

Nutritional therapy in obesity complicated by primary hypertension: a case study

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Abstract

Objective This study explored the therapeutic value of nutritional intervention in treating a patient with obesity complicated by primary hypertension.

Methods A patient with obesity and primary hypertension received an individualized nutritional intervention devised and continuously monitored by clinical nutritionists. The program included supplementation with probiotics, water-soluble vitamins, branched-chain amino acids, and whey protein powder. The nutritional plan was maintained for four weeks, with ongoing assessment of body weight and blood pressure. Antihypertensive medications were discontinued during follow-up.

Results After four weeks of nutritional therapy, the patient lost 5.2 kg in weight, and blood pressure normalized and remained stable even after cessation of antihypertensive drugs. No adverse reactions were observed.

Conclusion Nutritional therapy may provide a new, non-pharmacological option for managing obesity accompanied by primary hypertension. Its benefits may stem from improvements in metabolic function, insulin sensitivity, and inflammation, offering an alternative strategy to conventional pharmacotherapy.

Keywords: primary hypertension, obesity, nutritional therapy, weight management, metabolic syndrome

Introduction

With the improvement of living standards and lifestyle changes, the prevalence of obesity in China has

grown rapidly. In 2025, the proportion of overweight or obese adults in China is projected to reach 38.2%, an increase of 3.6% compared with 2015 ^[1]. Obesity often leads to elevated blood pressure, which results

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from the direct effects of excessive adipose tissue on the onset and progression of hypertension. Specifically, adipose tissue can activate the renin–angiotensin–aldosterone and sympathetic nervous systems and cause insulin and leptin resistance, an inflammatory state, alterations in endocrine function, and impaired water-sodium regulation, all of which contribute to elevated blood pressure [2].

The intervention approach for this case of a patient with obesity complicated by primary hypertension involved dietary supplementation to correct the patient's nutrient deficiencies alongside a nutrition-based weight loss program. To achieve the best possible therapeutic outcome, clinical nutritionists with extensive clinical experience and a solid foundation in nutrition were involved in the formulation, implementation, monitoring, and adjustment of the nutritional therapy plan for this patient throughout the intervention period.

Case Information

The patient was a 38-year-old male with a history of hypertension who had been taking oral antihypertensive medications to control his blood pressure. He presented to the clinic in April 2025 with the complaint of “a three-year history of diagnosed hypertension and poor weight loss results despite self-initiated dietary restrictions.” Three years previously, he had been diagnosed with primary hypertension and had started taking antihypertensive medications regularly. His blood pressure fluctuated between 110/90 and 140/100 mmHg. His previous body mass index was 32.9 kg/m² (height 159 cm, weight 83.3 kg), with an upper arm circumference of 32 cm, a waist circumference of 92 cm, a hip circumference of 105 cm, and a thigh circumference of 50 cm. Ultrasonography of the liver, gallbladder, spleen, and pancreas indicated that the patient had fatty liver. In addition, blood tests revealed the following re-

sults: a ferritin level of 485 ng/mL; a serum vitamin D level of 12.1 ng/mL; a fasting C-peptide level of 1 153 pmol/L; a fasting insulin level of 103 pmol/L; a blood uric acid level of 446.7 μmol/L; an alanine aminotransferase level of 162.4 IU/L; an aspartate aminotransferase level of 67.6 IU/L; a γ-glutamyltransferase level of 60.7 IU/L; a total cholesterol level of 6.55 mmol/L; a low-density lipoprotein level of 5.05 mmol/L; and an apolipoprotein B level of 1.57 g/L. The diagnoses were 1) primary hypertension and 2) obesity.

Nutritional Therapy Process

Pre-Intervention Nutritional Assessment and Clinical Laboratory Indicator Evaluation

Dietary Survey: The patient had been attempting to lose weight through self-imposed dietary restrictions before the visit, which had resulted in inadequate intakes of carbohydrate, protein, and fat.

Medication History: The patient took irbesartan (an angiotensin receptor blocker, 150 mg/day) orally in the morning and nifedipine sustained-release tablets (a calcium channel blocker, 10 mg/day) orally after dinner.

Formulation of an Individualized Nutritional Intervention Plan

Nutritional Goals:

Calorie Restriction: The patient's daily calorie intake was restricted to ~1500–1800 kcal, with adjustments made to the energy contribution ratios of various nutrients.

Key Adjustments:

Sodium intake was restricted to less than 2000 mg/day (equivalent to less than 5 g of salt/day).

Potassium intake was set at 3500 mg/day (achieved

through consuming 500 g of fruits and vegetables daily).

Probiotics were administered to regulate the gut microbiota.

Water-soluble vitamins were supplemented to provide coenzymes necessary for metabolism.

Branched-chain amino acids were used to improve liver function and promote muscle gain.

Whey protein powder was provided to offer high-quality protein and facilitate protein synthesis.

Implementation Strategies:

Dietary Pattern:

A balanced combination of refined and whole grains as staple foods was advised, with a focus on vegetables, meat, eggs, and dairy products.

