

Analysis of A Case of Growth Retardation of Infants Caused By Maternal Medication During Lactation

Junhua Zhang*

Function Department, Shijiazhuang Traditional Chinese Medicine Hospital, Shijiazhuang 050051, China

Abstract. Short stature in childhood and even adulthood mostly originates from infancy and young children. It has been reported that 30.7% of children start to experience short stature before 6 months of age, 32.3% of children start to experience short stature between 6 and 24 months of age, and 88.3% of children start to experience short stature before 3 years of age [1]. In outpatient visits to children with short stature, the proportion of idiopathic short stature (ISS) is as high as 41% [2]. This article discusses and analyzes cases of commonly used drugs during postpartum lactation that may lead to delayed growth and development in infants and young children, aiming to identify the causes of growth retardation in this stage and improve prevention and intervention for growth retardation in infants and young children.

1 General information

A children Male, the Han nationality born with a length of 51cm and a weight of 3.85kg, underwent cesarean section without intrauterine growth retardation, with an Apgar score of 10. He was breastfed 24 hours after birth, and due to maternal reasons, he took motherwort granules on the 3rd day after delivery until the 21st day of cessation (15g/dose, 2 times/day). During this period, he continued to breastfeed with sufficient milk. Preschoolers have a full moon length of 54cm and a weight of 4.85kg; At the age of 3 months, the body length is 60cm and the weight is 6.5kg; At the age of 6 months, the body length is 66cm and the weight is 8.1kg; 9-month-old, with a body length of 69cm and a weight of 8.9kg; 12 months old, with a body length of 72cm and a weight of 9.5kg; 15 months old, with a body length of 75cm and a weight of 9.9kg; 18 months old, with a body length of 78cm and a weight of 10.5kg; 21 months old, with a body length of 80cm and a weight of 11.0kg; At 24 months of age, the body length is 82cm and the weight is 11.5kg. My mother is 158cm tall and my father is 169cm tall. After birth, all laboratory tests (blood routine, urine routine, liver and kidney function, blood glucose, trace elements, thyroid function, etc.) were within the normal range, excluding milk protein allergy. At 12 months of age, insulin-like growth factor IGF-1: 64.1ng/ml (reference value 15-129ng/ml), imaging examination showed no significant abnormalities in the pituitary gland, and the secretion peak of growth hormone stimulation test was 10ng/dL.

2 Discuss

In this case, the postnatal body mass index and various laboratory indicators of the patient were within the normal range. Therefore, congenital intrauterine factors, malnutrition, chromosomal abnormalities, and chronic systemic disease factors were excluded. The growth rate of the patient slowed down, and the growth curve gradually deviated from the median by about -2SD (Refer to Table 1). The peak secretion of growth hormone stimulation test met the standard, and the concentration of IGF-1 was within the normal range. The clinical diagnosis was idiopathic delayed body development.

3 Analysis

Motherwort (*Leonurus japonicus* Houtt.) is a kind of herbal plant in the family Lamiaceae, which has effects of promoting blood circulation, resolving stasis, regulating menstruation, and relieving pain (Fig. 1). It is clinically used mainly for postpartum vaginal bleeding and postpartum abdominal pain [3-7]. By searching the chemical components of motherwort collected the Traditional Chinese Medicine Systems Pharmacology Analysis Platform (TCMSP), Li Conglin et al. [8] found that motherwort has 14 main components, and more than 120 compounds have been identified and classified (the chemical formula of the compounds is shown in Table 2 [9]) corresponding 216 targets (including 5 key targets AKT1, TP53, IL-6, CALM2, JUN), involving 59 biological processes, revealing the material basis and multi-dimensional pharmacological effects of motherwort. Many studies have also shown that

* Corresponding author: 13933022012@163.com

motherwort alkaloids can inhibit the J2/STAT3 signaling pathway [10], inhibit the Akt/MDM2/p53 signaling [11],

kill cancer cells, induce their apoptosis, ultimately inhibit the progression of malignant tumors.

Table 1. Standard deviation of infant height and weight (male).

