

Brazilian dentists' perceptions of using bone grafts: an inland survey

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ABSTRACT

Pre-clinical assessments of bone substitute materials are frequent in the literature, but research papers about the clinical situation of bone graft use and consumer market acceptance are rare. The aim of this study was to evaluate the dental use of bone grafts according to the perception of dentists in the city of Sobral, Brazil. We interviewed 183 professionals and analyzed their professional data, knowledge of the subject, specific use, and opinions on cost-effectiveness and biosafety. Most of the respondents had 10 years' or less experience in the profession, and lacked specialization though they had been familiar with the subject since they graduated. The most frequently mentioned compositions were ceramics, followed by composites. Only a quarter of the respondents had performed bone grafts, generally with up to 50 cases, with the most frequent applications being using simultaneously with a dental implant, fresh dental sockets and maxillary sinus lifting. Autogenous and xenogeneic grafts were more frequent than alloplastic and allogeneic; ceramics were the most frequently used composition, and the association

of bone graft with membrane was more frequent than bone graft alone or associated with autologous fibrin. Professional and patient satisfaction was high, cost was considered moderate, and differences were found regarding patient participation in the choice and country of origin of the product. Bone grafts were used more often in the private than public service. Dentists stated that they follow the instructions. Inflammatory or infectious complications were found to be related to the frequency of the procedure performed and safety regarding the origin. Opinions were favorable regarding the use of grafts derived from animals and unfavorable to grafts derived from cadavers. Very few respondents were registered in human bone tissue banks. The good level of acceptance for dental use of bone grafts in a Brazilian inland city provides a promising scenario for the development of the sector.

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Keywords: bone transplantation - biocompatible materials - bone regeneration.

Uso de enxertos ósseos na percepção de cirurgiões-dentistas do interior do Brasil

RESUMO

Avaliações pré-clínicas sobre materiais osseosubstitutos são frequentes na literatura, mas são raras pesquisas sobre o panorama clínico de uso de enxertos ósseos e aceitação do mercado consumidor. O objetivo deste estudo foi avaliar o uso odontológico de enxertos ósseos na percepção de dentistas da cidade de Sobral, Brasil. Foram entrevistados 183 profissionais e analisados dados profissionais, conhecimento temático, uso específico, relação custo-efetividade e biossegurança. A maioria dos cirurgiões-dentistas exibiu até 10 anos na profissão, ausência de especialização, porém familiaridade com a temática desde a graduação. As cerâmicas, seguidas de compósitos, compuseram as composições mais citadas. Apenas um quarto dos cirurgiões-dentistas já realizaram enxertos ósseos, em geral com realização de até 50 casos, com maior tendência de aplicação em alvéolo dentário fresco, simultânea a implante dentário e para levantamento de seio maxilar. As origens autógena e xenógena tiveram maior destaque do que aloplástica e alógena, as cerâmicas foram a composição mais usada e a associação do

enxerto ósseo com membrana foi mais frequente do que enxerto ósseo sozinho ou associado à fibrina autóloga. A satisfação do profissional e paciente foi alta, o custo considerado moderado, havendo diferenças quanto a participação do paciente na escolha e no país de origem do produto, com maior uso no serviço privado do que no público. Os dentistas afirmaram seguirem a bula, que as complicações inflamatórias ou infecciosas estão relacionadas com a frequência de procedimento realizado e segurança quanto à origem. Houve opinião favorável ao uso de enxertos derivados de animais e desfavorável ao de cadáveres, havendo raros profissionais cadastrados em bancos de tecidos ósseos humanos. A boa aceitação para uso odontológico de enxertos ósseos em cidade do interior do Brasil configura um cenário promissor para o desenvolvimento do setor.

Palavras-chave: transplante ósseo - materiais biocompatíveis - regeneração óssea.

INTRODUCTION

Bone regeneration in the human body has been studied over the past century with a wide variety of purposes, approaches and surgical materials¹. Bone grafts are indicated in medical and dental practice for restoring compromised function and aesthetics due to bone defects². In oral surgery, bone grafts contribute to the treatment of small to moderate bone defects resulting from periodontal or endodontic disease, dental socket filling after extraction, maxillary sinus lifting or rehabilitation of bone atrophy prior to implants, and even large bone defects caused by traumas, congenital deformities, pathologies and infections involving the maxillofacial complex³.