Behavioral Interventions:

Keeping a dietary diary.

Weighing oneself every morning.

Limiting or abstaining from alcohol consumption.

Dynamic Monitoring:

Daily monitoring of blood pressure and weight.

Reviewing relevant laboratory tests every 4 weeks.

Dynamic Adjustments

Before Intervention: The patient’s average blood pressure was 130/92 mmHg (dependent on medication).

Day 7 of Intervention: Blood pressure stabilized at

125/85 mmHg, and nifedipine was discontinued.

Day 10 of Intervention: Blood pressure improvements were maintained at 120/78 mmHg, and irbesartan was discontinued (meaning the patient had discontinued all antihypertensive medications).

Day 14 of Intervention (4 days after the patient had discontinued all antihypertensive medications): Blood pressure improved further to 115/82 mmHg, with a heart rate of 65–75 beats per minute.

Day 21 of Intervention: Weight continued to decrease, and blood pressure remained stable.

Day 28 of Intervention: Weight decreased by 5.2 kg (body mass index dropped to 30.8 kg/m²), and blood pressure remained stable.

Changes in Observed Indicators After 28 Days of Intervention

Changes in Anthropometric and Laboratory Examination Indicators

After 28 days of nutritional intervention, the patient’s ferritin levels significantly decreased, which indicates a gradual resolution of chronic inflammation [3]. The deficiency in vitamin D showed improvement, and the patient was subsequently advised to increase the supplementation dose to achieve normal levels. Both fasting C-peptide and fasting insulin levels significantly decreased, which suggests a marked improvement in insulin resistance. Homocysteine levels tended towards normal, which indicates an improvement in the body’s methylation function. Liver function largely returned to normal, oxidative stress was alleviated, uric acid levels normalized, and dyslipidemia significantly improved (Table 1).

Fluctuations in Average Blood Pressure

The patient’s average blood pressure was maintained at 130/92 mmHg with medication before the intervention; therefore, control of systolic blood pressure was insufficient. On the 7th day of the intervention, the patient’s blood pressure stabilized at 125/85 mmHg, and the first antihypertensive drug, nifedipine, was discontinued. On the 10th day of the intervention, the patient’s blood pressure stabilized at 120/78 mmHg, and the second drug, irbesartan, was discontinued (meaning the patient had discontinued all antihypertensive medications). On the 14th day of the intervention (4 days after complete

discontinuation), the patient’s average blood pressure was maintained at 112.5/82.5 mmHg. The fluctuations in average blood pressure during the 28-day intervention period are shown in Figure 1.

Discussion

For patients with obesity complicated by primary hypertension, the primary task of nutritional therapy is to control total energy intake, adjust the intake ratio of the three major nutrients, and reduce body weight. Studies have confirmed that a weight loss of 5% to 10% can lower systolic blood pressure by 5 to 20 mmHg (con-

Table 1. Changes in observed indicators before and after nutritional intervention.

Observed Indicators	Before Intervention	28 Days After Intervention	Change Value*
Height (cm)	159	159	/
Weight (kg)	83.3	78.1	-5.2
Body Mass Index (kg/m²)	32.9	30.8	-2.1
Ferritin (ng/mL)	485	373	-112
Serum Vitamin D (ng/m)	12.1	26.8	+14.7
Fasting C-peptide (pmol/L)	1153	809	-344
Fasting Insulin (pmol/L)	103	56.2	-46.8
Homocysteine (umol/L)	30.1	12	-18.1
Blood Uric Acid (umol/L)	446.7	323	-123.7
Alanine Aminotransferase (IU/L)	162.4	54.6	-107.8
Aspartate Aminotransferase (IU/L)	67.6	29	-38.6
γ-Glutamyltransferase (IU/L)	60.7	29.5	-31.2
Total Cholesterol (mmol/L)	6.55	4.08	-2.47
Low-Density Lipoprotein (mmol/L)	5.05	2.72	-2.33
Lipoprotein B (g/L)	1.57	0.94	-0.63

Note: * “-” indicates a decrease in the indicator compared with before the intervention; “+” indicates an increase in the indicator compared with before the intervention.

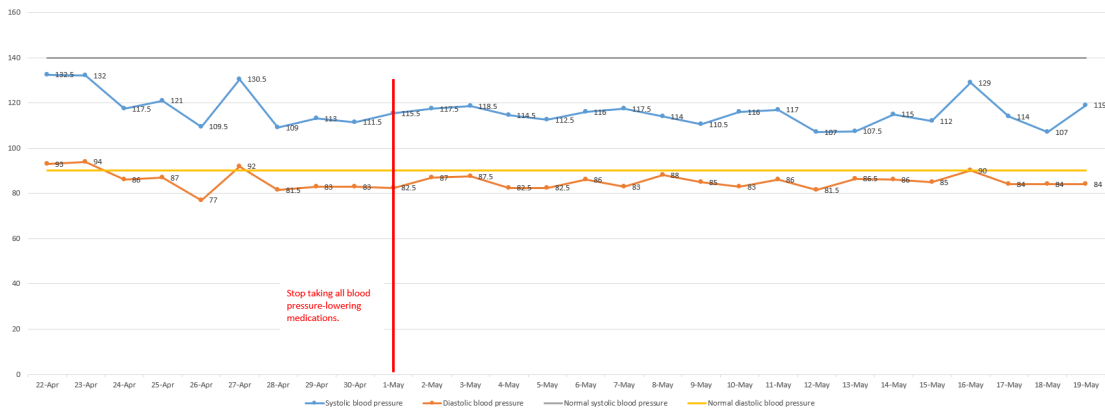


Figure 1. Fluctuations in the patient’s average blood pressure during the 28-day intervention period.

