# Evolution of Inflammatory and Oxidative Stress Markers in Romanian Obese Male Patients with Type 2 Diabetes Mellitus after Laparoscopic Sleeve Gastrectomy: One Year Follow-Up

Ariana Picu [1,2,†], Laura Petcu [1,2,†,*], Diana Simona Ştefan [1], Graţiela Grădişteanu Pîrcălăbioru [2,3,*], Manuela Mitu [1], Daiana Bajko [1], Daniela Lixandru [4], Cristian Guja [1,5], Octavian Savu [1,6], Anca Pantea Stoian [5], Alina Constantin [7], Bogdan Smeu [8], Cătălin Copăescu [8], Mariana Carmen Chifiriuc [2,3,*], Elena Ionica [2] and Constantin Ionescu-Tîrgovişte [1,9]

**Supplemental Table 1.** Results of Clinical, Biochemical, Anthropometrical and Metabolic Status Parameters Determination in the Two Studied Groups at Baseline (V1).

| Clinical and Biochemical Parameters | CTG | LSG | *P* value |
|---|---|---|---|
| | n=21 | n=20 | |
| Waist Circumference (WC) (cm) | 135.9±10.72 | 139.85±16.69 | 0.37 |
| BMI (kg/m²) | 41.51±5.56 | 41.2±4.8 | 0.85 |
| Systolic Blood Pressure (SBP) (mmHg) | 135.29±13.59 | 131.58±16.33 | 0.43 |
| Diastolic Blood Pressure (DBP) (mmHg) | 83.8±8.08 | 76.05±11.37 | 0.17 |
| HbA1c (%) | 8.35±1.49 | 8.82±1.56 | 0.33 |
| Glycaemia (mg/dl) | 213.19±84.17 | 220.9±90.33 | 0.77 |
| Insulin (µUI/mL) | 28.41±3.76 | 23.71±3.74 | 0.38 |
| HOMA-IR (%) | 14.48±5.47 | 14.88±5.88 | 0.82 |
| HOMA-β (%) | 129.77±63.07 | 132.79±85.76 | 0.89 |
| Proinsulin (pmol/L) | 11.72±2.25 | 7.67±1.86 | 0.21 |
| Proinsulin/Insulin | 0.46±0.09 | 0.37±0.06 | 0.46 |
| C Peptide (ng/ml) | 9.40±0.47 | 9.36±0.46 | 0.95 |
| Total cholesterol (mg/dl) | 203.2±33.41 | 182.49±36.40 | 0.06 |
| HDL-cholesterol (mg/dl) | 37.19±6.36 | 34.62±13.67 | 0.44 |
| Triglycerides (mg/dl) | 211.10±92.51 | 218.94±117.77 | 0.81 |
| LDL-cholesterol (mg/dl) | 123.79±33.8 | 104.08±39.70 | 0.09 |
| Uric Acid (mg/dl) | 5.65±2.05 | 5.99±1.84 | 0.58 |
| Creatinine (mg/dl) | 1.10±0.24 | 1.13±0.20 | 0.77 |
| Urea (mg/dl) | 39.74±20.82 | 40.55±7.58 | 0.87 |
| AST | 36.02±4.45 | 35.89±4.82 | 0.98 |
| ALT | 65.03±15.24 | 47.43±6.19 | 0.3 |
| GGT | 106.42±38.16 | 59.52±8.15 | 0.24 |
| Albumin (g/dl) | 4.55±0.39 | 4.44±0.32 | 0.35 |
| Total Protein (g/dl) | 7.22±0.54 | 7.1±0.59 | 0.49 |
| RMR measured (kcal/day) | 2381.2 ± 462.15 | 2512.7 ± 440.25 | 0.36 |
| RMR predicted (kcal/day) | 2438.5 ± 285.7 | 2413.05 ± 254.98 | 0.76 |
| VO₂ in rest state (ml/min) | 347.6 ± 68.19 | 364.4 ± 62.82 | 0.42 |

| | | | |
|---|---|---|---|
| **VCO$_2$ in rest state (ml/min)** | 272.85 ± 52.64 | 295.35 ± 57.19 | 0.20 |
| **Fat Mass (%)** | 35 ± 5.32 | 31.12 ± 8.74 | 0.09 |
| **Free Fat Mass (kg)** | 81.9 ± 13.85 | 87.92 ± 14.39 | 0.18 |

Mean ± SD;.

