

A bibliometric analysis of the scientific literature on dental implants in large animal models

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TO CITE THIS ARTICLE

Matos FG, Stremel ACA, Lipinski LC, Cirelli JA, Dos Santos FA. A bibliometric analysis of the scientific literature on dental implants in large animal models. *J Osseointegr* 2023; 15

DOI 10.23805/JO.2023.600

KEYWORDS: Animal models, Bibliometrics, Dental implants, Osseointegration, Sheep, Swine

ABSTRACT

Aim This bibliometric review aims to report and discuss the main bibliographic characteristics of the scientific literature on dental implants in large animal models.

Material and Methods This review followed the Preferred Reporting for Systematic Reviews and Meta-Analyses guidelines, and searches were performed until March/2023 in multiple databases such as Pubmed, Scopus, Scielo, Web of Science, Embase, Science Direct, Brazilian Bibliography of Dentistry, Latin American and Caribbean Health Sciences Literature, Directory of Open Access Journals, and Abstracts Database of Reviews of Effects, in addition to gray literature.

Results A total of 2,618 articles were found, of which 70 were eligible. The majority of these articles were published in Germany, followed by China, with C. on Wilmowsky and X.Y. Ma being the prominent first authors from these countries, respectively. The journal with the most publications was *Clinical Oral Implants Research*, with an impact factor of 5.021. The most used keywords were “dental implant” and “osseointegration,” which demonstrates the object and the main objective of the studies. In terms of citations, the oldest article contained the highest number, which led to a discussion of factors related to citations such as author collaborations and their influence.

Conclusion The bibliometric analysis demonstrated valuable data from implant dentistry studies involving large animals with systemic diseases. Despite the relevance of these articles, the number of published studies on this subject remains small. The focus of the majority of these articles was osseointegration in connection with the development of surface modifications, which involves the area of biomaterials.

INTRODUCTION

Dental implants offer the possibility of rehabilitating edentulous spaces by providing esthetics, function, and comfort, and they have increasingly become popular with patients. Between 2000 and 2010, the number of implants used in the United States increased ten-fold, and it is predicted that this will increase by 12% to 15% over the coming years. This scenario is similar in other countries such as Israel, South Korea, and Brazil (1). The advent of dental implants has generated much demand; however, it also requires that researchers improve studies related to implants in dentistry.

Experimental studies with animals are an important part of research regarding the introduction of new drugs, materials, or techniques into humans. Such studies should cover issues such as the relationship between bioethics and responsibility, and they should follow the principles of reduction, replacement, and refinement (2). Animal models, such as pigs and sheep, are well defined in the literature and have been used to evaluate the osseointegration process of dental and orthopedic implants. Of the small animal models, pigs and sheep are frequently used due to their similarity to human anatomy and physiology (3, 4).

Pigs and sheep are readily available compared to other animals such as monkeys. Their size makes it possible to more reliably test the same devices and procedures that will be applied to humans (5). The characteristics of the porcine model, such as bone repair and bone density, as well as the maxillary bone, allow studies to evaluate the osseointegration of dental implants placed directly into the oral cavity of pigs (4). However, studying osseointegration in the oral cavity of sheep can be challenging due to their classification as ruminant animals. Therefore, long bones are often preferred when studying implant osseointegration in sheep (3, 6).

In addition, pig and sheep animal models allow the development of systemic diseases that can affect the implant healing process, such as diabetes and osteoporosis. Osteoporosis, a systemic disease, causes changes in the microstructure of trabecular bones, resulting in increased bone porosity and fragility. These changes, combined with an imbalanced bone remodeling process, contribute to an elevated risk of fractures and complications with implant osseointegration (7). Likewise, diabetic patients are more likely to have clinical complications, poor healing processes, and negative effects on bone formation around the implant compared to healthy patients (8, 9). These conditions are also linked to periodontitis, which can cause more significant tooth loss (8, 10). Health conditions that affect a considerable part of the population, such as edentulism (11), and systemic diseases such as diabetes (12) and osteoporosis (13), inspire researchers to improve the quality of life of patients. Bibliometric analyses are being progressively used as a mechanism, not only for bibliometricians, but also in other professional fields (14). Bibliometric analyses provide a scientific basis to identify true priorities, for example, in health aspects, where they can guide investment (15). Indeed, the development of bibliometric analyses in the area of animal experimentation in implant dentistry can help researchers to measure the impact of research studies in this area. For example, citations can be used to ascertain the following: when other researchers have

used an article as a basis to produce more information; the main countries that have strong research in a particular area; and the main research groups and researchers, as well as the interaction between them (16). Recognition of the importance of bibliometric reviews also comes from governments, especially in terms of the scope of public investment (14, 17). Therefore, this study aims to identify the most recurrent bibliometric characteristics of articles that analyze the osseointegration of dental implants in large animal models with systemic diseases. Evaluating the year of publication, the journals used and their respective impact factors, the authors, co-authors, countries and centers of study, and keywords, provides a perspective on the origin of the articles and the level of evidence for researchers interested in the area of implant dentistry, as well as the possibilities of studies using a translational animal model.

