

OBESIDADE, CIRURGIA BARIÁTRICA E O IMPACTO NA SAÚDE BUCAL: REVISÃO DE LITERATURA

*Obesity, bariatric surgery and the impact
on oral health: a literature review*

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RESUMO

Introdução: o consumo irregular de alimentos calóricos e pouco nutritivos elevou a prevalência da obesidade e a procura pela cirurgia bariátrica. Entretanto, tais condições podem causar consequências negativas na cavidade bucal. **Objetivo:** o objetivo deste estudo foi revisar a literatura acerca da relação entre obesidade, cirurgia bariátrica e alterações bucais. **Métodos:** foi realizada consulta ao PubMed e ao BVS utilizando os termos “cirurgia bariátrica”, “periodontite”, “síndrome x metabólica”, “obesidade”, “força de mordida”, “cardiopatas”, “qualidade de vida”, “desgaste dos dentes” e

“eliminação salivar” entre 2000-2017. Documentos do Ministério da Saúde brasileiro e da Organização Mundial da Saúde com dados epidemiológicos foram incluídos. **Resultados:** observou-se que cárie dentária é frequente e o estado crônico de inflamação do obeso contribui para o desenvolvimento da doença periodontal. Além disso, o obeso possui maior risco de desordens cardiovasculares, que pode ser potencializada por bactérias da doença periodontal. Contudo, a cirurgia bariátrica, ao contrário do esperado, pode agravar ainda mais a doença periodontal e, devido a frequentes episódios de vômito, também pode levar ao desgaste dentário. **Conclusão:** a literatura evidencia a importância do cirurgião-dentista no controle de riscos, na prevenção e no tratamento dos pacientes obesos e bariátricos.

Palavras-chave: Cardiopatias. Cirurgia Bariátrica. Obesidade. Síndrome X Metabólica.

ABSTRACT

Introduction: *irregular intake of caloric and low-nutrient foods has raised the prevalence of obesity and the demand for bariatric surgery. However, such conditions may have negative consequences on the oral cavity.* **Objective:** *the aim of this study was to review the literature on the relationship between obesity, bariatric surgery and oral disorders.* **Methods:** *PubMed and BVS were consulted using the terms “bariatric surgery”, “periodontitis”, “metabolic syndrome”, “obesity”, “bite force”, “heart disease”, “quality of life”, “tooth wear” and “salivary elimination” between 2000-2017. Documents from the Brazilian Ministry of Health and the World Health Organization with epidemiological data were included.* **Results:** *it was observed that dental caries is frequent, and the chronic inflammatory state of the obese patient contributes to the development of periodontal disease. In addition, the obese is at increased risk for cardiovascular disorders, which may be worsened by bacteria from periodontal disease. Yet, bariatric surgery, contrary to expectations, may further aggravate periodontal disease and, due to frequent vomiting episodes, can also lead to tooth wear.* **Conclusion:** *it can be concluded that literature highlights the importance of the dentist in the control of risks, in the prevention and treatment of obese and bariatric patients.*

Keywords: *Heart diseases. Bariatric Surgery. Obesity. Metabolic X Syndrome.*

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INTRODUCTION

Throughout the last decades, the population has changed its lifestyle and dietary habits, which are marked by increased consumption of sugar-, fat- and sodium-rich foods. This may be held responsible for reduced malnutrition, yet, this scenario has contributed to overweight and obesity increase (BARROS, 2008).

Obesity is defined as a chronic non-transmissible disease that affects general health due to the abnormal adipose tissue accumulation (WORLD HEALTH ORGANIZATION, 2000). It is considered multifactorial, with a possible correlation between genetic, metabolic, social, cultural and behavioral factors.

According to a Brazilian Inquiry, approximately 53.8% of the Brazilian population are overweight and 18.9% are already obese. Also, overweight is numerically more significant in men (57.7%) than in women (50.15%) (BRASIL, 2017).

Obesity has been considered one of the greatest public health challenges around the world due to its several systemic consequences on the body, such as the development of arterial hypertension, dyslipidemia, atherosclerosis, arthritis, type II diabetes mellitus, obstructive sleep apnea, acute myocardial infarction, some endocrine dysfunctions and biopsychosocial impact (FORATORI et al., 2016). In addition, obesity is also indirectly related to several oral problems, such as reduced salivary flow, tooth wear, caries, periodontal disease and tooth loss, directly affecting the patient's quality of life (MOURA-GREC et al., 2014a; YAMASHITA et al., 2015; FORATORI et al., 2016).

