The 300 Most-Cited Articles in Implant Dentistry

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Purpose: *The purpose of this study was to review and evaluate the characteristics of the 300 most-cited articles that have been published in the most important implant dentistry journals.* ***Materials and Methods:*** *A search and selection of the most-cited articles up to October 2014 was conducted for implant journals with the highest impact factors, according to the ISI Web of Science. The 300-most-cited articles were evaluated according to the most commonly studied topics and methodological designs used. The most-cited journals and the number of articles cited by year were calculated. Descriptive statistics were used to summarize the results.* ***Results:*** *The most-cited topics consisted of implant success/survival and guided bone regeneration, and the most-cited methodological designs were case series and cohort studies. The most frequently referenced journal was The International Journal of Oral and Maxillofacial Implants, with 47% of the citations, and the period with the most citations was 1996 to 2000.* ***Conclusion:*** *Longitudinal studies of success and survival have had great scientific impact on the practice of implant dentistry. Awareness of the most-cited articles in implant dentistry will contribute to scientific advances, as it serves to identify the most researched areas, the most frequently used study designs, and areas that require further research.* Int J Oral Maxillofac Implants 2017;32:e1–e8. doi: 10.11607/jomi.5104

Keywords: *dental implants, evidence-based dentistry, impact factor, journal article, MEDLINE*

Clinical decisions in implant dentistry should be based on an adequate search for information and critical analysis of the scientific literature.[1] Today, clinicians have access to a wide variety of information sources, but they do not necessarily tend to assess the quality of publications.[2] One way to objectively evaluate the impact and popularity of a study is based on the number of times it has been cited in indexed journal publications.[3] Generally speaking, this appraisal represents the academic importance and qualitative significance of indexed publications.[4]

Over the years, controversy has arisen in the literature regarding whether a relationship exists between the frequency that articles are cited and their scientific quality, but only a few studies have investigated the quality of the evidence and research designs for clinical decision-making.[5] Recently, it has been shown that clinical experts in implant dentistry do not always base their decisions on scientific evidence but instead on agreed-upon protocols without greater evidence.[6] In fact, clinical decisions should be based on many factors—eg, patient needs, cost and value of the treatment, and an understanding of benefits and potential risks of interventions.[7] Furthermore, clinicians should have the skills to recognize and consider the individual beliefs, attitudes, and values of their patients when selecting a treatment.[8]

Histories and descriptions of the most-cited articles in medical science have been presented for distinct fields of medicine.[9–12] In dentistry, bibliometric reviews have been performed at a general level, and there have been specific reviews in the areas of endodontics, orthodontics, and maxillofacial surgery in which the authors emphasized the importance of knowledge of the cited literature for the development of these dental specialties.[13–16]

The Institute of Scientific Information (ISI) provides an online scientific platform called the ISI Web of Science that facilitates access to data sets and resources covering all fields of scientific knowledge. Among its myriad offerings, the ISI Web of Science identifies the

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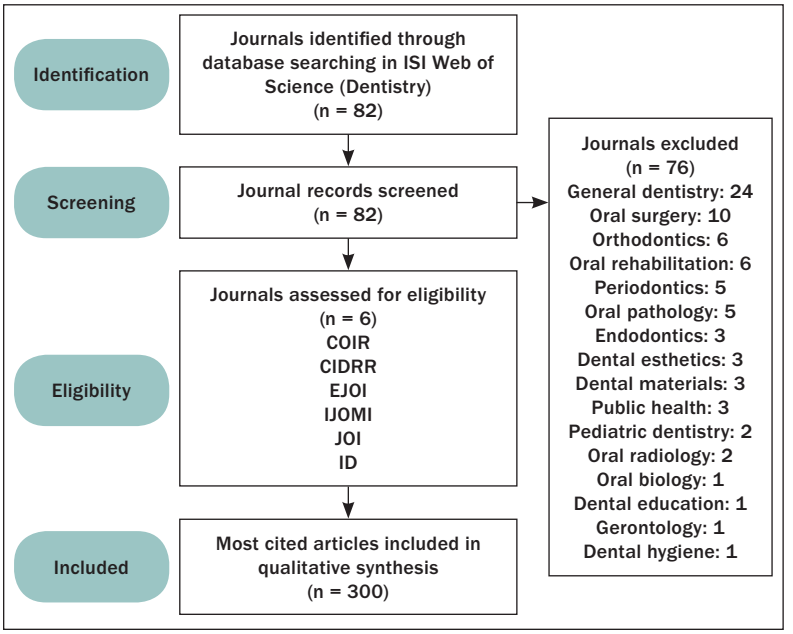

Fig 1 PRISMA flow for the screening process.

most-cited articles in dentistry—including those in the field of implant dentistry—and provides the number of citations for each published article.[17]

Many articles have contributed greatly to the development of implant dentistry, but to date, the articles cited in indexed implant-related journals have not been ranked and descriptively analyzed. Such evaluation could be a meaningful tool for academic and clinical purposes. Hence, the objective of the present study was to conduct a comprehensive search of the 300 most-cited articles in implant dentistry in six indexed journals and to analyze their characteristics and evaluate their research topics and study design.

MATERIALS AND METHODS

Focused Question

What are the most-cited articles in implant dentistry journals?

Screening Process

The search information was obtained using the virtual ISI Web of Science[17] platform at the Graduate School of Dentistry of the Cayetano Heredia Peruvian University, Lima, Peru. Using this website, a search was conducted of the following indexed implant dentistry journals: *Clinical Oral Implants Research* (COIR), *Clinical Implant Dentistry and Related Research* (CIDRR), *European Journal of Oral Implantology* (EJOI), *The International Journal of Oral & Maxillofacial Implants* (JOMI), *Implant Dentistry* (ID), and *Journal of Oral Implantology* (JOI).

Data Extraction

All articles published by these six journals from the journal's date of creation until October 2014 were surveyed. The information extracted from the articles included the title, author names, journal name, volume and issue numbers, pages, publication date, and number of citations. Finally, the list of articles was sorted by the number of citations from highest to lowest, which allowed rapid visualization and identification of the most-cited articles (the citation count only included the number of times the article was cited by articles from journals covered by the ISI Web of Science).

The process of searching and selecting the articles was performed by two reviewers (DE and CM) who were previously trained and calibrated in the use of and search for information on the ISI platform. Cohen's kappa (κ) coefficient was analyzed to measure the inter-rater agreement in the selection of the papers. After discussion to achieve agreement on the evaluation prior to its execution, the κ coefficient was 0.9, showing almost perfect inter-examiner agreement. Any disagreements in data extraction were resolved by discussion. During this process of training, the assessors consulted the supervising author (MA), who piloted the form to resolve any unclear issues (Fig 1). Each group of articles organized by journal was independently stored in six different files to be subsequently compiled and sorted according to the number of citations using spreadsheet software (Excel, Microsoft).

