Unicompartmental Knee Arthroplasty Over the Past 40 Years: a Global Analysis and Review of the Most Highly Cited Articles

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Abstract

Background: The aim of this study was to use citation analysis to identify the top 100 papers in unicompartmental knee arthroplasty (UKA) and report the qualities and characteristics of the most influential articles in UKA research.

Methods: UKA–related articles published from 1950 to June 2020 were identified using multiple databases. The 100 most cited articles were selected for further analysis of citation count, citation density, current citation rate, authorship, theme, geographic distribution, level of evidence, and network analysis.

Results: The top 100 articles' publication dates ranged from 1980 to 2015, with the largest number in the 2000s. Total citations per article ranged from 65 to 473. The USA was the most productive country, but England led the race in terms of citations. The Bone & Joint Journal was the most prolific journal with 25 articles. Price AJ was the most productive first author and corresponding author. The most popular study theme was therapeutic research, followed by prognostic research. The most common level of evidence was level IV. The network analysis connoted that follow-up study had the highest degree of centrality.

Conclusions: The study of UKA is steadily evolving. It could be predicted that there will be an increasing number of publications on UKA research in the following years according to the current global trends, the United States and England will likely maintain leadership in this area. Meanwhile, further prospective studies are required to better recognize the prognosis of UKA procedures.

Introduction

After its resurgence in popularity, unicompartmental knee arthroplasty (UKA) is now considered one of the most effective methods to treat end-stage osteoarthritis of the knee which is limited to a single compartment.[1] The concept of UKA was first clearly proposed by McKeever and MacIntosh who introduced the utilization of a metallic prosthesis for arthroplasty of the knee in the 1950s.[2–4] The first UKA prosthesis in the modern sense was designed by L. Marmor in 1972, known as the “Marmor Knee”, which significantly enhanced the range of motion of the joint and subsequently became a model for many fixed-bearing unicompartmental knee implants to imitate.[5] In its early days, however, UKA was often avoided by surgeons due to the relatively high revision risk,[6] which to some degree is still a major stumbling block today. Besides, some questions such as indications and contraindications for UKA, choice of prosthesis and long term survival were not yet understood.[7] But UKA had still unceasingly fascinated more and more scholars and surgeons since the improved component designs and advanced surgical techniques had promoted excellent clinical outcomes in knee osteoarthritis patients from the late twentieth century onward.[8, 9] Having the characteristics of ligament-sparing and smaller incision, UKA is now regarded as an alternative to total knee arthroplasty in appropriately selected patients.[10, 11]

Bibliometric analysis has been a popular statistical and quantitative tool used by more and more researchers since Garfield’s JAMA publication in 1987.[12] It has become a popular method for analyzing

the qualities and scholarly impact of publications within a research field through identifying and evaluating some quantitative factors like total citations, citation rate and geographical distributions, aiming to allow orthopaedic surgeons to gain insight into the history, current status, and future directions of a specific research field.[13] To better present a visual result of the bibliometric study, the visualization of a bibliometric network has been commonly used to map the interrelationships among various nodes and reveal research hotpots.[14] The nodes in bibliometric networks can represent keywords, authors and institutions, while lines among nodes reflect the density of their relationships.[15] CiteSpace, VOS Viewer and Ucinet are widely-used software packages for bibliometric analysis and visualization. Bibliometric methodology has stimulated the trend of analyzing the top cited one hundred classics retrieved from literature database since the number of citations for an article is a valuable measure of the article's impact on the topic it covers. There has also been a trend of bibliometric analysis in orthopaedics, from investigating the general orthopaedic literature[16, 17] to analyzing varied orthopaedic fields.

This study aimed to allocate the 100 most cited publications in the field of UKA, highlighting intellectual milestones and listing analytical focuses in the field, analyzing the qualities and characteristics of the most frequently cited original papers to allow future surgeons and researchers to comprehend better the current status and global trends in UKA research.

Materials And Methods

Search strategy and criteria

Articles were obtained through searching the Web of Science Core Collection, BIOSIS Citation Index, KCI-Korean Journal Database, MEDLINE, Russian Science Citation Index, and SciELO Citation Index for all articles related to UKA. Two independent researchers performed the search at the same time in order to enhance the search sensitivity. The search terms were as follows: unicompartmental knee arthroplast* OR unicondylar knee arthroplast* OR partial knee arthroplast* OR unicompartmental knee replacement* OR unicompartmental knee replacement* OR partial knee replacement* OR unicondylar knee replacement* OR unicondylar knee prosthesis implantation* OR unicompartmental knee prosthesis implantation*.

The search was carried out on June 1, 2020 for publications published since 1950 and a total of 4,040 articles were retrieved from the database. The search results were then filtered by "journal articles" and the remaining results were 3,758. It was predefined that only original articles were included. Therefore, reviews, meta-analyses, systematic reviews, and guidelines were excluded while registry data were included. Articles were then sorted based on the total number of citations from the highest to the lowest. The articles cited less than 60 times were excluded to ensure the quality of the research. As a result, 304 articles were included for further selection. Two independent investigators (the first two authors in the author list) read the title and the abstract of the included articles. Articles that met the following criteria were accepted: (i) basic study, animal study, and clinical trials related to any aspect of UKA; (ii) the clinical therapeutic, prognostic, diagnostic, epidemiological studies of UKA; (iii) articles investigating

materials or properties related to UKA; (iv) the registry data in relevant institutions. Disagreement on which publications to include between two reviewers were resolved by discussion. There were 113 articles remaining after reviewing the title and abstract. These articles were ranked in descending order of citations and the first 100 most cited articles were included and pooled for data extraction (Figure 1).

