The Effect of Ileal Interposition on Plasma Glucagon Like Peptide (GLP-1) and Pancreas GLP-1 Receptor Expression in Rats With Metabolic Syndrome

Melek Tunç Ata[1], Fatih Altıntaş[1], Hande Şenol[2], Vural Küçükatay[1]

1) Pamukkale University, Department of Physiology, Denizli, Turkey
2) Pamukkale University, Department of Biostatistics, Denizli, Turkey

AIM: Metabolic syndrome (MeTS) is a cluster of metabolic abnormalities that include hypertension, abdominal obesity, insulin resistance, and atherogenic dyslipidemia. For the treatment of MeTs, gastrointestinal system structure has recently been an important research point in the treatment of closely related diseases including MeTs. In this regard, our aim in this study is to ensure the remission of parameters that define MeTs with ileal interposition (IT), which is a surgical procedure involving the transfer of the distal ileum segment in the isoperistaltic direction, and to examine the effect of IT on plasma GLP-1 and pancreatic GLP-1 receptor expression.

METHODS: For MeTs; newborn male Wistar Albino rats were given monosodium glutamate (4 g/mg) on days 0, 2, 4, 6, 8, 10, and saline (0.01 ml/g) to the control group. At the 5th month, IT and sham operations were performed on Mets rats. For IT, the 15 cm intestine segment was provided with cuts from 10 and 25 cm regions prior to the ileocecal valve. The jejunum was cut 5 cm distal from Treitz's ligament and the 15 cm ileum was placed isoperistalticly in between. 2 months later; lipid levels, abdominal obesity (by weighing perigonadal-retroperitoneal fat), plasma insulin, glucose tolerance (OGTT), Lee index, insulin resistance (HOMA-IR), plasma GLP-1 and pancreas GLP-1R expression was evaluated.

RESULTS: In rats with MeTs, IT was found to significantly improve hyperinsulinemia (p=0,017), correct lipid profile (triglyceride p=0,0001, total cholesterol p=0,008), normalize the Lee index (p=0,006) and insulin resistance. While IT did not affect the secretion of the incretin hormone GLP-1 from the L cells in the distal intestine, the pancreas increased the level of GLP-1R expression (p=0,006).

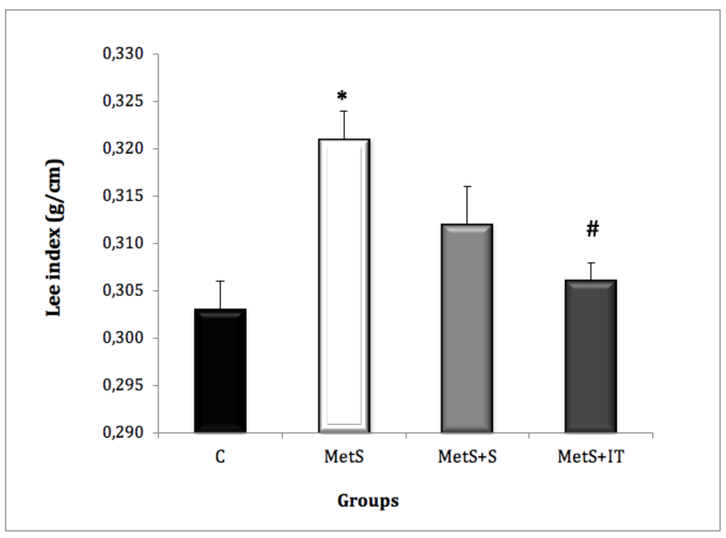
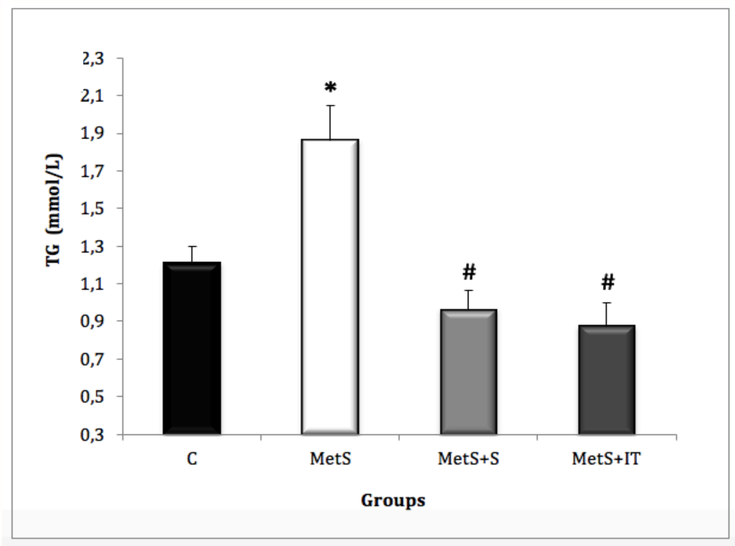