The 300 articles with the most citations were collected as a representative sample of published articles. This arbitrarily predefined sample was used to obtain a quantity of articles that was both manageable and relevant to perform the descriptive evaluations. A full

Table 1 The 10 Most-Cited Articles in Implant Dentistry Journals

Rank	Article	Citations	Journal	Topic
1	Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-term efficacy of currently used dental implants: A review and proposed criteria of success. Int J Oral Maxillofac Implants 1986;1:11–25.	1,331	JOMI	Success and/or survival
2	Adell R, Eriksson B, Lekholm U, Brånemark PI, Jemt T. A long-term follow-up study of osseointegrated implants in the treatment of totally edentulous jaws. Int J Oral Maxillofac Implants 1990;5:347–359.	1,130	JOMI	Success and/or survival
3	Buser D, Mericske-Stern R, Pierre Bernard JP, et al. Long-term evaluation of non-submerged ITI implants. Part 1: 8-year life table analysis of a prospective multi-center study with 2359 implants. Clin Oral Implants Res 1997;8:161–172.	678	COIR	Success and/or survival
4	Buser D, Brägger U, Lang N, Nyman S. Regeneration and enlargement of jaw bone using guided tissue regeneration. Clin Oral Implants Res 1990;1:22–32.	437	COIR	Guided bone regeneration
5	Tarnow DP, Emtiaz S, Classi A. Immediate loading of threaded implants at stage 1 surgery in edentulous arches: Ten consecutive case reports with 1- to 5-year data. Int J Oral Maxillofac Implants 1997;12:319–324.	383	JOMI	Immediate loading
6	Buser D, Weber H, Lang N. Tissue integration of non-submerged implants. 1-year results of a prospective study with 100 ITI hollow-cylinder and hollow-screw implants. Clin Oral Implants Res 1990;1:33–40.	362	COIR	Success and/or survival
7	van Steenberghe D, Lekholm U, Bolender C, et al. Applicability of osseointegrated oral implants in the rehabilitation of partial edentulism: A prospective multicenter study on 558 fixtures. Int J Oral Maxillofac Implants 1990;5:272–281.	362	JOMI	Success and/or survival
8	Anitua E. Plasma rich in growth factors: preliminary results of use in the preparation of future sites for implants. Int J Oral Maxillofac Implants 1999;4:529–535.	355	JOMI	Plasma rich in growth factors
9	Lindquist L, Carlsson G, Jemt T. A prospective 15-year follow-up study of mandibular fixed prostheses supported by osseointegrated implants. Clinical results and marginal bone loss. Clin Oral Implants Res 1996;7:329–336.	346	COIR	Success and/or survival
10	Friberg B, Jemt T, Lekholm U. Early failures in 4,641 consecutively placed Brånemark dental implants: A study from stage 1 surgery to the connection of completed prostheses. Int J Oral Maxillofac Implants 1991;6:142–146.	345	JOMI	Success and/or survival

JOMI = *The International Journal of Oral & Maxillofacial Implants*; COIR = *Clinical Oral Implants Research.*

reading of each of the articles was conducted by the two reviewers and the following characteristics were recorded: title, authors, year of publication, number of citations, journal of origin, theme, country of the institution where the study was conducted, and study design.

The included articles were ranked according to the number of citations each received and were organized in decreasing order. The different research topics were determined and adapted after evaluating the consensuses of the European Association for Osseointegration (EAO) and the International Team for Implantology (ITI), which propose different topics on diagnosis and treatment in implant dentistry (included in the proceedings of the second, third, fourth, and fifth ITI Consensus Conferences and first, second, and third EAO Consensus Conferences). For the evaluation of the study design, the authors used an adapted form from the Cochrane Collaboration glossary[18] to classify studies.

RESULTS

Ranking and Characteristics of Included Studies

The most-referenced article, with 1,331 citations, was that of Albrektsson et al (1986), published in JOMI, entitled "The long-term efficacy of currently used dental implants: A review and proposed criteria of success."[19] A JOMI article by Adell et al (1990) and a COIR article by Buser et al (1997) were the second and third most frequently cited papers, respectively. The mean, median, range, and interquartile range (IQR) of the number of citations were 172.8, 142.5, 104–1331, and 65.75, respectively. Table 1 shows the 10 most-cited articles in the area of implant dentistry. Supplementary Table 1 (online only) shows the data for the 300 articles evaluated in the present study. Supplementary References (also online only) is the complete list of the 300 articles.

Table 2 Distribution of the 300 Most-Cited Articles by Journal

Journal	No. of articles	Percent
JOMI	142	47.33
COIR	135	45.00
CIDRR	14	4.60
ID	5	1.55
JOI	4	1.33

JOMI = *The International Journal of Oral & Maxillofacial Implants*; COIR = *Clinical Oral Implants Research*; CIDRR = *Clinical Implant Dentistry and Related Research*; ID = *Implant Dentistry*; JOI = *Journal of Oral Implantology*.

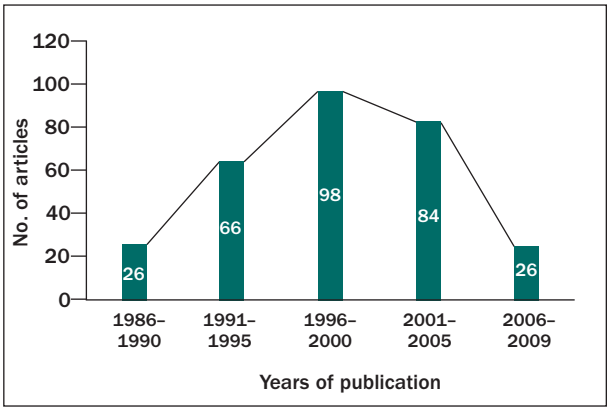

Fig 2 Distribution of articles published by publication year.