MATERIALS AND METHODS

Search strategy

This review was conducted using the Preferred Reporting for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and the appropriate checklist (18). The following databases were consulted: PubMed; Scopus; Scielo; Web of Science; Embase; Science Direct; Brazilian Bibliography of Dentistry

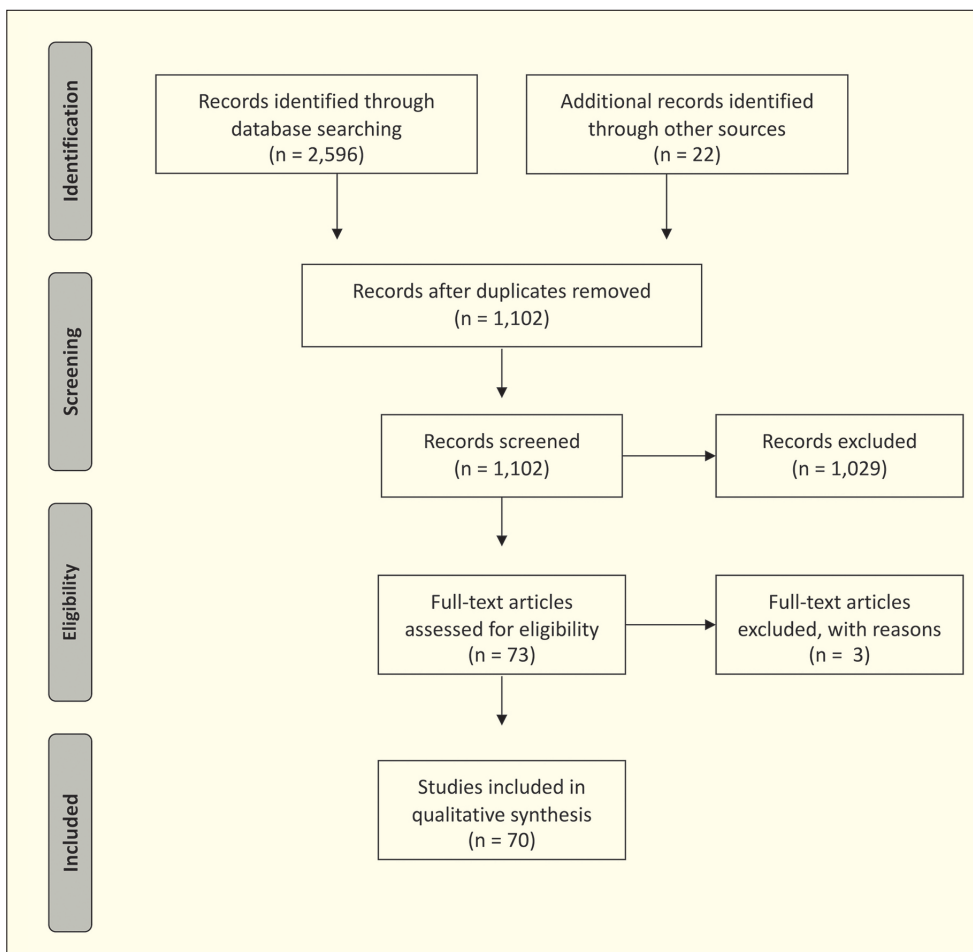


FIG. 1. Flowchart of file selection according to PRISMA guidelines.