Data extraction

The 100 most cited publications were pooled, and two independent well-trained investigators had reviewed all articles. The following information was extracted from all included articles: the journal name, publication date, first and corresponding authors, year of publication, geographic origin (based on the address of the first author), total number of citations of an article, citation density (total citations/article age), current citation rate (citations in the year 2019), research theme, and level of evidence (I through V, methodology has been described elsewhere [18]).

Statistical analysis

The Shapiro-Wilk test was utilized to confirm normality of the distribution of individual variables. Normally distributed data were presented as mean ± standard deviation. One-way analysis of variance (ANOVA) was used to compare means, and post-hoc testing was undertaken when necessary. Time-dependent trends were tested using the Mann-Kendall trend test. Correlation between variables was performed using the Spearman rank or Pearson tests. A $p<0.05$ was considered to be statistically significant. The analysis was performed using IBM SPSS Statistics, version 20.0. The Ucinet for windows, version 6.212 was used to perform the analysis for the degree of centrality.

Results

Time and citations

The top 100 cited articles on UKA were published between 1980 and 2015 and listed in (Table 1). All these articles had been published in the English language despite no language restrictions being imposed. About one half (55%) of the articles were published between 2000 and 2009, significantly outnumbering the articles published in the 1990s (23%), the 2010s (14%), and the 1980s (8%) (Figure 2). The year that yielded the greatest number of articles was 2005 (n=10). The number of total citations per article ranged from 65 to 473 with a median of 99 for each paper, and an interquartile range of 82-146. Citation density ranged from 2.22 to 29.17 per article. The current citation rate was between zero and 47 for each paper with a mean number of 8.33. The mean number of citations per article was greatest for articles published in the 1980s (c=142.75), followed by the 1990s (c=137.82), 2000s (c=112.95) and 2010s (c=103.57). The Kruskal Wallis H test showed no significant association between the decade the article was published and the total number of cites statistically ($p=0.171$). Mann-Kendall test showed that there was an increasing trend both between the current citation rate and the publication time ($z=5.7842$, $p<0.01$) (Figure 3) and between the citation density and the publication time ($z=6.7037$, $p<0.01$) (Figure 4).

Geographical distribution

The 100 articles came from 12 countries. The United States contributed to the most articles (n=38), followed by England (n=35), France (n=7), Sweden (n=7), and Australia (n=2). England enjoyed the highest overall citations (c=4,484), followed by the USA (c=4,390) and France (c=961). England was responsible for the highest number of the top 20 most cited articles (n=10), followed by the United States (n=5), France (n=3) and Sweden (n=2). A vast majority (97%) of the 100 articles came from Europe (n=58) and North America (n=39). The other three articles scattered in other areas: Australia and New Zealand. A detailed overview is presented as a world map (Figure 5). The articles from England were mainly published in The Journal of Bone and Joint Surgery-British Volume; while the articles from the USA were mainly published in Clinical Orthopaedics and Related Research. None of the journals were observed to be the favorite for other countries.

Journals

All the articles were published in thirteen journals, among which *The Journal of Bone and Joint Surgery-British Volume* published the greatest number of articles (n=25). This was followed by *Clinical Orthopaedics and Related Research* (n=22) and *The Journal of Arthroplasty* (n=16) (Table 2). These journals' impact factors (IF) in 2019 ranged from 1.809 (*Orthopaedics & Traumatology-Surgery & Research*) to 60.392 (*Lancet*), with a median IF of 3.709 and an interquartile range of 3.309-4.329. *The Journal of Bone and Joint Surgery-British Volume* had the highest mean citation count (153, range 72-473).

Authorships

There were sixteen authors who were first authors of multiple articles, and fifteen corresponding authors who possessed more than one article in the list (Table 3). Majority of these authors were based in the USA (8 authors) and England (7 authors). The most productive first author was Andrew J. Price from England with five first authorships, followed by H. Pandit from England with four first authorships. The most prolific corresponding author was also Andrew J. Price with six articles, followed by David W. Murray from England with five articles.

Institutions

Eleven institutions published more than one article in the list, contributed to 50 articles altogether (Table 4). The United States possessed six of the 11 institutions, followed by England with two institutions. The highest number of articles came from the Nuffield Orthopaedic Centre in England which produced 21% of the 100 articles, followed by Brigham and Women's Hospital in Massachusetts in the United States (5%) and Anderson Orthopaedic Research Institute in the United States (4%).

Types of research

When categorized according to type of research, majority of the articles reported on clinical research (n=92), with the remaining being basic research (n=8). The median number of citations per article showed no significant discrepancy between clinical research (median 98.5, range 65-473) and basic research (median 96.5, range 75-151) by using Mann–Whitney test; p=0.414. The studies in only six of the 92 clinical articles were designed as randomized controlled trials (RCT).