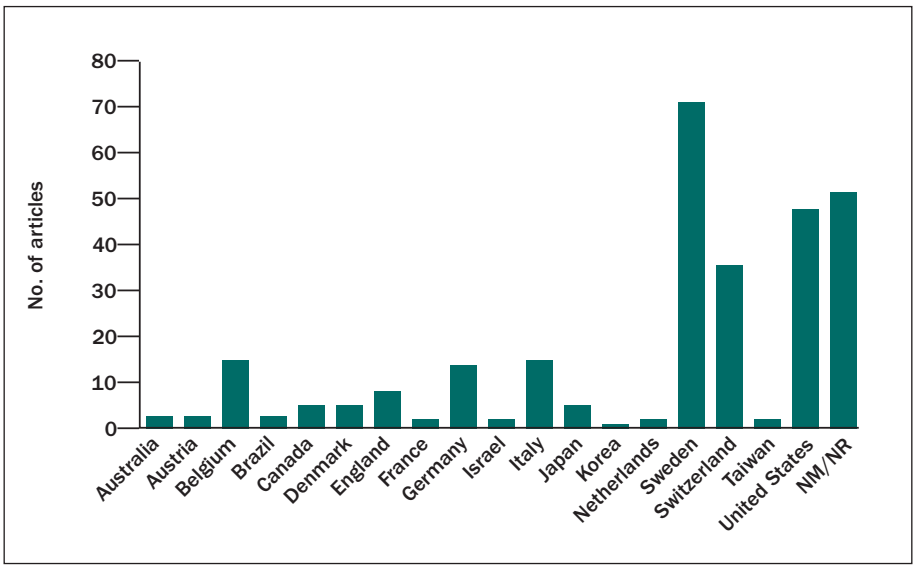

Fig 3 Distribution of articles published by country. NM = not mentioned; NR = not reported.

The two journals with the largest contribution to the 300 most-cited articles were JOMI and COIR, with 47% and 45% of the articles, respectively. The journals with only a few studies among the 300 most-cited list include CIDRR (5%), ID (2%), and JOI (1%). EJOI did not have any articles among the 300 most-cited publications (Table 2).

Evaluating the distribution of the articles by the year of publication revealed that the period with the largest number of citations was from 1996 to 2000, with 99 articles total: 1996 (27.72%), 1997 (22.77%), 1998 (13.86%), 1999 (13.86%), and 2000 (19.80%). The periods with the fewest articles on the list were from 1986 to 1990 and from 2006 to 2009. No articles published between 2010 and 2015 made the list (Fig 2). The top three countries of origin of the institutions that produced the most-cited articles were Sweden, USA, and Switzerland (Fig 3).

Research Topics

The 300 articles evaluated investigated a wide diversity of topics related to implant dentistry. The five most-cited topics were: *(1)* implant success and survival (43 articles, 14.33%); *(2)* guided bone regeneration (42 articles, 14%); *(3)* implant surfaces (30 articles, 30%); *(4)* maxillary sinus lift (24 articles, 8%); and *(5)* immediate implant loading (21 articles, 7%). The least cited topics concerned facial prostheses and impressions, with only one article describing each (Fig 4).

Research Designs

An evaluation of the different levels of evidence showed that the majority of these articles were either case series (n = 71), prospective cohort studies (n = 39), or animal studies (n = 51). Very few systematic reviews and controlled trial studies were found (Fig 5; Supplementary Table 1).

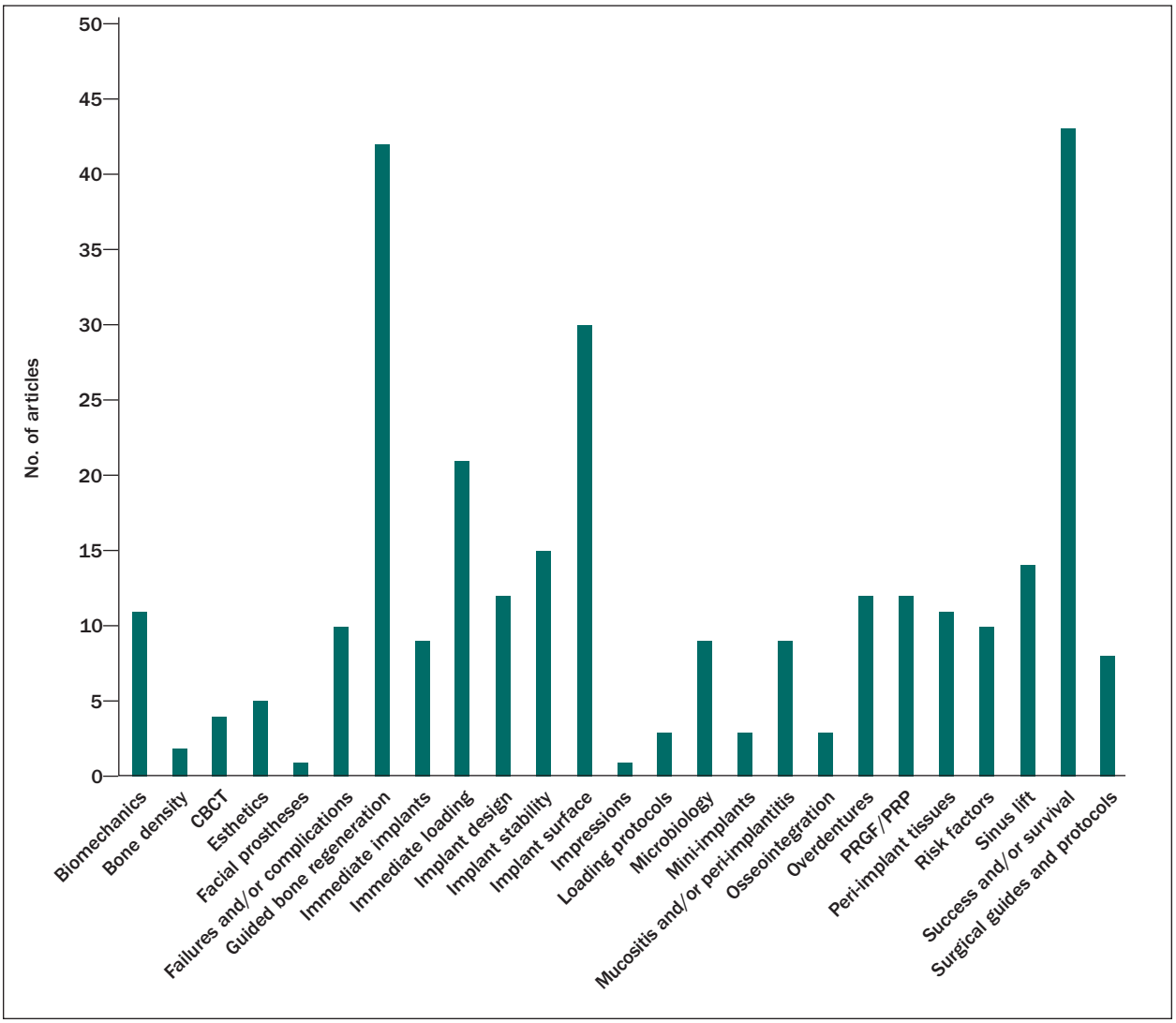

Fig 4 Distribution of articles by topic. CBCT = cone beam computed tomography; PRGF = plasma rich in growth factors; PRP = platelet-rich plasma.

