IFSO2024 Melbourne Free Papers Clinical Sciences 2

Changes in left ventricular parameters after laparoscopic sleeve gastrectomy in patients with severe obesity

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COI disclosure

The authors have no conflict of interests to disclose.

Speaker: Akira Umemura

Introduction

- Obesity is associated with left ventricular hypertrophy and dilation due to increased fat volume, insulin resistance, and leptin levels.
- Recent reports have explored significant changes in left ventricular parameters after MBS, however, consensus remains elusive.
- We investigated relationships between left ventricular functions and metabolic parameters following LSG in patients with severe obesity.

Patients

78 patients with severe obesity who underwent LSG

From August 2018 to February 2023.

✓Inclusion criteria

- Primary obesity (BMI ≥ 35 kg/m^2)
- 18 to 65 years old
- Resistant to medical therapy for more than six months
- Diagnosed with more than one obesity-related disease

✓Exclusion

- Secondary obesity (drug or endocrine disorders)
- Uncontrollable severe mental illness (schizophrenia, depression, etc)
- Patients with alcohol or drug dependence

Sasaki A, et al. Diabetol Int 2021

Methods

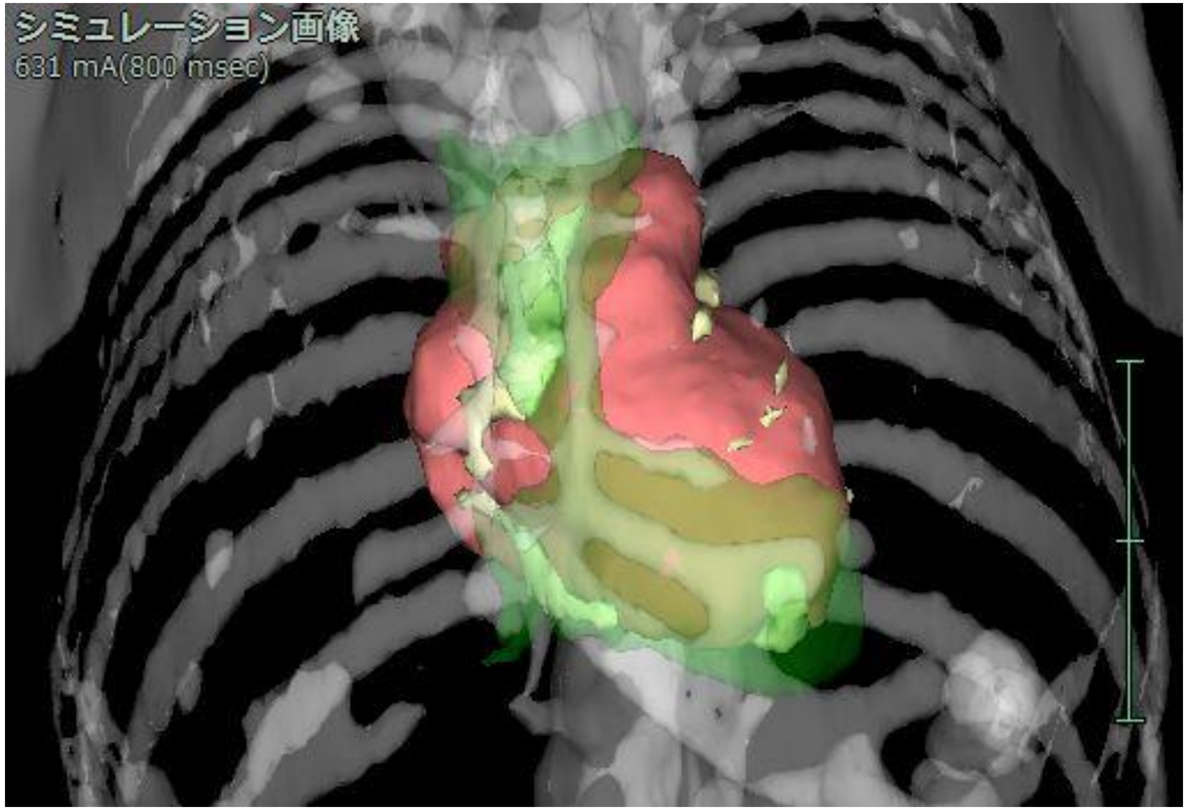
- CT volumetry of EAT and MF
- Collection of clinical parameters
- Examination of cardiac ultrasound

