

# SYSTEMIC CONSEQUENCES OF BARIATRIC SURGERY AND ITS REPERCUSSIONS ON ORAL HEALTH

## *Consequências sistêmicas da cirurgia bariátrica e suas repercussões na saúde bucal*

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**HEADINGS** - Bariatric surgery. Oral health. Postoperative complications. Deficiency Diseases.

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**DESCRITORES** - Cirurgia bariátrica. Saúde bucal. Complicações pós-operatórias. Deficiências nutricionais.

**ABSTRACT – Introduction** - Morbid obesity control can be done by bariatric surgery that restricts or reduces the amount of food absorption. The objective of this review was to identify the consequences of bariatric surgery and its repercussions on oral health. **Method** – It was used the Virtual Library of Health, which included articles that had any direct or indirect connection between bariatric surgery and oral health, and published in the last ten years. **Results** - Some complications of the surgery are chronicle reflux and nutritional deficiency, which may bring repercussions on the oral cavity, such as tooth erosion, bone loss and dental caries. On the other hand, there are also positive impacts, such as the decrease of diabetes, apnea and improvement on self-esteem, that makes the patients less vulnerable to complications regarding oral health, for example xerostomy and periodontal disease. **Conclusion** - Maintaining proper oral health in patients undergoing bariatric surgery contributes to success after surgery protecting benefits and minimizing side effects.

**RESUMO – Introdução** - O controle da obesidade mórbida pode ser realizado através da cirurgia bariátrica que leva à restrição e/ou à má-absorção de alimentos. O objetivo dessa revisão foi identificar consequências desse procedimento e suas repercussões na saúde bucal. **Método** - Foi realizada busca na Biblioteca Virtual em Saúde, sendo incluídos artigos com relação direta ou indireta entre cirurgia bariátrica e saúde bucal e publicados nos últimos dez anos. **Resultados** - Verificaram-se algumas complicações decorrentes dessa operação, como regurgitação crônica e deficiências nutricionais, que podem trazer repercussões na cavidade bucal como erosão dentária, perda óssea e cárie dentária. Por outro lado, existem consequências positivas como controle da diabetes, da apnéia e melhora da auto-estima, que tornam os pacientes menos susceptíveis à complicações na cavidade oral, como xerostomia e doença periodontal. **Conclusão** - A manutenção da saúde bucal adequada em pacientes submetidos à cirurgia bariátrica contribui para o sucesso após a operação, resguardando os benefícios e minimizando os efeitos colaterais.

## INTRODUCTION

Changes in dietary profile, as consumption of foods with great energy density, coupled with the increasing sedentary lifestyle are occurring rapidly in developing countries, leading to increased prevalence of obesity in all genders, ages and social strata<sup>10</sup>. According to the World Health Organization<sup>58</sup> obesity is diagnosed by Body Mass Index (BMI) obtained by calculating the ratio of body weight (kg) by the square of height (m<sup>2</sup>), considering obese individuals with BMI  $\geq 30\text{kg} / \text{m}^2$ <sup>17</sup>.

Obesity is associated with some of the most prevalent chronic diseases and non-infectious diseases in modern society and has been therefore considered a public health problem<sup>20</sup>. Among these co-morbidities can be mentioned type 2 diabetes mellitus, hypertension, hyperlipidemia, atherosclerosis, arthritis, sleep apnea syndrome, endocrine disorders, some cancers, periodontal disease, lack of skills for daily activities, and

psychosocial problems<sup>7,20,26,44</sup>.

The control of morbid obesity (BMI  $\geq$  40 kg / m<sup>2</sup>) can be done by bariatric surgery through a mechanism that leads to restriction or malabsorption of the food; it has been shown to be effective and lasting<sup>28</sup>. Three surgical techniques are recognized by Latin American Obesity Consensus: vertical banded gastroplasty, gastric banding and gastroplasty with gastro-jejunal bypass<sup>12</sup>. A technique that combines the reduction of the reservoir and restricting gastric emptying by a ring - known as Roux-en-Y gastric-jejunal bypass -, is today the most used in the Brazilian Unified Health System (SUS)<sup>49</sup>.

The number of operations for obesity has increased in recent years<sup>5,47</sup> and its success is founded on the effective weight loss, control of comorbidities and increased quality of life<sup>1,5,9,29,47</sup>. However, some negative effects have also been reported in several studies, such as hyperparathyroidism and osteoporosis<sup>39,55,57,59</sup> chronic regurgitation, nutritional deficiencies<sup>2,6,28,30,59</sup>, kidney problems<sup>3,16</sup> and oral problems<sup>22,23,31,49</sup>.

The objective of this review was to identify the consequences of postoperative bariatric surgery (as vitamin deficiency, gastroesophageal reflux, kidney disturbances, psychological alterations, reduction of diabetes mellitus, improvement in obstructive sleep apnea and, also, to check its impact on oral health and dental caries, xerostomy, erosion and bone resorption.

