The relationship Between Serum Superoxide Dismutase and Thyroid Function in Obese Patients after Laparoscopic Sleeve Gastrectomy

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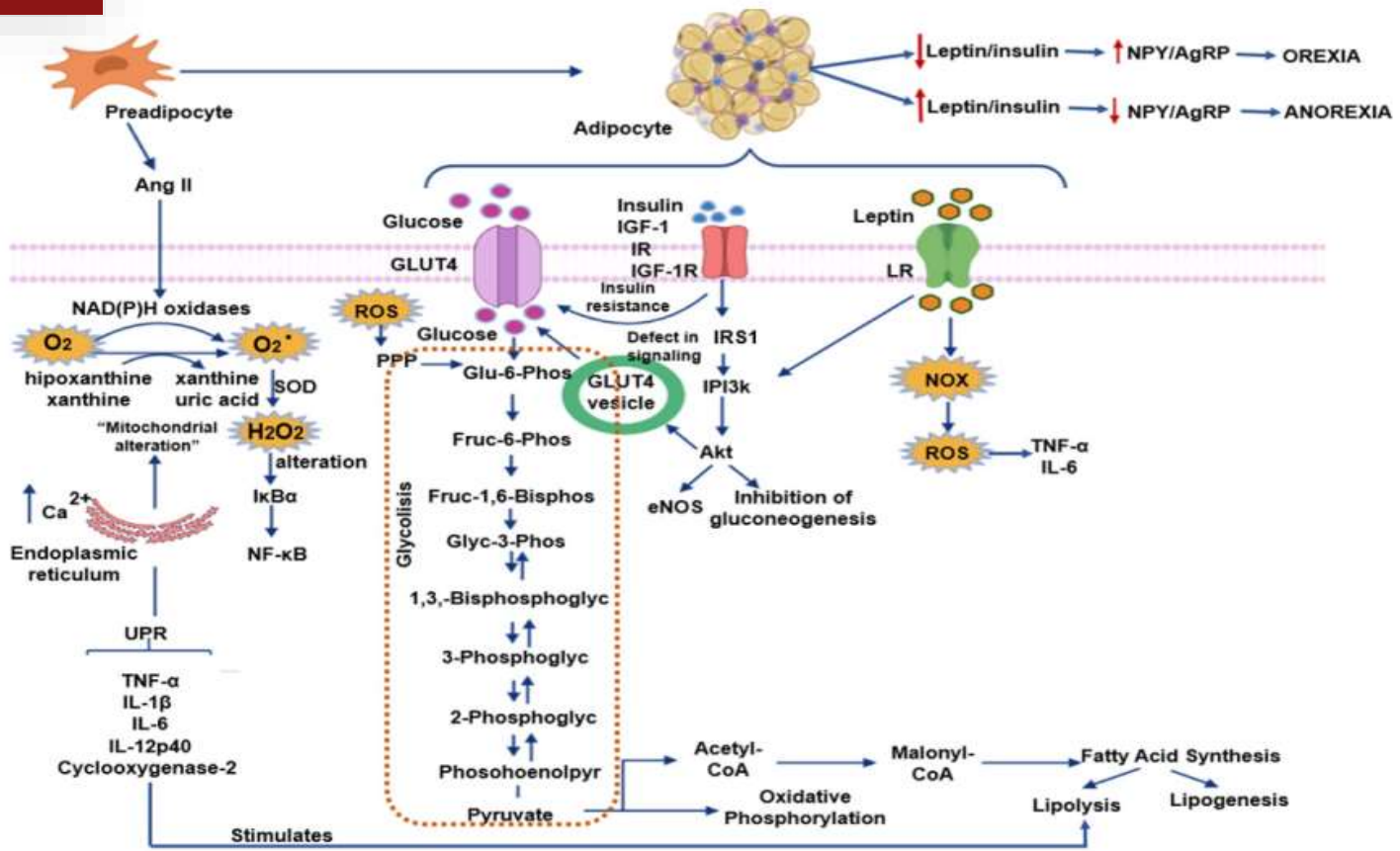
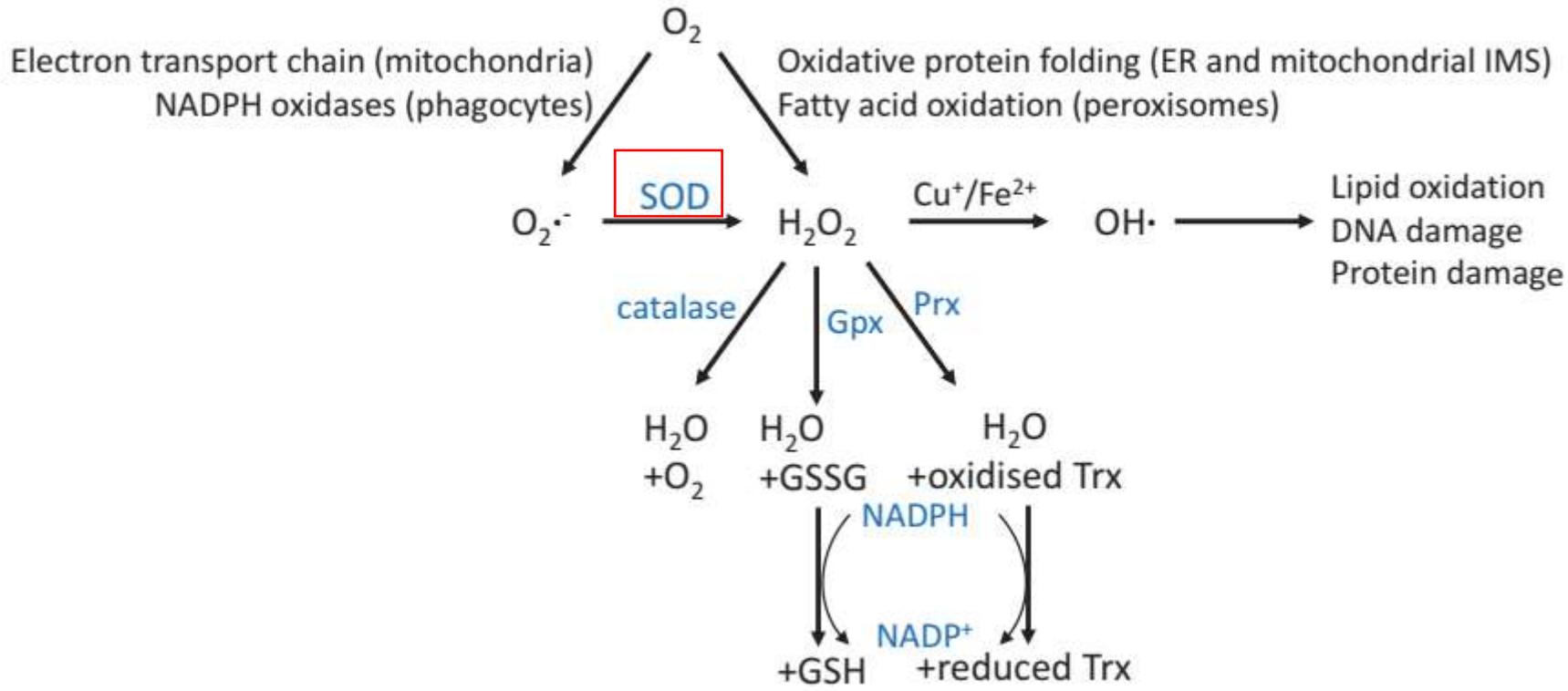
01 Background