(month/year)	-3SD		-2SD		-1SD		Median		-1SD		-2SD		-3SD	
	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)	Height (cm)	Weight (kg)
Born	45.2	2.26	46.9	2.58	48.6	2.93	50.4	3.32	52.2	3.73	54.0	4.18	55.8	4.66
2m	52.2	3.94	54.3	4.47	56.5	5.05	58.7	5.68	61.0	6.38	63.3	7.14	65.7	7.97
4m	57.9	5.25	60.1	5.91	62.3	6.64	64.6	7.45	66.9	8.34	69.3	9.32	71.7	10.39
6m	61.4	5.97	63.7	6.70	66.0	7.51	68.4	8.41	70.8	9.41	73.3	10.50	75.8	11.72
9m	65.2	6.67	67.6	7.46	70.1	8.35	72.6	9.33	75.2	10.42	77.8	11.64	80.5	12.99
12m	68.6	7.21	71.2	8.06	73.8	9.00	76.5	10.05	79.3	11.23	82.1	12.54	85.0	14.00
15m	71.2	7.68	74.0	8.57	76.9	9.57	79.8	10.68	82.8	11.93	85.8	13.32	88.9	14.88
18m	73.6	8.13	76.6	9.07	79.6	10.12	82.7	11.29	85.8	12.61	89.1	14.09	92.4	15.75
21m	76.0	8.61	79.1	9.59	82.3	10.69	85.6	11.93	89.0	13.33	92.4	14.90	95.9	16.66
24m	78.3	9.06	81.6	10.09	85.1	11.24	88.5	12.54	92.1	14.01	95.8	15.67	99.5	17.54
2.5y	82.4	9.86	85.9	10.97	89.6	12.22	93.3	13.64	97.1	15.24	101.0	17.06	105.0	19.13
3y	85.6	10.61	89.3	11.79	93.0	13.13	96.8	14.65	100.7	16.39	104.6	18.37	108.7	20.64
3.5y	89.3	11.31	93.0	12.57	96.7	14.00	100.6	15.63	104.5	17.50	108.6	19.65	112.7	22.13
4y	92.5	12.01	96.3	13.35	100.2	14.88	104.1	16.64	108.2	18.67	112.3	21.01	116.5	23.73
4.5y	95.6	12.74	99.5	14.18	103.6	15.84	107.7	17.75	111.9	19.98	116.4	22.57	120.6	25.61
5y	98.7	13.50	102.8	15.06	107.0	16.87	111.3	18.98	115.7	21.46	120.1	24.38	124.7	27.85
5.5y	101.6	14.18	105.9	15.87	110.2	17.85	114.7	20.18	119.2	22.94	123.8	26.24	128.6	30.22
6y	104.1	14.74	108.6	16.56	113.1	18.71	117.7	21.26	122.4	24.32	127.2	28.03	132.1	32.57
6.5y	106.5	15.30	111.1	17.27	115.8	19.62	120.7	22.25	125.6	25.89	130.5	30.13	135.6	35.11
7y	109.2	16.01	114.0	18.20	119.0	20.83	124.0	24.06	129.1	28.05	134.3	33.08	139.6	39.50
7.5y	111.2	16.70	116.8	19.11	121.9	22.06	127.1	25.72	132.4	30.33	137.8	36.24	143.4	43.99
8y	114.1	17.33	119.3	19.97	124.6	23.23	130.0	27.33	135.5	32.57	141.1	39.41	146.8	48.57

A study on data of physical growth and development of children in China (Before the age of 3 for the length)



Fig. 1. Herba Leonuri rhizomes and leaf flowers.

Table 2. Compounds isolated and identified from *L. japonicas* (chemical formulas).