Baseline and 1 year after LSG

Clarify relationships between changes of EAT/MF and cardiac function

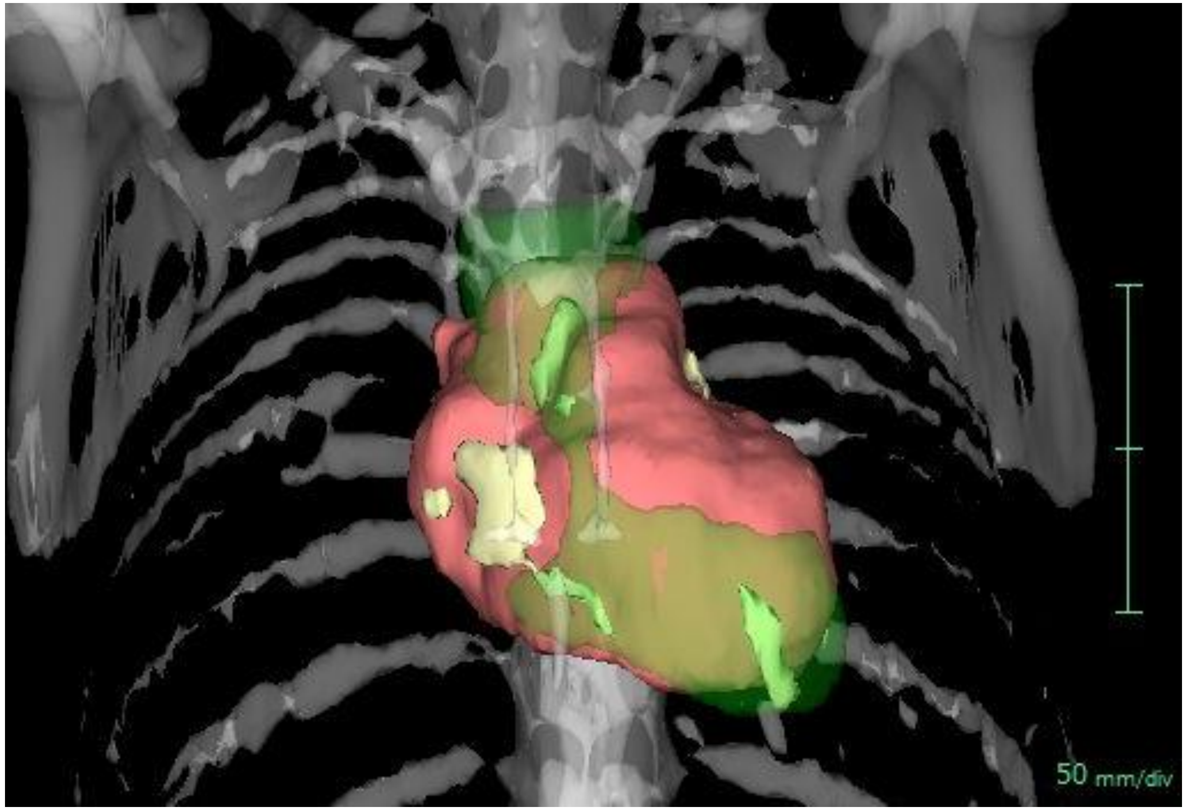
Volumetry of EAT/MF before and after MBS

Baseline



EAT: 127ml
MF: 194ml

1 year after LSG



EAT: 65ml
MF: 92ml

Patients characteristics

Variables	
Age (years)	42.4 ± 11.3
Gender (Male / Female)	34/41
Initial body weight (kg)	118.0 ± 21.2
Initial BMI (kg/m^2)	43.3 ± 5.9
Obesity-related disease, n (%)	
T2D	42 (56.0)
Histopathological MASH	37 (49.3)
Hypertension	53 (66.7)
Dyslipidemia	43 (57.3)
Hyperuricemia	36 (48.0)
Obstructive sleep apnea	73 (97.3)

