

THE ROLE OF MICRORNA-142 AND TRANSFORMING GROWTH FACTOR-BETA IN OBESITY-INDUCED ERECTILE DYSFUNCTION IN RATS

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Introduction

Erectile dysfunction (ED) is the persistent inability to achieve and/or maintain an erection firm enough for satisfactory sexual intercourse. Millions of men worldwide are affected with an estimate of 322 million men in 2025. Evidence from animal to human research supports the association between obesity and ED, with all the known obesity indices already linked to ED. MiRNAs have already been established as biomarkers in many diseases. And hence their levels are disturbed in both ED and obesity, there are high hopes for them to act as biomarkers in those diseases too. MiRNA-142 came to the light repeatedly in both obesity and ED research but with not enough data on its level or role in obesity-induced ED. TGF- β was proven to play a role in ED through the induction of cavernous fibrosis. Similarly, elevated levels of TGF- β have been linked to obesity and high BMI.

Aim of the work

To assess the role of miRNA-142 and TGF- β in pathogenesis of obesity-induced erectile dysfunction in rat model fed with high fat diet.

Experimental animals and Methods

Experimental animals:
The study was carried out on 20 young male Wistar rats (3 months old), weighing approximately 150 $\pm$ 10 grams. Rats were divided into two groups (10 rats each). Group I (Control group) was fed standard chow diet (5% fat), and group II (HFD group) was fed modified HFD with 30% fat throughout the 20 weeks of the study.
Methods:
The establishment of obesity was confirmed by measuring the total weight gain, lee index, BMI, the mass of white adipose tissue (WAT), and the adiposity index. The development of ED was assessed through an induction test using 5 μ g alprostadil. Then a histological examination of the penile tissue was done to identify any structural change using H&E, Masson trichrome, and SMA stains. Fasting blood glucose and lipid profile were also measured. Penile tissue homogenate was used to measure the level of miRNA-142 using RT-PCR and the level of TGF- β using Elisa kits.

Results

Table 1 demonstrated a statistically significant difference between the two studied groups concerning the miRNA-142 level showing that the HFD group had a statistically higher levels of miRNA-142 (mean value 1.84) compared to the control group (mean value 0.99) with a $p < 0.001$.
Table 2 demonstrated a statistically significant difference between the two studied groups concerning the TGF- β level showing that the HFD group had a statistically higher levels of TGF- β (mean value 16.60) compared to the control group (mean value 10.83) with a $p < 0.001$.

Table (1): Comparison between the two studied groups according to miRNA-142 level

	Control (n = 10)	HFD (n = 10)	t	p
miRNA-142				
Min – Max.	0.90 – 1.02	1.50 – 2.30	8.440*	<0.001*
Mean $\pm$ SD.	0.99 $\pm$ 0.04	1.84 $\pm$ 0.32		
Median (IQR)	1.0 (0.97 – 1.02)	1.75 (1.60 – 2.21)		

Table (2): Comparison between the two studied groups according to TGF- β level

	Control (n = 10)	HFD (n = 10)	t	p
TGF- β				
Min – Max.	9.70 – 13.20	13.20 – 22.30	5.780*	<0.001*
Mean $\pm$ SD.	10.83 $\pm$ 1.20	16.60 $\pm$ 2.92		
Median (IQR)	10.30 (9.80 – 11.70)	16.80 (14.0 – 18.20)		

