

Is Intestinal Microbiota Transplantation Enough to Correct Metabolic Syndrome?

Álvaro Zamudio Tiburcio^{1*}, Héctor Bermúdez Ruiz², Silverio Alonso López³ and Pedro Antonio Reyes López⁴

¹Department of Gastroenterology, Intestinal Microbiota Transplantation Medical Specialties Naples Unit, Mexico

²Endoscopy Service, Oncology Hospital, National Medical Center, XXI Century, Mexican Social Security Institute, Hospital Trinidad, Mexico City, Mexico

³Department of Urologist, Chairman Medical Specialties Naples in Mexico City, Mexico

⁴Immunologist, Rheumatologist, National Institute of Cardiology "I. Chávez", Mexico City, Mexico

***Corresponding Author:** Álvaro Zamudio Tiburcio, Department of Gastroenterology, Intestinal Microbiota Transplantation Medical Specialties Naples Unit, Mexico.

Received: July 07, 2023; **Published:** July 26, 2023

Abstract

Although the relationship between both the inflammatory process and insulin resistance (IR) in obesity (O), mediated by the intestinal microbiota, is currently unquestionable, it is essential to carry out a review to determine as close as possible, if it is enough with the fecal microbiota transplant (Microbiota modulator), to improve the metabolic syndrome (MetS).

MetS is a group of processes that increase the risk of diseases such as coronary artery disease, type 2 diabetes mellitus, stroke and others. And it usually manifests: arterial hypertension, increased blood glucose, increased LDL and triglycerides. In addition to O, Polycystic Ovary Syndrome, as well as increased abdominal diameter. There is adiposity, genetic susceptibility, endothelial dysfunction and hypercoagulability and chronic stress. Non-alcoholic fatty liver disease and lipodystrophy associated with protease inhibitors should be included in all cases. It is very frequent in the United States of America, presenting the process in one of every 3 adults. Being able to prevent with simple measures, although very quickly abandoned. The patient is usually sedentary and eats an atherogenic diet.

Due to the above, we consider that to all the known measures to combat MetS, others should be added to improve this frequent pathology. Among these procedures, the fecal microbiota transplant (FMT) stands out.

In this article we address all the measures that are in the medical arsenal, including the central theme that is the FMT.

Keywords: *Metabolic Syndrome (MetS); Fecal Microbiota Transplantation (FMT); Insulin Resistance (IR); Obesity (O)*

Introduction

In the world, especially in the West, MetS appears as an extraordinarily frequent process that causes enormous morbidity and mortality [1]. There are many procedures that are carried out to positively influence the relief of its symptoms, ranging from the prevention of type 2 diabetes mellitus to cardiovascular disease [2]. Determined by the presence of increased abdominal diameter, triglycerides, as well as low cholesterol in high-density lipoproteins; fasting hyperglycemia and increased blood pressure [3]. Being able to determine a man-

agement based on: diet and exercise, which achieve, even a little weight loss. The recommended diet is high in fiber and low in saturated fat. Among the medications, metformin is usually decisive, as well as renin-angiotensin-aldosterone system inhibitors and aspirin; without forgetting psychotherapy, which includes medication. We cannot underestimate that lifestyle change is required, even as a number one priority [4].

As we can see, there are multiple actions to follow, so the patient must be fully informed and encouraged to comply with the various indications given. Therefore, it will require a leading physician and a medical team, expert in each of the issues and convinced that it will take a long time, to make a change to normal status. Which is achieved in few cases.

When the goals are not met, we can still offer some alternatives, although we must be convinced that the patient should consider them, since the management will be for life. And some of them produce improvements, temporary.

Discussion

Among the announced measures that we can carry out, they must be linked to the procedures previously described, since we are convinced that none of them, in isolation, will achieve improvement, but rather that we must offer them together, such as:

- Stem cells.
- Bariatric surgery.
- Fecal microbiota transplantation.

Stem cells in the MetS

In relation to mesenchymal stem/stromal cells, they have a promising future in cell therapy. Even when the efficacy, safety and coherence of the different sources call into question its absolute application. In addition, the doses to be administered and the method of administration must also be considered. Despite the above, reports indicate that they are a good alternative to improve abdominal obesity, hypertriglyceridemia, hyperglycemia, as well as arterial hypertension [5]. Despite the above, including the efficacy and safety of Stem cells transplantation should be optimized in the clinical environment [6]. Likewise, there are conflicting data on the action of PPAR-gamma in O and stable adult type 2 diabetes mellitus [7].

Surgery in the MetS

Although metabolic bariatric surgery can improve type 2 diabetes mellitus, non-alcoholic fatty liver and in some cases cure the condition, or at least exclude insulin therapy, it is not usually permanent. And often patients drop out of the treatment challenge and return to their old weight [8].

Another matter that pays in metabolic surgery is laparoscopic surgery, which has reduced morbidity and mortality. Without forgetting the complications that have been observed in these processes such as osteoporosis, iron deficiency, anemia and diarrhea [9].