The choice of a bone substitute should be guided by its physicochemical, mechanical and biological characteristics, including architecture, porosity, resistance, biocompatibility, biodegradability, osteoconduction, osteoinduction and/or osteogenesis, in order to mimic the bone tissue to be repaired⁴. Biomaterials can be classified according to their origin (autogenous, allogeneic, xenogeneic or alloplastic), composition (metals and alloys, ceramics and bio-glass, polymers or composites) or interaction with the biological environment (bioinert, bioabsorbable or bioactive)⁵.

There are advantages and limitations in the use of bone grafts. Higher success rates have been achieved with autogenous bone, despite its limited supply and higher morbidity^{5,6}. Donated allografts are more readily available, having been reported over the last sixty years and used increasingly in Europe. However, difficulties in processing the biomaterial and risk of an immunogenic inflammatory response may reflect delay or decrease in osteogenesis⁶. Xenografts have been popular since the 1960s, especially bovine bone, despite the controversies with relation to the risk of transmission of zoonoses, which, in fact, have never been documented in dental practice⁷. Currently, animal byproducts could subsidize the generation of natural materials and contribute to the consolidation of a sustainable industry⁸. Alloplastic materials are satisfactory alternatives to natural materials, but face the challenge of controlling the great variability of results depending on their composition, associated with resorption and inflammatory or repair responses⁹. In view of this evidence, there is still no ultimate or single biomaterial for bone reconstruction, which motivates the biotechnological development of the sector¹⁰.

The growth of the industry and the consumer market for bone substitute materials for dental use converges with the higher life expectancy of the population and the increase in purchasing power in developing countries¹¹. This market is markedly significant in North America, followed by Europe, Asia, Latin America, Oceania and Africa¹². A worldwide increase of 4.4%¹³ to 9.5%¹² is estimated for the period from 2018 to 2026 in guided bone regeneration procedures involving bone grafts and membranes, which may be associated with greater clinical demand from both professionals and patients seeking better results¹³. In the United States and Europe, more than half a million people annually receive treatment for bone defect repair, and the international bone graft market moved USD 493 million in 2018 and expects to generate USD 931 million by 2025¹⁴. In Latin America, this market was valued at USD 116.8 million in 2018¹⁵. In Brazil, the political and economic crisis in the country and the bureaucracy involved in opening new companies are expected to delay the growth of this sector¹³. In a price-sensitive market, the costs and benefits of bone graft procedures should be considered for clinical choice¹⁶.

In this broad market scenario, there is a lack of evidence in the literature about the permeability to bone grafts in dental practice in medium and small cities. The city of Sobral, located in the interior of the State of Ceará, northeastern Brazil (3°41'42.0"S 40°20'28.3"W) is located 232 km from the state capital, Fortaleza. It has an estimated population of 208,935, being the fifth-largest city in this Brazilian state, with a rate of 24.6% of professional occupation, average of 2 minimum monthly wages, gross domestic product per capita of R\$ 20,258.09 or USD 4,771.08, municipal human development index of 0.714, 88.35% of urban population, 67.83% in the 15- to 64-year age group and Gini index 0.56¹⁷. There are 39 outpatient units with dental care, 1 emergency facility with maxillofacial surgery¹⁷, 44 oral health teams in primary care, 2 dental specialty centers (1 municipal and 1 regional) in secondary care¹⁸ and 2 schools of dentistry (1 public and 1 private) with dental care for the population. In the Sobral Campus of the Federal University of Ceará, it was estimated that in 2019, about 4,000 procedures involving oral surgery, periodontics or implantology were performed at the dental clinic.

Thus, the aim of this study was to assess the general

profile of use of bone grafts in the perception of dentists in the Brazilian inland.

MATERIALS AND METHODS

Ethical and legal aspects

This research adopted the ethical principles of respect for people, non-maleficence, beneficence and justice described in the Belmont Report (1978) and the Brazilian guidelines of the Resolution of the National Health Council No. 466 (2012), which establishes the basic requirements for research involving human beings in the country. This research was assessed and approved by the local Ethics Committee of the Universidade Estadual Vale do Acaraú via Plataforma Brasil (register CAAE #04644918.4.0000.5053 and approval protocol #3.145.268), before data collection started.