Mean ± SD

Weight-loss and metabolic effects

Variables	Baseline	1 year after LSG	p-value
Body weight (kg)	118.0 ± 21.2	87.5 ± 15.7	< 0.001
BMI (kg/m^2)	43.3 ± 5.9	32.2 ± 4.8	< 0.001
TWL (%)	-	25.3 ± 8.2	-
SFA (cm^2)	534.5 ± 140.3	344.8 ± 135.4	< 0.001
VFA (cm^2)	247.9 ± 65.9	133.8 ± 58.3	< 0.001
LV (mL)	2111.0 ± 359.3	1650.1 ± 276.6	< 0.001
SBP (mmHg)	131.3 ± 20.2	123.2 ± 14.7	< 0.001
DBP (mmHg)	80.7 ± 14.2	75.7 ± 11.2	0.005
renin (ng/mL)	8.8 ± 20.4	2.2 ± 3.4	0.022
Aldosterone (pg/mL)	110.8 ± 62.9	85.4 ± 58.5	0.017
PAI-1 (ng/mL)	48.5 ± 26.7	23.7 ± 14.1	< 0.001
Leptin (ng/ml)	34.9 ± 19.6	15.8 ± 12.2	< 0.001
TNF-α (ng/mL)	2.3 ± 1.5	3.3 ± 4.2	0.813
TG (mg/dL)	129.1 ± 65.2	99.4 ± 54.4	< 0.001
TC (mg/dL)	182.5 ± 36.6	187.8 ± 34.1	0.705
LDL (mg/dL)	119.2 ± 31.0	109.0 ± 29.0	0.007
HDL (mg/dL)	43.2 ± 10.5	56.4 ± 14.9	< 0.001

Mean ± SD

Change in adipose tissue after LSG

Variables	Baseline	1 year after LSG	p-value
EAT (mL)	77.5± 33.7	56.5 ± 23.8	< 0.001
MF (mL)	144.0 ± 96.2	72.1 ± 51.4	< 0.001
EAT+MF (mL)	221.6 ± 118.4	128.6 ± 68.4	< 0.001

Mean ± SD

Change in cardiac ultrasound parameters

Variables	Baseline	1 year after LSG	p-value
EF (%)	65.5 ± 4.9	65.0 ± 3.7	0.364
average E/e' (no unit)	8.7 ± 2.9	7.9 ± 2.4	0.041
Septal e' (cm/s)	0.09 ± 0.02	0.10 ± 0.02	0.022
Septal E/e' (no unit)	9.5± 3.0	8.1 ± 2.7	0.013
Lateral e' (cm/s)	0.11 ± 0.03	0.12 ± 0.03	0.277
Lateral E/e' (no unit)	7.8± 3.1	8.1 ± 2.5	0.459
TRV (m/s)	2.12± 0.51	2.22 ± 0.30	0.254
LAVI (mL/m^2)	27.1 ± 8.5	32.1 ± 10.1	< 0.001
LAV (mL)	59.0 ± 20.1	60.3 ± 21.8	0.848
PWd (cm)	1.10 ± 0.18	1.04 ± 0.16	< 0.001
LVM (g)	197.2± 58.6	183.8 ± 56.4	0.009
IVST (cm)	1.14 ± 0.20	1.07 ± 0.20	< 0.001
LVDs (cm)	2.91 ± 0.46	2.82 ± 0.36	0.091
LVDd (cm)	4.78 ± 0.49	4.73 ± 0.47	0.256

Mean ± SD

Classification of diastolic function of enrolled patients based on algorithm at before and after MBS

Classification of diastolic function of enrolled patients	
Variables	n, (%)
Normal Diastolic function	67(88)
Indeterminate	6(9)
Diastolic Dysfunction	2(3)
Improvement of diastolic dysfunction	
Baseline	1-year after LSG
Indeterminate n=6	Normal Diastolic function n=3 Indeterminate n=3
Diastolic Dysfunction n=2	Normal Diastolic function n=1 Indeterminate n=1

