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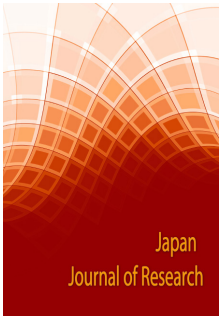
Short Communication



Patients with Severe Obesity and Hypertension-Antihypertensive Treatment Before and After Bariatric Surgery-Five Years of Follow-Up

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Obesity, laparoscopic sleeve gastrectomy, hypertension

Abstract

Background: *Hypertension is the most common comorbidity associated with obesity. Hypertension can be treated with antihypertensive drugs, but weight loss can also lower BP, reducing the need for antihypertensive medication. Bariatric surgery is the most effective treatment for patients with severe obesity.*

Material and methods: *The study group consisted of 30 obese patients with hypertension or newly diagnosed hypertension. Before laparoscopic sleeve gastrectomy (LSG) each patient was precisely interviewed, taking into account the antihypertensive drugs taken. We divided drugs into groups: beta-blockers (BBs), angiotensin-converting enzyme inhibitors (ACEIs), angiotensin II receptor blockers (ARBs), calcium channel blockers (CCBs), diuretics: thiazide diuretics / thiazide-like diuretics (TDs), loop diuretics (LDs), mineralocorticoid receptor antagonists (MRAs) and others: centrally acting drugs and alpha-blockers (ABs). Each patient had ABPM. Actually BMI and antihypertensive treatment was assessed 5 years after LSG.*

Results: *The study group consisted of 30 patients with severe obesity (BMI≥40kg/m2) with an average age of 42.5 years (25-69), including 11 males and 19 females.17 of patients had been previously diagnosed and treated hypertension,13 had been newly diagnosed hypertension. The decrease in the frequency of ACEIs use before and after SLG was significant observed (from 83% to 24%,p<0.001), CCBs (from 45% to 14%, p=0.008), TDs (from 31% to 3.5%, p=0.013).The decrease of body mass and BMI before and after SLG was significant(from 135kg to 100kg,p<0.001; 47.3 to 33.8, p<0.001). Antihypertensive medication was discontinued in a large proportion of patients after surgery, and the mean number of antihypertensive medications decreased. Bariatric procedures have strong evidence of efficacy and safety.*

Conclusions: *Patients with severe obesity and hypertension should be offered surgical weight loss earlier in their disease process.*

Introduction

Obesity is one of the most important cardiovascular risk factors. According to the World Health Organization (WHO), in 2016, more than 1.9 billion adults aged 18 and over were overweight. Of these, more than 650 million were obese [1]. Recent studies show that about 14% of obese patients are severely obese [2]. Numerous studies have confirmed that the higher the body mass index (BMI), the greater the risk of many diseases and the higher the mortality rate [3]. A number of studies have shown that weight reduction is associated with significant improvement or remission of many of the obesity-related comorbid conditions and can lead to a decrease in the predicted cardiovascular risk [4-7]. The treatment of hypertension in obesity is complicated by a high prevalence of resistant hypertension. LSG has become the most frequent bariatric surgery in the world due to the shorter duration of this procedure and its simpler technique in comparison with gastric bypass [8].

Methods

The study included 30 obese patients (BMI ≥40kg/m^2) with hypertension or newly diagnosed hypertension hospitalized at the Department of Cardiology and Internal Diseases of the University Clinical Hospital in Olsztyn. Patients with recent infection, fever, cancer, liver, and lung diseases were excluded. Before laparoscopic sleeve gastrectomy (LSG) each patient was precisely interviewed, taking into account the antihypertensive drugs taken. We divided drugs into groups: beta-blockers (BBs), angiotensin-converting enzyme inhibitors (ACEIs), angiotensin II receptor blockers (ARBs), calcium channel blockers (CCBs), diuretics: thiazide diuretics / thiazide-like diuretics (TDs), loop diuretics (LDs), mineralocorticoid receptor antagonists (MRAs) and others: centrally acting drugs and alpha-blockers (ABs).The frequencies of use

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of antihypertensive drug classes were analyzed. Each patient had a 24/7 BP measurement (ABPM) using the IEM Mobil-O-Graph NG PWA. The device was installed on the first or second day of hospitalization. Arterial hypertension was diagnosed at blood pressure values >135/85mmHg throughout the day based on the European Society of Hypertension (ESH) guidelines [9]. The body mass index (BMI) was calculated according to the Quetelet formula - body weight (kg)/height (m^2). Obesity was diagnosed based on BMI according to WHO criteria [10]. Within 2 years after internal medicine assessment, the patient underwent bariatric surgery using laparoscopic sleeve gastrectomy. Actually body weight, BMI and antihypertensive treatment was assessed 5 years after LSG based on telephone survey.

