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The effect of intragastric balloon therapy on the intestinal microbiome in obese patients with non-alcoholic fatty liver disease, and correlations with anthropometric indices, nutritional factors, and serum immunological markers

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Background and Aims: The prevalence of non-alcoholic fatty liver disease (NAFLD) closely parallels the obesity epidemic, and the rates of both are rising rapidly. There is growing interest in the role of the gut microbiota both in disease pathogenesis, and as potential novel therapies. The primary aim was to determine any changes in the intestinal microbiota in obese patients with NAFLD following assisted weight loss with an intragastric balloon (IGB). Secondary aims included: assessment of metabolomics and peripheral markers of inflammation, and examination for any correlations with gut microbial changes.

Method: Obese patients with NAFLD were prospectively recruited for IGB treatment. Clinical, anthropometric and nutrient data, serum biochemistry and inflammatory markers, and faecal samples for gut microbiota composition were collected at baseline, and at the end of IGB therapy (6 months).

Results: Thirty-four patients were recruited. The majority were female (70%) with an average age of 47 years. Mean baseline weight was 110.5kg (BMI 39.4 kg/m²), with median HOMA-IR 4.37 (1.65-4.51). Paired follow-up results were available for 28 patients: 15 successfully achieved $\geq 9.5\%$ baseline weight loss (Group 1), while the remaining 13 patients (Group 2) did not. Significant improvements in several anthropometric and metabolic indices were observed in Group 1 (mean weight loss -17kg, waist circumference reduction 15cm, HOMA-IR reduction 3.05, $p < 0.01$ for all), but not in Group 2 (mean weight change -2.1kg, HOMA-IR reduction of 1.17, $p = 0.1$). Those in Group 1 reported an average reduction in carbohydrate intake after the intervention (CHO intake in %Kilojoules 54.5 to 49.1, $p = 0.04$), while consumption of sugar was increased in Group 2 (total sugars 77.8g to 137.3g, $p = 0.02$). There were no significant changes in inflammatory cytokines, but a few peripheral blood lymphocyte alterations were noted (significant increase in CD4 T-cells, and decline in NK cells in Group 1). No clinically significant changes in any gut microbial taxonomic units were observed following IGB therapy in both groups, nor were there any significant modifications in metabolomic outputs. A negative correlation with saturated fat intake and low level bacteria was observed (*Dorea*; $r = 0.28$, $p = 0.03$, and *Butyricoccus*; $r = 0.26$, $p = 0.04$).

Conclusion: In this cohort, no clinically significant alterations in the gut microflora or associated metabolomics was observed following IGB therapy, despite significant improvements in several metabolic, hepatic and immunological indices in those who achieved a substantial amount of weight loss.