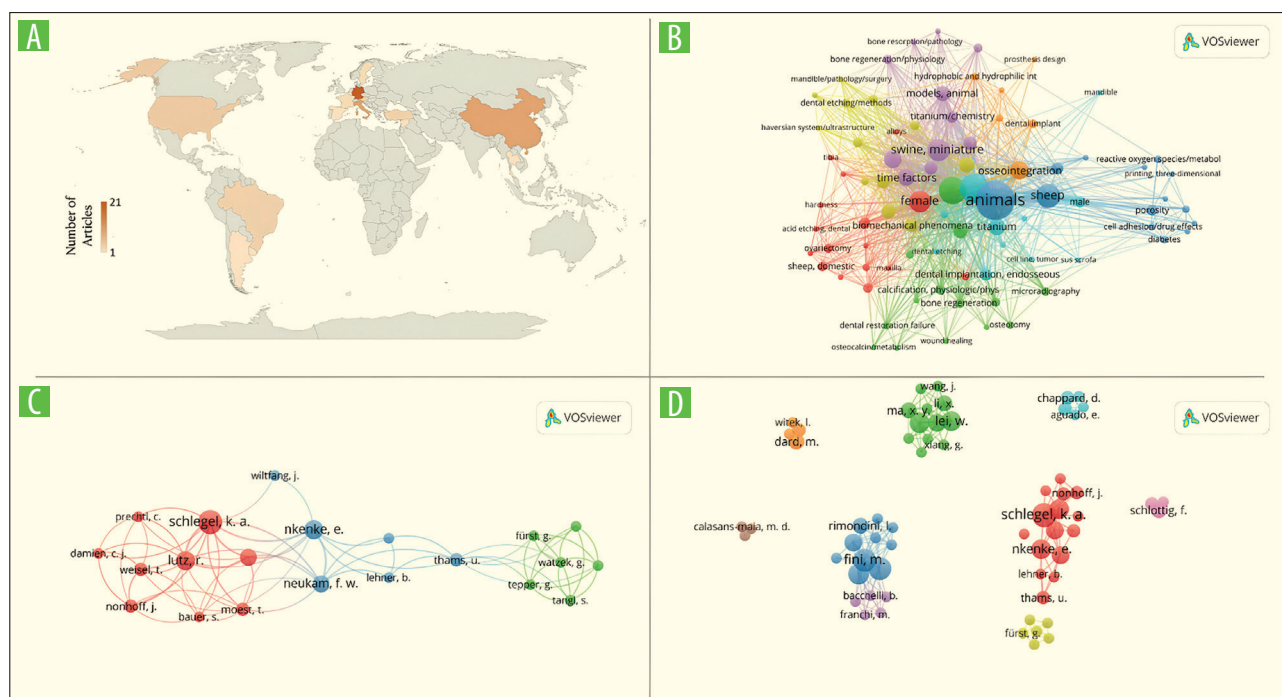


FIG. 2. (A). Country participation in articles on osseointegration of implants using pigs and/or sheep. (B). Co-occurrence network visualization of keywords (minimum keyword occurrences: two). (C). Co-authored article network visualization (minimum author documents: two; minimum total link strength: two). (D). Largest set of connected items (minimum author documents: two; minimum total link strength: two). The size of the author's name represents their frequency of occurrence in the studies. The links indicate the number of co-authorship connections between researchers. Closer proximity between authors signifies a stronger relationship. The color of an item corresponds to its respective set. This figure includes all authors involved in the study, not just the first authors.

(BBO); Latin American and Caribbean Literature in Health Sciences (LILACS); Directory of Open Access Journals (DOAJ); and the Database of Abstracts of Reviews of Effects (DARE) until March 2023. Access was through CAPES-CAFe (Coordination for Higher Education Staff Development- Federated Academic Community) using an institutional login.

The keywords chosen were: dental implants; screw; osseointegration; ovariectomy; osteoporosis; diabetes; sheep; and swine. To avoid bias, no filters were used during the process, including data, language, abstract, and keywords. The gray literature was also searched through the System for Information on Grey Literature in Europe (Open Grey); the WorldCat Library Catalog; the Animal Study Registry; the Brazilian Open Access Scientific Publications Portal (OASISbr); and Google. The Brazilian Digital Library of Theses and Dissertations catalogs and CAPES were consulted to obtain dissertations and theses, and the conference proceedings of the International Association for Dental Research (IADR) were also included.

Eligibility criteria

Experimental studies that evaluated the osseointegration of dental implants in healthy pig/sheep or experimentally-induced osteoporosis/diabetes were included, as well as dissertations, theses, reports, and congress annals. All interventions to induce diabetes or osteoporosis, and the methods for assessing implant osseointegration, were considered eligible. The following were excluded: articles

about pedicle screws articles; uniquely orthopedic articles; studies of orthodontic mini-implants; reviews, meta-analyses; articles using animals with comorbidities; ex vivo or in vitro models; and studies without methodological details.

Study selection

The selection process was carried out by two independent reviewers. Endnote® X7 (Clarivate Analytics®, Philadelphia, PA, USA) was used, and duplicates were checked manually. The remaining files had their titles and abstracts read and filtered using the selection criteria shown in Fig. 1. Subsequently, the texts were fully explored and their data were extracted.

