The Effect of Bofutsushosan on Weight Reduction in Humans

Takashi ITOHa Shoko SENDAb Hiroki INOUEb
Yasuhide SAITOHa Masaru KAGAMIC Fuminori MATSUBARAC
Haruhiko AOYAGIC

a Center for Japanese Oriental Medicine, Kashima Rosai Hospital, Labour Welfare Corporation, 1-9108-2 Douihocho, Kamis, Ibaraki 314-0343, Japan
b Department of Internal Medicine, Kashima Rosai Hospital
c Department of Pharmacy, Kashima Rosai Hospital

Abstract

We administered Bofutsushosan (Bo) to 127 obese patients who consulted our clinic, and investigated the effect of this herbal formula on reducing body weight in 33 obese patients who received continuous administration for more than six months. The abdominal muscle tension of these 33 patients was assessed mainly as “strong” (four) under the five-grade scale of Kampo diagnostics, which was higher than that of 9 other patients with side effects (including diarrhea and abdominal pain) assessed mainly as “middle” (three). Sixteen patients reported a decrease in appetite following administration of Bo. Weight before medication in the patients with decreased appetite was 67.1 ± 2.5 kg, and that in 17 patients with unchanged appetite was 75.9 ± 2.4 kg. There was a significant difference between the two. Weight change in the patients with decreased appetite was -4.8 ± 1.0 kg and was significantly lower than -1.4 ± 0.7 kg in the patients with unchanged appetite. Their blood triglycerides levels decreased significantly following administration of Bo. This decrease in appetite was considered to be due not only to activation of the adrenaline β receptor, through the administration of Ephedrae Herba, Schizonepetae Spica, Rhei Rhizoma, Forsythiae Fructus and Glycyrrhizae Radix but also to the psychotropic actions of Ephedra Herba, Rhei Rhizoma and Gardeniae Fructus. Recently severe side effects of Bo have been reported. This study suggested that patients showing a grade of strong (four) or more in abdominal muscle tension, were indicated for this treatment and that the long-term administration of this herbal formula should be continued in patients whose appetite was identified as being suppressed.

Key words: appetite, body mass index (BMI), Bofutsushosan, obesity, weight

要旨

外来を受診した肥満患者127例に一定に防風通聖散（Bo）を投与し、6カ月以上服薬できた33例についてエキス剤の体重減量効果を検討した。対象例の腹力は5段階で（4）以上の者が多かったが、これは服薬前後の副作用で長期投与が出来なかった9例で中間（3）が多かったのに対照して、腹力の強さをつけた者に高かった。服薬後の食欲低下は16例に認められた。食欲低下例と食欲不変例の投与前の体重はそれぞれ67.1±2.5kg, 75.9±2.4kgであり、推計学的有意差が認められた。食薬低下例の体重の変化は-4.8±1.0kgで、食欲不変例の-1.4±0.7kgに比較して明らかに差がみられた。血中の中性脂肪値はBo投与後有意に低下した。作用機序として麻黄、荊芥、大黄、連翹、甘草によるAdrenalina β receptorの活性化だけでなく、大黄と山梔子による向精神作用が推測された。近年本薬に関する重要な副作用報告がなされている。本剤の投与対象は腹力が強（4）以上が望ましく、長期投与は食欲低下が認められる例によいと思われた。

キーワード：食欲、体格指数、防風通聖散、肥満、体重

* Corresponding author : Takashi ITOH
Received 18 November 2004, Accepted 8 August 2005
Introduction

It was just a few years ago that the Chinese herbal weight loss aids Chaso and Onshido induced acute liver injury in many patients, leading to death in some patients. N-Nitroso-fenfluramine, which does not exist in nature, was added to these herbal supplements in order to decrease appetite and was the cause of these adverse effects. That event evoked a worldwide attention to side effects of "natural medicines" or supplements. Recently, the inappropriate usage of supplements including Ephedra Herba without artificial chemical compounds, had caused severe cardiovascular events including death. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

Mazindol and the Kampo medicine Bofutsusho-san (Bo) are approved for treating obesity under the Japanese insurance system. Mazindol can be used for three months or less only in obese patients whose body mass index (BMI) is thirty-five or more kg/m². Bo can be used for such patients without these limitations. Ephedra Herba is one of the agents used in Kampo medicine, which has been carefully practical for about two thousand years. These unfortunate recent events might be due to ignorance about traditional medicine, and the difficulties experienced by obese patients in weight reduction efforts.