Participants' consent was registered through a Free and Informed Consent Form (FICF), which provided information in appropriate language about the purpose of the research, as well as ensuring the confidentiality of identities.

Type of study

This was an exploratory, descriptive, cross-sectional study by intensive direct observation with a quantitative, structured approach. The target population consisted of dentists working in the city of Sobral.

Sample

In a previous consultation with the Federal Council of Dentistry, which is a professional-class entity responsible for managing all enrollments and the legality of dental practice in Brazil, it was informed that there are 233 registered practitioners in the city of Sobral. Considering a population of 233 dentists in the city of Sobral and calculating a representative sample with 99% confidence interval and 5% margin of error, we idealized a sample of 173 dentists.

To achieve significant, homogeneous sampling, a random field study was conducted from February to September 2019, restricted to the Sobral municipality, using the snowball technique to access these professionals.

Inclusion criteria were dentists working in the city of Sobral, in private practice or public assistance in primary, secondary or tertiary care of the Brazilian Unified Health System, duly registered with the

Federal Council of Dentistry, of legal age (over 18 years old), of either sex, with no limitation regarding year of graduation, and who accepted to participate voluntarily in this study. Professionals who did not sign the FICF or cases of error in filling out forms were excluded.

Data collection

For the standardization of data collection and analysis, an anonymous, self-reported, face-to-face form was used, applied in individual voluntary interviews in a dental office or health unit.

The variables considered in this study were based on the methodology developed by Castro-Silva and Coutinho (2012)¹⁹. The form consisted of closed objective or semi-open questions, grouped into five basic categories (professional data, subject knowledge, specific use, cost-effectiveness and biosafety).

Data analysis

After the generation of an electronic bank with data collected in the Excel for Windows software (Office 2010™, Microsoft Corporation, USA), the quantitative variables were described in terms of absolute and relative values, being presented in the form of a table. Intergroup inferential statistical analysis of frequencies was performed using the Statistical Package for the Social Sciences software version 20 (IBM™, USA) applying the chi-square test and Fisher's exact post-test for nonparametric data, considering significant differences if $P < 0.05$.

RESULTS

Among the 233 dentists in the city of Sobral, a total 183 volunteers comprised the sample, equivalent to 78.54% of the city's professionals. Remarkably, the sample used in this study was greater than the size determined using statistical parameters as mentioned above. The representative sample of dentists in this study increases the level of confidence in the results found for the city of Sobral.

The prevalence of females (117 participants) was almost double that of males (66 participants) (Fig. 1A). Mean age \pm standard deviation was 35.37 ± 10.21 years and there was prevalence of three quarters of the sample in the age group up to 40 years (Fig. 1B). The vast majority of the sample did not have any specialization or expertise in Orthodontics (Fig. 1C). Table 1 shows respondents' general knowledge about