Data collection and data analysis

The data resulting from the text of the selected articles were organized using Microsoft Excel® version 2016 (Microsoft Co., Ltd., Redmond, WA., USA). The data extracted were: year of publication; affiliation; journal; country; authors; and citations. The networking data among authors and the keywords were analyzed using VOSviewer version 1.6.18 (<https://www.vosviewer.com>) from EndNote X7 data.

RESULTS

At the beginning of the search, 2,618 articles were identified. The number of articles found by each database is shown in

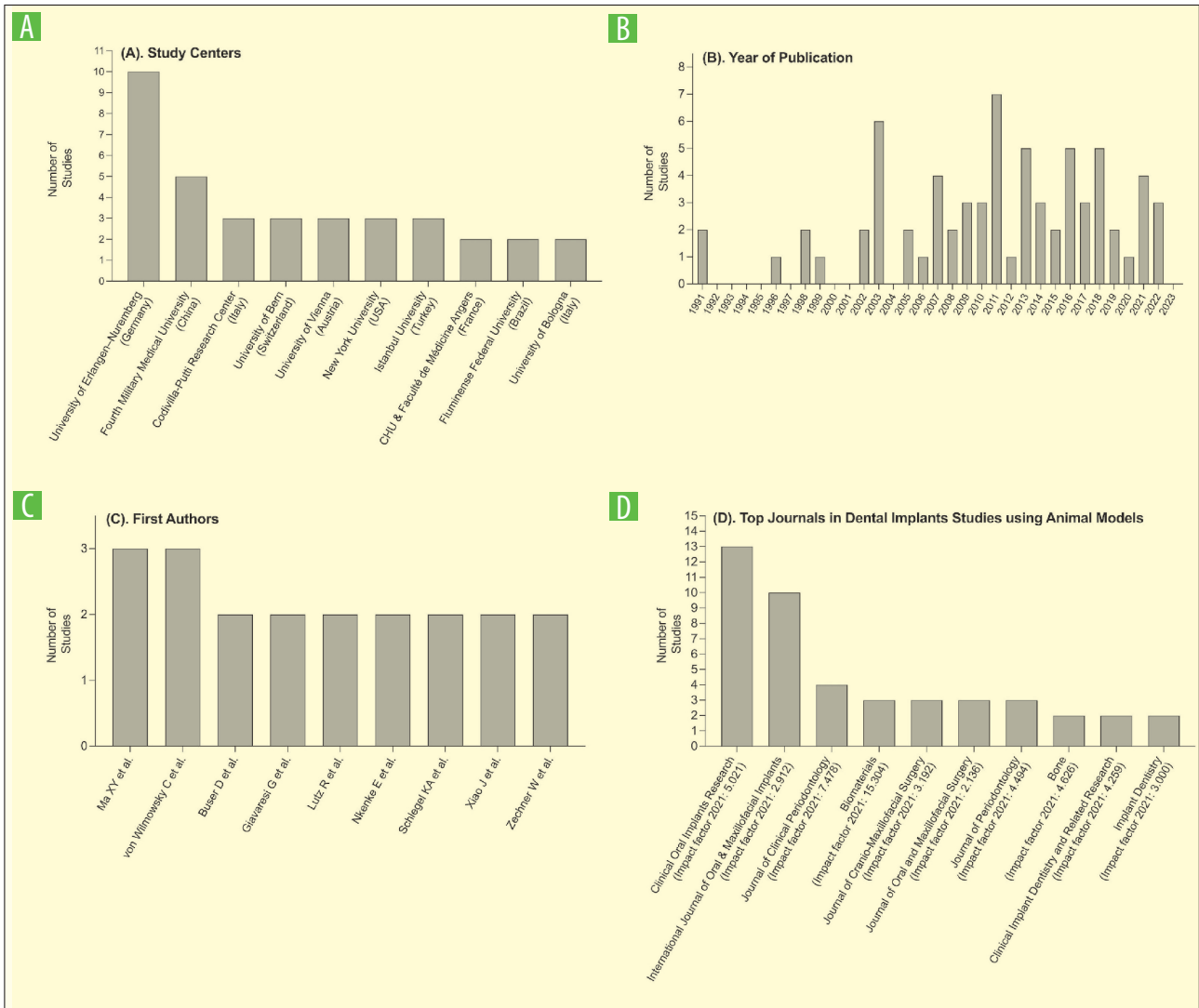


FIG. 3. (A). Global research centers studying implants using pigs and/or sheep. (B). Distribution of published articles on implants using pigs and sheep over time. (C). Distribution of published articles by authors (only first authors with a minimum of two articles were included). (D). Top journals for pig and /or sheep implant studies (only journals with a minimum of two published articles on the topic were included).