- Obesity, can be defined as increased adipose tissue.
- Adipose tissue secretes numerous adipokines, inducing reactive oxygen species (ROS) production, resulting in oxidative stress (OS)

Int J Mol Sci. 2021 Feb 11;22(4):1786.

01 Background



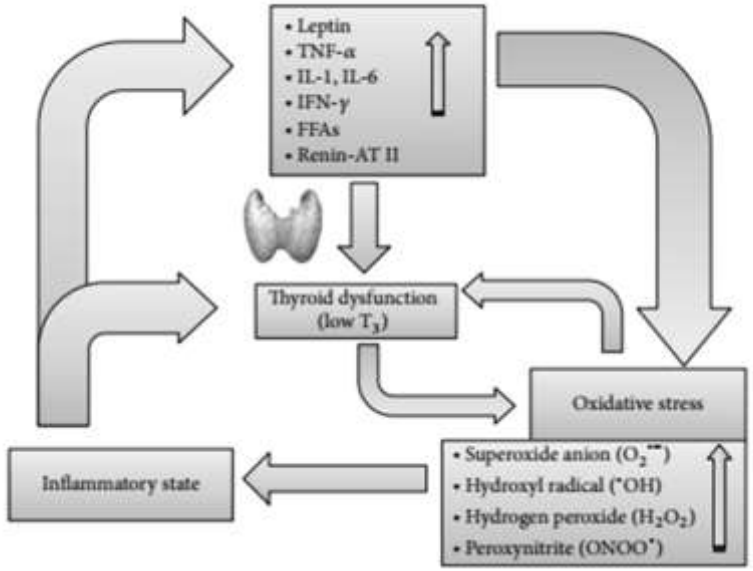
- Antioxidant enzymes to eliminate ROS: superoxide dismutase (SOD), catalase(CAT), glutathione peroxidase (GPx) .
- SOD : the first step in the enzymatic antioxidant pathway and the only known enzyme to directly scavenge superoxide anion(O2-).

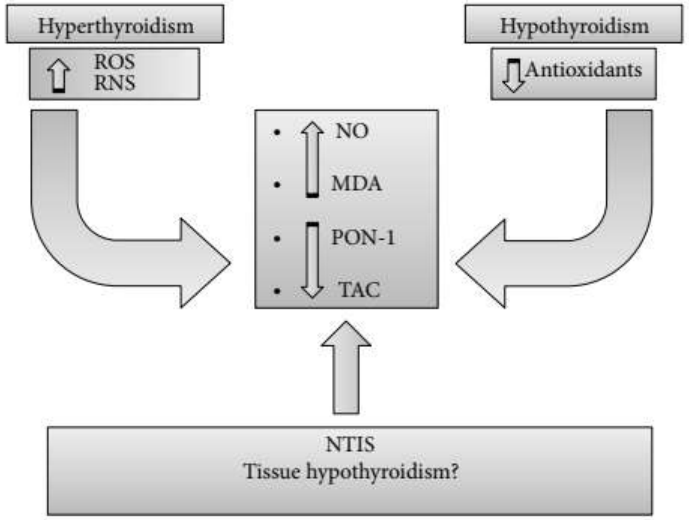
Subcell Biochem. 2018;90:425-450
Nutrition journal 2013, 12:18.

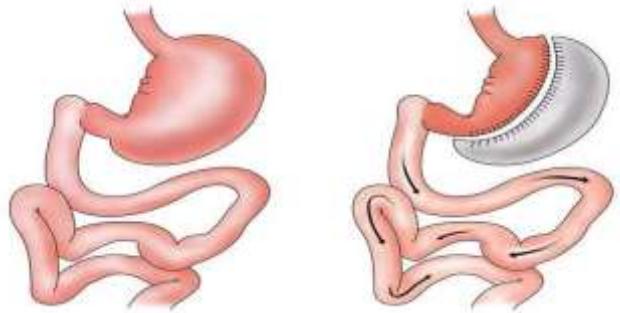
01 Background

- In morbidly obese patients, TSH is moderately increased;
- Thyroid dysfunction can cause OS;
- LSG： a significantly effective treatment option for patients with morbid obesity ;

The relationship between SOD and thyroid function in obese patients, especially after LSG.







Laparoscopic Sleeve Gastrectomy, LSG

Mediators Inflamm. 2016;2016:6757154

Aim:

- To investigate the effect of LSG on postoperative thyroid activity;
- To investigate the cross-sectional and longitudinal correlation between SOD levels and thyroid function with obesity before and after LSG;

02 Methods

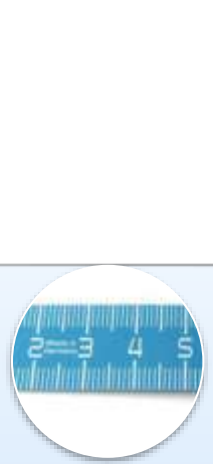
Morbid obesity who underwent LSG (n=219, 112 males and 107 females)