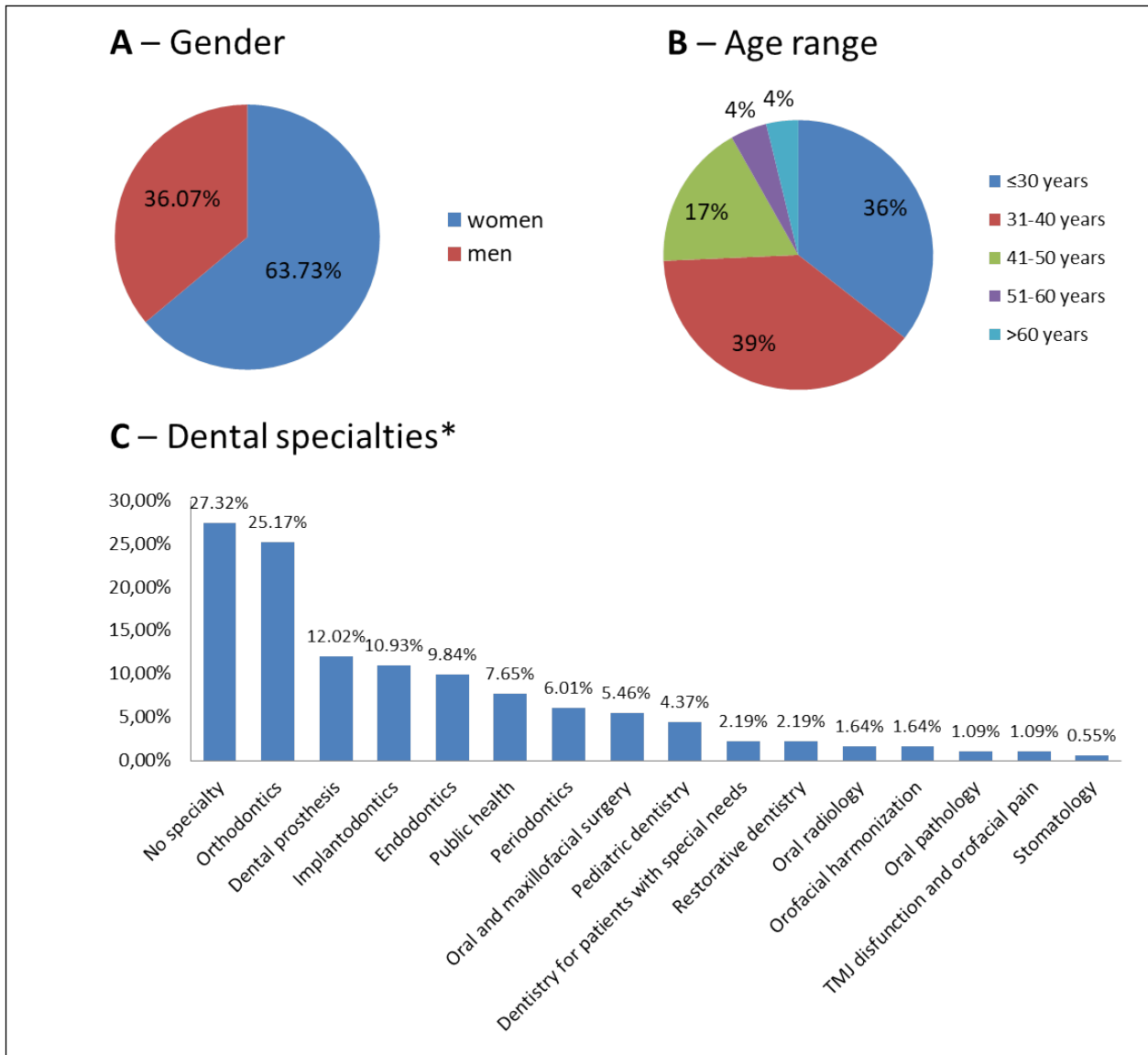


Fig. 1: Profile of dentists in the city of Sobral, Brazil (n=183)

bone grafts. Most respondents sample had graduated up to 10 years previously and demonstrated significant familiarity with the subject. They had acquired such knowledge mainly at undergraduate level, in comparison to postgraduate studies and dental conferences. Among the natural or synthetic compositions mentioned, ceramics were the most prevalent, followed by composites, while there was little mention of polymers and glasses. Bovine mineral bone was the material most frequently cited by all participants.

Table 2 shows that only a quarter of the respondents (45 or 24.59%) had performed bone grafts. Regardless of the intensity of use (from ≤ 10 to >100

cases), the most frequent bone graft applications were simultaneously with a dental implant, fresh dental sockets and maxillary sinus lifting, while the least frequent were periodontal use, paraendodontic use and extensive bone reconstruction. Autogenous and xenogeneic grafts were more often used than alloplastic and allogeneic grafts. Ceramics were the most frequently used composition of bone grafts and their association with membrane was more frequent than bone graft alone or associated with autologous fibrin.

Table 3 shows the high satisfaction of professionals and patients with bone grafts, with material or technical costs being considered moderate.

Table 1. Knowledge about the subject of bone grafts among dentists in Sobral, Brazil (n=183).

Variable	Categories	Frequency of time since graduation (years)					P**
		≤ 10	11-20	21-30	31-40	≥ 40	
Knowledge about bone grafts or bone substitute biomaterials	None	1(0.55%)	0	1(0.55%)	0	0	<0.01
	Yes, in undergraduate level	88(48.09%)	34(18.58%)	7(3.83%)	0	0	
	Yes, in postgraduate studies	41(22.40%)	35(19.13%)	11(6.01%)	4(2.19%)	3(1.64%)	
	Yes, at dental conferences	15(8.20%)	16(8.74%)	4(2.19%)	5(2.73%)	3(1.64%)	
Citation of bone grafts (by composition)*	Ceramics	59(32.24%)	57(31.15%)	12(6.55%)	0	3(1.64%)	0.22
	Glasses	1(0.54%)	1(0.54%)	0	0	0	
	Polymers	2(1.09%)	4(2.18%)	2(1.09%)	0	1(0.54%)	
	Composites	30(16.39%)	15(8.20%)	9(4.92%)	2(1.09%)	1(0.54%)	

*Possibility of more than one option **Statistical chi-square test

Table 2. Specific use of bone grafts by dentists in Sobral, Brazil (n=45).