Tab. 1. The total number of duplicated files was 1,516, and 1,102 documents were eligible for screening. After the reviewers read the titles and abstracts, 73 articles were selected and 2,545 were excluded according to the selection criteria. Consequently, the 73 articles were fully read, and three papers were excluded at this point because one did not include the ethics committee or animal care, another was only about orthopedics, and the last did not present enough methodological data. Therefore, 70 articles were included for information extraction.

Manuscript origin

Most articles were published in Germany, with 21 studies (8, 19-38) (Fig. 2A), and ten of the articles published in Germany were published by the University of Erlangen-Nuremberg (8, 23-25, 28, 29, 32, 33, 37, 38) (Fig. 3A).

Database	Articles	
	n	%
SCOPUS	1,908	72.9
Science Direct	575	22.0
Web of Science	65	2.5
PubMed	36	1.4
EMBASE	12	0.5
Others	22	0.8
Total	2,618	100

TABLE 1. Articles found by database.

Title of the study	Nº of Citations
Influence of surface characteristics on bone integration of titanium implants. A histomorphometric study in miniature pigs (58)	1,340
Removal torque values of titanium implants in the maxilla of miniature pigs (53)	218
Biomechanical and histomorphometric comparison between zirconia implants with varying surface textures and a titanium implant in the maxilla of miniature pigs (21)	200
In vivo evaluation of anodic TiO ₂ nanotubes: An experimental study in the pig (37)	193
Osseous healing characteristics of three different implant types (52)	143
Evaluation of a new titanium-zirconium dental implant: a biomechanical and histological. comparative study in the mini pig (71)	119
Mechanical and histomorphometric evaluations of titanium implants with different surface treatments inserted in sheep cortical bone (6)	104
Enhanced bone apposition around biofunctionalized sandblasted and acid-etched titanium implant surfaces. A histomorphometric study in miniature pigs (48)	104
Osteointegration of hydroxyapatite-titanium implants coated with nonglycosylated recombinant human bone morphogenetic protein-2 (BMP-2) in aged sheep (31)	98
Bone contact, growth, and density around immediately loaded implants in the mandible of mini pigs (29)	89
The promotion of osteointegration under diabetic conditions using chitosan/hydroxyapatite composite coating on porous titanium surfaces (45)	83
Bone conditioning to enhance implant osseointegration: an experimental study in pigs (32)	73
Mechanical anchorage and peri-implant bone formation of surface-modified zirconia in minipigs (34)	71
Influence of different implant surfaces on peri-implant osteogenesis: histomorphometric analysis in sheep (72)	66
Enhanced bone integration of implants with increased surface roughness: a long term study in the sheep (73)	59
Biofunctionalization of titanium implants with a biomimetic active peptide (P-15) promotes early osseointegration (25)	59
The early remodeling phases around titanium implants: a histomorphometric assessment of bone quality in a 3- and 6-month study in sheep (54)	57
Immediate versus delayed loading of dental implant in the maxillae of Minipigs: follow up of Implant Stability and implant failures (28)	48
Influence of a zirconia sandblasting treated surface on peri-implant bone healing: An experimental study in sheep (74)	48
Early bone apposition to hydrophilic and hydrophobic titanium implant surfaces: a histologic and histomorphometric study in minipigs (51)	47
Promotion of osteointegration under diabetic conditions by tantalum coating-based surface modification on 3-dimensional printed porous titanium implants (75)	44
Diabetes mellitus negatively affects peri-implant bone formation in the diabetic domestic pig (8)	43
In vitro and in vivo performance of a novel surface treatment to enhance osseointegration of endosseous implants (76)	41
Osseointegration and stability of a modified sand-blasted acid-etched implant: an experimental pilot study in sheep (39)	40
Osseointegration of SLActive implants in diabetic pigs (33)	40
Titanium Alloy Osseointegration in cancellous and cortical bone of ovariectomized animals: histomorphometric and bone hardness measurements (55)	38
Effect of interimplant distance (2 and 3 mm) on the height of interimplant bone crest: a histomorphometric evaluation (41)	37
Comparative 3D micro-CT and 2D histomorphometry analysis of dental implant osseointegration in the maxilla of minipigs (19)	34
The effect of hierarchical micro/nanosurface titanium implant on osseointegration in ovariectomized sheep (44)	34
Early tissue reaction at the interface of immediately loaded dental implants (27)	31
Surface-conditioned dental implants: an animal study on bone formation (35)	31