There were nine adverse effects including five patients with diarrhea, two patients with abdominal pain and two patients with abdominal discomfort, but these symptoms promptly disappeared after discontinuing administration. In eight of the nine patients, Bo administration was stopped within the first two days, and in one, it was stopped after six weeks. There were no patients with liver dysfunction. The details

Table 1 Distribution of obese patients administered Bofutsusho-san by the body mass index (BMI) and the administration period.

<table>
<thead>
<tr>
<th>BMI</th>
<th>SE</th>
<th>&lt;2 months</th>
<th>&lt;6 months</th>
<th>6 months</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25</td>
<td>1/0</td>
<td>3/1</td>
<td>10/2(2)</td>
<td>7/0</td>
<td>24/2</td>
</tr>
<tr>
<td>&lt;30</td>
<td>3/0</td>
<td>8/3 (1)</td>
<td>9/4</td>
<td>17/1</td>
<td>37/8</td>
</tr>
<tr>
<td>&lt;35</td>
<td>4/0</td>
<td>5/2 (2)</td>
<td>11/1(1)</td>
<td>11/1(1)</td>
<td>31/4</td>
</tr>
<tr>
<td>≥35</td>
<td>0/0</td>
<td>3/1 (1)</td>
<td>1/0</td>
<td>5/0</td>
<td>9/1</td>
</tr>
<tr>
<td>total</td>
<td>9/0</td>
<td>25/7</td>
<td>34/8</td>
<td>42/2</td>
<td>110/17</td>
</tr>
</tbody>
</table>

Subjects and methods

Background

Between April 2001 and March 2004, 127 patients consulted the outpatient clinic of the center of Japanese Oriental Medicine of our hospital to reduce weight under treatment with Kampo medicine. Of these 127, there were 90 obese patients whose body mass index (BMI) 25.0 kg/m² or more after excluding eleven patients whose weight or height data were not recorded. Twenty-six patients had a BMI under 25.0 kg/m². We administered Bo to all obese patients who expressed a desire to reduce weight at their first consultation. Informed consent was obtained from each patient. 119 patients were administered an extract of Kampo medicine, Bo (7.5 gram per day, Kanebo., Ltd.) and the other eight patients were administered a decoction of the same prescription according to patient preference. There were nine adverse effects including five patients with diarrhea, two patients with abdominal pain and two patients with abdominal discomfort, but these symptoms promptly disappeared after discontinuing administration. In eight of the nine patients, Bo administration was stopped within the first two days, and in one, it was stopped after six weeks. There were no patients with liver dysfunction. The details
of BMI and the administration period are shown in Table 1. Thirty-three female obese patients who were administered the extract for more than six months were investigated in this study. Two male obese patients who were administered Bo for more than six months were excluded from this study (Table 1).

Characteristics of the subjects

In patients receiving long-term administration of Bo, the mean age was 54.9 ± 2.1(Mean±S.E.) years, height was 152.9 ± 1.0 cm, weight was 71.6 ± 1.9 kg and BMI was 30.6 ± 0.7 kg/m². The laboratory lipid data were as follows: Total cholesterol was 230.8 ± 8.9 mg/dl (n=31), triglyceride was 145.5 ± 13.5 mg/dl (n=30) and HDL cholesterol was 66.4 ± 4.0 mg/dl (n=29). A constipation tendency was recognized in twenty-two patients (67%). The five-grade assessment of abdominal muscle tension (strongest, strong, middle, weak and weakest) based on the standards of Kampo medicine showed nineteen patients were categorized as strong grade, eight patients as middle, 4 patients as strongest and 2 patients as weak.