Variable	Categories	Frequency of bone grafts (cases)				P**
		≤ 10	11-50	51-100	> 100	
Application*	Fresh dental socket	14(31.11%)	8(17.78%)	2(4.44%)	7(15.56%)	0.85
	Simultaneously with a dental implant	17(37.78%)	10(22.22%)	3(6.67%)	6(13.33%)	
	After periodontal treatment	7(15.56%)	5(11.11%)	1(2.22%)	0(0%)	
	Maxillary sinus lifting	13(28.89%)	7(15.56%)	3(6.67%)	7(15.56%)	
	Paraendodontic surgery	2(4.44%)	3(6.67%)	1(2.22%)	2(4.44%)	
	Extensive bone reconstruction	5(11.11%)	2(4.44%)	3(6.67%)	4(8.89%)	
Origin*	Autogenous	10(22.22%)	9(20%)	3(6.67%)	6(13.33%)	0.86
	Allogeneic	4(8.89%)	1(2.22%)	1(2.22%)	0	
	Xenogeneic	13(28.89%)	10(22.22%)	2(4.44%)	6(13.33%)	
	Alloplastic	5(11.11%)	2(4.44%)	2(4.44%)	2(4.44%)	
Composition*	Ceramics	24(53.33%)	16(35.55%)	9(20%)	16(32.55%)	0.80
	Glasses	0	1(2.22%)	0	0	
	Polymer	2(4.44%)	0	1(2.22%)	1(2.22%)	
	Composites	5(11.11%)	4(8.89%)	1(2.22%)	2(4.44%)	
Association*	Bone graft alone	9(20%)	5(11.11%)	2(4.44%)	5(11.11%)	0.53
	Bone graft+Cement	0	0	0	1(2.22%)	
	Bone graft+Membrane	20(44.44%)	9(20%)	3(6.67%)	6(13.33%)	
	Bone graft+Autologous fibrin	3(6.67%)	3(6.67%)	2(4.44%)	5(11.11%)	

*Possibility of more than one option **Statistical chi-square test

However, the fact that professionals never or rarely include the patient in the choice of this form of treatment is remarkable. The reported country of origin of the bone graft used differed significantly according to how many bone grafts the respondent had performed: most of those who had performed up to 10 cases did not know country of origin or had used imported material, while respondents who had performed over 50 cases reported using imported or imported+national materials. Use of bone grafts was higher in the private service than in the public for most of the analyzed ranges.

Table 4 shows that professionals always follow datasheets and recommendations for the use of bone grafts. Respondents who had performed up to 50 cases did not overall report having patients with inflammatory or infectious complications after bone grafts, while the profile is significantly reversed for

respondents who had performed more than 50 cases, although they reported feeling safe regarding the origin of the materials. In general, both the opinion of the professionals and their perception of the belief of their patients were more favorable to the use of bone grafts from animals than from humans. Within all three dental specialties, the low number of professionals registered in the Brazilian Transplant System for use of bone tissue banks confirms the low level of acceptance among professionals of allografts, with only 2 registered dentists in the specialties of Oral and Maxillofacial surgery or Implantodontics.

DISCUSSION

The local register of 233 dentists for a population of 208,935 inhabitants in Sobral¹⁷ shows the ratio of 1 professional to 896 individuals, which is a lower rate

Table 3. Cost-effectiveness of bone grafts for dentists in Sobral, Brazil (n=45).