sistent with the reduction in systolic blood pressure in this case) ^[4]. Nutritional therapy is a prerequisite for weight loss. The personalized nutritional therapy for this patient was divided into two parts: first, correcting previous incorrect dietary habits and ensuring that the patient consumed the energy required for daily life; and second, supplementing various nutrients to improve nutritional deficiencies and regulate and stabilize numerous pathologies caused by obesity ^[5].

For this patient, nutritional therapy involved calculating the amount of food needed for three meals a day and incorporating nutritional components into them. This ensured that the patient received all required nutrients while losing weight. The patient's blood pressure was closely monitored, and their antihypertensive medication regimen was adjusted promptly to avoid excessively low blood pressure. During the nutritional therapy process, clinical nutrition doctors provided guidance throughout and maintained close communication with the patient to answer questions and maximize the personalized nutritional therapy plan benefits ^[6].

Nutritional supplements such as probiotics, water-soluble vitamins, branched-chain amino acids, and whey protein powder were used for this patient. Patients with obesity often have problems with intestinal flora imbalance. Supplementation with probiotics can increase the abundance of beneficial bacteria in the patient's body, inhibit the growth of pathogenic bacteria, repair the intestinal barrier function, and reduce chronic inflammation caused by endotoxins entering the bloodstream ^[7]. Additionally, improving the intestinal flora of obese patients through probiotics can affect bile acid metabolism and short-chain fatty acid production, reduce the decomposition efficiency of fat in food, and decrease fat absorption ^[8]. Studies have shown that a high-sugar and high-fat diet can lead to vitamin B deficiency and exacerbate metabolic disorders. By contrast,

supplementation with vitamin B can increase the basal metabolic rate by 5% to 10% ^[9, 10]. In addition, vitamin C can promote carnitine synthesis, accelerate the transport of fatty acids to mitochondria, enhance fat oxidation, and neutralize free radicals to reduce the effects of oxidative stress on fat cells ^[11]. Therefore, supplemented water-soluble vitamins can serve as coenzymes and directly participate in the metabolic processes of carbohydrates, fats, and proteins ^[10-12]. Branched-chain amino acids can improve liver function and muscle synthesis in obese patients. Specifically, leucine can increase the abundance of propionate-producing bacteria (such as *Ruminococcus flavefaciens*), inhibit the expression of liver fat-generating genes, and reduce fat accumulation ^[13]. In addition, leucine strongly activates the mechanistic target of rapamycin complex 1 pathway, promotes muscle protein synthesis, and increases the resting metabolic rate ^[14]. Obese individuals often have branched-chain amino acid metabolism disorders; these lead to the accumulation of branched-chain amino acids in the blood, which induces insulin resistance. Supplementation with branched-chain amino acids can restore the activity of degradation enzymes, improve glucose metabolism, and alleviate insulin resistance ^[15]. Whey protein powder can provide a high-quality protein source for obese patients, which facilitates fat loss and muscle gain ^[16]. Overall, the synergistic effect of multiple nutrients helped this patient lose weight and achieve the goal of blood pressure control while reducing or discontinuing medication ^[17, 18].

In summary, nutritional therapy for this patient integrated the clinical experience of the cardiology department and the fundamentals of clinical nutrition. Professional advice on personalized nutritional therapy was provided to the patient, and close contact and monitoring of the patient's blood pressure were maintained through online methods. This effectively promoted the rationale for and efficacy of nutritional therapy, reduced the patient's

psychological stress, avoided adverse reactions and complications caused by medications, and provided professional answers to the patient's questions during the treatment process. In this patient, personalized nutritional therapy enabled them to discontinue antihypertensive medications. The patient recognized the value of advice from the medical staff and, therefore, accepted and adhered to it. This case provides a framework for similar patients who require weight loss interventions. In future research, we will focus on observing the significance of reducing insulin resistance and balancing inflammatory factors in dietary guidance for patients with obesity complicated by hypertension.

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Author contributions

Kun Zhang and Hongshi Liu conceived and designed the study, and wrote the original manuscript. Jinhua Bao and Chaorui Xu were responsible for data collection, data curation, and preliminary analysis. Lu Bo contributed to the visualization of data, including the creation of tables and figures. Yuze Li developed the theoretical framework and reviewed the manuscript. All authors read and approved the final manuscript.

Conflicts of Interest

All authors declare that there are no conflicts of interest in this article.

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