Median value of SOD levels: 183 U/mL

NSOD, n=112

HSOD, n=107

Follow-up: Baseline, 3, 6, and 12 months after LSG



Anthropometric measurements

- Height、weight、BMI

Thyroid function and immune index

- FT3, FT4, TT3, TT4, TSH
- TPOAb, TAG,TRAB

Serum SOD Levels

Baseline, 3, 6, and 12 months after LSG

03 Results

Table 1. Baseline characteristics of the study according to SOD level

Parameters	Obese population			*P value*
	Total(n=219)	NSOD (n=112)	HSOD (n=107)	
SOD(U/ml)	184.76±28.87	163.02±21.03	207.21±15.67	<0.001***
Age (years)	30.95±10.89	31.29±11.36	30.60±10.41	0.637
Sex(male/female)	112/107	45/67	48/59	0.484
BMI (kg/m^2)	40.33±6.19	41.66±6.64	38.93±5.36	<0.001***
FT3(pmol/L)	5.12±0.68	5.02±0.61	5.23±0.74	0.019*
FT4(pmol/L)	16.54±2.64	16.13±2.68	16.98±2.52	0.017*
TT3(nmol/L)	1.85±0.50	1.79±0.31	1.91±0.64	0.094
TT4(nmol/L)	106.93±21.62	110.10±20.38	103.69±22.35	0.031*
TSH(mU/L)	2.78±4.85	3.08±1.73	2.40±1.33	<0.001 **
TPOAb(IU/ml)	153/12	81/5	72/7	0.453
TAG (ng/ml)	134/4	69/1	65/3	0.298
TRAB(IU/L)	109/2	62/1	47/1	0.846

- BMI, TT4, and TSH levels were observed to be significantly lower in the HSOD group than in the NSOD group at baseline.
- FT3 and FT4 levels were also significantly higher in the HSOD group than in the NSOD group.

03 Results

Table 2. Association of SOD and thyroid function

Parameters	All subjects (n =219)		Adjusted for BMI,Age and Sex	
	r	*P*	r	*P*
Age (years)	-0.058	0.391		
Sex(male/female)	-0.083	0.222		
BMI (kg/m^2)	-0.172	0.011*		
FT3(pmol/L)	0.176	0.009**	0.047	0.620
FT4(pmol/L)	0.205	0.002**	0.272	0.004**
TT3(nmol/L)	0.088	0.201	0.182	0.059
TT4(nmol/L)	-0.130	0.061	-0.021	0.833
TSH(mU/L)	-0.192	0.005**	-0.222	0.021*
TPOAB(IU/ml)	-0.025	0.753	-0.110	0.334
TAG (ng/ml)	-0.104	0.276	-0.277	0.180
TRAB(IU/L)	-0.155	0.228	-0.115	0.390

Table 3. Regression analysis of SOD and thyroid function

Parameters	β	*P* value	95% CI
BMI (kg/m^2)	-0.183	0.009**	(-1.481, -0.210)
Age (years)	-0.115	0.089	(-0.646, 0.046)
Sex(male/female)	-0.065	0.352	(-11.63, 4.158)
FT4(pmol/L)	0.165	0.017*	(0.328, 3.239)
TSH(mU/L)	-0.138	0.048*	(-4.966, -0.022)

- SOD levels were significantly negatively associated with BMI and TSH, and positively associated with FT3 and FT4;
- After adjusting for BMI, age, and sex, SOD levels remained positively associated with FT4 and negatively correlated with TSH.
- Regression analysis revealed that BMI, FT4, and TSH were also significantly associated with SOD levels.