## METHOD

The methodology used was a literature review using Virtual Health Library (BIREME) and integrated databases (LILACS, IBECs, MEDLINE, Cochrane Library and SciELO) crossing the following descriptors: bariatric surgery, postoperative complications, oral health, bone loss, gastroesophageal reflux, GERD, vitamin D, type 2 diabetes mellitus, renal insufficiency, renal failure, nutritional deficiency, drugs, medicines.

Inclusion criteria for articles were: 1) the content: to provide direct or indirect relation of bariatric surgery with oral health; 2) for the period of publication: theses and articles published between 2001 and 2010.

The total number of papers / theses selected was 53; ten more were used for definitions and additional information required for the writing, regardless of publication year (Table 1).

The malabsorption of macro and micronutrients consequences is common in patients undergoing bariatric surgery, especially the Roux-en-Y gastric-jejunal bypass<sup>30</sup>. Occurs due to changes in the surgical anatomical characteristics of the gastrointestinal tract and restrictive diet, which

**TABLE 1** – Number of publications selected according to content / subject

Content / subject	n
Systemic consequences of bariatric surgery (first stage)	30
Relationship between oral health and systemic consequences of any bariatric surgery identified in the first step	19
Bariatric surgery and oral health ("direct relationship")	04
Other (obesity, bariatric surgery, oral health)	10
<b>TOTAL</b>	<b>63</b>

reduces both the amount of food intake and quality of ingested nutrients<sup>45</sup>.

Macronutrients found in deficient levels may include proteins and lipids and micronutrients<sup>30</sup> most often are associated with nutritional complications of B12 vitamin, iron, calcium and vitamin D<sup>30,32</sup>.

A deficiency of vitamin D-25 was found in the study by Madan et al.<sup>28</sup>, in 40% of patients in the preoperative period and 21% in the postoperative. Mauri et al.<sup>32</sup> already found that 29 of the 109 obese patients studied and followed-up after having undergone surgery, levels of vitamin D3-25-OH were significantly lower than the basal level after six months of operation. Furthermore, 31.7% of patients had the need to receive supplemental high doses of vitamin D.

Approximately 30% of people who undergo surgery develop nutritional deficiencies, such as anemia, osteoporosis and metabolic bone disease<sup>40</sup>, the most common being anemia and iron deficiency, which occurred in 54.4% and 36.6% of cases, respectively. Other postoperative complications found were hypocalcaemia in 23.8% and secondary hyperparathyroidism in 45.4%. All these complications were more frequent in patients who have undergone biliopancreatic diversion<sup>6</sup>.

Therefore, according to what is suggested in several studies<sup>30,40,56</sup>, nutritional counseling, monitoring, supplementation of vitamins and minerals, must be recommended especially in public service. These measures are essential for the prevention and treatment of metabolic consequences resulting from bariatric surgery, including its potential impact on oral health.

In a cross-sectional study with 72 patients who underwent Roux-en-Y gastric-jejunal bypass, 80% had serum vitamin D below 32 mg/ml<sup>2</sup>. Postoperative data showed that 45% of these patients continued with low rates of vitamin.

Malabsorption of fat soluble vitamins and minerals, including calcium and vitamin D, has been documented<sup>13,28</sup>. Vitamin D is essential to maintain normal calcium metabolism<sup>52</sup>. In case of vitamin D deficiency, calcium absorption is insufficient failing to maintain the body's needs, may lead to secondary hyperparathyroidism<sup>18,39,42,46,52</sup> which is an increase of production of parathyroid hormone, besides the removal of calcium from bone and reabsorption

in the kidneys to maintain their normal levels. Osteoporosis was found in 26.3% of 180 patients with vitamin D deficiency assessed by Silva et al.<sup>50</sup>.

A vitamin D deficiency is a situation that must be taken into consideration in the differential diagnosis of osteoporosis<sup>41</sup>. A disease caused by a deficiency in adults promotes hypocalcemia and secondary hyperparathyroidism with subsequent loss of trabecular bone and thinning of cortical bone, which leads to increased risk of fractures<sup>41</sup>.

The diagnosis of bone loss has been reported in some cases<sup>18,39,42,46</sup>. Bone loss associated with bariatric surgery was proven by Fleischer et al.<sup>39</sup> who evaluated 23 obese men and women, 20 to 64 years. The results showed decreased bone mineral femoral (9.2%) and hip density (8.0%). These declines are associated with the extent of weight loss. These findings show the need for studies to evaluate the conditions of the maxilla and mandible bones, because once these structures are affected, can lead to tooth loss by impairment of periodontal support.

The jaw may be affected by osteoporosis, which demonstrates its importance to the field of dentistry and can be considered potential contraindication for placement of dental implants<sup>35</sup>. The influence of vitamin D in gene expression during in vitro osseointegration of titanium pin was studied in 16 rats; they were divided into four groups according to the type of diet and insertion or not of implant in their femurs. Deficiency of this vitamin affected gene expression during and after osseointegration; the expression of collagen I and II increased in the presence of titanium<sup>35</sup>.

In a review study conducted by Mellado-Valero et al.<sup>34</sup> on the effect of osteoporosis on the osseointegration of implants, showed that osteoporotic individuals had no differences in implants survival compared with healthy individuals; therefore, osteoporosis could not be considered contraindication for implant placement, and the steps to be taken before starting a surgical implant would be not different from people without osteoporosis.