Levels of evidence

The most common level of evidence for the 100 articles was level IV (n=55), followed by II (n=19), III (n=14), V (n=9) and I (n=3). The eight basic research articles were all level V. The one-way ANOVA revealed no significant difference in citations per article among each group of levels of evidence (p=0.351), nor did citation density and current citation rate (p=0.133 and 0.237, respectively) (Figure 6).

Themes

The major themes of the 100 articles were as follows: therapeutic research (n=31), prognostic research (n=26), surgical indications (n=10), surgical methods and materials (n=10), and epidemiological investigation (n=7) (Figure 7). For the 92 clinical articles, majority of the studies conducted outcome follow-up (58/92). One-way ANOVA was conducted and no significant difference in citations per article among the various themes was detected (p=0.296). About two thirds of the clinical articles exclusively focused on UKA (60/92), outnumbering the papers that comparing the clinical outcomes between UKA and other surgical methods like total knee arthroplasty (TKA) (24/92), or high tibial osteotomy (HTO) (4/92); some articles compared UKA with TKA and HTO simultaneously (2/92).

Visualized network

The visualized network was utilized to analyze the article's key words or subject terms based on two periods of publishing time: in the 1980s and 1990s (31 articles) (Figure 8), in the 2000s and 2010s (69 articles) (Figure 9). The result indicated that "follow-up study" was the hottest topic in both periods. Additionally, "prosthesis failure, osteoarthritis, survival analysis and radiography" had a relatively high degree of centrality in the 1980s and 1990s; while "osteoarthritis, prosthesis failure, survival analysis, rehabilitation, comparative study and contraindications" had a relatively high degree of centrality in the 2000s and 2010s.

Discussion

To the best of our knowledge, this is the first bibliometric analysis identifying the 100 most cited articles pertaining to unicompartmental knee arthroplasty. The maximum number of citations merely reached 473 which was a paper on a survival study for UKA patients demonstrating a ten-year survival rate as high as 98% (Table 1). It is noticeable that the range of citations per article in the list is markedly lower than similar papers published on total knee arthroplasty (median 365, range 287–2640) [14] or total hip arthroplasty (median 259, range 191–994).[19] This can be partially explained by the following reasons:

1) the prevalence of unicompartmental disease is lower with a lower number of overall researchers focused on this topic, 2) the number of UKAs performed are less than other popular arthroplasties; for example, only 10.3% of primary knee replacements done in the United Kingdom in 2019 were UKAs, the remainder were TKAs (89.7%),[20] 3) the lower absolute citation number may be due to “lazy citations”, which refers to the fact that authors tend to cite the latest reviews on the matter instead of citing the original paper which first described the findings. [21]

In the present study, most of the articles were published after 2001 with only five articles published after 2012 on the list. This might be due to the delay for newly published papers to be thoroughly cited. We also found that the total number of citations was greatest for articles published in the 1980s. However, the citation density and the current citation rate both demonstrated an increasing trend as the articles become more recent (Fig. 3, 4). This means authors tend to cite more current papers than more historical papers, which is appropriate given the rapid evolution of UKA knowledge during the past few decades, leading people to agree more with the recently published articles and less with the older papers.

Our findings also revealed that 38% of the 100 articles originated in the United States which was more than England. But England leads the race in terms of quality, e.g. the number of citations and highly-cited articles. The most likely reason for the United States to be the most productive country can be its larger population size and higher gross domestic product (GDP) compared to European countries. Moreover, McKeever and L. Marmor, two pioneers in this field, were based in the USA. In this study, the USA has six of the eleven institutions from which more than one classic article originated, reflecting the USA’s great academic impact in this field. But the higher citation rating of England could be due to the dedicated National Joint Registry and the renowned researchers in certain institutions that concentrated on UKA and produced more papers, of whom Price AJ and Pandit H from the Nuffield Orthopaedic Centre and Murray DW from the University of Oxford were the most outstanding. The Nuffield Orthopaedic Centre in England, a famous hospital with strong affiliations to the University of Oxford, was the most prominent institution in UKA quality research output surpassing all other institutions in both the absolute number of classic articles as well as the number of highest-cited articles (Table 4).

In our study, the highest percentage of these articles were published in *The Journal of Bone & Joint Surgery British Volume*, which was renamed *The Bone & Joint Journal* in 2013. This journal has been widely recognized as a flagship orthopaedic journal and was established in 1948. *The Bone & Joint Journal* has been the most popular for UKA research from England, but in the United States, we found it much less popular than *Clinical Orthopaedics and Related Research* which released its first issue in 1953 (Table 2). It was revealed that the most-cited UKA articles from the United States were published almost exclusively in American journals and articles from England were almost exclusively published in British journals, which was similar to previous studies.[16, 22] Including the two journals mentioned above and along with *The Journal of Arthroplasty* and *The Journal of bone and joint surgery American volume*, these four journals together published 76% of the 100 most cited articles in the list and may keep on serving as the “main channel” for future findings in this field.