Fecal microbiota transplantation (FMT) in MetS

The intestinal microbiome, through specific functions, both metabolic and systemic immunological, and through the balance of pro-inflammatory and anti-inflammatory responses in the intestine, influence various pathologies, including: type 2 diabetes mellitus, cirrhosis, liver cancer and others. Generating the intestinal microbiome imbalance dysbiosis (Dysbacteriosis): "Imbalance in the number or type of intestinal microbial colonies" [10].

When eubiosis (normal status) is achieved in the intestine, either through various processes or with the administration of the "great probiotic", which are fecal feces, the incidence of a large number of diseases can be reduced, among which multiple sclerosis, autism, O

and other systemic diseases stand out [11]. For this reason, TMF is being investigated more frequently in the correction of MetS. Having the advantages that it is an outpatient procedure, with a minimum of complications and that mortality has been determined at 0.99%, due to lesion of the mucosal barrier [12]. Of course, the patient must continue to be treated, so that the transplant has a substantial impact, since it usually lasts from 1 to 5 years.

The patient must be offered the alternatives that currently exist, explaining their effects, complications, mortality and care, so that they add and adopt the one that best suits them, in communion with their treating physician.

Complications per procedure

Stem cells: Generated by high doses of radio and chemotherapy. Others due to rejection attempts [13]. Mucositis. Nausea and vomiting, sore mouth and throat, infections, bleeding, interstitial pneumonitis, graft-versus-host disease, gastric cramps, diarrhea, loss of appetite, abdominal pain, weight loss, diarrhea (watery and sometimes bloody). Loss of appetite, jaundice; abdominal pain, weight loss and others [14].

Bariatric surgery: Acid reflux. Risks related to anesthesia. Chronic nausea and vomiting. Dilatation of the esophagus. Inability to eat certain foods. Infection. Obstruction of the stomach. Weight gain or lack of weight loss. All of the above are usually rare, plus serious complications appear in 10% [15].

Fecal microbiota transplantation: FMT is the newest treatment method and can affect many diseases such as MetS. Its complications are usually few and quickly corrected; mainly diarrhea and fever [16].

Procedural mortality

Stem cells: Although there are controversies about the fact that the cause of mortality is not necessarily the use of stem cells, but the process itself, it has been considered that mortality ranges from 5% [17].

Bariatric surgery: Around 0.3% deaths occur in the first month after surgery. And they are usually due to sepsis, cardiac processes and pulmonary embolism [18].

Fecal microbiota transplantation: Although fatalities have been observed in FMT, they have been attributed to unrelated harm in elderly, critically or people who self-administer [19].

In addition to specific therapy for the various morbid processes that occur with MetS. Probiotics, prebiotics, or symbiotics can be used after any of the 3 procedures [20].

It has also been suggested that if FMT is used before bariatric surgery in severe O, there is no incidence in the evolution [21].

Among the probiotics recommended in the use of stem cells, the following stand out: *Streptococcus thermophiles* CRL 1190 and *Bifidobacterium bifidum* BF-1. Recommended for five days [22].

Meanwhile, in bariatric surgery, *Lactobacilli* and *Bifidobacteria* are considered, used in the pre-operative period [23]. Finally, in the modulation of the intestinal microbiota, *Bifidobacterium* and *Lactobacillus* have been used, as well as some strains of *Enterococcus* and *Streptococcus* [24].

The literature mentions xylo-oligosaccharides and galacto-oligosaccharides as prebiotics, due to the growth of *Bifidobacteria* and the concentration of short chain fatty acids in the use of stem cells [25]. In bariatric surgery, the use of prebiotics is associated with weight

loss, the improvement of both the availability and synthesis of vitamins, and the reduction of bacteria in the small intestine [26]. Finally, in FMT, the combination of prebiotics and symbiotics usually give positive results [27].

Conclusion

- The FMT surpasses the use of stem cells, as well as bariatric surgery in the management of MetS.
- In the three treatments, complications in the use of stem cells are more frequent.
- The most severe complications are observed in bariatric surgery.
- There are detractors of the TME, who prefer to wait until late complications appear.
- Any of the three methodologies require post-employment, either of probiotics, prebiotics and symbiotics, as well as therapeutic regimens to control MetS disorders.

Conflicts of Interest

The authors declare that they do NOT have affiliation or participation in organizations with financial interests.

Ethical Approval

This report does not contain any study with human or animal subjects carried out by the authors.

Informed Consent

The authors obtained informed written consent from the patients, in order to develop this article.