Statistical analysis

Descriptive statistics were performed. The normal distribution of continuous variable was tested using the Shapiro–Wilk test. The differences in BMI, weight before and after surgery were determined using Wilcoxon signed rank test. The changes in the proportion of categorized variables after surgery were estimated using McNemar's test. A p-value of < 0.05 was considered to be significant. The data analysis was conducted using Statistica (data analysis software), version 13. http:// statistica. io TIBCO Software Inc., Krakow, Poland (2017).

The study was approved by the Bioethics Committee at the Faculty of Medical Sciences of the University of Warmia and Mazury in Olsztyn on 22 June 2017.

Results

The study was conducted on 30 patients with severe obesity (BMI $\geq$ 40kg/m^2). Patients were in age 25-69 years (mean 42.5±11.9 years). There were included 11 males (36.7%) and 19 females (63.3%). 12 patients were smoking (40%). Median of body mass before LSG was 135kg, median of BMI – 47.3 (Table 1).

Before surgery 17 patients (56.7%) had been previously diagnosed and treated with hypertension, 13 patients (43.3%) had been newly diagnosed hypertension. 6 patients (20%) had diabetes and newly diagnosed diabetes.

11 of patients (36.7%)had been treated depression,13 patients (43.3%) - hyperlipdemia, 8 patients (26.7%) – hyperuricemia (Table 1).

Among the main groups of antihypertensive drugs, the most prescribed drugs group were ACEIs (83%). Almost half of the patients used CCBs (45%). MRAs was used only in 1 patient.

SPCs (double or triple) was used by 41% of patients. Triple SPCs were used relatively infrequently (7%) (Table 2).

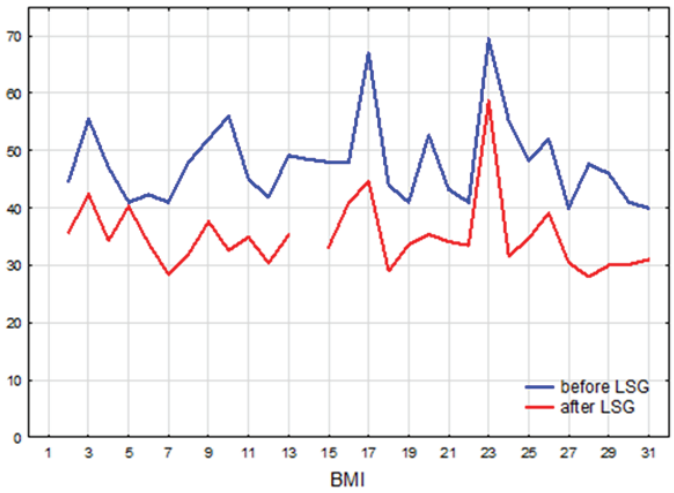

Figure 1. *Median BMI before and after surgery*

Table 1.General characteristic

Parameter	Before surgery	After surgery	p-value
Body mass median(95% IQR)	135 (123-146)	135 (123-146)	<0.001
BMI median (95% IQR)	47.3 (41.9-52.0)	33.8 (31.0-35.7)	<0.001
Smoking n (%)	12(40%)	11(36,6%)	-
Diabetes n (%)	3 (10%)	2 (6.7%)	1.00
Diabetes new diagnosed n (%)	3 (10%)	0 (0%)	-
Hypertension n (%)	17 (56.7%)	10 (33.3%)	0.02
Hypertension new diagnosed n (%)	13 (43.3%)	0 (0%)	-
Hypothyroidism n (%)	8 (26.7%)	8 (26.7%)	-
Depression n (%)	11 (36.7%)	2 (6.7%)	0.008
OSAa n (%)	3 (10%)	2 (6,7%)	1.00
Hiperlipidemia n (%)	13 (43.3%)	10 (33.3%)	0.25
Hiperurykemia n (%)	8 (26.7%)	6 (20%)	0.48

IQR – interquartile range; OSA Obstructive sleep apnea

Table 2. *Taken antihypertensive drugs*

Antihypertensive drug group	Before surgery	After surgery	p
Beta-blockers n (%)	10 (34%)	4 (14%)	p=0.13
Angiotensin converting enzyme inhibitors n (%)	24 (83%)	7 (24%)	p<0.001
Angiotensin receptor blockers n (%)	2 (7%)	0 (0%)	-
Calcium channel blockers n (%)	13 (45%)	4 (14%)	p=0.008
Thiazide diuretics n (%)	9 (31%)	1 (3.5%)	p=0.013
Loop diuretics n (%)	2 (7%)	0 (0%)	p=1.00
Mineralocorticoid receptor antagonists n (%)	1 (3.5%)	0 (0%)	p=0.48
Other n (%)	2 (7%)	0 (0%)	-
Double SPC n (%)	10 (34%)	4 (14%)	p=0.04
Triple SPC n (%)	2 (7%)	0 (0%)	-

Table 3. Complications after LSG

Complications after surgery	n,%
Covid-19 infection	15(52)
Cholecystectomy	5(17)
GERD	7(24)
Anemia	7(24)
Paroxysmal atrial fibrilation	2(7)
Death	1(3,5)

Each patient had bariatric surgery using the laparoscopic sleeve gastrectomy.