The level of evidence analysis revealed that majority of the 100 articles represented Level-IV and consisted of fewer articles with a high level of evidence, which contradicted the expectation that studies with a high level of evidence would be cited more frequently. Our findings were similar to the situation reported in previous bibliometric studies.[23, 24] Even the number one most cited paper only included a small number of patients and had level IV evidence. Knowing that level of evidence is used to evaluate study designs according to their protection against bias, this study echoes the concept that smaller case series or cohort study with more bias could still attract the attention of academics. For example, the article ranking 29th in the list reported an uncontrolled forty-one-patient case series and we regarded it as level IV considering its selection bias and information bias.

This study also examined the theme distribution of the 100 most cited articles. Therapeutic research and prognostic research were the top two themes (Fig. 7). The former had been frequently performed by doctors to compare UKA with TKA since the controversies between these two surgical procedures were hotly debated. Most of the therapeutic studies focused on the revision rate and the recovery of UKA procedures. Prognostic researches were also commonly conducted to determine the probability of the specified outcomes in UKA patients.[25] These researchers often utilized follow-up methodology lasting at least several years. The degree of centrality analysis of the author's key words also indicated that "follow-up" has a high degree of centrality in the past four decades. But we found that retrospective studies dominated these prognostic research studies and many of them were uncontrolled case series. The retrospective study design does truly have limitations in reducing bias when measuring predictors and outcomes while a prospective study or cohort study is reportedly a better design to resolve prognostic issues, although requires a longer follow-up duration and therefore greater expense.[26] To better guide doctors in making decisions and estimating the future outcomes of patients who have received UKA, further well-controlled prospective studies are expected to be conducted.

The degree of centrality analysis of the author's key words was performed to predict the hotspots and future trends in the research fields of interest. As shown in the bibliometric networks, such keywords as follow-up, osteoarthritis, prosthesis failure and survival analysis were highlighted with bigger icons (Fig. 8, 9). Among varied types of studies, follow-up outcome studies are predicted to continue their high popularity in UKA research, given they are more reliable with less inherent bias. Some keywords like "minimally invasive", "robot assisted" and "mobile bearing" were burgeoning with a much higher degree of centrality after 2000 than before. Considering that UKA is now a minimally invasive procedure with potential efficacy and safety benefits and given there is an aging population in most developed countries, it is expected that the number of UKA surgeries will continue to increasing, as will the related research. Thus, it still requires high-quality studies within the context of these aforementioned orientations.

The article with the highest impact factor among the 100 classics reported a study by Liddle AD et al. in 2014 and its total citation count ranked 15th in the list. This paper retrospectively compared the rates of adverse outcomes after TKR and UKR in more than 100,000 knees. The result showed a significantly higher risk of revision but lower risk of medical complications and shorter inpatient stays in patients undergoing UKR than for TKR. This research was of great importance because it was the first to confirm

the difference in mortality between UKA and TKA in comprehensively matched patients. When ranked by the citation counts in 2019, this paper ranked 1st of these 100 articles, indicating its currently highly valued. According to its citation trend, we expected that this paper would continuously be highly cited and probably become an outstanding landmark in the future.

Of all the articles selected, the oldest paper was published in 1980 and its citation number was ranked 7th. It reported the results of a follow-up study lasting an average of six years on UKA patients, showing an unfortunate result with the failure rate as high as 30%. Thus, the conclusion was that UKAs were more frequently revised than TKAs. This result reflected the historical background that UKA had not fully experienced the development of surgical techniques or component design in the 1970s. Thus the early designs of UKA failed early and often.[27] The survival study design of this paper was repeated by many following articles in this field.

This bibliometric analysis has provided some information of value, although there were limitations inevitably. In this study, only published articles were included but meta-analysis, meeting records, reviews and textbooks were excluded, which may cause omission bias. Moreover, as mentioned earlier, our study included only five articles published since 2012, suggesting that our study might not be very sensitive to recent changes in UKA research trends. Like other citation analysis articles, it should be admitted that we can’t have included all classics without allowing for the shortcomings of citation analysis. We tried to avoid missing classics by using extended search terms without quotation marks, utilizing a mix of databases and abandoning the search restrictions on publication time and language. Despite limitations, citation counts are still widely considered as the most currently-available standardized way to measure the impact of papers objectively in the scientific field.[28]

Conclusion

This article identified the top 100 most cited articles in UKA research and delineated their time and geographical distribution, research topic, authorship as well as their levels of evidence. The study of UKA has a trend of balanced development and is steadily evolving. It could be predicted that there will be an increasing number of publications on UKA research in the following years, with the United States and England maintaining leadership in this area. Meanwhile, well-controlled prospective studies should be further conducted to recognize the prognosis of UKA better. Future researchers could utilize this study to identify milestone articles and acknowledge the outstanding members who have altered the course of UKA over the decades.

Abbreviations

ANOVA analysis of variance

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing Interests

The authors have no conflicts of interest to declare that are relevant to the content of this article.

Authors' Funding

Not applicable.