Parallel to obesity, Metabolic Syndrome (MS) is another condition that has also increased its prevalence worldwide. MS is related to the increased risk of cardiovascular disease and type II diabetes mellitus (FORD et al., 2005). According to the National Cholesterol Education Program (NCEP-ATPIII), it can be defined as the presence of three or more of the following changes: fasting blood glucose levels ≥ 100 mg/dl, waist circumference ≥ 102 cm for men and ≥ 88 cm for women, arterial hypertension, triglyceride levels ≥ 150 mg/dl and reduction in levels of high-density lipoprotein (HDL) (≤ 50 mg/dl for women and ≤ 40 mg/dl for men) (NCEP-ATPIII, 2001). It is emphasized that obesity is one of the most frequently factors found in patients with MS.

The recommended treatment for MS is weight loss associated with practice of physical activities, which also helps at reducing obesity. However, an alternative treatment for patients with MS and morbid obesity is bariatric surgery. This surgery consists of the

reduction of the gastric volume associated or not with the reduction in the absorption of foods. Bariatric surgery is an affective surgical treatment for obesity and is indicated for patients with body mass index (BMI) $\geq 40 \text{ kg/m}^2$ or with BMI $\geq 35 \text{ kg/m}^2$ associated with other comorbidities, such as hypertension, diabetes, dyslipidemia (high LDL and low HDL levels), and obstructive sleep apnea.

Bariatric surgery, although performed in the digestive tract, has consequences on the whole-body metabolism. That's why it is commonly called metabolic surgery. It can be classified as restrictive, where there is a reduction of the capacity of the stomach; disabsorptive, where there is a reduction in the absorption capacity of the intestine; or mixed, where the surgical technique consists of an association of both techniques (MALINOWSKI, 2006).

Bariatric surgery can be performed by numerous techniques, including vertical banded gastroplasty, biliopancreatic diversion with duodenal switch, adjustable gastric band, gastric sleeve, jejunoileal bypass and Roux-en-Y gastric bypass. This latter technique, also known as Fobi-Capella surgery, associates the restrictive and disabsorptive characters and is considered the gold standard by literature (MALINOWSKI, 2006, PASSERI et al., 2016).

Since the Roux-en-Y gastric bypass technique reduces both gastric volume and food absorption, some systemic interurrences may appear, such as vitamin deficiencies. Also, with the reduction of gastric volume, there is an increase in the frequency of food intake, which may contribute to the development of dental caries.

Literature points to a relationship between obesity and reduced salivary flow, caused by the increased number of proinflammatory cytokines. These cytokines contribute to an increased inflammatory response, which may also interfere with the regulation of salivary gland secretion (YAMASHITA et al., 2015).

Patients who underwent bariatric surgery also reported an increase in the frequency of vomiting episodes, which increases the risk of erosive tooth wear. Dental wear begins with the contact of non-bacterial acids on the dental surface. This contact promotes a superficial demineralization that can be reversed by the action of saliva and other agents. This is known as tooth erosion. If this contact with the acid is prolonged, there is irreversible loss of tooth structure, known as erosive tooth wear (IMFELD, 1996; HUYSMANS, CHEW, ELLWOOD, 2011).

Bariatric patients are also at increased risk for periodontal disease and, consequently, tooth loss. Prosthetic rehabilitation of partially or totally edentulous obese patients prior to bariatric surgery may improve masticatory efficiency and thus contribute to

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adequate nutrient absorption after surgery. An example is iron levels, since iron deficiency is an adverse effect of the surgical technique and a great challenge in the postoperative period (FORATORI et al., 2016).