DISCUSSION

Since implant dentistry became a feasible alternative solution for oral functional rehabilitation, many studies have been performed to test its predictability. It is of crucial importance to know what areas of implant dentistry have been documented to date to better understand its reliability and areas in the need of further validation. Findings from the present study demonstrated that implant survival/success and guided bone regeneration for implant site development were the major topics cited, and thus explored, in the field of implant dentistry. Interestingly, most articles dealing with these topics were found to be based on studies with methodological limitations, such as case series. One might expect that studies with higher methodological quality, such as randomized clinical trials (RCTs), would be among the top-cited studies. The present study found that in many instances, advances in the field do not necessarily rely on these types of studies, as they may not reflect the daily clinical practice of implant dentistry.[20]

The most-cited studies date from an era in which methodological principles were not as strongly emphasized as they have been in recent years. Today there is more pressure throughout the scientific community to conduct studies with higher levels of methodological quality, with several groups, including the Cochrane Collaboration and the Equator Network, working to improve the quality of health information.[21] However, it is important to emphasize that a RCT cannot answer all types of research questions, but it is the most appropriate study design to determine a treatment's effectiveness.

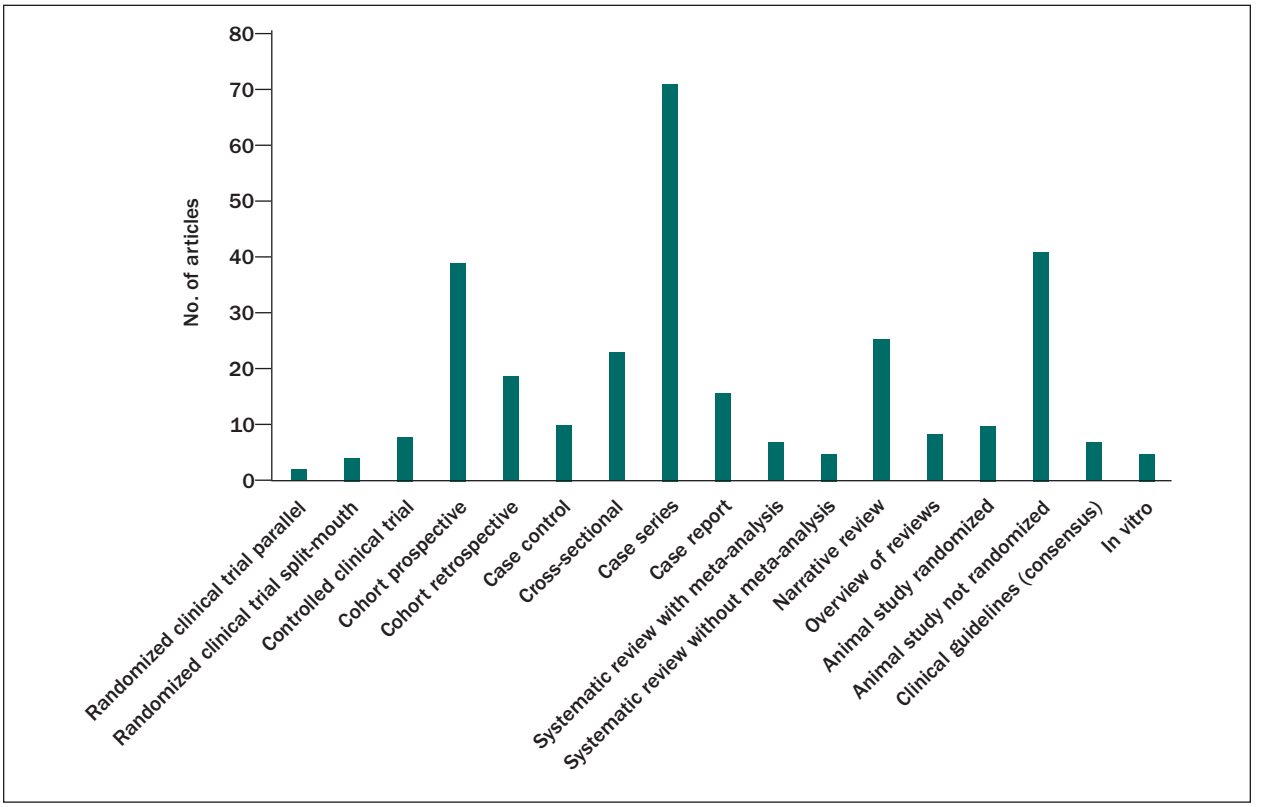

Fig 5 Distribution of the study design in the 300 most-cited articles (classification adapted from the Glossary of Terms in the Cochrane Collaboration[18]).

JOMI (47%) and COIR (45%) were the journals with the most-cited articles among the top 300. These data indicate that the scientific community uses these two journals (specifically implant dentistry journals, according to the ISI Web of Science) as their major sources of information when conducting research in implant dentistry. Two newer journals, CIDRR and EJOI, are also worthy of note: In 2014, the former stood out as the implant journal with the highest impact factor, and the latter specializes in articles with high levels of evidence (RCTs and systematic reviews).

Most of the highly cited articles were published between 1996 and 2000, which is understandable due to the increase in the number of scientific journals and articles during this time. Since these articles were published almost two decades ago, they have had a great deal of time to be cited. The fall off after 2000 would be due in part to many papers becoming out-of-date more quickly in this fast-moving field.

One notable exception is a systematic review published by Wennerberg and Albrektsson in 2009 entitled "Effects of titanium surface topography on bone integration: A systematic review." Despite its relatively recent publication date, the article has been cited 232 times and thus is ranked number 41 in the present study's list of the 300 most commonly cited studies. This may suggest that the article will receive many more citations in the near future.[22] Another noteworthy article, "Platelet-rich plasma (PRP): What is PRP and what is not PRP?" was authored by Marx in 2001. It is the only article published in the 21st century that appears in the top 20 most-cited articles in implant dentistry.[23] These data may indicate that there is current high interest in research on surface topography modifications, due to the novelty and magnitude of implant macro- and micro-designs by a wide variety of systems, as well as research on the emergence of biologic agents to promote bone formation for implant site development.

This review showed that the country of origin of most of the authors of highly cited articles is Sweden, followed by the United States and Switzerland. This is consistent with the fact that the experimental studies in Sweden conducted by Per-Ingvar Brånemark[24] led to groundbreaking advances in the field of implant dentistry. However, it is worthy of mention that some articles did not provide the name of the country where the study was developed, possibly because some journals did not have standardized protocols for submission in their early years.