Osteointegration of chitosan coated porous titanium alloy implant by reactive oxygen species-mediated activation of the PI3K/AKT pathway under diabetic conditions (77)	30
TiNOx coatings on roughened titanium and CoCr alloy accelerate early osseointegration of dental implants in minipigs (78)	25
Coating titanium implants with bioglass and with hydroxyapatite. A comparative study in sheep (79)	24
Early bone response to machined, sandblasting acid etching (SLA) and novel surface-functionalization (SLAffinity) titanium implants: characterization, biomechanical analysis and histological evaluation in pigs (80)	22
Hydrophilic surface of Ti6Al4V-ELI alloy improves the early bone apposition of sheep tibia (49)	20
Effect of obesity or metabolic syndrome and diabetes on osseointegration of dental implants in a miniature swine model: a pilot study (81)	20
Influence of platelet-rich plasma on osseous healing of dental implants: A histologic and histomorphometric study in minipigs (57)	20
Effect of a multiphasic anodic spark deposition coating on the improvement of implant osseointegration in the osteopenic trabecular bone of sheep (56)	17
Effect of ultraviolet photofunctionalization of dental titanium implants on osseointegration (26)	18
Histological and histomorphometrical evaluation of a new implant macrogeometry. A sheep study (82)	18
Influence of different drilling preparation on cortical bone: A biomechanical, histological, and micro-CT study on sheep (50)	16
Effects of micro/nano strontium-loaded surface implants on osseointegration in ovariectomized sheep (83)	15
Lactic acid of PLGA coating promotes angiogenesis on the interface between porous titanium and diabetic bone (84)	15
Biofunctionalization of the implant surface with different concentrations of a synthetic peptide (P-15) (24)	14
Sandblasted titanium osteointegration in young, aged and ovariectomized sheep (85)	13
The effect of combined delivery of recombinant human bone morphogenetic protein-2 and recombinant human vascular endothelial growth factor 165 from biomimetic calcium-phosphate-coated implants on osseointegration (43)	13
Evaluation of a new experimental model to study bone healing after ridge expansion with simultaneous implant placement - a pilot study in minipigs (36)	12
Involvement of FAK-mediated BMP-2/Smad pathway in mediating osteoblast adhesion and differentiation on nano HA/chitosan composite coated titanium implant under diabetic condition (46)	12
Immediate postextraction implant placement in sheep's mandibles: a pilot study (86)	9
Evaluation of neridronate on the osseointegration process of endosseous titanium implants in animal models (40)	8
Establishment of a new pull-out strength testing method to quantify early osseointegration- An experimental pilot study (30)	6
Effect of intraoperative bone quality testing on bone healing and osseointegration of dental implants (23)	6
Primary stability and osseointegration of dental implants in polylactide modified bone - A pilot study in Goettingen minipigs (20)	5
The influence of direct laser metal sintering implants on the early stages of osseointegration in diabetic mini-pigs (87)	5
Combined microcomputed tomography, biomechanical and histomorphometric analysis of the peri-implant bone: a pilot study in minipig model (88)	5
Aminobisphosphonate-treated ewes as a model of osteonecrosis of the jaw and of dental implant failure (89)	4
Evaluation of fixation of expandable implants in the mandibles of ovariectomized sheep (90)	4
Peri implant defect regeneration in the diabetic pig: a preclinical study (38)	4
Nitrogen plasma immersion ion implantation treatment of Ti6Al7Nb alloy for bone implant applications: Enhanced in vitro biological responses and in vivo initial bone-implant contact (91)	4
A comparative pilot study of two dental implant metals in a pig M model (92)	3

Promotion of osteointegration under diabetic conditions by a silk fibroin coating on 3D-printed porous titanium implants via a ROS-mediated NF- κ B pathway (47)	3
Effect of surgical instrumentation variables on the osseointegration of narrow- and wide-diameter short implants (93)	2
Sustained release of vitamin D3 enhanced osseointegration capacity: an experimental sheep study (94)	1
Effects of local single dose administration of parathormone on the early stages of osseointegration: A pre-clinical study (95)	1
Comparative study of osteoblastic activity of same implants (endopore) in the immediate extraction site utilizing single photon emission computerized tomography: peri-implant autogenous bone grafting with GTR versus no peri-implant bone grafting - experimental study in pig model (42)	1
Osseodensification enables bone healing chambers with improved lowdensity bone site primary stability: an in vivo study (96)	1
Induction of osseointegration by nacre in pigs (97)	1
Evaluation of titanium implant osseointegration in posterior edentulous areas of micro swine (98)	-
Does titanium surface treatment influence the bone-implant interface? SEM and histomorphometry in a 6-month sheep study (22)	-

Publication year

Seven articles (8, 39–44) were published in 2011, making it the year with the highest number of publications. Since 2005 at least one article about this theme was published every year (Fig. 3B).