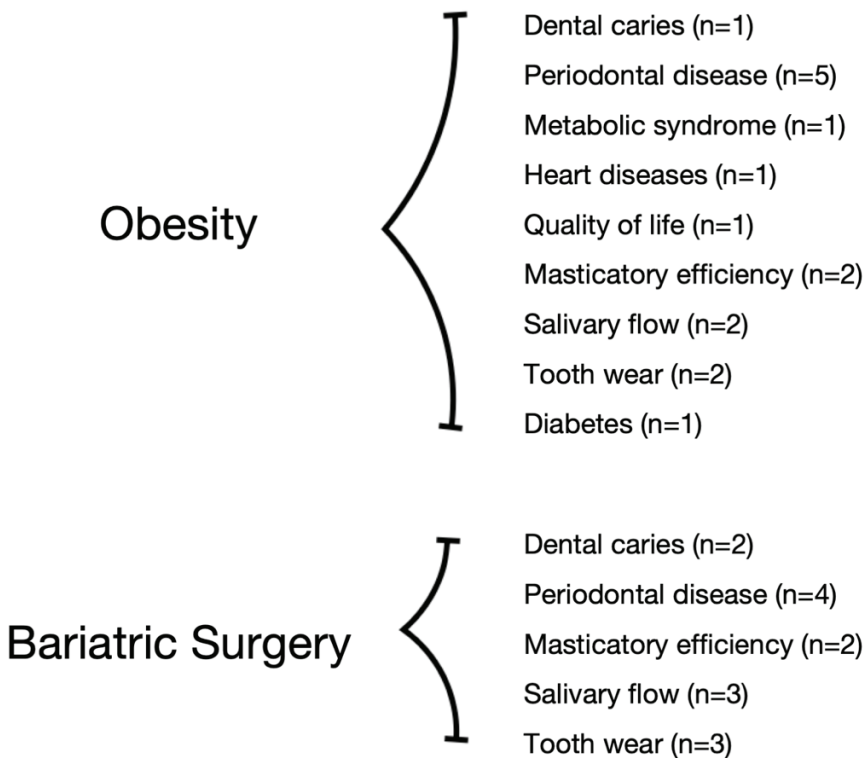
In view of the various oral alterations related to bariatric surgery, the dentist must closely follow these patients up in order to improve the results of the surgical intervention and help at achieving better quality of life for these patients (MOURA-GREC et al., 2012; MOURA-GREC et al., 2014b; SALES-PERES et al., 2015; FORATORI et al., 2016).

Considering the increase in the prevalence of obesity and MS, as well as the demand for bariatric surgery, this study aimed to elucidate the role of the dentist in providing dental treatment to obese and bariatric patients. Therefore, this study intends to list systemic and oral consequences related to the physiology of the organism of the obese patient and to the changes promoted in the digestive system after surgical intervention.

METHODS

A query was made to the Descriptors in Health Science (DeCS) so that the terms appropriate to the aim of this research could be found. After selecting such terms, both in Portuguese and in English, they were cross-referenced in search strategies in PubMed/MEDLINE and BVS databases. The terms used were: “bariatric surgery”, “oral health”, “periodontitis”, “metabolic syndrome x”, “obesity”, “bite force”, “heart disease” and “quality of life”. This search was limited from 2000 to 2017 and its results were confronted with documents from the Brazilian Ministry of Health and the World Health Organization, in order to allow Brazilian epidemiological data to be incorporated into the text. Only full-text papers available in Portuguese or English were selected. Among the studies and documents found, duplicates were excluded and both cross-sectional and longitudinal clinical studies, as well as systematic reviews investigating the association between obesity or bariatric surgery with the descriptors were elected. Studies that compared obese or bariatric patients to other groups of obese, bariatric or eutrophic patients, considering the previously mentioned descriptors, were also selected. Case reports were not included in the search.

Among the studies found, the main outcomes regarding obesity and bariatric surgery are represented in Figure 1.



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Figure 1 - Main outcomes extracted from the search in PubMed/MEDLINE and BVS databases regarding obesity and bariatric surgery.

Source: authors.

Epidemiological data from the Brazilian Ministry of Health on the prevalence of obesity and demand for bariatric surgery (BRASIL, 2016; BRASIL, 2017) were found, as well as the ordinance 425 of March 19, 2013 (BRASIL, 2013). Moreover, documents of the Brazilian Society of Bariatric and Metabolic Surgery containing the amount of surgeries performed throughout the years (SOCIEDADE BRASILEIRA DE CIRURGIA BARIÁTRICA E METABÓLICA, 2016), and data from the World Health Organization containing definitions, prevention methods and control of obesity were also inserted in this study (WORLD HEALTH ORGANIZATION, 2000).

RESULTS

Literature review

Obesity is classified by BMI ≥ 30 kg/m², and overweight by BMI ≥ 25 kg/m²; together, they reach approximately 1.7 billion people

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in developed and developing countries. For this reason, they are considered public health problems (MOURA-GREC et al., 2014b).

In Brazilian families, the high consumption of sugar and fat and the low consumption of fruits and vegetables still prevail. In 2008, approximately 41% of the Brazilian population was overweight and 8.8% had obesity. Yet, by 2016, according to the Ministry of Health, 53.8% of Brazilians were overweight and 18.9% were obese (BRASIL, 2017).

