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Long-Term Results of Patients with Hemochromatosis after Bariatric Surgery

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Abstract

Breast milk is considered the optimal source of nutrition for infants due to its rich bioactive components, including probiotic lactic acid bacteria. These bacteria contribute to gut microbiota balance and prevent the colonization of pathogenic microorganisms. This study aimed to evaluate the probiotic potential of lactic acid bacteria isolated from breast milk in Gabon, with a focus on their antibacterial properties and possible applications in antibiotic therapy. Thirty-four breast milk samples, including colostrum, transitional, and mature milk, were collected from lactating women in Gabon. The bacterial strains were isolated and identified using biochemical and molecular techniques. Their antibiotic susceptibility was assessed using the diffusion method. The probiotic potential of the strains was explored through their ability to survive in simulated gastric and intestinal conditions, growth under varying temperatures, and antibacterial activity against clinically relevant pathogens such as *Salmonella typhimurium, Staphylococcus aureus*, and *Escherichia coli* (ATCC 25922). A total of 49 bacterial strains were isolated, with *Lactobacillus acidophilus* being the most prevalent species across all milk types. The strains exhibited significant resistance to acidic and bile conditions, indicating their capacity to colonize the gut effectively. Additionally, they demonstrated strong antibacterial activity, highlighting their potential role in controlling gastrointestinal infections. The presence of such probiotic strains in Gabonese breast milk underscores the importance of breastfeeding in infant health, particularly in low-income populations where access to medical care is limited. These findings suggest that lactic acid bacteria from breast milk could serve as a natural source of probiotics with antimicrobial properties. Future research should focus on characterizing their bioactive compounds and exploring their application in probiotic supplements or therapeutic formulations for combating bacterial infections.

Keywords: Hemochromatosis, Gastric bypass, Sleeve gastrectomy

Introduction

Hereditary hemochromatosis is one of the most common hereditary metabolic disorders with an incidence of 1/200 in Caucasian populations in the United States and Western Europe. Due to a mutation, the control of iron absorption is lost which leads to an iron overload. Therapy consists of regular phlebotomies to deplete the elevated iron deposits to prevent secondary organ damage. Contrarily, bariatric operations are known to induce iron deficiencies, which may arise from the substantial reduction in food intake. Iron deficiency in Roux-en-Y Gastric Bypass (RYGB) patients may also result from malabsorption (because the main sites of iron absorption have been bypassed)

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and from reduced bioavailability of dietary iron because of the lack of hydrochloric acid production in the small gastric pouch [1]. There are only few cases and case series published showing a beneficial effect of bariatric surgery concerning iron overload in patients with hemochromatosis within the first years after operation [2-7].

Methods

We present two cases with hereditary hemochromatosis, which were treated with laparoscopic proximal gastric bypass and laparoscopic sleeve gastrectomy, respectively. Both patients gave written consent to publish their retrospectively collected data anonymously.

Results

A 48-year-old male patient received a proximal gastric bypass and a 49 year-old female patient underwent sleeve gastrectomy 6, respectively 4 years after the initial diagnosis of hemochromatosis. Baseline demographics of the two patients are shown in table 1. Both patients were treated by repetitive phlebotomies prior to their bariatric surgery. The decision to perform a sleeve gastrectomy was taken because of patient preference for this procedure. The post-bariatric course was uneventful in both cases with good results concerning weight control (diagram 1). The maximum percent total BMI loss (%TBMIL) was 27.1% in Patient 1 and 29.1% in Patient 2. %TBMIL at the last recorded follow-up was 23.9% and 19.7%, respectively. Patient 1 received additional supplementation of vitamin B12 and Vitamin D on top of the standard oral multivitamin according to the vitamin levels in his regular blood checks. Patient 2 developed no malnutrition but a reflux oesophagitis grade C according to the Los Angeles classification, which was asymptomatic and successfully treated with oral proton pump inhibitors. In both patients the regular phlebotomies before the bariatric operation could be stopped postoperatively without an increase in serum ferritin levels (diagram 2) and stable haemoglobin (diagram 3). This effect was permanent and still there at the last follow-up at 8 respectively 6 years postoperatively.

Table 1

	Patient 1	Patient 2
Age	48	49
Gender	Male	Female
Mutation	HFE C282Y homozygous	HFE C282Y/H63D compound heterozygous
Time from diagnosis of hemochromatosis to surgery	6 years	4 years
Type of operation	Proximal gastric bypass	Sleeve gastrectomy
Follow-up after bariatric operation	8 years	7 years
BMI at surgery	39.8 kg/m^2	37.5 kg/m^2