Bibliography

1. Metabolic Syndrome. What is Metabolic Syndrome? NIH. National Heart, Lung and Blood Institute. Official websites use (2020).
2. Julie Rask Larsen., *et al.* "The pharmacological management of metabolic syndrome". *Expert Review of Clinical Pharmacology* 11.4 (2108): 397-410.
3. Arati Wagh and Neil J Stone. "Treatment of metabolic syndrome". *Expert Review of Cardiovascular Therapy* 2.2 (2004): 213-228.
4. Jaspinder Kaur. "A Comprehensive Review on Metabolic Syndrome". *Cardiology Research and Practice* (2014).
5. Shamsuddin SA., *et al.* "Stem cells as a potential therapy in managing various disorders of metabolic syndrome: a systematic review". *American Journal of Translational Research* 13.11 (2021): 12217-12227.
6. Tang QR., *et al.* "Evaluation of the Clinical Efficacy of Stem Cell Transplantation in the Treatment of Spinal Cord Injury: A Systematic Review and Meta-analysis". *Cell Transplant* 30 (2021): 9636897211067804.
7. Matsushita K. "Mesenchymal Stem Cells and Metabolic Syndrome: Current Understanding and Potential Clinical Implications". *Stem Cells International* (2016): 2892840.
8. Runkel N and Brydnyak R. "Surgical Treatment of Metabolic Syndrome". *Visceral Medicine* 32.5 (2016): 352-356.
9. Ji Y., *et al.* "Effect of Bariatric Surgery on Metabolic Diseases and Underlying Mechanisms". *Biomolecules* 11.11 (2021): 1582.
10. Malnick SDH., *et al.* "Treating the Metabolic Syndrome by Fecal Transplantation. Current Status". *Biology* 10.5 (2021): 447.
11. Quaranta G., *et al.* "Fecal Microbiota Transplantation: A Potential Tool for Treatment of Human Female Reproductive Tract Diseases". *Frontiers in Immunology* 10 (2019): 2653.

12. Marcella C., *et al.* "Systematic review: the global incidence of faecal microbiota transplantation-related Adverse events from 2000 to 2020". *Alimentary Pharmacology and Therapeutics* 53.1 (2021): 33-42.
13. Sachs J. "Complications of Stem Cell Transplants". Medically Reviewed by Arnold Wax, WebMD (2012).
14. Waszczuk-Gajda A., *et al.* "Complications of Autologous Stem Cell Transplantation in Multiple Myeloma: Results from the CALM Study". *Journal of Clinical Medicine* 11.12 (2022): 3541.
15. Livingston EH. "Complications of Bariatric Surgery". *Surgical Clinics* 85.4 (2005): 853-868.
16. Zheng L., *et al.* "Fecal microbiota transplantation in the metabolic diseases: Current Status and perspectives". *World Journal of Gastroenterology* 28.23 (2022): 2546-2560.
17. Ragbourne SC and Crook MA. "Metabolic Syndrome in Long-Term Survivors of Hematopoietic Stem-Cell Transplantation". *Clinical Lymphoma Myeloma and Leukemia* 17.6 (2017): 340-346.
18. Batsis JA., *et al.* "Effect of bariatric surgery on the metabolic syndrome: a population-based, long-term controlled study". *Mayo Clinic Proceedings* 83.8 (2008): 897-907.
19. Marotz CA and Zarrinpar A. "Treating Obesity and Metabolic Syndrome with Fecal Microbiota Transplantation". *Yale Journal of Biology and Medicine* 89.3 (2016): 383-388.
20. Baldi S., *et al.* "Microbiota shaping - the effects of probiotics, prebiotics, and Fecal microbiota transplant on cognitive functions: A systematic review". *World Journal of Gastroenterology* 27.39 (2021): 6715-6732.
21. Lahtinen P., *et al.* "Effectiveness of Fecal Microbiota Transplantation for Weight Loss in Patients with Obesity Undergoing Bariatric Surgery. A Randomized Clinical Trial. Gastroenterology and Hepatology". *JAMA Network Open* 5.12 (2022): e2247226.
22. Al-Yassir F., *et al.* "Modulation of Stem Cell Progeny by Probiotics during Regeneration of Gastric Mucosal Erosions". *Biology* 10.7 (2021): 596.
23. Fleishman CIPA. "International Probiotics Association". Bariatric Surgery. A Role for Probiotics? (2022).
24. Quaranta G., *et al.* "Fecal Microbiota Transplantation and Other Gut Microbiota Manipulation Strategies". *Microorganisms* 10.12 (2022): 2424.
25. Andermann TM., *et al.* "Microbiota Manipulation with Prebiotics and Probiotics in Patients Undergoing Stem Cell Transplantation". *Current Hematologic Malignancy Reports* 11.1 (2016): 19-28.
26. Nowicki KN and Pories WJ. "Bacteria with potential: Improving outcomes through probiotic use following Roux-En-Y gastric bypass". *Clinical Obesity* 13.1 (2023): e12552.
27. Tan Q., *et al.* "Probiotics, prebiotics, synbiotics, and fecal microbiota transplantation in the treatment of behavioral symptoms of autism spectrum disorder: A systematic review". *Autism Research* 4.9 (2021): 1820-1836.

Volume 19 Issue 7 July 2023

All rights reserved by Álvaro Zamudio Tiburcio., *et al.*