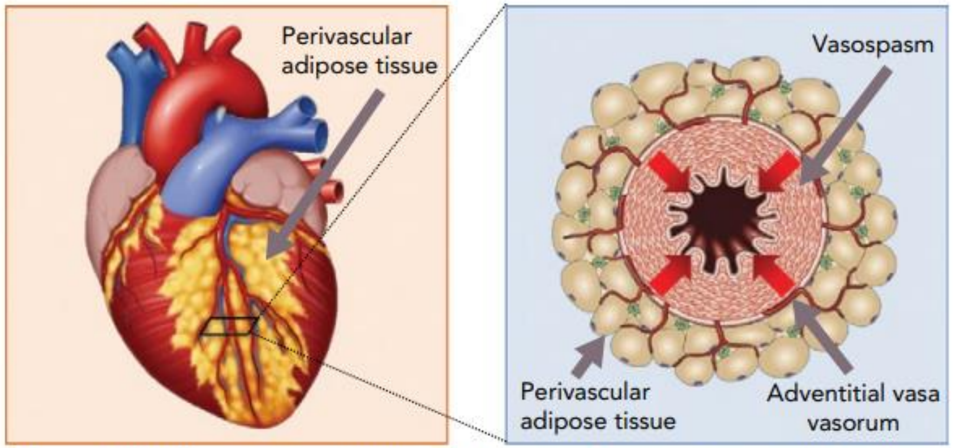
Relationships between EAT/MF and diastolic dysfunction

	Algorithm for diagnosis of LV diastolic dysfunction		
Baseline	Normal	Indeterminate and Diastolic Dysfunction	P-value
EAT, mL	74.6±31.6	102.2±42.6	0.041
MF, mL	139.7±93.8	180.7±115.04	0.239
EAT+MF, mL	214.3±113.5	283.0±148.3	0.120
IVS, cm	1.1±0.2	1.3±0.2	0.022
PWd, cm	1.0±0.2	1.2±0.2	0.025
LVM, g	191.1±51.3	271.4±93.1	0.042
LAD,cm	4.0±0.3	4.8±0.4	0.026

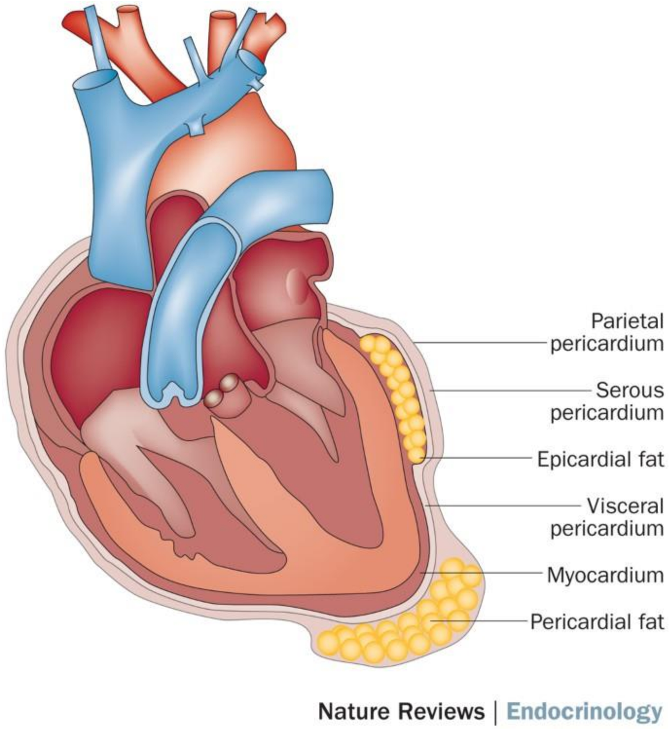
Mean±SD

Fat accumulation around the heart

Figure 1: Coronary Adventitia and Perivascular Adipose Tissue in Patients With Vasospastic Angina



The coronary artery consists of the intima, media, adventitia and perivascular adipose tissue. The adventitia also interacts with its adjacent perivascular adipose tissue, which is linked to microvessels and nerves. Perivascular adipose tissue is metabolically active, secreting a wide variety of bioactive substances to regulate vascular physiology, homeostasis and structural remodelling, exerting major influences on the progression or regression of vascular disease. Source: Ohyama et al. 2018.[25] Reproduced with permission from Elsevier.