Authors' Contributions

All authors contributed to the study conception and design. Tianlong Huang conceived and designed the work. Material preparation, data collection and analysis were performed by Buchan Jiang, Cong Wei, Wenchao Zhang, Daniel M George, Ning Tang and Tianlong Huang. The first draft of the manuscript was written by Buchan Jiang and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1: List of the 100 top-cited articles in total hip arthroplasty research

Rank	Article	Citation density	Citations in 2019	Total citations
1	Murray DW, Goodfellow JW, O'Connor JJ: The Oxford medial unicompartmental arthroplasty: a ten-year survival study. The Journal of bone and joint surgery British volume 1998, 80(6):983-989.	21.50	18	473
2	Engh GA, Dwyer KA, Hanes CK: Polyethylene wear of metal-backed tibial components in total and unicompartmental knee prostheses. The Journal of bone and joint surgery British volume 1992, 74(1):9-17.	10.21	7	286
3	Berger RA, Meneghini RM, Jacobs JJ, Sheinkop MB, Della Valle CJ, Rosenberg AG, Galante JO: Results of unicompartmental knee arthroplasty at a minimum of ten years of follow-up. Journal of Bone and Joint Surgery-American Volume 2005, 87A(5):999-1006.	18.53	24	278
4	Svard UCG, Price AJ: Oxford medial unicompartmental knee arthroplasty - A survival analysis of an independent series. Journal of Bone and Joint Surgery-British Volume 2001, 83B(2):191-194.	14.21	9	270
5	Price AJ, Webb J, Topf H, Dodd CAF, Goodfellow JW, Murray DW: Rapid recovery after oxford unicompartmental arthroplasty through a short incision. Journal of Arthroplasty 2001, 16(8):970-976.	12.89	19	245
6	Newman JH, Ackroyd CE, Shah NA: Unicompartmental or total knee replacement? Five-year results of a prospective, randomised trial of 102 osteoarthritic knees with unicompartmental arthritis. The Journal of bone and joint surgery British volume 1998, 80(5):862-865.	10.55	9	232
7	Insall J, Aglietti P: A five to seven-year follow-up of unicondylar arthroplasty. The Journal of bone and joint surgery American volume 1980, 62(8):1329-1337.	5.78	4	231
8	Argenson JNA, Chevrol-Benkeddache Y, Aubaniac JM: Modern unicompartmental knee arthroplasty with cement - A three to ten-year follow-up study. Journal of Bone and Joint Surgery-American Volume 2002, 84A(12):2235-2239.	11.06	12	199
9	Hernigou P, Deschamps G: Alignment influences wear in the knee after medial unicompartmental arthroplasty. Clinical Orthopaedics and Related Research 2004(423):161-165.	12.06	18	193
10	Pandit H, Jenkins C, Gill HS, Barker K, Dodd CAF, Murray DW: Minimally invasive Oxford phase 3 unicompartmental knee replacement RESULTS OF 1000 CASES. Journal of Bone and Joint Surgery-British Volume 2011, 93B(2):198-204.	21.00	13	189
11	Newman J, Pydisetty RV, Ackroyd C: Unicompartmental or total knee replacement THE 15-YEAR RESULTS OF A PROSPECTIVE RANDOMISED CONTROLLED TRIAL.	17.00	15	187

	Journal of Bone and Joint Surgery-British Volume 2009, 91B(1):52-57.			
12	Cartier P, Sanouiller JL, Grelsamer RP: Unicompartmental knee arthroplasty surgery. 10-year minimum follow-up period. The Journal of arthroplasty 1996, 11(7):782-788.	7.58	7	182
13	Goodfellow JW, Kershaw CJ, Benson MK, O'Connor JJ: The Oxford Knee for unicompartmental osteoarthritis. The first 103 cases. The Journal of bone and joint surgery British volume 1988, 70(5):692-701.	5.56	7	178
14	Laurencin CT, Zelicof SB, Scott RD, Ewald FC: Unicompartmental versus total knee arthroplasty in the same patient. A comparative study. Clinical orthopaedics and related research 1991(273):151-156.	6.10	15	177
15	Liddle AD, Judge A, Pandit H, Murray DW: Adverse outcomes after total and unicompartmental knee replacement in 101 330 matched patients: a study of data from the National Joint Registry for England and Wales. Lancet 2014, 384(9952):1437-1445.	29.17	47	175
16	Pandit H, Jenkins C, Barker K, Dodd CAF, Murray DW: The Oxford medial unicompartmental knee replacement using a minimally-invasive approach. Journal of Bone and Joint Surgery-British Volume 2006, 88B(1):54-60.	12.36	17	173
17	Price AJ, Svard U: A Second Decade Lifetable Survival Analysis of the Oxford Unicompartmental Knee Arthroplasty. Clinical Orthopaedics and Related Research 2011, 469(1):174-179.	18.89	21	170
18	Robertsson O, Knutson K, Lewold S, Lidgren L: The routine of surgical management reduces failure after unicompartmental knee arthroplasty. Journal of Bone and Joint Surgery-British Volume 2001, 83B(1):45-49.	8.63	10	164
19	Scott RD, Santore RF: Unicondylar unicompartmental replacement for osteoarthritis of the knee. The Journal of bone and joint surgery American volume 1981, 63(4):536-544.	4.15	3	162
20	Cobb J, Henckel J, Gomes P, Harris S, Jakopec M, Rodriguez y Baena F, Barrett A, Davies B: Hands-on robotic unicompartmental knee replacement - A prospective, randomised controlled study of the Acrobot system. Journal of Bone and Joint Surgery-British Volume 2006, 88B(2):188-197.	11.14	14	156
21	Price AJ, Waite JC, Svard U: Long-term clinical results of the medial Oxford unicompartmental knee arthroplasty. Clinical Orthopaedics and Related Research 2005(435):171-180.	10.33	7	155
22	Hernigou P, Deschamps G: Posterior slope of the tibial implant and the outcome of unicompartmental knee arthroplasty. Journal of Bone and Joint Surgery-American Volume 2004, 86A(3):506-511.	9.50	18	152