03 Results

Figure 1

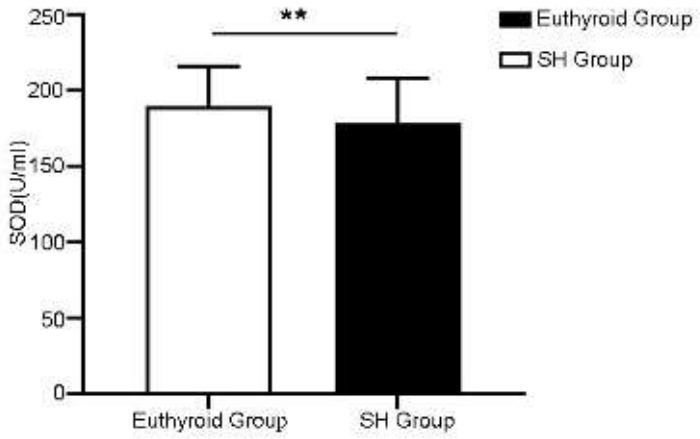


Table 4. Preoperative SOD may be a protective factor for SH in obese people

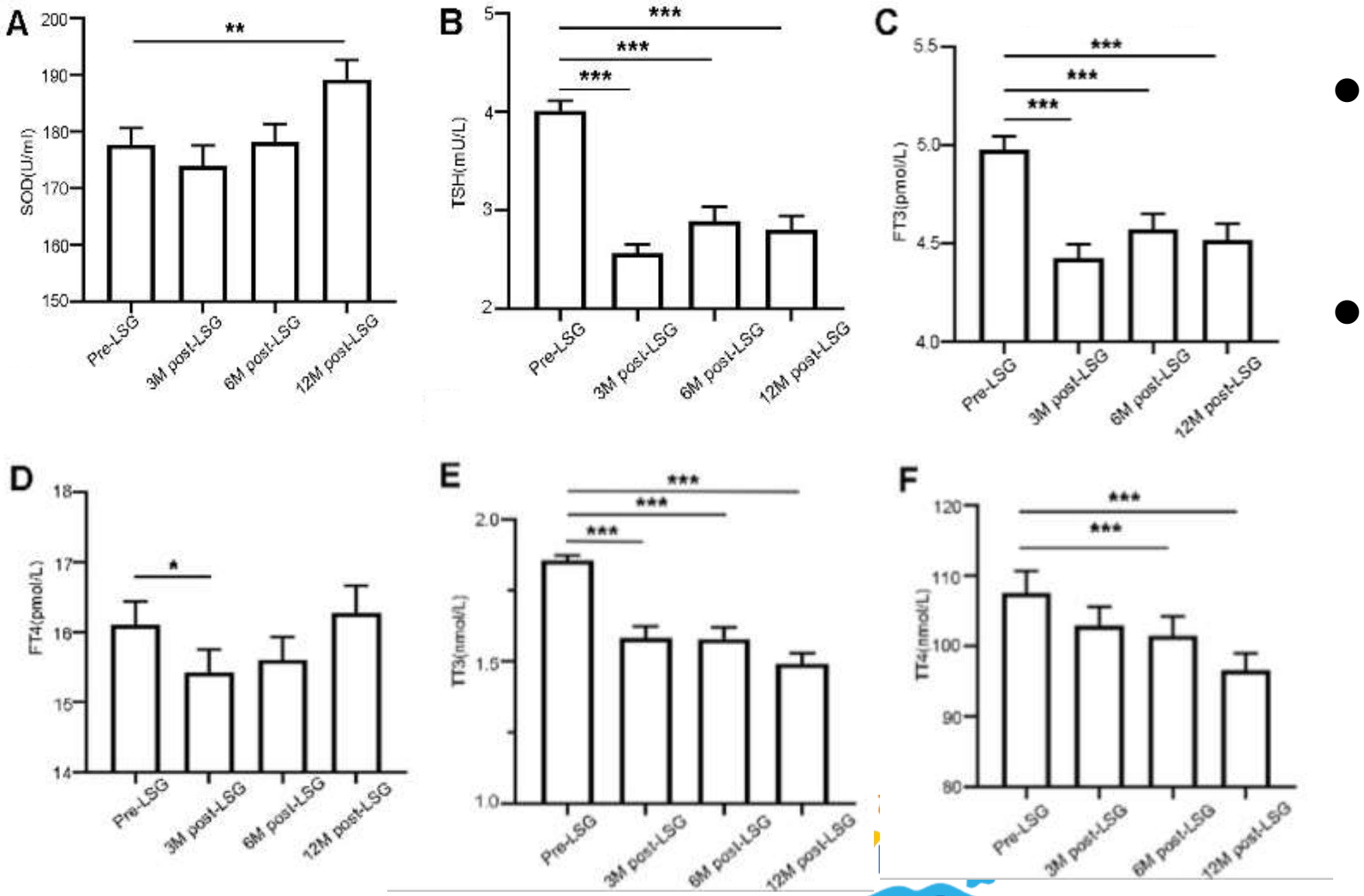
Model	β	*P* value	OR(95% CI)
Model 1	-0.015	0.004**	0.986(0.976,0.995)
Model 2	-0.012	0.005*	0.986(0.976,0.995)

Model 1: included SOD;

Model 2: included SOD, age, BMI, and Sex;

