Outcomes assessment of sleeve gastrectomy in a diet-induced non- alchoholic steatohepatitis rats

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Introduction and Objectives

- Sleeve gastrectomy (SG) may be a valuable method of treating or improving Nonalcoholic Steatohepatitis (NASH) in the obese population.
- This study was aimed to investigate short term outcomes of SG in NASH induced Sprague Dawley rats:
  - Body weight
  - Liver profile
  - Liver histology

Methodology

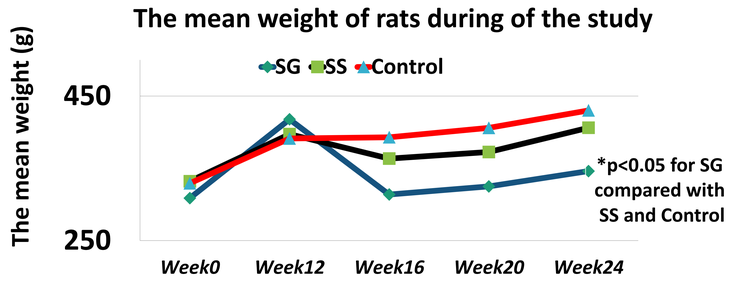
- After ethical approval, 24 male Sprague-Dawley rats (6 weeks of age, mean initial body weight; 326 g (±4.5) were fed with high fat diet to induce NASH. This NASH model rats were then randomized into three groups; SG (n=8), Sham Surgery (SS; n=8) and Control; (n=8). The SG and SS groups underwent surgery at week 12. Subsequently, all the rats (SG, SS and Control groups) were fed with the standard diet until week 24. Weekly body weight and liver profile bloods were collected at baseline, week 12 (pre-surgical intervention) and week 24 of the study. The liver of all the rats in each group was harvested at 24 week and subjected to histological analysis.
- Histological evaluation was based on the method of Kleiner et al, 2005. In this method, three features were detected including micro or macrovascular steatosis graded from 0-3, hepatocellular ballooning graded from 0-2, and inflammation graded from 0-3. When the sum of scores (as NAS scores) be ≥5 it was considered NASH.
- The acquired data was reported as the mean and standard deviation (SD) for continuous variables and significance was assessed at p<0.05. One-way ANOVA was used for statistical analyses. Tukey's post hoc comparison was utilized to determine the origin of significance.

Results

BODY WEIGHT:

- The mean body weight at 12 weeks for the SG, SS and control groups were 417 g (± 24.4), 397 g (± 29.9) and 391g (± 24.2); respectively (p>0.05).
- Post surgical intervention (at week 24), rats in the SG group had significant weight reduction (−16.5%; p < 0.001) but rats in the SS group had weight increment of 1.9 %.

Results

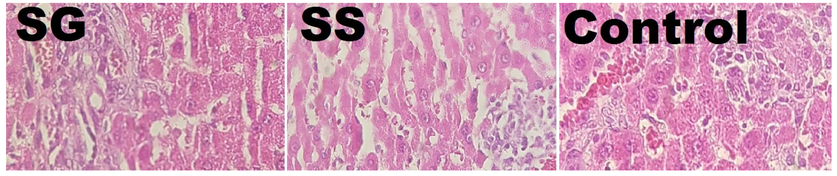


Body Weight Trends in NASH induced rats (mean, SD)

Body weight (g)	Groups			
	Week	SG	SS	Control
	0	308.8±16.3	322.2± 22.9	329.3± 27.0
	12	417.8± 24.4	397.5± 30.0	391.3± 24.1
	24	348.2± 15.1	406.2± 53.0	430.2± 22.2

LIVER HISTOLOGY:

The liver histopathological analysis was comparable at 24 weeks.



Liver histology evaluation and NAS scoring in NASH induced rats (n)

Liver NASH Grading score	Steatosis				Ballooning			Inflammation				NAS			
	0	1	2	3	0	1	2	0	1	2	3	4	5	6	7
SG	-	-	6	2	-	7	1	-	3	5	-	3	4	-	1
SS	-	-	6	2	-	6	2	-	1	7	-	-	6	1	1
Control	-	-	2	6	-	6	2	-	-	8	-	-	3	3	2

LIVER PROFILE:

- The SG group showed significant improvement in the serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) as compared to the SS and control groups (p< 0.05).

Liver profile (mean with SD)

	Group	Total Protein	Bilirubin	Albumin	ALT	AST	GGT
Week 0	SG	7.2±0.4	1.0±0.2	4.1±0.3	34.0±8.0	77.8±6.2	1.0±0.2
	SS	7.3±0.3	1.0±0.2	4.1±0.4	42.7±8.3	81.0±8.5	0.6±0.3
	Control	7.4±0.2	1.3±0.3	4.2±0.6	42.2±8.5	92.3±14.5	0.9±0.4
	P value	0.47	0.07	0.83	0.16	0.07	0.10
Week 12	SG	7.1±0.4	0.9±0.1	3.6±0.3	48.5±6.5	97.3±6.0	1.1±0.2
	SS	7.0±0.3	0.9±0.1	3.8±0.3	52.3±6.7	98.2±12.9	0.6±0.3
	Control	6.6±0.0	1.3±0.2	4.1±0.3	59.7±8.2	119.2±15.4	0.8±0.3
	P value	0.03	<0.001	0.06	0.18	0.01	0.05
Week 24	SG	7.0±0.4	0.9±0.1	3.6±0.2	38.8±5.5	71.7±5.1	1.0±0.3
	SS	6.8±0.2	0.9±0.1	3.7±0.1	50.0±3.1	95.7±12.2	0.6±0.4
	Control	6.4±0.3	1.0±0.1	3.7±0.3	60.7±7.7	122.2±14.3	0.9±0.5
	P value	0.02	0.35	0.79	<0.001	<0.001	0.28

Conclusion

- SG showed significant weight loss and liver function improvement (ALT and AST levels) in the NASH induced Sprague Dawley rat model at 12 weeks after surgery.
- Amelioration of the liver histology was not seen during this short study period.
- A longer-term study is warranted to confirm the benefits of SG on liver histology and other clinical risk factors.

Disclosure

- This study was funded by University Putra Malaysia (GPIPS/2019/9681800)