23	Blunn GW, Joshi AB, Minns RJ, Lidgren L, Lilley P, Ryd L, Engelbrecht E, Walker PS: Wear in retrieved condylar knee arthroplasties. A comparison of wear in different designs of 280 retrieved condylar knee prostheses. The Journal of arthroplasty 1997, 12(3):281-290.	6.57	5	151
24	Barrett WP, Scott RD: Revision of failed unicondylar unicompartmental knee arthroplasty. The Journal of bone and joint surgery American volume 1987, 69(9):1328-1335.	4.52	4	149
25	Scott RD, Cobb AG, McQueary FG, Thornhill TS: Unicompartmental knee arthroplasty. Eight- to 12-year follow-up evaluation with survivorship analysis. Clinical orthopaedics and related research 1991(271):96-100.	5.03	1	146
26	Marmor L: Unicompartmental knee arthroplasty. Ten- to 13-year follow-up study. Clinical orthopaedics and related research 1988(226):14-20.	4.41	2	141
27	Psychoyios V, Crawford RW, O'Connor JJ, Murray DW: Wear of congruent meniscal bearings in unicompartmental knee arthroplasty: a retrieval study of 16 specimens. The Journal of bone and joint surgery British volume 1998, 80(6):976-982.	6.14	6	135
28	Repicci JA, Eberle RW: Minimally invasive surgical technique for unicondylar knee arthroplasty. Journal of the Southern Orthopaedic Association 1999, 8(1):20-27.	6.19	3	130
29	Pennington DW, Swienckowski JJ, Lutes WB, Drake GN: Unicompartmental knee arthroplasty in patients sixty years of age or younger. Journal of Bone and Joint Surgery-American Volume 2003, 85A(10):1968-1973.	6.05	4	127
30	Berger RA, Nedeff DD, Barden RM, Sheinkop MM, Jacobs JJ, Rosenberg AG, Galante JO: Unicompartmental knee arthroplasty - Clinical experience at 6-to 10-year followup. Clinical Orthopaedics and Related Research 1999(367):50-60.	7.47	4	127
31	Price AJ, Dodd CAF, Svard UGC, Murray DW: Oxford medial unicompartmental knee arthroplasty in patients younger and older than 60 years of age. Journal of Bone and Joint Surgery-British Volume 2005, 87B(11):1488-1492.	8.27	9	124
32	Willis-Owen CA, Brust K, Alsop H, Miraldo M, Cobb JP: Unicondylar knee arthroplasty in the UK National Health Service: An analysis of candidacy, outcome and cost efficacy. Knee 2009, 16(6):473-478.	10.25	5	123
33	Emerson RH, Higgins LL: Unicompartmental knee arthroplasty with the Oxford prosthesis in patients with medial compartment arthritis. Journal of Bone and Joint Surgery-American Volume 2008, 90A(1):118-122.	11.18	16	123
34	Furnes O, Espehaug B, Lie SA, Vollset SE, Engesaeter LB, Havelin LI: Failure mechanisms after unicompartmental	9.23	10	120