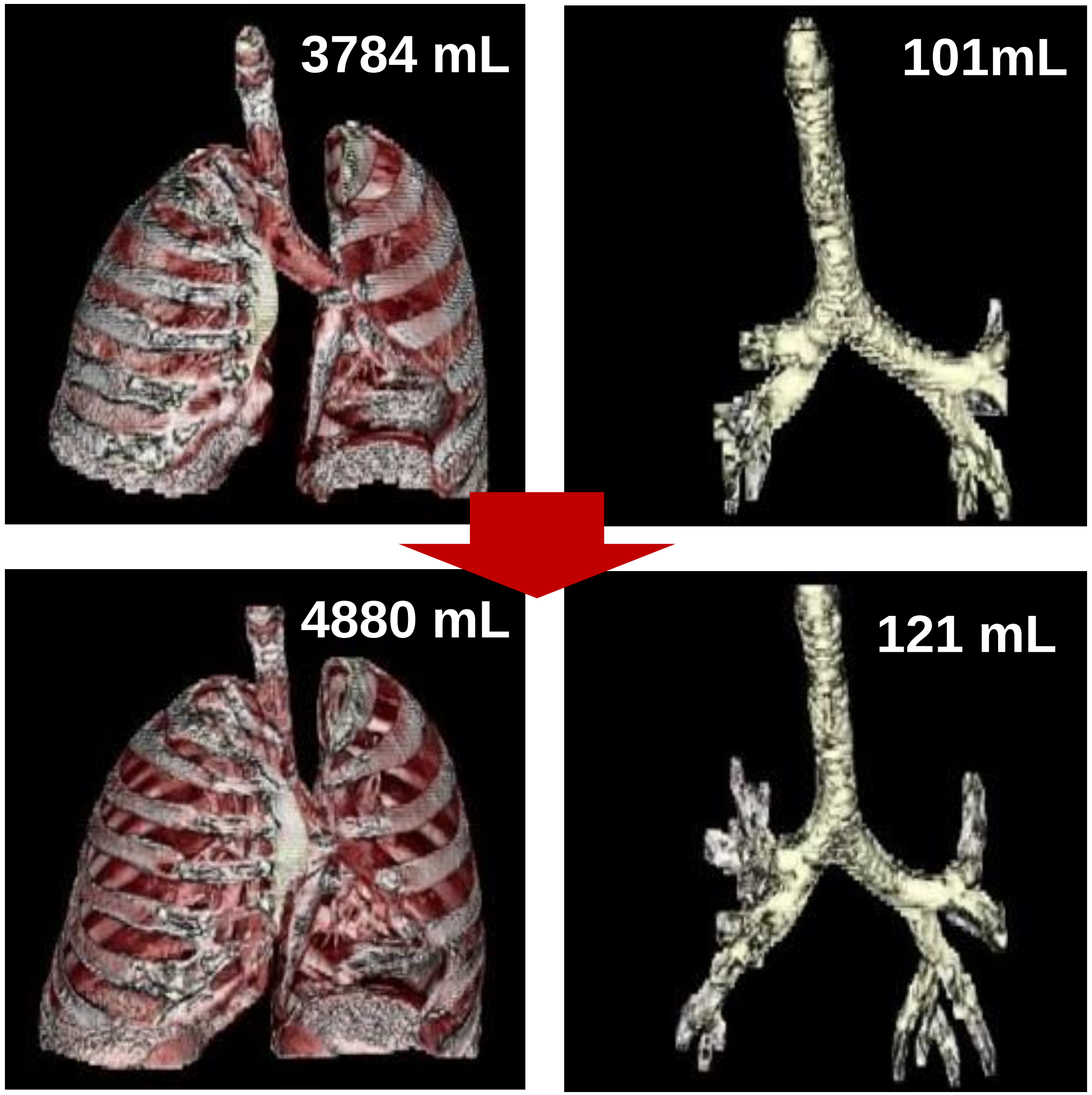


- Epicardial adipose tissue (EAT) endocrines cytokines and induces acute coronary syndrome.
- Mediastinal fat (MF) accumulation also restricts the diastolic function.

Ohyama K, et al. Eur Cardiol 2019
Iacobellis G. Nat Rev Endocrinol 2015

Changes in lung and airway volume after MBS

Lung volume **Airway volume**



Variables	LV		AV	
	ρ	P-Value	ρ	P-Value
VC	0.33	0.018	0.21	0.145
%VC	0.13	0.364	0.22	0.123
FEV1.0%	0.01	0.994	-0.01	0.964
ERV	0.33	0.018	0.11	0.430
FRC	0.79	< 0.001	0.69	< 0.001
DLco	0.15	0.505	0.18	0.428
DLco/VA	-0.16	0.483	-0.11	0.650

MBS increases both LV and AV.