Keywords

The keywords used and their connections are shown in Fig. 2B.

Authorship data

The first authors are represented in Fig. 3C. X.Y. Ma et al. (45–47) and C. von Milmowsky et al. (8, 37, 38), each published three articles. Fig. 2C displays the network of co-authors, encompassing all authors rather than just the first authors. Fig. 2D illustrates the connected group of authors.

Journals

Clinical Oral Implants Research published the most articles, with 13 articles (21, 24, 25, 29, 33, 36, 39, 43, 48–52) in total, followed by the International Journal of Oral & Maxillofacial Implants, with 10 papers (22, 23, 27, 28, 32, 53–57) (Fig. 3D).

Citations

The study entitled "Influence of surface characteristics on bone integration of titanium implants. A histomorphometric study in miniature pigs" (58) was the most cited, with 1,323 citations, which is shown in Tab. 2.

DISCUSSION

Although studies of large animals (pigs, sheep, monkeys) result in translational research (59), providing reliable data that can be applied to humans, they do not have the same accommodation handling facility as small animals (rats, mice, rabbits). Nevertheless, the significance of these studies is evident in their publication in high-impact journals, specifically in the fields of implant dentistry and biomaterials.

A high impact factor reflects the average number of citations of published articles; in general, well-designed methodological studies tend to be referenced (60). In this study, it was possible to observe that studies carried out on animals had good visibility in clinical journals, and they were potential choices for future publications. The journal that published the most studies in this category was Clinical Oral Implants Research, with an impact factor of 5.021. It was followed by the International Journal of Oral & Maxillofacial Implants, which had an impact factor of 2.912. Other journals, such as the Journal of Clinical Periodontology, and Biomaterials, had impact factors of 7.478 and 15.304, respectively.

There can be several factors that motivate a research group to dedicate itself to a certain topic. Regarding the study of dental implants in swine and ovine models, the majority of articles were published in Germany. The study center most focused on this theme was the University of Erlangen-Nuremberg, located in Germany, which was responsible for ten (8, 23–25, 28, 29, 32, 33, 37, 38) of the 21 articles published in Germany (8, 19–38). Nowadays, important dental implant companies worldwide are located in Germany such as Straumann®, Danaher®, Dentsply Sirona®, and Zimmer-Biomet®. Although the relationship between university research and private companies is complex (61), private sector investment in science collaborates with research development. In general, investment can be achieved by "push" mechanisms, which promote innovation through upfront direct funding for research and development, and "pull" mechanisms, which reward successful product development (62). In addition, the benefit of this relationship can extend to academics pursuing careers in industry (63). Furthermore, even if only indirectly, researchers may feel motivated to perform research when they perceive that their results may have a direct impact on the public, even if it is through commercialization, as is the case of dental implants. Local factors may also be a driving force in research. China is the country with the highest number of publications in this subject after Germany, and edentulism increased from 9% to 16% between 2011 and

2018 among adults aged 45 years in China (64). Thus, looking at the main countries responsible for these publications, it is understandable that the main authors of three articles each, were X.Y. Ma et al. (45–47) from China and C. von Milmsowsky et al. (8, 37, 38) from Germany.

The progress of science stems from the evolution of established concepts, identifying potential improvements and trends through data analysis in publications. Keywords have been recognized as a key component in articles, enabling the traceability of the evolution of knowledge. The more popular a keyword, the more likely it is to be selected by new researchers (65). In this study, it was possible to identify that the most used keywords were "dental implants" and "osseointegration", which showed the main focus of the analysis of the articles. Moreover, in this study, as reported in the literature (65), it was found that there was a hierarchical structure identified in the network, in which popular words that are frequently used are added to by new words that have been generated from new insights that come from the evolution of knowledge. The presence of words related to the chemical aspects of surfaces may indicate a research trend within the field. In addition, the choice of keywords can refer to important or popular methodologies for certain research topics. The keyword "histomorphometry" was found seven times and is one of the most common tests that these studies used to evaluate osseointegration. Subsequently, it was found that the keywords "animal study", "diabetes", "osteoporosis", and "titanium" were each used six times. The first of these keywords can replace "sheep" or "swine", for example, representing the use of the animal in the study. The second and third keywords explain the disease that was studied in that specific research. The keyword "titanium" denotes the main component material of dental implants today.