	and tricompartmental primary knee replacement with cement. Journal of Bone and Joint Surgery-American Volume 2007, 89A(3):519-525.			
35	Lombardi AV, Jr., Berend KR, Walter CA, Aziz-Jacobo J, Cheney NA: Is Recovery Faster for Mobile-bearing Unicompartmental than Total Knee Arthroplasty? Clinical Orthopaedics and Related Research 2009, 467(6):1450-1457.	10.73	17	118
36	Koskinen E, Paavolainen P, Eskelinen A, Pulkkinen P, Remes V: Unicondylar knee replacement for primary osteoarthritis - A prospective follow-up study of 1,819 patients from the Finnish Arthroplasty Register. Acta Orthopaedica 2007, 78(1):128-135.	3.44	1	117
37	Broughton NS, Newman JH, Baily RA: Unicompartmental replacement and high tibial osteotomy for osteoarthritis of the knee. A comparative study after 5-10 years' follow-up. The Journal of bone and joint surgery British volume 1986, 68(3):447-452.	9.00	5	117
38	Berger RA, Kusuma SK, Sanders SA, Thill ES, Sporer SM: The Feasibility and Perioperative Complications of Outpatient Knee Arthroplasty. Clinical Orthopaedics and Related Research 2009, 467(6):1443-1449.	10.64	25	117
39	Patil S, Colwell CW, Ezzet KA, D'Lima DD: Can normal knee kinematics be restored with unicompartmental knee replacement? Journal of Bone and Joint Surgery-American Volume 2005, 87A(2):332-338.	7.73	7	116
40	Romanowski MR, Repicci JA: Minimally invasive unicondylar arthroplasty: eight-year follow-up. The journal of knee surgery 2002, 15(1):17-22.	6.22	0	112
41	Koskinen E, Eskelinen A, Paavolainen P, Pulkkinen P, Remes V: Comparison of survival and cost-effectiveness between unicondylar arthroplasty and total knee arthroplasty in patients with primary osteoarthritis - A follow-up study of 50,493 knee replacements from the Finnish Arthroplasty Register. Acta Orthopaedica 2008, 79(4):499-507.	9.25	10	111
42	Lewold S, Goodman S, Knutson K, Robertsson O, Lidgren L: Oxford meniscal bearing knee versus the Marmor knee in unicompartmental arthroplasty for arthrosis. A Swedish multicenter survival study. The Journal of arthroplasty 1995, 10(6):722-731.	4.40	4	110
43	Naal FD, Fischer M, Preuss A, Goldhahn J, von Knoch F, Preiss S, Munzinger U, Drobny T: Return to sports and recreational activity after unicompartmental knee arthroplasty. American Journal of Sports Medicine 2007, 35(10):1688-1695.	8.15	9	106
44	Squire MW, Callagan JJ, Goetz DD, Sullivan PM, Johnston RC: Unicompartmental knee replacement - A	4.95	2	104

	minimum 15 year followup study. Clinical Orthopaedics and Related Research 1999(367):61-72.			
45	Stukenborg-Colsman C, Wirth CJ, Lazovic D, Wefer A: High tibial osteotomy versus unicompartmental joint replacement in unicompartmental knee joint osteoarthritis: 7-10-year follow-up prospective randomised study. Knee 2001, 8(3):187-194.	5.32	9	101
46	Hopper GP, Leach WJ: Participation in sporting activities following knee replacement: total versus unicompartmental. Knee Surgery Sports Traumatology Arthroscopy 2008, 16(10):973-979.	8.42	8	101
47	Robertsson O, Borgquist L, Knutson K, Lewold S, Lidgren L: Use of unicompartmental instead of tricompartmental prostheses for unicompartmental arthrosis in the knee is a cost-effective alternative - 15,437 primary tricompartmental prostheses were compared with 10,624 primary medial or lateral unicompartmental prostheses. Acta Orthopaedica Scandinavica 1999, 70(2):170-175.	4.76	7	100
48	Weale AE, Newman JH: Unicompartmental arthroplasty and high tibial osteotomy for osteoarthrosis of the knee. A comparative study with a 12- to 17-year follow-up period. Clinical orthopaedics and related research 1994(302):134-137.	3.81	4	99
49	Liddle AD, Pandit H, Judge A, Murray DW: Patient-reported outcomes after total and unicompartmental knee arthroplasty A STUDY OF 14 076 MATCHED PATIENTS FROM THE NATIONAL JOINT REGISTRY FOR ENGLAND AND WALES. Bone & Joint Journal 2015, 97B(6):793-801.	5.50	5	99
50	Argenson JNA, Komistek RD, Aubaniac JM, Dennis DA, Northcut EJ, Anderson DT, Agostini S: In vivo determination of knee kinematics for subjects implanted with a unicompartmental arthroplasty. Journal of Arthroplasty 2002, 17(8):1049-1054.	19.80	27	99
51	Collier MB, Eickmann TH, Sukezaki F, McAuley JP, Engh GA: Patient, implant, and alignment factors associated with revision of medial compartment unicondylar arthroplasty. Journal of Arthroplasty 2006, 21(6):108-115.	7.00	11	98
52	Aleto TJ, Berend ME, Ritter MA, Faris PM, Meneghini RM: Early failure of unicompartmental knee arthroplasty leading to revision. Journal of Arthroplasty 2008, 23(2):159-163.	8.17	6	98
53	Berend KR, Lombardi AV, Mallory TH, Adams JB, Groseth KL: Early failure of minimally invasive unicompartmental knee arthroplasty is associated with obesity. Clinical Orthopaedics and Related Research 2005(440):60-66.	6.33	11	95
54	Banks SA, Fregly BJ, Boniforti F, Reinschmidt C, Romagnoli S: Comparing in vivo kinematics of	6.27	4	94