↓

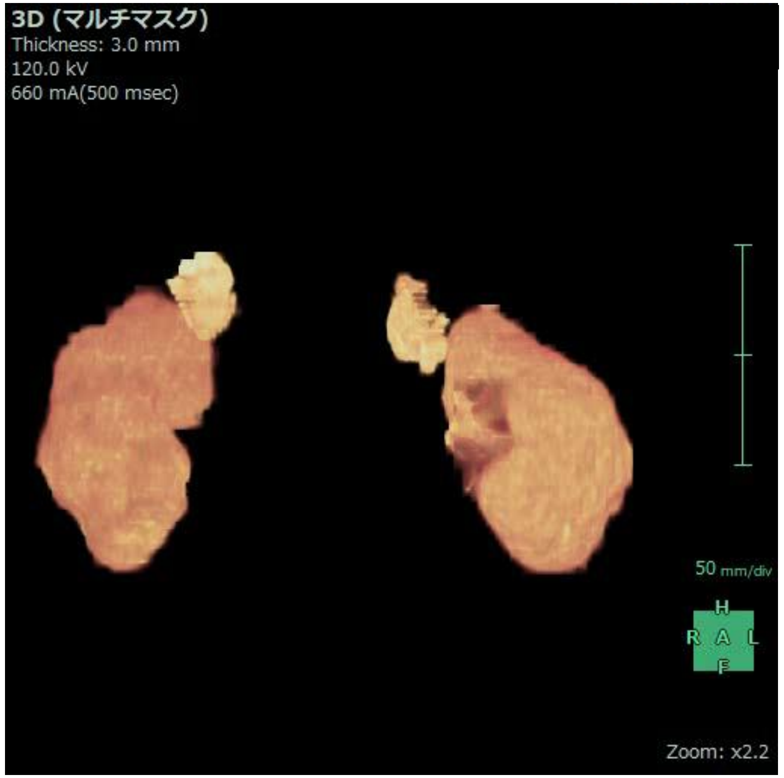
Respiratory dysfunction significantly improves.

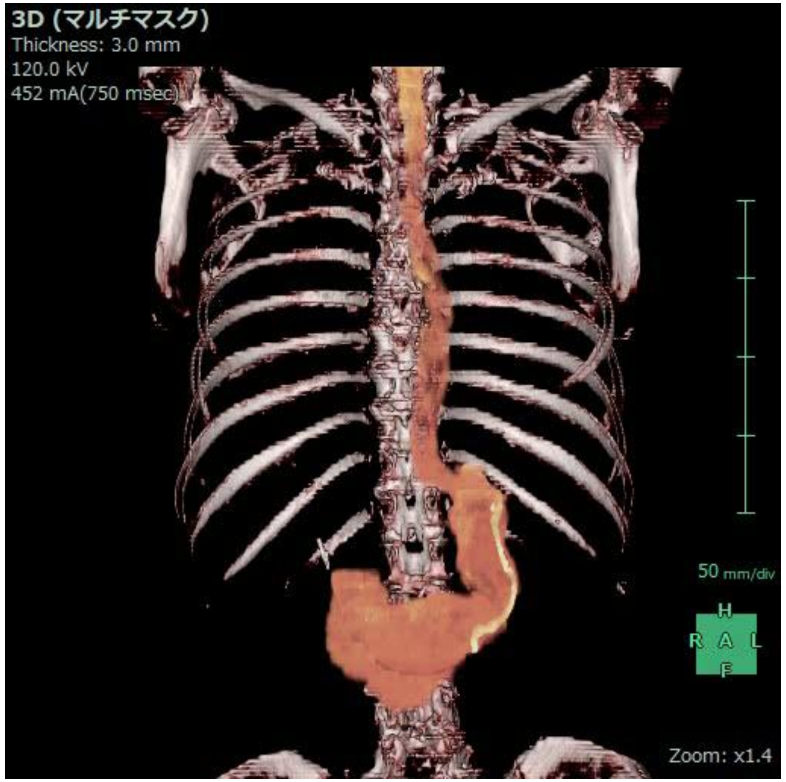
Umemura A, Sasaki A, et al. Langenbecks Arch Surg 2022.

Future perspective of volumetric parameters

BMS →

- Evaluation of ITSM
- Adrenal gland hypertrophy
- Insulin resistance of skeletal muscle





Conclusions

- BMS significantly improved cardiac hypertrophy and was associated with reduced fat volume and improved leptin levels.
- BMS may contribute to improved cardiac function especially in left ventricular diastolic performance.