Obesity can affect the oral health condition in five main aspects: reduction of salivary flow, tooth wear, dental caries, periodontal disease and tooth loss (YAMASHITA et al., 2015).

The release of proinflammatory cytokines by adipose tissue generates an inflammatory condition throughout the whole organism, which can also affect the salivary glands. This inflammatory state in the glands could lead to reduced salivary flow (MALINOWSKI, 2006), yet this statement is still inconclusive in literature. Saliva contains proteins and minerals that protect the teeth against dental caries, wear and periodontal disease, and the reduction in salivary flow consequently increases the susceptibility of obese patients to these diseases (NAVAZESH, 1994).

Dental wear has a multifactorial origin caused by the interaction of chemical, biological and behavioral factors, resulting in the loss of tooth mineral structure (enamel and dentin) through non-bacterial acids. These acids may be of intrinsic (e.g. gastroesophageal reflux) and extrinsic (e.g. acidic beverages and foods) origin. Wear is a common condition in patients with bulimia nervosa, compulsion and obesity, or in patients with eating and behavioral habits that involve these acids. Obese patients are more likely to have gastroesophageal reflux. In addition, patients with Gastroesophageal Reflux Disease (GERD) have a reduced salivary buffer capacity. The buffer capacity of saliva corresponds to its ability to neutralize acid pH, reducing the demineralization of the dental surface (BARDOW et al., 2000). In these cases, the dentist may interfere with this process in an attempt to avoid dental wear by using protective materials containing fluoride, suggesting a reduction in the consumption and frequency of acidic beverages intake, and also informing that the patient should seek medical treatment to treat GERD. Also, it is extremely important to provide guidance to patients, such as: avoid toothbrushing immediately after vomiting or consumption of acidic beverages and use dentifrices with desensitizing agents (WIEGAND, SCHLUETER, 2014).

It is suggested that obese patients are also susceptible to dental caries because of their diets rich in sugar and fermentable

carbohydrates, which serve as common factors for the development of both obesity and dental caries. However, this relationship is also inconclusive in literature (MARSICANO et al., 2012).

Unlike the caries-obesity relationship, periodontal disease has a well-established relationship with obesity and overweight (MOURA-GREC et al., 2012; MOURA-GREC et al., 2014a; MOURA-GREC et al., 2014b; SALES-PERES et al., 2015; YAMASHITA et al., 2015). Periodontal disease is a pathological inflammatory process that, with the accumulation of plaque, begins in the gingival unit and can progress to destruction of the alveolar bone. More than two-thirds of the world population suffers from periodontal disease (AL-ZAHRANI, BORAWSKI, BISSADA, 2005; SALES-PERES et al., 2015).

Overweight and obesity are capable of interfering with the development of periodontal disease because the individual's adipose tissue produces proinflammatory cytokines, such as C-reactive protein. This protein is able to exacerbate the inflammatory response in the whole body, with effects in the oral cavity. Thus, a small accumulation of dental plaque generates a greater inflammatory response, contributing to the development of periodontal disease. This fact explains the higher prevalence of periodontitis in obese individuals (MOURA-GREC et al., 2012; MOURA-GREC et al., 2014a; MOURA-GREC et al., 2014b; SALES-PERES et al., 2015).

Periodontal disease has bacterial plaque as its main etiological agent. In obese adult patients, due to the high consumption of food and greater plaque accumulation, poor hygiene may contribute to the increase of the prevalence of periodontal disease (YAMASHITA et al., 2015). Likewise, gingivitis and periodontitis can also be influenced by alcohol consumption, smoking, stress and genetic predisposition or immunological defects, systemic diseases such as diabetes mellitus, metabolic syndrome and obesity itself. These conditions interfere in the production of inflammatory mediators, affecting the susceptibility of the host to the disease (PAGE, KORNMAN, 2000; BULLON et al., 2009).

It is important to emphasize that the relationship between obesity and periodontal disease is extremely important, since both are risk factors for cardiovascular diseases. Thus, periodontal disease is not only seen as an oral pathology, but also as a chronic disease with systemic consequences (WORLD HEALTH ORGANIZATION, 2000). Accordingly, obesity has been considered one of the biggest public health problems around the world.

If the periodontal disease is not treated, it can progress to tooth loss. Several studies show that tooth loss impairs masticatory function, since the contact area between teeth is reduced. Faced with

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this, a consequence of masticatory dysfunction is the substitution of fibrous and hard natural foods for soft foods, which are usually richer in fat, sodium and carbohydrates, contributing to the development of obesity. However, it is still inconclusive in literature the association between obesity and tooth loss (MOURA-GREC et al., 2014a; FORATORI et al., 2016; PASSERI et al., 2016).