Fig. 1 Effect of ileal transposition and sham operations on Lee index. Data are the means±SEM (p<0.05). Data analysis was carried out with one-way ANOVA and Kruskal-Wallis test. The letters over the bars represent significant differences. Asterisk indicates groups that differ from C group, number sign indicates groups that differ from MetS group, C: control, (n= 10); MetS: metabolic syndrome, (n= 9); S: sham, (n= 9); IT: ileal transposition, (n= 9).



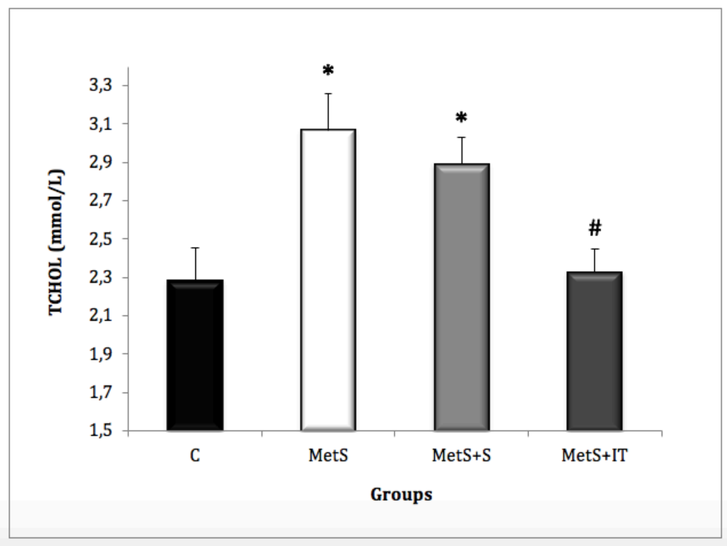
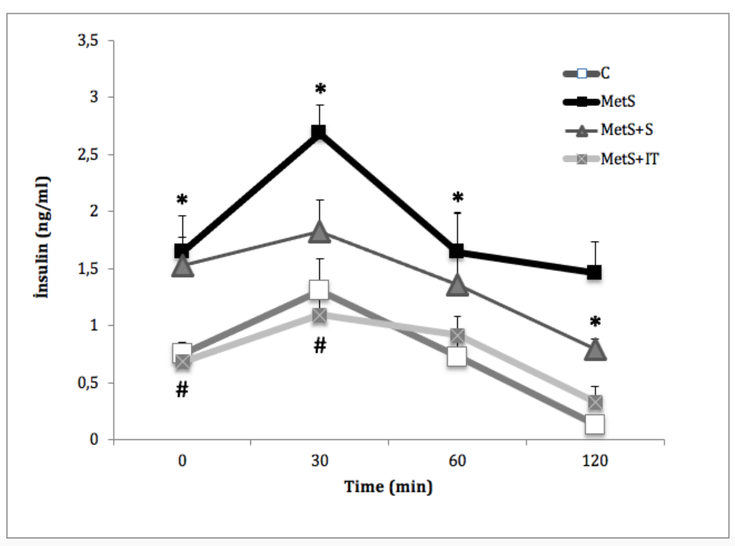
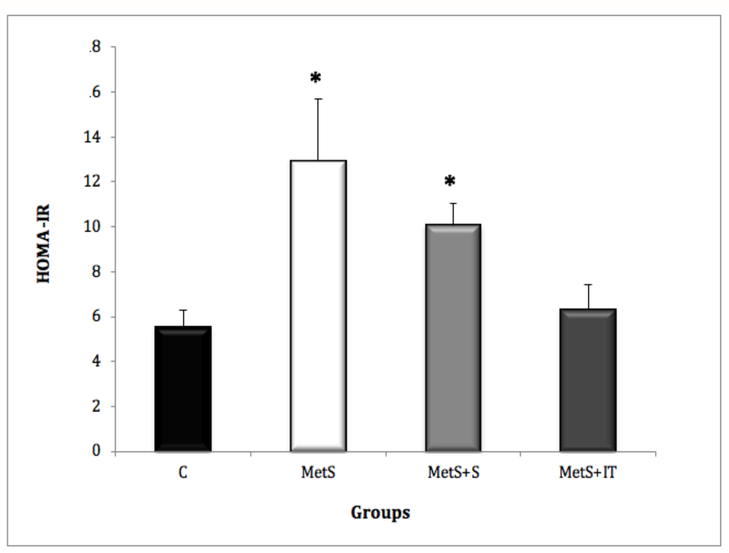
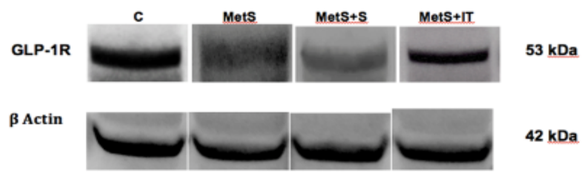