Because there are differences in the literature, it is necessary to analyze the pre-implant patient's history. Check if he/she underwent bariatric surgery, if there is a nutritional deficiency and if there is osteoporosis; only after this investigation should be recommended the dental care, seeking the best possible treatment to the patient. Moreover, it is important to know how is the absorption and bioavailability of drugs, such as oral bisphosphonates, which may be compromised in bariatric surgery<sup>37</sup>. Bisphosphonates are drugs that inhibit osteoclasts and are prescribed to patients with an imbalance in bone metabolism leading to osteoporosis<sup>33</sup>.

Another consequence often found in people who have undergone Roux-en-Y gastric bypass,

is the chronic regurgitation or gastroesophageal reflux; it may be due to the narrow diameter of the silicone ring and also hypotonicity of the lower esophageal sphincter<sup>1</sup>. The clinical consequences of this reflux reaching the mouth, may result in erosion of the enamel or erosive lesions of the oral mucosa<sup>8</sup>. Dental erosion is a type of non-carious lesion that develops from the loss of tooth structure caused by chemical action, without the involvement of bacteria, and may originate from intrinsic or extrinsic factors. The causative factors are extrinsic diet (fruits, acidic drinks), environment (chemical, chlorinated pools) and medicines (vitamin C, aspirin). Intrinsic factors are diseases that cause regurgitation of gastric juice or decreased salivary flow<sup>51</sup>.

Patients who have gastroesophageal reflux tend to have higher incidence of dental erosions, ulcers, burning mouth, tooth sensitivity and sour taste and a lower incidence of carious lesions<sup>11,62</sup>. This susceptibility to dental erosion highlights the importance of the presence of a dental surgeon in the multidisciplinary team that treat these patients.

The oral health of bariatric patients depends on a number of behavioral changes, since they were used eating fatty foods in large quantities and after the operation, with the reduction of the stomach, major change in eating habits happens. The patient feed in smaller quantities and more frequently<sup>22</sup>. Thus, the fact of having to eat more often during the day, means that there is need for special attention to hygiene to prevent dental problems such as tooth decay. In this situation the disease-causing bacteria in the mouth is favorable. According Heling et al.<sup>23</sup> on 113 patients who had been operated on three Jerusalem hospitals, 37% reported eating more sweet foods after surgery; only 20% reported improvement in oral hygiene; 34% reported increased frequency of dental visits; and 37% more dental hypersensitivity after surgery. The authors found postoperative decrease in basic healthy oral condition. Marsicano<sup>31</sup> compared to obese individuals undergoing bariatric surgery and demonstrated a reduction in the oral health of patients, especially in relation to periodontal disease.

Moreover, in some cases, change the physical appearance of the patient may have positive impact, including increases in quality of life, in sense of personal strength, improvement on social relationship and self-esteem. Thus, there is a stimulation for better diet and oral hygiene<sup>48</sup>.

Bariatric surgery, also can lead to other complications, such as rhabdomyolysis, acute renal failure and gastric ulcer's<sup>3</sup> It is important that the dentist be careful in the administration of local anesthetics in patients who have acute renal failure or rhabdomyolysis, since, according Mercatello<sup>36</sup>, anesthetics act on renal function by changing

the self-regulating of blood flow and glomerular filtration rate.

Regarding the occurrence of gastric ulcer, it is related to surgical procedures<sup>60</sup>. Dentists should take care in prescribing medication, and should avoid it in patients who have undergone bariatric surgery, and so have higher risk for ulcer.

The sleep apnea is associated with overweight and is characterized by stop breathing during sleep. Dry mouth can submit during this period<sup>9</sup>. It's called xerostomia and leads to increased tooth decay, since the protective effect of saliva is absent. It also makes the oral mucosa more vulnerable to infections<sup>53</sup>.

It is known that periodontal disease has a higher prevalence and severity in diabetic subjects compared with non-diabetic<sup>15,24</sup>. It is important to the maintenance and promotion of periodontal health among patients with diabetes because of their high risk for periodontal diseases<sup>63</sup>. Study by Blanco et al.<sup>4</sup> observed a higher number of missing teeth in the diabetic population compared to the healthy population. Differences were found in the number of cavities, with index slightly higher in diabetic patients. Considering that diabetes is associated with manifestations in the oral cavity - diseases of the oral mucosa and salivary glands, xerostomia, periodontitis and oral candidiasis<sup>61,63</sup> -, one can deduce that diabetic patients submitted to bariatric surgery with diabetes control, may have oral improvement compared to previous situation.

Based in all these data, it is clear the importance on recognizing the special needs in bariatric patients and integration of dental professional on the team that takes care of the patients.

## CONCLUSION

A number of factors highlights the need for oral health, and the importance of dentist integration on the multidisciplinary team that takes care of these patients. Maintaining oral health in patients undergoing bariatric surgery contributes to success after the operation, helping with the benefits and minimizing side effects.

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