Weight was measured at a similar time during each monthly check-up while wearing a similar weight of clothes. All patients had experienced difficulty in reducing weights by diet alone. At the beginning of Bo, we did not strongly promote any diet, nor did we prohibit dieting. We did not encourage patients to increase their daily exercise, neither.

Method

Comparison of the grade of abdominal muscle tension between patients who were administered Bo for more than six months and patients who discontinued Bo due to side effects.

Changes in the subjects’ weights were investigated every four weeks (one month) for twenty-four weeks (six months) following the administration of Bo. And their weights and BMI were analyzed based on two categories of change in appetite and following a reducing diet. Decrease in appetite was assessed in a range from anorexia all day to just a feeling of fullness during eating earlier than that before medication.

The laboratory lipid data including total cholesterol, triglyceride and HDL cholesterol before and after six months of Bo administration were statistically analyzed.

Statistical methods

Spearman’s correlation coefficient by rank was used for comparison of abdominal muscle tension between patients with long-term administration of Bo and patients with side effects.

We used unpaired t-test for comparison of the two groups before medication, one-factor analysis of variance (ANOVA) for analysis of weight changes in one group and repeated measured ANOVA for weight changes between two groups during the study period.

We also used paired t-test for comparison of the lipid blood levels before and after medication. Statistical significance was defined as p<0.05.

### Table 2

Comparison of the grade of the abdominal muscle tension between patients administered Bofutsushosan (Bo) for more than six months(*) and patients who discontinued Bo administration due to side effects (△). Abdominal muscle tension was assessed in five grades as strongest, strong, middle, weak and weakest under the standard of Kampo medicine. There was a significant difference between the two groups using Spearman’s correlation coefficient by rank (p=.00415).

<table>
<thead>
<tr>
<th>Grade of abdominal muscle tension</th>
<th>Weak</th>
<th>middle</th>
<th>strong</th>
<th>strongest</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>patients over 6Mo *</td>
<td>2</td>
<td>8</td>
<td>19</td>
<td>4</td>
<td>33</td>
</tr>
<tr>
<td>patients with SE△</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

### Table 3

Change in appetite in patients following a reducing diet and in patients not following a diet during the oral administration of Bo.

<table>
<thead>
<tr>
<th>Appetite</th>
<th>No dietary restriction</th>
<th>Dietary restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>since one month before</td>
<td>simultaneously or within one month</td>
</tr>
<tr>
<td>Unchanged</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Decreased</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>11</td>
</tr>
</tbody>
</table>
Results

1) Comparison of abdominal muscle tension between patients with long-term administration of Bo and patients who discontinued administration due to side effects (Table 2).

The abdominal muscle tension of the patients with that long-term administration was significantly higher than that of patients with side effects.

2) Dieting and change in appetite (Table 3).

Reduction of dietary intake was begun in nine patients simultaneously or within less than one month before the medication. Eleven patients already had reduced their diet over one month before medication. Thirteen patients had not reduced dietary intake before the medication or throughout the medication period.

Sixteen patients reported a decrease in appetite, and the other seventeen patients reported no change. A decrease in appetite was observed in eleven of these patients from the first week of Bo administration, then gradually became obscure in most of them. Two patients continued to feel an appetite decrease after two months of Bo administration, and one patient continued to feel a decrease after three months. Two patients reported no change in normal appetite, but their desire to overeat decreased.

There was no difference in the percentage of patients with decreased appetite among patients who did not follow a reducing diet, patients who followed reducing diet for over two months before medication and patients who began a reducing diet almost simultaneously.

3) Change in weight and BMI (Table 4).

Weight gradually decreased from 71.6 ± 1.9 kg to 68.6 ± 2.2 kg six months following oral administration of Bo, but there was no significance using one-factor ANOVA. BMI also showed a similar tendency during this study.

4) Comparison weights and BMI with a reducing diet and a decrease in appetite (Table 4).

We compared weight, BMI and age between patients following a reducing diet and patients who did not follow a diet. There was no difference in any parameter between groups. Weight change in patients following a diet was -4.5 ± 0.9 kg over six months, showing a greater loss than -0.8 ± 0.8 kg in patients without dieting. Similar tendency was also recognized in change of BMI.