It is important that the patient with eating disorders receives instructions on the importance of consuming natural foods (e.g. raw vegetables and fruits). This patient should also eat meat rich in protein and iron, which are extremely important in the postoperative period of bariatric surgery (FORATORI et al., 2016).

A recent laboratory study by Fukushima-Nakayama et al. (2017) evidenced that reduced masticatory function may also reduce neuronal functions such as memory and learning ability. This occurs as a result of the decline in neurogenesis, neural activity and synapse formation, all of which are related to the expression of neurotrophic factors in the hippocampus. However, clinical studies are still needed to substantiate this finding.

Faced with the fact that partial or total edentulous patients may have reduced masticatory efficiency, and this masticatory dysfunction may compromise their eating habits and perhaps their cognitive ability, their prosthetic rehabilitation is, indeed, important. Literature shows that prosthesis users have a lower nutrient absorption when compared to total dentate patients. However, since they have been prosthetically rehabilitated, these prosthesis users have healthier diets rich in vegetables, fruits and meat (FORATORI et al., 2016).

Even though prosthetic rehabilitation is not able to faithfully replace natural teeth, studies have shown that rehabilitated patients presented better masticatory efficiency when compared to partial or total edentulous patients (AKEEL, NILNER, NILNER, 1992; ALBERT, BUSCHANG, THROCKMORTON, 2003). Thus, prosthetic rehabilitation should be considered important for improving the masticatory function of individuals. It is worth mentioning that the replacement of natural teeth with prostheses still confers some degree of loss in chewing efficiency (ALBERT, BUSCHANG, THROCKMORTON, 2003).

Bariatric surgery is the surgical treatment of obesity and can be performed by several techniques. The most commonly used technique is the Roux-en-Y gastric bypass, where an incision is made in the upper portion of the stomach forming a 60 ml pouch, which is separated from the rest of the stomach. Then, after 45 cm of the intestine, which corresponds to the portion of the duodenum,

an incision is made, separating the jejunum from the duodenum and connecting the jejunum to the pouch, and then the duodenum is attached in a lower portion of the jejunum, giving the appearance of Y. Weight loss occurs because of the stomach reduced volume associated with reduced food absorption due to the smaller extent of the intestine. The change in the stomach causes it to reach its maximum capacity more quickly, which generates a signal to the brain that the patient is satiated. Gastric juice produced by the large portion of the stomach, along with other digestive fluids travel to the portion of the duodenum and reach the Y region, allowing food to be absorbed and digested therefrom. As the initial portion of the intestine is bypassed, food is less absorbed, reducing the number of calories the body absorbs, also facilitating weight loss (CAPELLA et al., 1991; FOBI, 1991).

Demand for bariatric surgery has increased over the years. The Brazilian Society of Bariatric and Metabolic Surgery informs that in the year 2012 were performed 72 thousand surgeries. If compared to 2015, where 93,500 bariatric surgeries were performed, an increase of approximately 30% in this period can be seen (SOCIEDADE BRASILEIRA DE CIRURGIA BARIÁTRICA E METABÓLICA, 2016). Data from the Ministry of Health show that there was an increase in the number of bariatric surgeries performed by the public health system: in 2010 there were 4,489 surgeries and in 2015, 7,530 procedures (BRASIL, 2016).

After bariatric surgery, the patient should undergo a change in their eating habits and should chew their food properly. Partial or total edentulous patients may have a compromised masticatory function, which jeopardize food absorption, since mastication promotes the initial stages of digestion. Prosthetic users have a lower dietary intake of macro and micronutrients when compared to those with natural teeth. However, their prosthetic rehabilitation allows a healthier diet, rich in vegetables, fruits and meat, when compared to patients with tooth loss who were not rehabilitated (FORATORI et al., 2016). Thus, edentulous patients, whether partial or total, should be rehabilitated prior to bariatric surgery, which may contribute to postoperative recovery.

If these patients are not properly rehabilitated, the size of the particles ingested is great and this can cause serious complications, such as high intestinal obliteration and phytobenzoar, where the masticatory deficiency generates a food bolus in the stomach and is colonized by fungi, requiring surgical removal or by laparoscopy. Poor chewing also increases the chance of stomach clogging,

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repetitive vomiting, nausea, and persistent vomiting (ALBERT, BUSCHANG, THROCKMORTON, 2003).