Variable	Categories	Frequency of bone grafts (cases)				P*
		≤ 10	11-50	51-100	≥ 100	
Professional satisfaction	Yes	24(53.33%)	11(24.44%)	3(6.67%)	7(15.55%)	1.00
	No	0	0	0	0	
	Don't know	0	0	0	0	
Patient satisfaction	Yes	24(53.33%)	11(24.44%)	3(6.67%)	7(15.55%)	1.00
	No	0	0	0	0	
	Don't know	0	0	0	0	
Material or technical costs	Low	1(2.22%)	1(2.22%)	0	0	0.40
	Moderate	11(24.44%)	5(11.11%)	3(6.67%)	6(13.33%)	
	High	1(2.22%)	5(11.11%)	0	1(2.22%)	
	Don't know	1(2.22%)	0	0	0	
Patient participates in the choice	Always	4(8.89%)	3(6.67%)	1(2.22%)	1(2.22%)	0.82
	Often	5(11.11%)	3(6.67%)	0	2(4.44%)	
	Rarely	3(6.67%)	3(6.67%)	1(2.22%)	0	
	Never	11(24.44%)	2(4.44%)	1(2.22%)	4(4.44%)	
	Don't know	1(2.22%)	0	0	0	
Country of origin	National	3(6.67%)	3(6.67%)	0	0	0.02
	Imported	12(26.67%)	2(4.44%)	2(4.44%)	5(11.11%)	
	National+Imported	6(13.33%)	6(13.33%)	1(2.22%)	2(4.44%)	
	Don't know	13(28.89%)	0	0	0	
Service*	Public	11(24.44%)	3(6.67%)	2(4.44%)	2(4.44%)	0.67
	Private	19(42.22%)	11(24.44%)	3(6.67%)	7(15.55%)	

*Statistical chi-square test

Table 4. Biosafety of bone grafts for dentists in Sobral, Brazil (n=45).

Variable	Categories	Frequency of bone grafts (cases)				P***
		≤ 10	11-50	51-100	≥ 100	
Professionals always follow datasheets and recommendations	Never	0	0	0	0	0.86
	Always	21(46.67%)	11(24.44%)	3(6.67%)	6(13.33%)	
	Sometimes	2(4.44%)	0	0	1(2.22%)	
	Don't know	1(2.22%)	0	0	0	
Patients with inflammatory or infectious complications after bone grafts	No	19(42.22%)	6(13.33%)	1(2.22%)	1(2.22%)	0.04
	Yes	4(8.89%)	5(11.11%)	2(4.44%)	6(13.33%)	
	Don't know	1(2.22%)	0	0	0	
Professional feels safe regarding the origin	No	1(2.22%)	1(2.22%)	0	0	0.83
	Yes	21(46.67%)	10(22.22%)	3(6.67%)	7(15.55%)	
	Don't know	2(4.44%)	0	0	0	
Professional favorable to use of bone graft from animals	No	3(6.67%)	0	0	0	0.55
	Yes	19(42.22%)	11(24.44%)	3(6.67%)	7(15.55%)	
	Don't know	2(4.44%)	0	0	0	
Patient favorable to use of bone graft from animals	No	4(8.89%)	1(2.22%)	0	1(2.22%)	0.44
	Yes	9(20.00%)	8(17.78%)	2(4.44%)	5(11.11%)	
	Don't know	11(24.44%)	2(4.44%)	1(2.22%)	1(2.22%)	
Professional favorable to use of bone graft from human beings	No	9(20.00%)	5(11.11%)	1(2.22%)	3(6.67%)	0.95
	Yes	7(15.55%)	4(8.89%)	1(2.22%)	3(6.67%)	
	Don't know	8(17.78%)	2(4.44%)	1(2.22%)	1(2.22%)	
Registration in the Brazilian Transplant System*	OMS**	1(2.22%)	0	0	1(2.22%)	0.39
	Implantodontics	0	0	0	1(2.22%)	
	Periodontics	0	0	0	0	
Patient favorable to use of bone graft from human beings	No	9(20.00%)	2(4.44%)	1(2.22%)	3(6.67%)	0.65
	Yes	1(2.22%)	2(4.44%)	0	0	
	Don't know	14(31.11%)	7(15.55%)	2(4.44%)	4(8.89%)	

*Possibility of more than one option **OMS: Oral and maxillofacial surgery ***Statistical chi-square test

than the Brazilian average of 1 dental professional to 668 inhabitants²⁰. Even in the face of favorable demand, the low number of experts would explain the generalist profile of dentists in the city and may explain the low use of bone grafts in the sample.