While the frequency of citations of a study can influence certain perspectives and opinions among researchers, such as the correlation between article quality, visibility, and overall citation impact, as well as the perception of fairness (or lack thereof) in the scientific system (66), it is generally recognized that articles can be cited based on their quality and relevance within a specific domain (67). It is generally understood that articles with high methodological quality are more reliable, may represent greater scientific advances, and can serve as inspiration for new studies. In addition, the domain represents the thematic area on which the study focuses, and the domain may be larger than other domains, consequently attracting more citations than smaller domains (68). In this study, the oldest article was the one with the highest number of citations (58). The fact that this article was pioneering in the area may have initially been the motivating factor for citation; however, other characteristics may have been responsible for the continuing relevance of the article over time, despite the fact that subsequent studies may have been produced with more up-to-date technology. Subjective factors, such as the presentation of an article (i.e. its objectivity, clarity, and the length of the title) may contribute to the choice of that article and its respective citation in another study (67). In addition, social perspective can influence citation choice, in

other words, who wrote the article. High-level scientists tend to produce articles that achieve higher visibility. Networking and communication through collaboration, as well as co-authored papers, can positively influence not only an increase in citations but also the number of publications (69).

Collaboration networks between authors can demonstrate the activity of researchers (69). Such networks can be very beneficial to novice researchers, who can be incorporated into groups that are already consolidated in certain areas of study. Likewise, co-authorship collaborations can advance research. In this study, K.A. Schlegel stood out in terms of networking. Although he was not among the researchers with the highest number of publications as the first author, he was involved in nine articles on the studied theme (8, 24, 25, 30, 32, 33, 37, 38, 43), and he was the last author in six articles (8, 24, 25, 30, 37, 43), indicating that he was probably the research mentor in those articles. Over the course of several years (2003, 2009, 2010, 2011, 2013, 2015, 2016) it is evident that additional studies were conducted, involving various authors who have contributed to the collaborative network.

In the field of health professionals' education, evaluative bibliometrics, which focus on measuring the number of citations and publications, are more prevalent than relational bibliometrics (17). Relational bibliometrics, on the other hand, establish connections between authors and journals, providing a more straightforward understanding of the subject matter. Although bibliometrics analyses are a good source of data, they do have limitations. The variables that affect the quality of this type of analysis can be divided into dependent and independent. Dependent variables are those over which the researcher has no control, such as the resources available in the software to apply the research, and independent variables are directed to the researcher's knowledge and development regarding this type of study (70). The present study limited our searches for articles to the most commonly used words in studies in the field without adding other standardized terms such as MeSH or Emtree or more synonyms of the words, which might have resulted in more complete results and obtained a greater number of articles. It should also be noted that in this study, the specification of dental implants in a certain group of animals, and with specific conditions (osteoporosis/diabetes), directly influenced the number of results found. Conversely, employing VosViewer software directly within EndNote following the systematic selection of articles, instead of individually searching each database, probably contributed to a reduction in biased results.

CONCLUSION

This study used bibliometric analysis to map information regarding the use of large animal models (pigs and sheep) with laboratory-induced systemic diseases. Although the number of publications per year still seems limited, the research carried out in this area has had scientific recognition, being published in clinical journals with high impact in both implant dentistry and the area of biomaterials, and also producing high citation

rates. The evaluation of osseointegration has been the main goal of such studies, and chemical modifications on the surface have shown to be a focus of interest for researchers in the area.

Acknowledgments

The authors also wish to thank Dr. Sean J. Stroud for reading this manuscript and offering his valuable comments.

Conflict of interest

The authors declare no conflict of interest.

Ethical Approval

Not applicable

Funding

This study was supported by the Coordination for the Improvement of Higher Education Personnel (CAPES) – Finance Code 001.

Authors' contributions:

Flávia Gomes Matos: Concept/Design, Data collection, Data analysis/interpretation, Drafting article.

Anna Clara Abreu Stremel: Data collection, Data analysis/interpretation.

Leandro Cavalcante Lipinski: Critical revision of the article, Approval of article.

Joni Augusto Cirelli: Critical revision of the article, Approval of article.

Fábio André dos Santos: Concept/Design, Critical revision of the article, Approval of article.

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