Table 2

	Operation	Age	Gender	Mutation	Time between diagnosis of hemochromatosis and bariatric surgery	Frequency of phlebotomies		Follow-up	Last reported ferritin level
						Preoperatively	Postoperatively		
1	RYGB	32	F	Homozygous HFE C282Y	Diagnosis postoperatively	-	Stopped	1 years	119 µg/l
2	RYGB	55	M	Homozygous HFE C282Y	2.5 years	Every 10 weeks	Every 5 months for 2.5 years	-	-
3	RYGB	40	M	Homozygous HFE C282Y	4 years	Every 12 weeks	Once, then stopped	2 years	25 µg/l
4	RYGB	45	M	-	-	Every 2 weeks	Stopped	2 years	30 µg/l
5	RYGB	55	F	Homozygous HFE C282Y	12 years	Every 12 weeks	Every 6 months for 3 years	5 years	4 µg/l
6	RYGB	41	M	Heterozygous C282Y/H63D	9 years	Every 4 weeks	stopped	6 years	69 µg/l
7	RYGB	45	F	Homozygous HFE C282Y	2 years	Every 3 weeks	for 6 months	4 years	18 µg/l
8	RYGB	-	-	-	-	"periodically"	Stopped	4 years	-
9	RYGB	-	-	-	-	"periodically"	Stopped	4 years	-
10	RYGB	-	-	-	-	"periodically"	every 6 months for 3 years	4 years	-

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11	RYGB	48	M	Homozygous HFE C282Y	6 years	Every 12 weeks	Stopped	8 years	27 µg/l
12	Sleeve	48	M	Homozygous HFE C282Y	3 years	Every 5 weeks	Every 5 months for 2 years	2 years	99 µg/l
13	Sleeve	49	F	Heterozygous C282Y/H63D	4 years	Every 8 weeks	stopped	7 years	83 µg/l

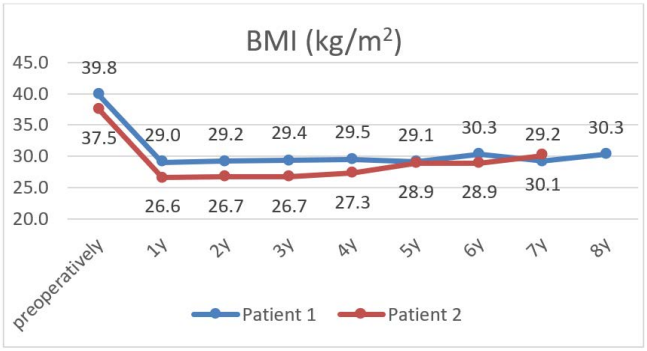

Diagram 1

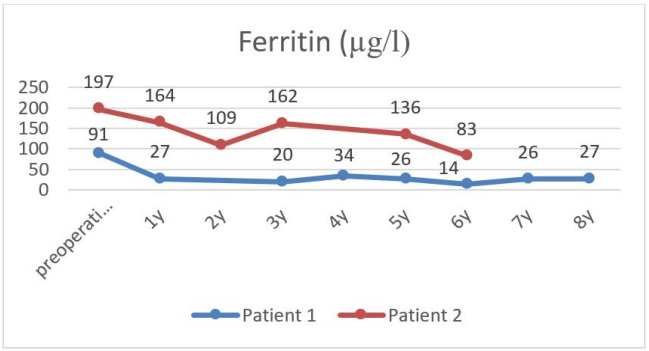

Diagram 2

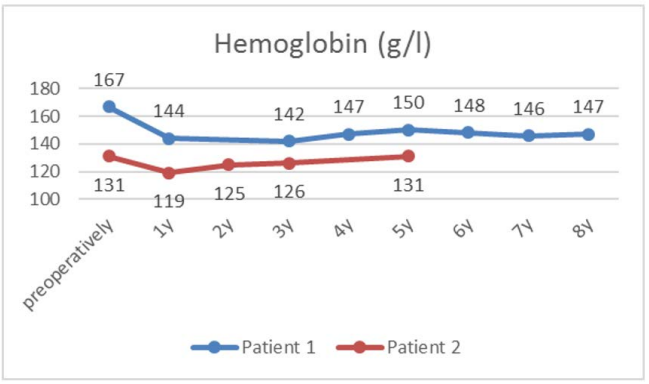

Diagram 3

Discussion

Including our two patients, there are thirteen reported cases of patients with hemochromatosis undergoing RYGB or sleeve gastrectomy until today (table 2). The follow-up time ranges from 1 to 8 years and all patients had a successful weight reduction. In all cases phlebotomies could be stopped and ferritin levels remained low even in long term follow-up, despite the possible adaptation of the more distal small bowel to improve iron absorption. Patients with a RYGB seem to reach lower ferritin levels than those with sleeve gastrectomies, but the number of cases is too small for this to be statistically significant. Because a major component of RYGB, in addition to stomach reduction, is the exclusion of the duodenum and the portion of the jejunum, which is the main location of iron absorption, it is reasonable to assume, that this result would be confirmed in larger series [8]. There seem to be no negative effect of the hemochromatosis on the success of the bariatric operation.

Conclusion

The reduced iron intake and absorption after bariatric interventions is outweighing the uncontrolled iron absorption in hemochromatosis. Bariatric operations are therefore able to control the iron overload in patients with hemochromatosis and eliminate the need for phlebotomies. There seems to be an advantage for gastric bypass over sleeve gastrectomy, most likely due to the bypassing of the main location of the iron uptake in the duodenum and the proximal jejunum.

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