Weight, BMI and age before medication were similarly between patients with an appetite decrease and those with no change. Weight of patients with appetite decrease was 67.1 ± 2.5 kg, which was significantly lower than 75.9 ± 2.4 kg in patients with no change in appetite. BMI of patients with an appetite decrease was 28.3 ± 0.8 kg/m², lower than 32.8 ± 1.0 kg/m² in patients with no appetite change, which was also significantly different.

Following the oral administration of Bo for six months, weight change in patients with an appetite decrease was -4.8 ± 1.0 kg, which was a greater loss than -1.4 ± 0.7 kg in patients with no appetite change.

5) Weight changes in groups classified by dieting and a decrease in appetite (Figure 1).

On repeated measure ANOVA, weight changes in groups classified by dieting and a decrease in appetite showed a significantly greater variance between subjects as well a variance within subjects between...
the 3rd to 6th month of medication. Otherwise, there was no difference recognized in interaction between the two during this period.

6) Changes in blood pressures and blood lipid data (Table 5).

Systolic and diastolic blood pressures at rest did not change following the administration of Bo.

Changes in blood lipid data were analyzed in twenty-three patients after excluding three patients who were administered an anti-hyperlipidemia drug. There was a slight decrease in total cholesterol. Triglyceride decreased after six months of Bo administration. The decrease in triglyceride occurred not only in patients with appetite decrease and appetite unchanged, but also in patients dieting or not dieting (Data not shown). There was no change in HDL cholesterol.

Figure 1 Comparison of weight following oral administration of Bofutsushosan between two classifications.

Panel A, the patients following a reducing diet and the patients not following a diet. Open squares, patients not following a diet. Closed squares, patients following a restricted diet.

Panel B, the patients with unchanged appetite and the patients with a decreased appetite. Open circles, patients with no change in appetite. Closed circles, patients with a decreased appetite.

Discussion

In this paper, we confirmed a reasonable result that dieting and a decrease in appetite were the clinically most important factors for weight reduction in obese patients following the oral administration of Bo.

There was no difference in weight or BMI between patients who followed a reducing diet and patients who did not. However, there was a difference in appetite reaction to Bo by degree of obesity. The BMI of patients who felt a decrease in appetite following the oral administration of Bo was less than that of patients who did not feel a decrease. It was supposed that more obese patients could hardly feel a decrease in appetite.

Of 127 patients, there were only two patients who felt an appetite decrease to the extent of anorexia all
day. Many patients reported that Bo helped them to feel full slightly earlier than before or reduced desire to overeat. Some patients became less irritable when not eating and noticed a greater psychological stability than before.

The sixteen patients with an appetite decrease might have been able to reduce their dietary intake regardless of whether they intended to because they had reduced their weight apparently. Nevertheless their feeling of a decrease in appetite gradually became obscure, and it was supposed that they might have become accustomed to reduced dietary consumption, since their weight did not re-increase during medication. This action was mild, but might be definite even in some patients who reported becoming hardly able to feel the decrease in appetite because they felt an appetite increase after forgetting to take Bo.

The action mechanism involved in the appetite decrease is unknown. There is a possibility that some factors other than Bo might influence their appetite. Of these factors, the reducing diet itself might be a relatively stronger factor, but it would be much weaker than Bo because the appetite decrease was similarly recognized in patients who did not follow a reducing diet, patients who had followed a reducing diet for more than one month before starting this medication and patients who started a reducing diet almost simultaneously.

The BMI decrease was smaller in patients reporting no change in appetite compared to that in patients with an appetite decrease in our study. The severity of obesity may also influence the effect of Bo on appetite.

It is easy to think that this action of suppressing appetite might be due to Ephedrae Herba (麻黄), which stimulates the sympathetic nerves. Ephedrae Herba was reported to be a dangerous supplement, which induced severe cardiovascular events including death and permanent disability31. In the U.S., The Food and Drug Administration (FDA) proposed limits on the dose and duration of supplements include ephedra alkaloids and finally stopped their sale as a supplement in April 2004. Ephedrae Herba is one of the important medicinal plants that need to be used very carefully in Kampo medicine similar to Rhei Rhizoma (大黄) and Natrium Sulfuricum (芒硝). Kampo diagnostics might prevent their side effects when monitored by a physician trained in traditional medicine because these herbs should be limited to patients whose abdominal muscle tension has been assessed as strong or strongest on the five-grade scale.

