0.05, in contrast with same group prior to treatment;
**P value lower than 0.05, in contrast with control group following therapy

Table 3: Comparison of the two groups' serological parameters

Serological Parameters	Control group N = 57		Treatment group N = 57	
Observed period	Before Treatment (M±SD)	After Treatment (M±SD)	Before Treatment (M±SD)	After Treatment (M±SD)
IGF-1 (n g · mL −1)	91.40±12.53	135.62±13.46*	92.38±12.58	166.86±13.77**
Nesfatin-1(p g·mL −1)	49.85±4.68	45.22±1.31*	49.73±4.74	42.55±1.22**
IGFBP-3 (μ g·mL -1)	3.41±0.21	4.99±0.27*	3.37±0.18	6.83±0.33**
25-(OH)D(μ g·L−1)	23.30±1.36	24.79±1.58*	22.76±0.70	27.15±0.45**
Ghrelin (p g·mL −1)	6158.14±138.78	5365.57±116.79*	6083.53±4.22	5973.60±2.36**

*P < 0.05, comparison with the group's pre-treatment data;
**P < 0.05, after-treatment comparison with the control group

Comparison of the two groups' biochemical parameters

Following treatment, blood levels in both patient groups dramatically increased, with serum levels of IGF-1, IGFBP-3, and 25-(OH) D significantly rising and serum levels of nesfatin-1 and ghrelin significantly falling (P value lower than 0.05), and patients in the therapy group had considerably superior serological indices than those in the control group (P value lower than 0.05), as revealed in Table 3.

Comparison of the two groups' indicators of bone metabolism

Serum OC, ICTP, BAP, and PINP levels in the two groups significantly rose following therapy (P value lower than 0.05), Moreover, the treatment group's bone metabolism measures were statistically different from those of the control group in that they were significantly greater (P value lower than 0.05). as seen in Table 4.

Table 4: Comparison of the two groups' indicators of bone metabolism

Biochemical Parameters	Control group N = 57		Treatment group N = 57	
Observed period	Before Treatment (M±SD)	After Treatment (M±SD)	Before Treatment (M±SD)	After Treatment (M±SD)
OC (ng·mL −1)	89.78±12.58	122.43±12.65*	89.94±1.06	138.32±1.34**
ICTP (μg·L −1)	15.53±2.26	19.64±2.27*	15.37±0.77	23.18±0.57**
BAP (U·L −1)	92.60±14.68	145.99±16.33*	92.88±1.11	190.65±0.62**
PINP (μg·L −1)	489.88±79.58	584.39±81.36*	487.21±3.34	678.51±1.24**

*P < 0.05, comparison with same group before treatment;
**P < 0.05, comparison with control group after treatment

DISCUSSION

In internal medicine, short stature in children is a prevalent secretory disease. Short stature in children is rather common in my country—about 30%, depending on the etiology, which may be split into growth hormone deficiency, idiopathic short stature, GC, and other forms. Idiopathic short stature, which relates to children with normal length at birth, is most frequently associated with growth hormone insufficiency. Children without malnutrition and other problems also have sufficient dwarf hormone secretion, and children without malnutrition and other problems have dwarfism [5], It brings a great financial burden to children and their families.

As early as 1985, the United States used rhGH for the treatment of dwarfism in children. Recombinant human growth hormone injection has the same effect as endogenous hormone, which can stimulate the differentiation of epiphyseal soft cells, it can stimulate the differentiation and proliferation of epiphyseal soft cells, and stimulate the growth of cartilage stromal cells. Stimulates cartilage stromal cells to differentiate and proliferate, resulting in accelerated linear growth and widening of bones; At the same time, it can promote the synthesis of immunoglobulin and protein; supplement human growth hormone deficiency, regulate bone metabolism, fat, etc. [2]. Lysine in calcium lysine phosphate particles is an essential acid in the human body. It has the effect of promoting human growth; calcium is involved in bone formation, and has the functions of maintaining muscle contraction and nerve transmission [7]. Therefore, for the treatment of children with idiopathic short stature, this study used lysine phosphate hydrogen calcium granules along with recombinant human growth hormone, and achieved satisfactory results. An important factor in promoting the growth of human bones is vitamin D, which can promote the proliferation of osteoblasts and the formation of matrix, and the active product in vivo is 25-(OH) D, which is a common indicator for evaluating the growth status of children [8]. IGF-1 is a single-chain polypeptide, which has the effect of promoting cartilage growth and has extensive hormone-dependent long-term effects [9]. Nesfatin-1 is a polypeptide, which is widely distributed in the hypothalamus, fat and other secretory cells. Its expression is regulated by nutritional status, and its expression regulates food intake, reduces body fat

content, and promotes energy consumption [10]. IGFBP-3 is a macromolecular protein that can be synthesized and secreted by a variety of cells, and is the main carrier of IGF-1 in the blood [7]. Ghrelin not only regulates the secretion of GH, but also regulates energy, and its receptors are widely distributed in peripheral organs [9,10]. The results of this study showed that the treatment group's serum levels of IGF-1, nefatin-1, IGFBP-3, 25-(OH)D, and ghrelin were considerably higher than those of the control group following treatment. (P value lower than 0.05). This suggests that lysine phosphate hydrogen calcium granules and recombinant human growth hormone can successfully increase the level of cytokines in the body and stimulate growth and development in children with idiopathic short stature. OC and BAP are clinical markers that reflect bone formation, and PINP is a collagen that can directly reflect the activity and shape rate of osteoblasts. ICTP is an important marker clinically used to reflect bone resorption [11,12]. Serum OC, ICTP, BAP, and PINP levels in this study's treatment group were considerably higher than those in the control group (P value lower than 0.05). This suggests that recombinant human growth hormone and calcium lysine phosphate hydrogen calcium granules can enhance growth and speed up bone production in kids with idiopathic short stature [13–15]. Additionally, the treatment group's total effective rate following treatment was higher than the control group's (95.21% vs. 82.31%), P value less than 0.05). Following therapy, both groups of children's heights, weight, body mass, growth rate, and bone age considerably improved, with the treatment group being the more pronounced improvement (P value lower than 0.05) [5–7]. This suggests that the combination of recombinant human growth hormone and calcium lysine phosphate hydrogen granules has a considerable impact on the treatment of children with idiopathic short stature [16].

CONCLUSION

In conclusion, lysine phosphate hydrogen calcium granules combined with recombinant life and long hormone therapy can effectively promote height growth in kids with idiopathic short stature, not only by promoting IGF-1, Nesfatin-1, IGFBP-3, 25-(OH)D, and Ghrelin levels but also by promoting the improvement of bone metabolism indexes, which has good clinical value.

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