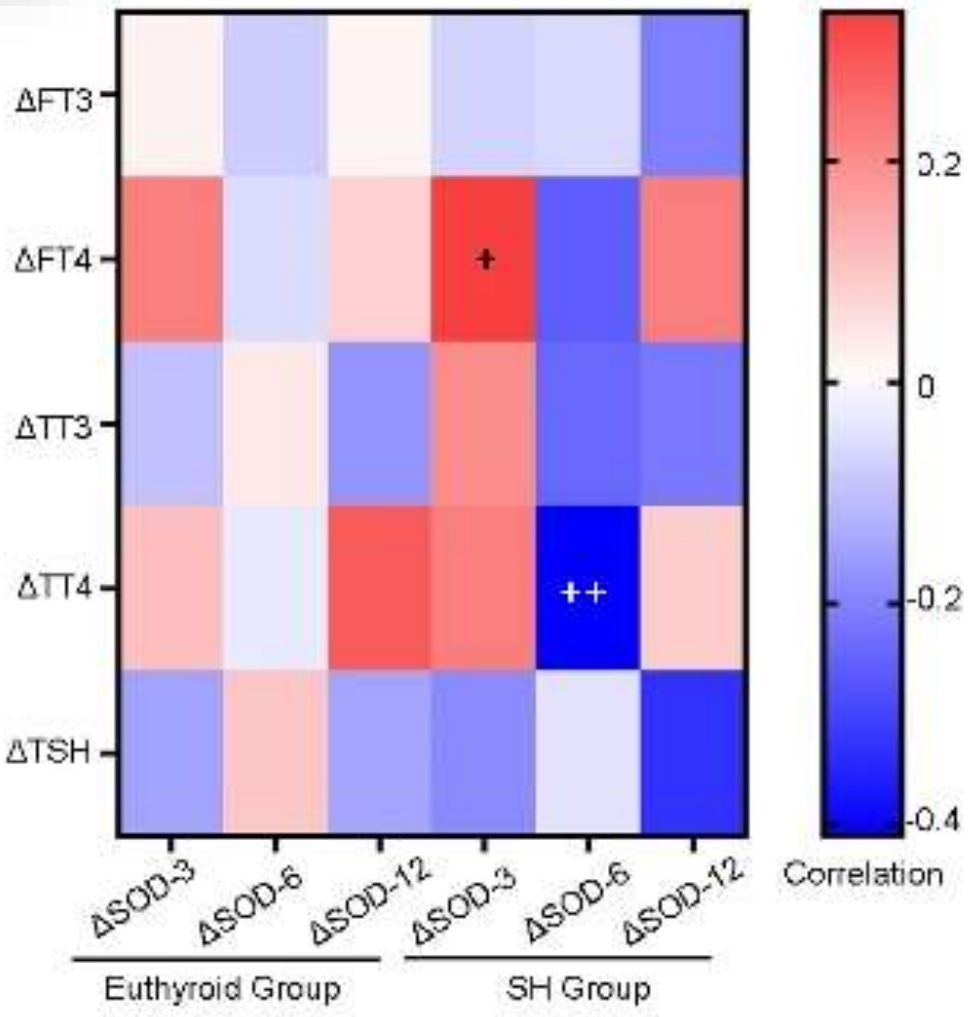
- 22.31% (NSOD: 66.67%; HSOD: 33.33%) had subclinical hypothyroidism（SH）;
- The SH group had lower SOD levels than the non-SH group;
- Preoperative SOD was a protective factor for SH;

03 Results



- In SH group, SOD significantly increased at 12 months post-LSG;
- TSH, FT3, and TT3 levels significantly decreased at 3, 6, and 12 months post-LSG;

03 Results



- Changes in SOD levels at 3 months post-LSG were positively correlated with changes in FT4 levels in the SH group;
- Changes in TT4 levels were negatively associated with changes in SOD levels at 6 months post-LSG in the SH group

04 Conclusion

- SOD, which is related to thyroid hormones, protects against SH in patients with obesity.
- The improvement in thyroid function with SH after LSG may be related to increased SOD levels.

05 Limitation

To study the causal relationship between SOD levels and changes in thyroid hormone levels.

The correlation of GPx and CAT with obesity needs to be further studied.

Increase the sample size and follow-up time

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[ ] I have no potential conflict of interest to report

Acknowledgements

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Shen Qu's team

Thanks for listening!