1. C ₇ H ₁₄ ClNO ₂	2. C ₁₄ H ₂₁ O ₅ N ₃ ·HCl·H ₂ O	3. C ₂₂ H ₃₄ O ₆	4. C ₂₃ H ₃₆ O ₆
5. C ₂₀ H ₃₂ O ₅	6. C ₂₀ H ₃₂ O ₄	7. C ₂₀ H ₃₀ O ₄	8. C ₂₀ H ₃₀ O ₃ (5sorts)
9. C ₂₃ H ₃₆ O ₇	10. C ₂₄ H ₃₈ O ₇	11. C ₂₂ H ₃₆ O ₆	12. C ₂₂ H ₃₆ O ₅
13. C ₂₁ H ₃₄ O ₅ (3sorts)	14. C ₂₃ H ₃₆ O ₇	15. C ₂₁ H ₃₂ O ₆	16. C ₂₀ H ₃₀ O ₄₀
17. C ₂₀ H ₂₈ O ₃	18. C ₂₀ H ₂₈ O ₄ (2sorts)	19. C ₂₀ H ₂₉ O ₄	20. C ₂₅ H ₃₈ O ₈
21. C ₂₀ H ₂₈ O ₂	22. C ₂₀ H ₃₀ O ₃	23. C ₂₂ H ₃₂ O ₅	24. C ₂₀ H ₂₆ O ₃
25. C ₂₀ H ₃₆ O ₂	24. C ₂₀ H ₃₄ O ₃	25. C ₂₂ H ₃₄ O ₇	26. C ₂₀ H ₂₈ O ₄
27. C ₂₇ H ₃₀ O ₁₆	28. C ₁₅ H ₁₀ O ₇ (3sorts)	29. C ₂₁ H ₂₀ O ₁₂	30. C ₁₅ H ₁₀ O ₅
31. C ₃₆ H ₃₉ O ₁₉	32. C ₃₆ H ₃₈ O ₁₉	33. C ₃₆ H ₃₈ O ₂₀	34. C ₃₀ H ₂₆ O ₁₃
35. C ₂₇ H ₃₀ O ₁₆	36. C ₂₁ H ₂₀ O ₁₁	37. C ₂₇ H ₃₀ O ₁₅	38. C ₃₀ H ₂₆ O ₁₃
39. C ₂₁ H ₂₀ O ₁₁	40. C ₂₀ H ₂₀ O ₇	41. C ₁₅ H ₁₀ O ₄	42. C ₃₆ H ₃₈ O ₂₀
43. C ₃₄ H ₄₄ O ₁₉	44. C ₃₄ H ₄₄ O ₂₀ (2sorts)	45. C ₂₉ H ₃₆ O ₁₅	46. C ₄₃ H ₆₂ O ₁₉
47. C ₂₆ H ₄₀ O ₁₆	48. C ₂₀ H ₃₂ O ₁₆	49. C ₂₇ H ₄₂ O ₁₇	50. C ₁₄ H ₂₀ O ₇
51. C ₁₉ H ₂₈ O ₉	52. C ₈ H ₁₀ O ₂	53. C ₁₀ H ₁₂ O ₄	56. C ₁₇ H ₂₆ O ₁₀
57. C ₁₆ H ₂₂ O ₁₀	58. C ₁₂ H ₈ O ₄	59. C ₁₃ H ₁₁ O ₅	60. C ₁₆ H ₁₅ O ₅
61. C ₁₆ H ₁₄ O ₄	62. C ₁₅ H ₁₆ O ₅	63. C ₁₅ H ₁₆ O ₄	64. C ₁₅ H ₁₄ O ₄
65. C ₁₅ H ₁₆ O ₃	66. C ₂₃ H ₃₂ O ₆	67. C ₂₄ H ₃₂ O ₆	68. C ₂₀ H ₁₈ O ₆
69. C ₂₀ H ₂₀ O ₇	70. C ₂₉ H ₄₈ O ₂	71. C ₂₉ H ₄₈ O ₃	72. C ₃₀ H ₅₀ O
73. C ₃₀ H ₄₈ O ₃	74. C ₂₉ H ₄₈ O ₂	75. C ₃₀ H ₄₄ O ₃	76. C ₃₀ H ₅₂ O ₂
77. C ₃₀ H ₄₈ O ₄	78. C ₃₀ H ₄₆ O	79. C ₄₄ H ₇₈ O ₄	80. C ₃₀ H ₅₀ O
81. C ₃₀ H ₄₈ O ₃	82. C ₁₁ H ₁₄ O ₅	82. C ₈ H ₈ O ₄	83. C ₉ H ₁₀ O ₅
84. C ₉ H ₈ O ₄	85. C ₁₄ H ₂₀ O ₉	86. C ₇ H ₈ O ₂	87. C ₁₀ H ₁₂ O ₃
88. C ₈ H ₁₀ O ₃	89. C ₁₀ H ₁₀ O ₅	90. C ₁₀ H ₁₀ O ₄	91. C ₁₃ H ₂₀ O ₃
92. C ₇ H ₆ O ₂	93. C ₂₉ H ₄₈ O (3sorts)	94. C ₇ H ₆ O ₃	95. C ₃₁ H ₄₀ O ₁₅

As is well known, newborn children grow and develop rapidly, and GH and IGF-1 are important regulatory factors for longitudinal growth. Glucocorticoids, paracrine growth factors including various FGF, BMP, Wnt signaling pathways, parathyroid hormone related peptides, Indian hedgehog factor, and C-type natriuretic peptide can all affect the growth and development of infants and young children. It has been confirmed that an increasing number of genes are associated with dwarfism, and mutations in the paracrine

signaling system can seriously damage bone growth [12]. Growth hormone mainly promotes bone growth by stimulating the division of chondrocytes in the growth plate. If the growth plate is involved in the proliferation, hypertrophy, and secretion of extracellular matrix of chondrocytes, genetic abnormalities can also lead to a slower growth rate in young children [13].

4 Conclusion

The DrugBank database consists of approximately 800 genes that are well-characterized drug targets, and rare mutations in drug target genes can lead to complex diseases and are widespread [14]. During the neonatal period, the mother absorbed the components of Leonurus japonicus through her breast milk, and the time was long. The rapid growth and development of the infant required many factors and signal pathways to participate in, the chemical composition of Leonurus heterophyllus and its influence on signal pathway may lead to the corresponding gene variation during its growth, such as paracrine growth factor, growth plate involved in cartilage extracellular matrix and so on. The author advocated breast-feeding period as far as possible without medication or less medication, if necessary for the condition of the case of drug use, to infant formula.

Declaration of conflict of interest

The manuscript's author, Jun-hua Zhang has no conflicts of interest or financial ties to disclose.

Ethical Statement

This study has been to comply with medical ethics and protect the rights of the subjects. The child's guardian has agreed to publish this study.

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