Fig. 2 Effect of the ileal transposition and sham operations on TG, TCHOL in Wistar albino rats. The letters over the bars represent significant differences. Asterisk indicates groups that differ from C group, number sign indicates groups that differ from MetS. Data are the means±SEM. p<0.05. Data analysis was carried out with one-way ANOVA and Kruskal-Wallis Test. C: control, (n= 10); MetS: metabolic syndrome, (n= 9); S: sham, (n= 9); IT: ileal transposition, (n= 9).







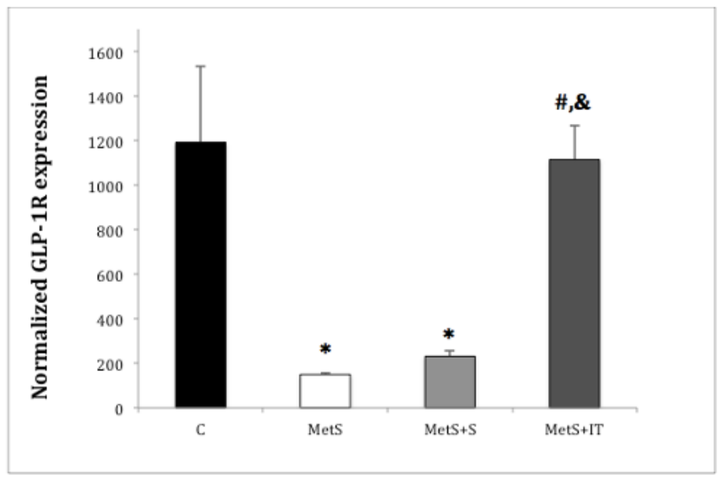
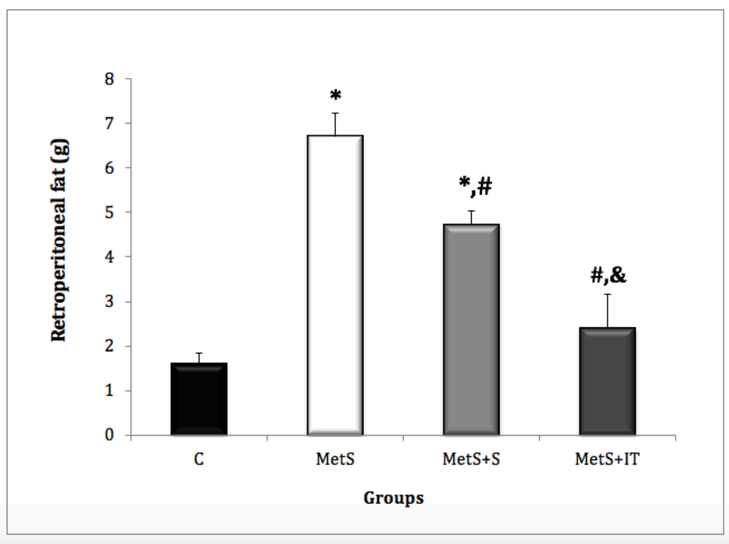
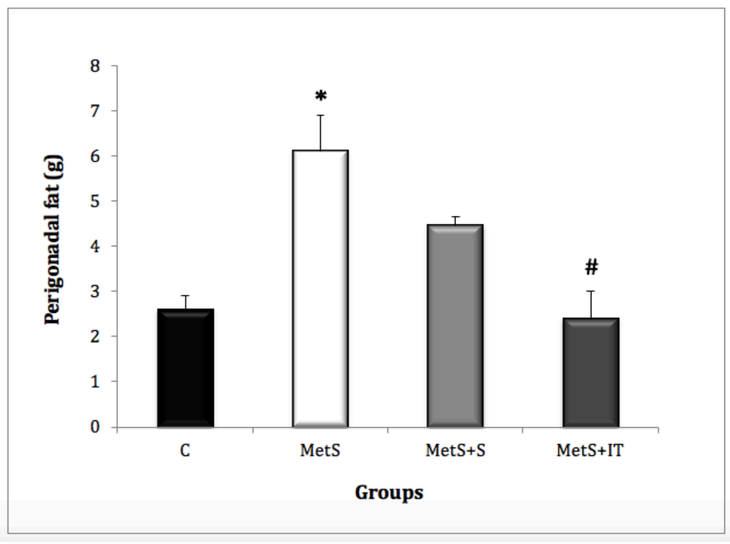