The field of implant dentistry is diverse, which is why the present study's review of the 300 most-cited articles found that they focused on various topics related to diagnosis, prognosis, and surgical approaches, as well as clinical implant dentistry and related research (ie, bone grafting). The most-frequently cited topic was implant success/survival, which was directly related to the research designs that were most commonly used (case series and cohort studies). This confirms that the scientific community is dependent on long-term clinical outcomes.

Guided bone regeneration and sinus lift were also among the most-frequently cited topics, which reflects the field's great interest in the development of new techniques and technologies as well as the economic support from various manufacturers to scientifically test the benefits of their products. The present study's results are consistent with those of a recent publication,[25] which highlighted higher levels of interest in surgical topics, rather than prosthodontic issues, in the 21st-century literature on clinical implant dentistry and related research.

The VIII European Workshop on Periodontology reported on the confusion that exists with regard to study design of implant dentistry articles.[26] In this regard, the present study used an adapted form from the Cochrane Collaboration Glossary of Terms to classify the studies more specifically (Fig 5, Supplementary Table 1 [online only]). Difficulties encountered when classifying studies included inaccuracies among comparators or ways of performing the procedure, among others. Only 6 (2%) RCTs were found among the 300 most-cited articles. Most articles were reports with lower methodological levels, such as case series ($n = 71$), which represented 24% of the sample. Thus, it seems that the evidence generated by these studies has been used to guide further research in several areas of implant dentistry. It can be argued that lower-level and potentially biased evidence may generate unreliable information to guide further research. Thus, it is important that the quality of these studies be revisited in order to determine whether the replication of their findings is necessary. Moreover, an evaluation of the most-cited articles in other dental fields should be also performed to understand whether their most-cited articles are also based on studies using lower methodological levels. The authors are currently working on a project to evaluate the 300 most-cited articles in periodontology.

Limitations of the Study

The methodology applied in this study was chosen to reduce the risk of bias; however, the authors must note the intrinsic limitations of using the ISI Web of Science. For example, the ISI Web does not exclude self-citations, which may inflate the number of citations for any given article. The impact factor of a journal, which is determined by examining the number of citations it receives in a given year, may vary if self-citation is a variable that controls it. Thus, it may be necessary to consider other evaluation measures, such as the Eigenfactor, a new measure of assessing a journal's scientific impact.[9]

Furthermore, it is necessary to clarify that there are other articles in implant dentistry with a high number of citations that were not considered for this evaluation because they were published in dental or medical journals that were not specifically implant dentistry journals. Therefore, some potential selection bias may be present.

CONCLUSIONS

Bibliometric evaluation of the most-cited articles in the field of implant dentistry strengthens the scientific community by identifying the most developed areas of study and their levels of evidence. Identifying the articles among the literature with the highest classic and current relevance may also contribute to and encourage the development of graduate programs specializing in implant dentistry. Finally, the authors hope that this article will bring further recognition to the researchers, institutions, and scientific journals that have contributed most to the development of the specialty of implant dentistry.

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Supplementary Table 1 List of 300 Most-Cited Articles

Rank	Authors	Year	Citations	Journal	Topic	Design[a]
1	Albrektsson et al	1986	1,331	JOMI	Success and/or survival	11
2	Adell et al	1990	1,130	JOMI	Success and/or survival	7
3	Buser et al	1997	678	COIR	Success and/or survival	7
4	Buser et al	1990	437	COIR	GBR	8
5	Tarnow et al	1997	383	JOMI	Immediate loading	7
6	Buser et al	1990	362	COIR	Success and/or survival	7
7	Van Steenberghe et al	1990	362	JOMI	Success and/or survival	7
8	Anitua	1999	355	JOMI	PRGF/PRP	7
9	Lindquist et al	1996	346	COIR	Success and/or survival	7
10	Friberg et al	1991	345	JOMI	Success and/or survival	7
11	Schnitman et al	1997	336	JOMI	Immediate loading	7
12	Bowers et al	1992	334	JOMI	Implant surface	12
13	Berglundh et al	1991	326	COIR	Peri-implant tissues	13.2
14	Rangert et al	1989	326	JOMI	Biomechanics	11
15	Meredith et al	1996	324	COIR	Implant stability	11
16	Jensen et al	1996	313	JOMI	Sinus lift	14
17	Marx	2001	313	ID	PRGF/PRP	11
18	Wennerberg et al	1995	303	COIR	Implant surface	13.2
19	Jemt et al	1996	298	JOMI	Success and/or survival	3
20	Quirynen et al	1992	297	COIR	Success and/or survival	7
21	Henry et al	1996	291	JOMI	Success and/or survival	3
22	Schenk et al	1994	287	JOMI	GBR	13.1
23	Bain and Moy	1993	285	JOMI	Risk factors	4
24	Lekholm et al	1999	284	JOMI	Success and/or survival	7
25	Jemt	1991	283	JOMI	Failures and/or complications	7
26	Cochran et al	2002	281	COIR	Implant surface	2
27	Lindhe et al	1992	273	COIR	Mucositis and/or peri-implantitis	13.2
28	Jung et al	2007	266	COIR	Failures and/or complications	3
29	Berglundh et al	2003	265	COIR	Osseointegration	13.2
30	Isidor	1996	264	COIR	Osseointegration	13.2
31	Dhalin et al	1989	261	JOMI	GBR	13.2
32	Brunette	1988	261	JOMI	Implant surface	11
33	Berglundh and Linde	1997	257	COIR	GBR	13.2
34	Aghaloo and Moy	2007	255	JOMI	GBR	3
35	Rangert et al	1995	253	JOMI	Failures and/or complications	7
36	Jemt et al	1989	253	JOMI	Osseointegration	7
37	Adell et al	1990	246	JOMI	GBR	8
38	Engquist et al	1988	244	JOMI	Overdentures	7
39	Jemt and Lekholm	1995	239	JOMI	Failures and/or complications	4
40	Zitzmann et al	1997	237	JOMI	GBR	4
41	Wennerberg and Albrektsson	2009	232	COIR	Implant surface	3
42	Cox and Zarb	1987	232	JOMI	Success and/or survival	7
43	Brånemark et al	1999	231	CIDRR	Surgical guides	7
44	Chiapasco et al	1997	227	COIR	Overdentures	7