**Supplemental Table 2.** Comparison of clinical and metabolic characteristics determined at V1 and V2 for the two study groups.

| Clinical and Biochemical Parameters | CTG | | | LSG | | |
|---|---|---|---|---|---|---|
| | **V1** | **V2** | **p** | **V1** | **V2** | **p** |
| | **n=21** | **n=17** | | **n=20** | **n=19** | |
| **Waist Circumference (cm)*** | **139.0 (14.0)** | 133.00 (10.00) | **0.001 [1]** | 134.0 (16.0) | 105.0 (10.5) | **<0.001[1]** |
| **BMI (kg/m²)*** | 40.50 (8.60) | 39.10 (8.30) | **<0.001[1]** | 39.60 (4.90) | 29.30 (2.25) | **<0.001[1]** |
| **SBP (mmHg)*** | 135.0 (12.0) | 120.00 (10.00) | **<0.05[1]** | 130.00(13.75) | 125.0 (30.50) | 0.3256 [1] |
| **DBP (mmHg)*** | 90.00 (10.00) | 80.00 (20.00) | 0.262 [1] | 80.00 (10.00) | 82.00 (13.00) | **<0.05[1]** |
| **HbA1c (%)*** | 7.56 (1.87) | 7.91 (2.62) | 0.5791 [1] | 8.40 (1.45) | 6.60 (0.75) | **<0.001[1]** |
| **Glycaemia (mg/dl)*** | 184.5 (99.3) | 145.17 (103.63) | 0.2842 [1] | 197.7 (107.4) | 99.56 (27.48) | **<0.001[1]** |
| **Total cholesterol (mg/dl)#** | 194.14±26.75 | 191.16±55.01 | 0.08 [2] | 184.65±36.04 | 184.55±32.05 | 0.99 [2] |
| **HDL-cholesterol (mg/dl)*** | 36.10 (8.20) | 35.30 (9.50) | 0.2446 [1] | 34.20 (8.15) | 39.20 (9.90) | **<0.05[1]** |
| **Triglycerides (mg/dl)*** | 187.4 (123.26) | 167.35 (100.68) | 0.5791 [1] | 178.23 (137.50) | 89.43 (48.30) | **<0.001[1]** |
| **LDL-cholesterol (mg/dl)*** | 121.15 (31.6) | 119.86 (42.86) | 0.2247 [1] | 111.15 (34.7) | 126.54 (17.5) | **0.06 [1]** |
| **Uric Acid (mg/dl)*** | 5.99 (1.45) | 6.38 (1.54) | 0.1594 [1] | 5.89 (2.34) | 6.51 (2.19) | 0.2753 [1] |
| **Creatinine (mg/dl)*** | 1.02 (0.10) | 1.10 (0.22) | 0.9058 [1] | 1.09 (0.19) | 1.00 (0.15) | **<0.05[1]** |
| **Urea (mg/dl)*** | 35.25 (7.12) | 33.92 (8.19) | 0.7119 [1] | 40.18 (9.31) | 36.93 (11.07) | 0.8596 [1] |
| **AST (IU/L)*** | 24.34 (12.45) | 20.51 (14.75) | **0.07 [1]** | 29.60 (23.58) | 16.74 (3.68) | **<0.001[1]** |
| **ALT (IU/L)*** | 36.18 (17.38) | 33.06 (24.66) | 0.1743 [1] | 41.38 (46.41) | 15.36 (6.16) | **<0.001[1]** |
| **GGT (IU/L)*** | 45.34 (24.00) | 33.46 (13.15) | **0.07 [1]** | 53.91 (40.11) | 28.57 (22.34) | **<0.05[1]** |
| **Albumin (g/dl)*** | 4.59 (0.43) | 4.55 (0.28) | 0.3087 [1] | 4.48 (0.32) | 4.58 (0.23) | 0.4444 [1] |
| **Total Protein (g/dl)*** | 7.28 (0.74) | 7.33 (0.45) | 0.246 [1] | 7.27 (0.82) | 7.08 (0.65) | 0.7475 |

* - Median and IQR range; # - mean ± SD; 1 - Wilcoxon signed rank test; 2 - Paired T Test.