A study conducted by Foratori et al. (2016) showed that prosthetic rehabilitation of edentulous candidates for bariatric surgery resulted in improvement in iron levels when compared to dentate patients candidates for bariatric surgery. This improvement in iron levels can occur due to increased masticatory efficiency and, consequently, improvement in their alimentary profile. In this study, edentulous patients, due to their reduced masticatory efficiency, ate soft and non-nutritious foods. After prosthetic rehabilitation and bariatric surgery, they developed a diet rich in vitamins, minerals and proteins and, even with worsening of absorption due to surgical intervention, iron levels increased, characterizing an improvement in the nutritional status of these patients.

The surgical technique, because it interferes in ingestion and absorption of food, it generates systemic consequences for patients. Caloric-protein malnutrition and anemia are not uncommon in the postoperative period. Anemia can occur due to deficiency in iron absorption, which is common when the patient underwent disabsorptive surgery, or because of vitamin B12 deficiency, which is common in restrictive surgeries. Also, literature shows digestive complications in the immediate postoperative period, such as an increasing number of gastroesophageal reflux episodes (MOURA-GREC et al., 2012).

After surgery, vitamins and minerals deficiencies are also common. Among them are deficiencies of iron, vitamin B12, calcium and vitamin D, mainly when mixed surgical techniques are used. These various deficiencies may contribute to the appearance of other manifestations, such as hair loss, nail weakness, loss of skin elasticity, generalized weakness, and decreased visual and cognitive acuity. In order to prevent these complications, vitamin supplements are essential. Nutritional deficiencies can corroborate with the development of hyperparathyroidism, osteopenia and osteoporosis, which are considered risk factors for periodontal disease, since they may influence the rate of alveolar bone loss in chronic periodontitis and may lead to tooth loss. Therefore, it is imperative that the patient is followed up postoperatively (MALINOWSKI, 2006; MOURA-GREC et al., 2014a).

Transposing these systemic complications to the oral cavity, it can be said that these nutritional changes interfere in the oral health of patients after surgical intervention. The lower volume of the stomach demands that bariatric patients start to eat less, but more frequently. This dietary modification may contribute to the development of dental

caries and periodontal disease if proper hygiene is not performed. Also, due to the greater number of episodes of vomiting that result in contact of the acidic gastric juice with the dental surface, dental erosion can occur, which, if prolonged, allows for wear of the dental structure. Considering this, these patients should be advised on the correct cleansing for biofilm removal and on avoiding toothbrushing immediately after vomiting, preventing the potentiation of abrasive wear by abrasion (NAVAZESH, 1994; MOURA-GREC et al., 2012; MOURA-GREC et al., 2014a).

*A study by Sales Peres et al. (2015) pointed out the relationship between bariatric surgery, periodontal disease and risk of heart disease. The obese patient seeks surgical treatment for obesity in order to improve the systemic condition, characterized by the increased risk of cardiovascular diseases. Therefore, after the surgical treatment of obesity and its comorbidities, it is expected that the periodontal disease situation will also improve, since surgery promotes great weight loss and a consequent improvement in the patients' generalized inflammatory conditions. However, in this study, after surgery, there was worsening of the periodontal condition, increasing the level of aggressive bacteria, such as *Tanarella forsythia* and *Porphyromonas gingivalis*, which are also related to heart diseases. Therefore, even after the patients have undergone surgery, there is still a risk for heart disease, which further underscores the importance of dentists in the multiprofessional team that specializes in the care of obese patients and who undergo bariatric surgery.*

Ordinance No. 425 of March 19th, 2013 shows as general requirements for the Service of High Complexity Assistance to Individuals with Obesity the presence of doctors, nutritionists, psychologists or psychiatrists and does not insert dentists in that context. Faced with the relationship between obesity and bariatric surgery with oral health, the dentist is of paramount importance in the obese patient care networks. These patients, after bariatric surgery, present a risk of tooth wear, dental caries, periodontal disease and cardiovascular diseases which may be at reduced risk with the collaboration of this professional, which may contribute positively to the systemic results of bariatric surgery, ensuring quality of life for patients (BRASIL, 2013).

CONCLUSION

It is important to note that obese patients, after bariatric surgery, present favorable conditions for the development of periodontal

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disease and cardiovascular diseases, also suggesting the possibility of developing dental caries and wear. Therefore, the participation of dentists in the multiprofessional team specialized in the care of the patient with obesity and who was submitted to bariatric surgery can improve the results of surgery. In addition, prevention and health promotion carried out by a team with a dentist guarantees a better quality of life after bariatric surgery.

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