Supplementary Table 1 *continued* List of 300 Most-Cited Articles						
Rank	**Authors**	**Year**	**Citations**	**Journal**	**Topic**	**Design[a]**
45	Nyman et al	1990	227	JOMI	GBR	8
46	Sanchez et al	2003	225	JOMI	PRGF/PRP	3
47	Mericske-Stern et al	1994	223	COIR	Overdentures	7
48	Becker et al	1994	223	JOMI	Immediate implants	3
49	Quirynen et al	2002	222	COIR	Mucositis and/or peri-implantitis	11
50	Jemt and Lekholm	1993	221	JOMI	Success and/or survival	6
51	Gapski et al	2003	219	COIR	Immediate loading	3
52	Meredith et al	1997	218	COIR	Implant stability	6
53	Buser et al	2004	215	JOMI	Esthetics	11
54	Abrahamsson et al	1996	214	COIR	Mucositis and/or peri-implantitis	13.2
55	Berglundh et al	1992	214	COIR	Mucositis and/or peri-implantitis	13.2
56	Kallus and Bessing	1994	213	JOMI	Failures and/or complications	7
57	Randow et al	1999	208	COIR	Immediate loading	3
58	Kan et al	2003	207	JOMI	Immediate loading	6
59	Jovanovic et al	1992	206	JOMI	GBR	6
60	Carlsson et al	1988	206	JOMI	Implant surface	13.2
61	Cheng et al	2004	205	JOMI	Mini-implants	3
62	Karoussis et al	2003	202	COIR	Success and/or survival	3
63	Klollevold et al	1997	202	COIR	Implant stability	13.2
64	Becker et al	1990	202	JOMI	Success and/or survival	7
65	Piatelli et al	1999	199	JOMI	Sinus lift	8
66	Wetzel et al	1995	198	COIR	Sinus lift	13.2
67	Storgard et al	1996	198	JOMI	GBR	13.1
68	Buser et al	1991	198	JOMI	Implant design	7
69	Pjetursson et al	2004	196	COIR	Failures and/or complications	3
70	Wood and Moore	1988	196	JOMI	Sinus lift	8
71	Szmukler-Moncler et al	2000	195	COIR	Immediate loading	11
72	Pjetursson et al	2007	195	COIR	Success and/or survival	3
73	Johansson and Albrektsson	1987	193	JOMI	Implant stability	13.2
74	Brånemark et al	1995	191	COIR	Success and/or survival	4
75	Dahlin et al	1991	189	COIR	GBR	4
76	Abrahamsson et al	2004	186	COIR	Implant surface	13.1
77	Laney et al	1994	186	JOMI	Success and/or survival	7
78	Teughels et al	2006	185	COIR	Implant surface	3
79	Johns et al	1992	185	JOMI	Overdentures	7
80	Brunski et al	2000	184	JOMI	Biomechanics	11
81	Misch	1997	182	JOMI	GBR	7
82	Hutton et al	1995	181	JOMI	Overdentures	3
83	Sarment et al	2003	178	JOMI	Surgical guides	5
84	Hermann et al	2001	177	COIR	Peri-implant tissues	13.1
85	Chen et al	2004	176	JOMI	Immediate implants	3
86	Gelb	1993	175	JOMI	Immediate implants	7
87	Duyck et al	2001	173	COIR	Loading protocols	13.2
88	Malo et al	2003	172	CIDRR	Success and/or survival	7
89	Buser et al	1998	172	JOMI	Implant stability	13.2

Supplementary Table 1 *continued* List of 300 Most-Cited Articles

Rank	Authors	Year	Citations	Journal	Topic	Design[a]
90	Pontoriero et al	1994	171	COIR	Mucositis and/or peri-implantitis	3
91	Jansen et al	1997	171	JOMI	Macroscopic design/ microbiology	12
92	Hallman et al	2002	169	JOMI	Sinus lift	2
93	Wennerberg et al	1997	169	JOMI	Implant surface	13.2
94	Chiapasco et al	2006	168	COIR	GBR	3
95	Leonhardt et al	1999	168	COIR	Microbiology	5
96	Cook et al	1987	167	JOMI	Implant surface	13.1
97	Brägger et al	2001	166	COIR	Failures and/or complications	3
98	Balshi and Wolfinger	1997	166	ID	Immediate loading	7
99	Yildirim et al	2000	165	COIR	Sinus lift	7
100	Weber et al	1992	165	COIR	Success and/or survival	7
101	Bollen et al	1996	163	COIR	Implant surface	7
102	Isidor	1997	163	COIR	Biomechanics	13.2
103	Hürzeler et al	1996	163	JOMI	Sinus lift	7
104	Jemt and Book	1996	162	JOMI	Failures and/or complications	4
105	Sennerby et al	1992	162	JOMI	Implant stability	13.2
106	Schnitman et al	1990	162	JOI	Immediate loading	7
107	Rocci et al	2003	161	CIDRR	Surgical protocols	4
108	Ericsson et al	2000	161	COIR	Immediate loading	3
109	Wheeler et al	1996	161	JOMI	Sinus lift	7
110	Nkenke et al	2000	160	COIR	GBR	3
111	Binon	2000	160	JOMI	Implant design	11
112	Glauser et al	2004	159	COIR	Implant stability	7
113	Renouard and Nisand	2006	159	COIR	Implant design	10
114	Van Steenberghe et al	2002	159	JOMI	Surgical guides	8
115	Wennerberg and Albrektsson	2000	159	JOMI	Implant surface	11
116	Jemt et al	1991	159	JOMI	Success and/or survival	7
117	Bruyn and Collaert	1994	158	COIR	Risk factors	4
118	Ellingsen et al	2004	158	JOMI	Implant surface	13.2
119	Ekfeldt et al	1994	158	JOMI	Success and/or survival	7
120	Keller et al	1987	158	JOMI	GBR	7
121	Meredith et al	1997	157	COIR	Implant stability	13.2
122	Mombelli and Lang	1992	156	COIR	Mucositis and/or peri-implantitis	7
123	Norton and Gamble	2001	156	COIR	CBCT	2
124	Spiekermann et al	1995	156	JOMI	Overdentures	4
125	Simion et al	2001	155	COIR	GBR	4
126	Rosenquist and Björn	1996	154	JOMI	Immediate implants	7
127	Jordi and Aparicio	1990	154	JOMI	Implant stability	7
128	Buser et al	1998	153	COIR	GBR	13.2
129	Bengazi et al	1996	153	COIR	Peri-implant tissues	3
130	Krekmanov et al	2000	153	JOMI	Biomechanics	7
131	Rangert et al	1997	153	JOMI	Biomechanics	14
132	Listgarten et al	1991	152	COIR	Peri-implant tissues	11
133	Glauser et al	2001	151	CIDRR	Immediate loading	3