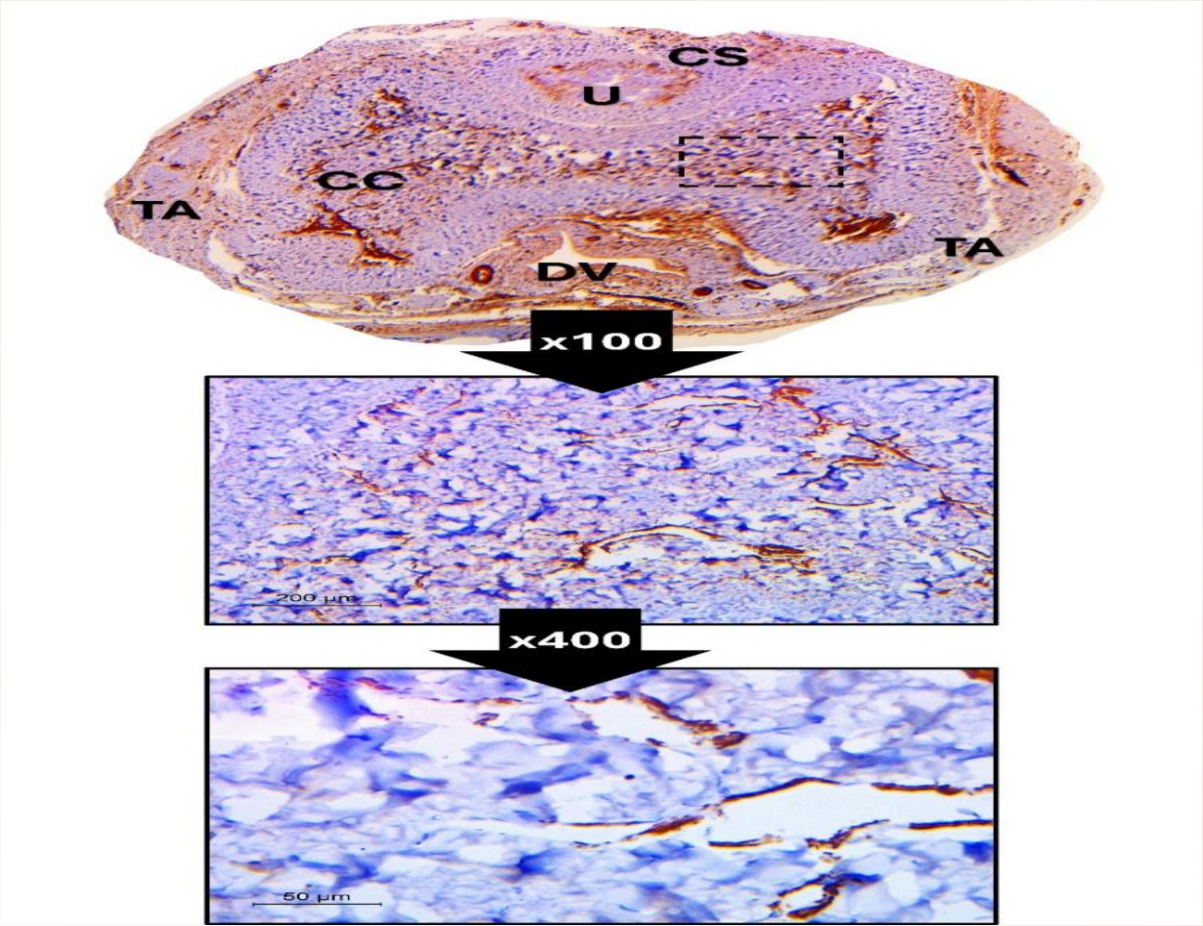


Figure (1): Alpha-smooth muscle actin (A-SMA) stained transverse section of rat penis in HFD group . Smooth muscles are brown in color. Upper photos show low power stitched image of whole penis cut section. Normal structures are highlighted (Urethra (U) is seen surrounded by corpora spongiosum (CS). Two compartments of corpora cavernosum (CS) are present surrounded by tunica albuginea (TA). Doral veins (DV) are also seen. high power of corpus cavernosa (x100 and x400) a notable decrease of brown stained smooth muscle fibers. (low power, x100, high power, x400).

Conclusion

The data conducted from this study showed significant increases in both miRNA-142 and TGF- β in rats with obesity-induced ED, signifying their role in the pathogenesis of ED induced by obesity, and suggesting their potential as biomarkers and therapeutic targets in obesity-induced ED. One of the proposed mechanisms in pathogenesis is fibrosis, based on the results of the histological examination of the penile tissue, which revealed a marked decrease in the smooth muscles to collagen ratio in obese rats.