The superiority of Kampo diagnostics was shown by the result that simple diagnostic technique for assessment of the abdominal muscle tension could prevent side effects including abdominal pain and diarrhea.

Considering that the amount of Ephedra Herba was just 1.2 g/day and there were no patients with palpitation or insomnia, stimulation of sympathetic nerve system by this herb might not have been excessive. We could not account for the decrease in appetite by Ephedrae Herba only.

The mechanism of reducing dietary intake by Bo administration has been clarified. Ephedrae Herba promotes stimulation of Norepinephrine, and Schizonepetae Spica (荆芥), Rhei Rhizoma, Forsythiae Fructus (連翘) and Glycyrrhizae Radix (甘草) inhibit phosphodiesterase. All these medicinal plants promote Adrenalin β receptors on fat cell surfaces, increase intracellular cyclic AMP. These actions were considered to enhance thermogenesis in the brown adipose tissue, lipolysis of triglycerides and inhibition of triglyceride synthesis32-34.

The decrease in blood triglyceride observed in this study was due to this action. This action may be also associated with the decrease in appetite. Unlike animals with weight loss without changes in dietary intake after Bo administration shown by previous

---

Table 5  Changes in blood pressure and blood lipid level after the administration of Bofutushosan

<table>
<thead>
<tr>
<th></th>
<th>Systolic pressure</th>
<th>Diastolic pressure</th>
<th>Total cholesterol</th>
<th>Triglyceride</th>
<th>HDL-chol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(mmHg)</td>
<td>(mmHg)</td>
<td>(mg/dl)</td>
<td>(mg/dl)</td>
<td>(mg/dl)</td>
</tr>
<tr>
<td>Number</td>
<td>33</td>
<td>33</td>
<td>23</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>Before</td>
<td>134.5±2.9</td>
<td>80.6±1.4</td>
<td>234.2±9.6</td>
<td>161.6±17.3</td>
<td>61.7±2.6</td>
</tr>
<tr>
<td>After</td>
<td>129.2±2.8</td>
<td>79.7±1.5</td>
<td>222.4±6.6</td>
<td>65.6±3.1</td>
<td>65.9±3.2</td>
</tr>
<tr>
<td>(p-value)</td>
<td>n.s.</td>
<td>n.s.</td>
<td>0.096</td>
<td>&lt;.0001</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

(mean±SE)
studies, the patients in this study showed weight loss only when their dietary intake decreased. In obese patients without changes in dietary intake, though fat was reduced by Bo, their dietary intake may have increased, resulting in no changes in weight. The decrease in appetite in humans observed in this study may be due to not only the above-described promotion of the degradation of fat cells but also other actions.

A possible psychotropic action by Bo might also contribute to the decrease in appetite. Many patients in this study reported feeling in a good mood during the administration of Bo. And we have the experience that some depressed patients could recover by the administration of Bo only. This psychotropic effect of Bo has not been reported, but Senmeiron (宣明論), which is the classic paper about Bo, indicated that a mental disorder described as delirium and excitement (謝妄驚狂) was one of the indications for Bo. Rhei Rhizoma and Gardeniae Fructus (山梔子) are reported to have a psychotropic action.

Bo may be used too widely for many women who desire to reduce weight. It would be meaningless except as a laxative drug to continue administration in patients with no change in appetite who do not follow a reducing diet. Some adverse events including severe liver injury and interstitial pneumonia due to Bo have been reported. Although these events were infrequent, administration of Bo should not be continued to obese patients without a good response.

In this paper, we point out that a decrease in appetite following the administration of Bo is one of the important factors influencing the decrease in body weight and that assessment of abdominal muscle tension is important for preventing side effects including diarrhea and abdominal pain. Further investigation into the effect of Bo should be performed.

References