Inorganic bioceramics were bone substitute materials most frequently cited and used by respondents, in agreement with most studies on the subject^{9,21,22}. This preference is supported by osteoconductive action, ability to carry osteogenic cells^{9,21} or osteoinductive growth factors²³, versatility of concentrations, formats and particle sizes²² as well as the possible association of apatites with collagen or other polymers with the aim of achieving biological synergism^{15,21,24}. Thus, the basic understanding of the properties of biomaterials for bone regeneration and their appropriate applications is very important in making a good clinical choice¹⁹.

The most frequent clinical applications were simultaneous use with a dental implant, fresh dental sockets and maxillary sinus lifting, in agreement with the two most prevalent surgical beds in the dental literature^{19,24,25}. The present study found a higher frequency of bone graft in association with membranes or autologous fibrin than in isolated form, disagreeing with another Brazilian study¹⁹ and international reports, which state that dentists make less use of membranes next to the bone graft because it represents an additional cost to the patient^{16,26}. The adjunct use of autologous fibrin has been promising, as it has a high concentration of angiogenic and osteogenic growth factors, evidencing the evolution of bone regeneration techniques²⁷.

The prevalence of use of autogenous and xenogeneic grafts compared to alloplastic and allogeneic, associated with a more favorable perception of the use of bone grafts from animals than from humans, agrees with other studies on the topic^{19,28}. Autografts are a gold standard for the treatment of bone defects²⁸, but the preference of professionals for xenografts and alloplastic grafts has increased gradually in Latin America¹⁵ and Brazil²⁶ for medical and dental applications^{3,22}. The advantages of xenografts and alloplastic grafts are biomimicry of human bone tissue²⁴ and absence of patient's donor bed, which explains their wide range of clinical uses^{9,19,22}. Stigmatization of the cadaverous source, lack of disclosure²⁹ and ethical, moral or religious values of users could explain low choice of allografts^{30,31}.

Satisfaction with bone grafts in this study was high,

confirming an Indian study with 59% of utilization³¹. Refusal rates to bone grafts has been more often associated to the geopotential context than to age, gender, education and religion, ranging from 2% for alloplastic grafts to 20% for allografts in Chilean study³⁰ or from 11% for autografts to 67% for xenografts in Saudi Arabia²⁹.

The present study confirmed the existing knowledge on use of materials of imported^{12,13} or national origin²⁴. Multinational companies, predominantly US, currently dominate the global market for dental bone grafts^{12,13}. Brazilian industry gains representation among companies already consolidated in the market, with 3 out of 5 institutions responsible for 65% of dental bone grafts in the country²⁶.

Costs were considered moderate by the respondents, predominantly from private practice in Sobral, a finding similar to those from a large city in southeastern Brazil¹⁹. However, the country suffers from chronic underfunding in public health³², where the costs of procedures can be substantial limitations^{13,33} and only a small percentage of its population has undergone bone reconstruction procedures^{16,34}. In private practice, costs are associated to the loyalty of dentists to the use of bone grafts³³.

Dentists may select therapeutic options that involve high cost, based on their perception of the patient's profile and oral condition or on the patient's feedback regarding motivation or being able to afford the cost of the treatment³⁵. The current study highlighted the low level of patient participation in the choice of material to be grafted, in contrast to most international studies^{29-31,35}. This emphasizes the need to improve professional interaction with patients in order to make successful joint decisions regarding the use of bone graft.

High occurrence of inflammation or infection in grafted patients was proportional to high density of surgical care performed by the respondents. The rigid biosafety involved in processing, sterility and standardized validation tests of grafting^{12,36} reduces fears regarding the transmission of animal or human diseases^{30,31} and increases the safety perceived by dentists regarding their use³⁷. Nevertheless, grafting procedure failure can range from 5 to 10% as a result of infections or inappropriate graft stabilization¹⁵. Factors such as filling large bone defects with bone block, mixed grafts (autogenous + synthetic) and diabetes mellitus may also be associated with

infections³⁸. To reduce potential out-of-office complications with bone grafting, it can be helpful to apply antibiotic therapy used sparingly³⁹ and intensification of care with oral hygiene habits³⁴. Although there is still little dental use of bone grafts in Sobral, their cost-effectiveness and biosafety are

generally satisfactory and in accordance with the literature. This study confirms good acceptance by dentists and their knowledge of the subject of bone grafts in Sobral, a medium-sized city in the Brazilian inland, which constitutes a promising scenario for the development of the sector.

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