Supplementary Table 1 *continued* List of 300 Most-Cited Articles						
Rank	**Authors**	**Year**	**Citations**	**Journal**	**Topic**	**Design[a]**
134	Glauser et al	2003	151	CIDRR	Immediate loading	7
135	Wiltfang et al	2003	151	COIR	PRGF/PRP	13.1
136	Fürhauser et al	2005	151	COIR	Esthetics	6
137	Chanavaz	1990	151	JOI	Sinus lift	11
138	Quirynen and Steenberghe	1993	150	COIR	Microbiology	6
139	Moy et al	2005	150	JOMI	Risk factors	4
140	Kobayashi et al	2004	148	JOMI	CBCT	6
141	O'Sullivan et al	2000	147	CIDRR	Implant stability	6
142	Rocci et al	2003	147	CIDRR	Immediate loading	1.2
143	Quirynen and Listgarten	1990	147	COIR	Microbiology	6
144	Hammerle et al	1998	147	COIR	GBR	13.2
145	Gotfredsen et al	1992	147	COIR	Implant stability	13.2
146	Jansen et al	1993	146	COIR	Superficie	6
147	Valentini et al	1998	143	COIR	Sinus lift	8
148	Evans and Chen	2007	143	COIR	Immediate implants/esthetics	4
149	Cochran et al	2004	143	JOMI	Loading protocols	14
150	Bergendal and Engquist	2008	143	JOMI	Overdentures	3
151	van Steenberghe et al	2005	142	CIDRR	Surgical guides	3
152	Mericske-Stern	1990	142	JOMI	Overdentures	6
153	Rosenberg et al	1991	141	COIR	Microbiology	6
154	Sykaras et al	2000	140	JOMI	Implant design	11
155	Bischof et al	2004	139	COIR	Implant stability	4
156	Sailer et al	2007	139	COIR	Success and/or survival	9
157	Horiuchi et al	2000	139	JOMI	Immediate loading	8
158	Roccuzzo et al	2001	138	COIR	Implant surface	1.2
159	Wennerberg et al	1998	138	COIR	Macrogeometry—surface	13.2
160	Esposito et al	2006	138	JOMI	GBR	9
161	Rimondini et al	2002	138	JOMI	Microbiology	6
162	Hutmacher et al	1996	138	JOMI	GBR	11
163	Pinheiro Ottoni et al	2005	137	JOMI	Immediate loading	4
164	Roos et al	1997	137	JOMI	Success and/or survival	7
165	Joméus et al	1992	137	JOMI	Biomechanics	6
166	Motoyoshi et al	2006	136	COIR	Mini-implants	7
167	Merz et al	2000	136	JOMI	Implant design	6
168	Cochran et al	1996	135	COIR	Implant surface	13.2
169	Chaushu et al	2001	135	JOMI	Immediate loading	7
170	Esposito et al	1999	135	JOMI	Failures and/or complications	11
171	Skoglund et al	1997	135	JOMI	ROG/ridge augmentation	7
172	Kasemo and Lausmaa	1988	135	JOMI	Implant surface	11
173	Holmgren et al	1998	135	JOI	Biomechanics	6
174	Tan et al	2004	134	COIR	Success and/or survival	9
175	Gatti et al	2000	134	JOMI	Overdentures	7
176	Cardaropoli et al	2006	133	COIR	Peri-implant tissues	7
177	Cordaro et al	2002	133	COIR	GBR	7
178	Scheller et al	1998	133	JOMI	Success and/or survival	7

Supplementary Table 1 *continued* List of 300 Most-Cited Articles

Rank	Authors	Year	Citations	Journal	Topic	Design[a]
179	Wennerberg et al	1996	133	JOMI	Implant surface	13.2
180	Lindht et al	1998	132	COIR	Success and/or survival	9
181	Wehrbein et al	1996	132	COIR	Mini-implants	8
182	Quirynen et al	1994	132	COIR	Microbiology	6
183	Ericsson et al	1992	132	COIR	Mucositis and/or peri-implantitis	13.2
184	Bahat	1993	132	JOMI	Success and/or survival	7
185	Schwarz et al	1987	132	JOMI	CBCT	8
186	Nedir et al	2004	131	COIR	Implant stability	3
187	Carmagnola et al	2003	131	COIR	GBR	2
188	Barewal et al	2003	131	JOMI	Implant surface	7
189	Rosen et al	1999	131	JOMI	Sinus lift	7
190	Hemmings et al	1994	131	JOMI	Overdentures	5
191	Misch et al	2007	131	ID	Success and/or survival	14
192	Weber et al	1996	130	COIR	Peri-implant tissues	13.2
193	Raghoebar et al	2001	130	COIR	Sinus lift	4
194	Fransson et al	2005	130	COIR	Success and/or survival	6
195	Cooper et al	2002	130	JOMI	Immediate implants	7
196	Quirynen et al	1996	130	JOMI	Implant surface	1.2
197	Misch et al	1992	130	JOMI	GBR	8
198	Clavero and Lundgren	2003	129	CIDRR	Sinus lift	5
199	Tan et al	2004	129	COIR	Success and/or survival	9
200	Chen et al	2007	129	COIR	Esthetics	1.1
201	Zitzmann et al	2001	129	JOMI	GBR	1.2
202	Wheeler	1996	129	JOMI	Implant surface	4
203	Hurzeler et al	1997	128	COIR	Sinus lift	13.2
204	Graziani et al	2006	127	COIR	PRGF/PRP	15
205	Chang et al	1999	127	COIR	Esthetics	5
206	Salcetti et al	1997	127	JOMI	Microbiology	5
207	Jemt et al	1992	127	JOMI	Failures and/or complications	7
208	Chiapasco	2009	126	JOMI	GBR	10
209	Tolman	1995	126	JOMI	GBR	11
210	Flemming	2006	125	COIR	Biomechanics	11
211	Mustafa et al	2001	125	COIR	Implant surface	15
212	Hermann et al	2000	125	COIR	Peri-implant tissues	13.1
213	Brocard et al	2000	125	JOMI	Success and/or survival	3
214	Nevins and Langer	1993	124	JOMI	Success and/or survival	3
215	Araujo et al	2006	123	COIR	Immediate implants	13.2
216	Dominguez and Dominguez	2002	123	JOMI	Surgical protocols	7
217	Chiapasco et al	2001	123	JOMI	Overdentures	2
218	Tong et al	1998	123	JOMI	Sinus lift	2
219	Gruber et al	2002	122	COIR	PDGF	15
220	Lang et al	1994	122	COIR	Immediate implants	8
221	Lang et al	1994	122	COIR	GBR	7
222	Bahat	2000	122	JOMI	Success and/or survival	3
223	Jovanovic et al	1995	122	JOMI	GBR	13.1