**Table 3.** Comparison of clinical and metabolic characteristics determined at V1 and V3 for the two study groups.

| Clinical and Biochemical Parameters | CTG | | P value V1 vs. V3 | LSG | | P value V1 vs. V3 |
|---|---|---|---|---|---|---|
| | V1 | V3 | | V1 | V3 | |
| | n=21 | n=15 | | n=20 | n=19 | |
| Waist Circumference (cm)* | **139.0 (14.0)** | 128.00 (13.00) | **<0.001[1]** | 134.0 (16.0) | 102.0 (10.25) | **<0.001[1]** |
| BMI (kg/m²)* | 40.50 (8.60) | 40.30 (7.50) | **<0.05[1]** | 39.60 (4.90) | 28.70 (1.50) | **<0.001[1]** |
| SBP (mmHg)* | 135.0 (12.0) | 130.00 (19.00) | 0.8504 [1] | 130.00(13.75) | 128.0 (31.50) | 1.000[1] |
| DBP (mmHg)* | 90.00 (10.00) | 92.00 (11.00) | 0.1236 [1] | 80.00 (10.00) | 86.00 (22.00) | **<0.05[1]** |
| HbA1c (%)* | 7.56 (1.87) | 8.74 (2.69) | 0.804 [1] | 8.40 (1.45) | 5.90 (0.69) | **<0.001[1]** |
| Glycaemia (mg/dl)* | 190.1 (168.0) | 163.80 (119.97) | 0.1354 [1] | 197.7 (107.4) | 96.33 (29.98) | **<0.001[1]** |
| Total cholesterol (mg/dl)# | 208.91±37.66 | 196.06 (±44.23) | **<0.05[2]** | 184.65±36.04 | 188.75±41.84 | 0.7105 [2] |
| HDL-cholesterol (mg/dl)* | 35.70 (9.60) | 32.40 (15.45) | 0.9547 [1] | 34.20 (8.15) | 50.70 (15.65) | **<0.001[1]** |
| Triglycerides (mg/dl)* | 201.10 (116.85) | 147.62 (111.41) | **0.05[1]** | 178.23 (137.50) | 86.26 (64.14) | **<0.001[1]** |
| LDL-cholesterol (mg/dl)* | 121.15 (31.6) | 130.43 (50.94) | 0.804 [1] | 111.15 (34.7) | 111.4 (61.53) | 0.2935 [1] |
| Uric Acid (mg/dl)* | 5.99 (1.45) | 5.96 (1.92) | 0.7197 [1] | 5.89 (2.34) | 5.59 (1.34) | 0.9217 [1] |
| Creatinine (mg/dl)* | 1.02 (0.10) | 1.04 (0.22) | 0.164 [1] | 1.09 (0.19) | 1.02 (0.12) | 0.06409 [1] |
| Urea (mg/dl)* | 35.25 (7.12) | 37.84 (11.62) | 0.5995 [1] | 40.18 (9.31) | 49.88 (14.72) | **<0.001[1]** |
| AST (IU/L)* | 24.34 (12.45) | 22.10 (9.53) | 0.2293 [1] | 29.60 (23.58) | 17.38 (5.32) | **<0.001[1]** |
| ALT (IU/L)* | 36.18 (17.38) | 30.52 (12.71) | 0.2293 [1] | 41.38 (46.41) | 22.80 (9.63) | **<0.05[1]** |
| GGT (IU/L)* | 45.34 (24.00) | 33.93 (8.83) | 0.1876 [1] | 53.91 (40.11) | 30.95 (20.36) | **<0.05[1]** |
| Albumin (g/dl)* | 4.59 (0.43) | 4.62 (0.31) | 0.3626 [1] | 4.48 (0.32) | 4.54 (0.30) | 0.7022 [1] |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Total Protein (g/dl)*** | 7.28 (0.74) | 7.29 (0.55) | 0.4212 [1] | 7.27 (0.82) | 7.11 (0.74) | 0.5066 [1] |
| **RMR measured (kcal/day)*** | 2218 (557.50) | 2073 (274.00) | 0.8926 [1] | 2489 (471) | 1732 (276) | **<0.001[1]** |
| **RMR predicted (kcal/day)*** | 2413.43 ±276.73 | 2372.84 (±286.59) | **<0.05[2]** | 2392.31±244.03 | 1846.31±175.58 | **<0.001[2]** |
| **RMRm - RMRp** | -118.68 ±412.26 | -150.38 ±356.41 | 0.6981 [2] | 119.89±396.91 | -125.00±170.52 | **<0.05[2]** |
| **Fat Mass (%)*** | 36.50 (7.80) | 34.80 (7.65) | **<0.05[1]** | 32.70 (9.85) | 20.30 (7.60) | **<0.001[1]** |
| **Free Fat Mass (kg)*** | 77.40 (10.50) | 81.10 (10.25) | **<0.05[1]** | 86.96 (20.50) | 71.50 (9.60) | **<0.001[1]** |
| **Visceral Fat Level (%)#** | 20,86±5 | 19,2±4,92 | 0.331 | 21,65±5,28 | 10±4,07 | **<0.001** |

* - Median and IQR range; # - mean ± SD; 1 - Wilcoxon signed rank test; 2 - Paired T Test.