During 5 years of observation, half of patients (52%) were infected with COVID-19, including 1 patient who died from it. 5 patients (17%) had cholecystectomy, 7 patients (24%) suffered from GERD and 7 patients (24%) suffered from anemia (Table 3).

There was significant decrease of depression after LSG (from 36.7% to 6.7%; p=0.008) (Table1).

Very high satisfaction with the operation was observed. 82% of patients would perform the procedure again.

All patients with new diagnosed hypertension before LSG achieved complete remission after bariatric surgery.

After LSG there was observed significant decrease in the frequency of hypertension (from 56.7% to 33.3%; p=0.02) and in median of body mass (from 135kg to 100kg; p<0.001) and BMI (from 47.3 to 33.8; p<0.001) (Table 1, Figure 1).

The decrease in the frequency of ACEIs use before and after LSG was significant observed (from 83% to 24%, p<0.001), CCBs (from 45% to 14%, p=0.008), TDs (from 31% to 3,5%, p=0.013) (Table 2).

Discussion

Hypertension is one of the most prevalent and clinically important cardiovascular complications of obesity [11]. Consequently, not only the prevalence of obesity but also the prevalence of hypertension is increasing worldwide. Regarding available antihypertensive treatment, data from clinical trials suggest that all first-line antihypertensive drugs should be of similar relevance in reducing systemic blood pressure and hypertension-related organ damage in obese patients [12]. Weight loss is essential in managing obesity-hypertension syndrome. Lifestyle modification like diet, exercise, drugs, and a combination of these measures should be used. Although antihypertensive drugs are considered important components, their efficacy in the most obese patients compared with only overweight patients is questionable [13].

Numerous mechanisms have been proposed as to how obesity contributes to the development of hypertension. Some of them include alteration in the renin–angiotensin–aldosterone system, increased sympathetic nervous system activity, development of insulin resistance, hyperleptinemia and leptin resistance, altered coagulation factors, inflammation, and endothelial dysfunction [14]

The combination of obesity and hypertension puts patients at a higher cardiovascular risk than those patients without hypertension. In a large population of 197 patients, Batsis et al. found a significant improvement in hypertension, diabetes, and dyslipidemia leading to a decrease in the estimated 10-year risk of cardiovascular events in morbidly obese patients after gastric bypass [15].

In our study, the weight loss following LSG led to significant decrease in the frequency of hypertension (from 56.7% to 33.3%; p=0.02). Outcome data from the Swedish Obese Subjects (SOS) study, which compared 1,157 obese patients who underwent bariatric surgery to 1,031 obese-matched medically treated patients, revealed marked reductions in both weight and blood pressure in the surgical group when compared to the medically treated group [16].

In a various meta-analysis 50% of obese patients who underwent bariatric surgery had a diagnosis of hypertension before surgery; these patients experienced a 75% remission of hypertension [17-19]. All our patients with new diagnosed hypertension before LSG achieved complete remission after bariatric surgery.

The treatment of hypertension in obesity is complicated by a high prevalence of resistant hypertension. While hypertension can be treated with antihypertensive drugs, but weight loss can also lower BP, reducing the need for antihypertensive medication. In our study antihypertensive drugs was discontinued in a large proportion of patients after surgery, and the mean number of antihypertensive medications decreased. Fernstrom et al. Found that many patients taking antihypertensive medications before surgery discontinued them after surgery and remained normotensive [20].

Conclusion

In conclusion, weight loss associated with LSG significantly reduces blood pressure and is effective in leading to discontinuation or a marked reduction of hypertensive medication requirements in a large proportion of severe obese hypertensive patients. This suggests that perhaps patients with severe obesity and hypertension should be offered bariatric surgery earlier in their disease process.

Study limitations

This study had a number of limitations, including its small sample size. Moreover, a long-term observation outside of the hospital would allow a better understanding of the hypertension impacts and treatments as well as their linkage to body weight. In addition, the ABPM assessment was based only on one measurement. Ideally, this would be done multiple times and using different equipment to confirm validity.

Conflict of interest

This research received no external funding. The authors report no competing interests.

Author contributions

Conceptualization, B.M.; Methodology, Validation, Formal analysis, Investigation, Data curation, Resources, Writing – original draft: all authors;

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