Supplementary Table 1 *continued* List of 300 Most-Cited Articles						
Rank	**Authors**	**Year**	**Citations**	**Journal**	**Topic**	**Design[a]**
224	Lang et al	1994	121	COIR	Peri-implant tissues	13.2
225	emt	1994	121	COIR	Success and/or survival	3
226	Hammerle et al	2004	121	JOMI	Immediate implants	14
227	Tada et al	2003	121	JOMI	Implant design	6
228	Assif et al	1996	121	JOMI	Impressions	6
229	Junker et al	2009	120	COIR	Implant surface	11
230	Trisi and Rao	1999	120	COIR	Bone density	9
231	Christensen et al	1997	120	COIR	Peri-implant tissues	6
232	Weibrich et al	2002	120	JOMI	PRGF/PRP	12
233	Ferrigno et al	2002	119	COIR	Success and/or survival	3
234	Hammerle and Lang	2001	119	COIR	GBR	8
235	Hammerle et al	1996	119	COIR	Implant design	4
236	Bain	1996	119	JOMI	Risk factors	3
237	Avivi-Arber and Zarb	1996	119	JOMI	Success and/or survival	7
238	Jemt et al	1992	119	JOMI	Overdentures	7
239	Malo et al	2005	118	CIDRR	Immediate loading	7
240	Aparicio et al	2001	118	CIDRR	Success and/or survival	7
241	van den Bergh et al	2000	118	COIR	Sinus lift	11
242	Wennerberg and Albrektsson	2009	118	JOMI	Implant surface	11
243	Feine et al	2002	118	JOMI	Overdentures	14
244	Lundgren et al	2004	117	CIDRR	Sinus lift	7
245	Becker et al	1995	117	JOMI	GBR	13.2
246	Misch and Dietsh	1993	117	ID	GBR	11
247	Wiltfang et al	2003	116	COIR	Sinus lift	4
248	Hardt et al	2002	116	COIR	Risk factors	4
249	Arvidson et al	1998	116	COIR	Success and/or survival	3
250	Haas et al	1998	116	COIR	GBR	13.2
251	Grunder et al	1999	116	JOMI	Immediate loading	3
252	Haack et al	1995	116	JOMI	Biomechanics	12
253	Chiapasco et al	2004	115	COIR	GBR	1.1
254	Bachle and Kohal	2004	114	COIR	Implant surface	10
255	Jensen et al	2002	114	JOMI	GBR	7
256	Testori et al	2001	114	JOMI	Success and/or survival	3
257	Nkenke et al	2001	113	COIR	Implant stability	15
258	Sul et al	2002	113	COIR	Implant stability	13.1
259	Chiapasco et al	1999	113	COIR	GBR	2
260	Ericsson et al	1996	113	COIR	Peri-implant tissues	13.2
261	Schropp et al	2003	113	JOMI	Immediate implants	5
262	Kim et al	2002	113	JOMI	PRP	5
263	Teerlinck et al	1991	113	JOMI	Implant stability	9
264	Ganeles et al	2001	112	JOMI	Immediate loading	8
265	Wilson et al	1998	112	JOMI	Immediate implants	6
266	Nystrom et al	1993	112	JOMI	GBR	3
267	Small et al	1993	112	JOMI	Sinus lift	8

Supplementary Table 1 *continued* List of 300 Most-Cited Articles

Rank	Authors	Year	Citations	Journal	Topic	Design[a]
268	Holmes et al	1997	112	JOI	Bone density	12
269	Oosterwyck et al	1998	111	COIR	Biomechanics	12
270	Ericsson et al	2000	110	CIDRR	Loading protocols	2
271	Pjetursson et al	2004	110	COIR	Success and/or survival	10
272	Hatano et al	2004	110	COIR	Sinus lift	5
273	Palmer et al	2000	110	COIR	Success and/or survival	7
274	Dahlin et al	1995	110	JOMI	GBR	3
275	Bornstein et al	2005	109	COIR	Implant surface	3
276	Persson et al	1996	109	COIR	Microbiology	6
277	Sahin and Çehreli	2001	108	ID	Biomechanics	11
278	Zhao et al	2006	107	COIR	Implant surface	12
279	Buser et al	2000	107	COIR	Surgical protocols	11
280	Hansson	1999	107	COIR	Implant surface	12
281	Sigurdsson et al	1997	107	COIR	GBR	13.2
282	Khoury	1999	107	JOMI	Sinus lift	7
283	Lundgren et al	1996	107	JOMI	Sinus lift	7
284	Araujo et al	2006	106	COIR	Immediate implants	13.2
285	Ericsson et al	1994	106	COIR	Surgical protocols	5
286	Lang et al	1993	106	COIR	Mucositis and/or peri-implantitis	13.2
287	Hirsch and Ericsson	1991	106	COIR	Sinus lift	8
288	Parel and Tjellstrom	1991	106	JOMI	Facial prostheses	7
289	Ostman et al	2005	105	CIDRR	Immediate loading	7
290	Astrand et al	2004	105	COIR	Peri-implant tissues	7
291	Lorenzoni et al	2003	105	COIR	Immediate loading	3
292	Schmid et al	1997	105	COIR	GBR	13.2
293	Warrer et al	1995	105	COIR	Mucositis and/or peri-implantitis	13.2
294	Wennstrom et al	1994	105	COIR	Peri-implant tissues	7
295	Storgård and Terheyden	2009	105	JOMI	GBR	10
296	Belser et al	2004	105	JOMI	Success and/or survival	11
297	Schlegel et al	2003	105	JOMI	Sinus lift	13.1
298	Klinge et al	1998	105	JOMI	CBCT	12
299	Berglundh et al	2007	104	COIR	Implant surface	13.2
300	Storgård et al	2006	104	COIR	GBR	13.2

JOMI = *The International Journal of Oral & Maxillofacial Implants*; COIR = *Clinical Oral Implants Research*; CIDRR = *Clinical Implant Dentistry and Related Research*; ID = *Implant Dentistry*; JOI = *Journal of Oral Implantology*; CBCT = cone beam computed tomography; PRGF = plasma rich in growth factors; PRP = platelet-rich fibrin; GBR = guided bone regeneration.

[a]Study design classification adapted from Glossary of Terms in The Cochrane Collaboration Version 4.2.5, May 2005: 1 = randomized controlled trial; 1.1 = parallel; 1.2 = split-mouth; 1.3 = crossover; 2 = controlled (clinical) trial; 3 = cohort prospective; 4 = cohort retrospective; 5 = case control; 6 = cross-sectional; 7 = case series; 8 = case report; 9 = systematic review with meta-analysis; 10 = systematic review without meta-analysis; 11 = narrative review; 12 = overview of reviews; 13 = animal study; 13.1 = randomized; 13.2 = not randomized; 14 = clinical guidelines (eg, consensus); 15 = in vitro.

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