Fig. 3 Effect of the IT and sham operations on plasma insulin,, HOMA-IR in Wistar albino rats. The letters over the bars represent significant differences. Asterisk indicates groups that differ from C group, number sign indicates groups that differ from MetS group. Data are the means±SEM. p<0.05. Data analysis was carried out with one-way ANOVA and Kruskal-Wallis Test. C: control, (n= 10); MetS: metabolic syndrome, (n= 9); S: sham, (n= 9); IT: ileal transposition, (n= 9).





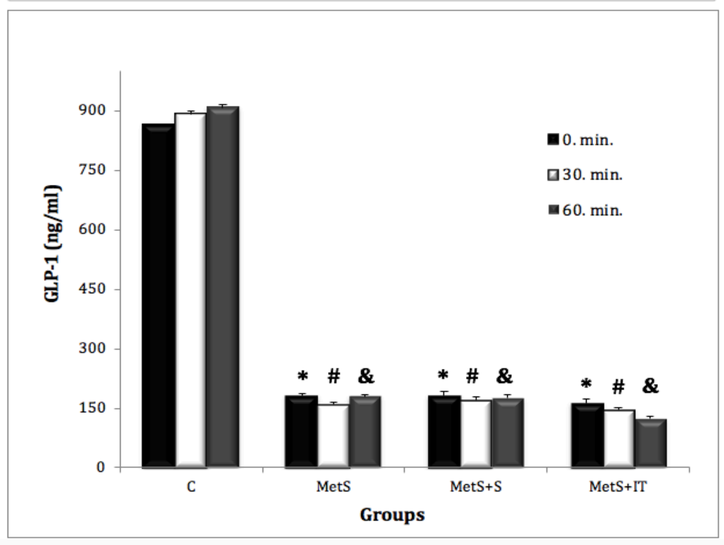


Fig. 4 Effect of ileal transposition and sham operations on perigonadal fat, retroperitoneal fat in 28-week-old Wistar albino rats. Data are the means±SEM (p<0.05). Data analysis was carried out with one-way ANOVA and Kruskal-Wallis test. The letters over the bars represent significant differences. Asterisk indicates groups that differ from C group, number sign indicates groups that differ from MetS group, and ampersand indicates groups that differ from S group; C: control, (n= 10); MetS: metabolic syndrome, (n= 9); S: sham, (n= 9); IT: ileal transposition, (n= 9).

Fig. 5 Effect of the ileal transposition and sham operations on plasma total GLP-1 levels and pancreas GLP-1R expression. The letters over the bars represent significant differences. Data are the means±SEM. p<0.05. Data analysis was carried out with one-way ANOVA and Kruskal-Wallis test. C: control, (n= 9); MetS: metabolic syndrome, (n= 9); S: sham, (n= 9); IT: ileal transposition, (n= 9).

CONCLUSION: Based on our data, it can be thought that the increase in pancreatic GLP-1R expression may play an important role in the improvement of MeTs criteria.