	unicondylar and bi-unicondylar knee replacements. Knee Surgery Sports Traumatology Arthroscopy 2005, 13(7):551-556.			
55	Rougraff BT, Heck DA, Gibson AE: A comparison of tricompartmental and unicompartmental arthroplasty for the treatment of gonarthrosis. Clinical orthopaedics and related research 1991(273):157-164.	2.82	8	93
56	Ridgeway SR, McAuley JP, Ammeen DJ, Engh GA: The effect of alignment of the knee on the outcome of unicompartmental knee replacement. Journal of Bone and Joint Surgery-British Volume 2002, 84B(3):351-355.	3.21	4	93
57	Kennedy WR, White RP: Unicompartmental arthroplasty of the knee. Postoperative alignment and its influence on overall results. Clinical orthopaedics and related research 1987(221):278-285.	5.17	3	93
58	Kuipers BM, Kollen BJ, Bots PCK, Burger BJ, van Raay JJAM, Tulp NJA, Verheyen CCPM: Factors associated with reduced early survival in the Oxford phase III medial unicompartment knee replacement. Knee 2010, 17(1):48-52.	7.08	6	92
59	Beard DJ, Pandit H, Ostlere S, Jenkins C, Dodd CAF, Murray DW: Pre-operative clinical and radiological assessment of the patellofemoral joint in unicompartmental knee replacement and its influence on outcome. Journal of Bone and Joint Surgery-British Volume 2007, 89B(12):1602-1607.	9.20	10	92
60	O'Rourke MR, Gardner JJ, Callaghan JJ, Liu SS, Goetz DA, Vittetoe DA, Sullivan PM, Johnston RC: The John Insall Award - Unicompartmental knee replacement - A minimum twenty-one-year followup, end-result study. Clinical Orthopaedics and Related Research 2005(440):27-37.	6.00	5	90
61	Pandit H, Jenkins C, Gill HS, Smith G, Price AJ, Dodd CAF, Murray DW: Unnecessary contraindications for mobile-bearing unicompartmental knee replacement. Journal of Bone and Joint Surgery-British Volume 2011, 93B(5):622-628.	9.89	9	89
62	Pandit H, Hamilton TW, Jenkins C, Mellon SJ, Dodd CAF, Murray DW: The clinical outcome of minimally invasive Phase 3 Oxford unicompartmental knee arthroplasty A 15-YEAR FOLLOW-UP OF 1000 UKAS. Bone & Joint Journal 2015, 97B(11):1493-1500.	17.80	26	89
63	Beard DJ, Pandit H, Gill HS, Hollinghurst D, Dodd CAF, Murray DW: The influence of the presence and severity of pre-existing patellofemoral degenerative changes on the outcome of the Oxford medial unicompartmental knee replacement. Journal of Bone and Joint Surgery-British Volume 2007, 89B(12):1597-1601.	6.29	6	88
64	Amin AK, Patton JT, Cook RE, Gaston M, Brenkel IJ:	6.77	7	88

	Unicompartmental or total knee arthroplasty? Results from a matched study. Clinical Orthopaedics and Related Research 2006(451):101-106.			
65	Pearse AJ, Hooper GJ, Rothwell A, Frampton C: Survival and functional outcome after revision of a unicompartmental to a total knee replacement THE NEW ZEALAND NATIONAL JOINT REGISTRY. Journal of Bone and Joint Surgery-British Volume 2010, 92B(4):508-512.	8.70	8	87
66	Brown NM, Sheth NP, Davis K, Berend ME, Lombardi AV, Berend KR, Della Valle CJ: Total Knee Arthroplasty Has Higher Postoperative Morbidity Than Unicompartmental Knee Arthroplasty: A Multicenter Analysis. Journal of Arthroplasty 2012, 27(8):86-90.	10.88	16	87
67	Weale AE, Murray DW, Newman JH, Ackroyd CE: The length of the patellar tendon after unicompartmental and total knee replacement. Journal of Bone and Joint Surgery-British Volume 1999, 81B(5):790-795.	4.10	9	86
68	Reilly KA, Beard DJ, Barker KL, Dodd CAF, Price AJ, Murray DW: Efficacy of an accelerated recovery protocol for Oxford unicompartmental knee arthroplasty - a randomised controlled trial. Knee 2005, 12(5):351-357.	5.73	4	86
69	Lonner JH, John TK, Conditt MA: Robotic Arm-assisted UKA Improves Tibial Component Alignment A Pilot Study. Clinical Orthopaedics and Related Research 2010, 468(1):141-146.	8.50	11	85
70	Saldanha KAN, Keys GW, Svard UCG, White SH, Rao C: Revision of Oxford medial unicompartmental knee arthroplasty to total knee arthroplasty - results of a multicentre study. Knee 2007, 14(4):275-279.	5.25	3	84
71	Muller PE, Pellengahr C, Witt M, Kircher J, Refior HJ, Jansson V: Influence of minimally invasive surgery on implant positioning and the functional outcome for medial unicompartmental knee arthroplasty. Journal of Arthroplasty 2004, 19(3):296-301.	6.46	6	84
72	Tabor OB, Jr., Tabor OB: Unicompartmental arthroplasty: a long-term follow-up study. The Journal of arthroplasty 1998, 13(4):373-379.	3.46	4	83
73	Levine WN, Ozuna RM, Scott RD, Thornhill TS: Conversion of failed modern unicompartmental arthroplasty to total knee arthroplasty. The Journal of arthroplasty 1996, 11(7):797-801.	3.77	0	83
74	Essving P, Axelsson K, Kjellberg J, Wallgren O, Gupta A, Lundin A: Reduced hospital stay, morphine consumption, and pain intensity with local infiltration analgesia after unicompartmental knee arthroplasty. Acta Orthopaedica 2009, 80(2):213-219.	7.55	4	83
75	Pearle AD, O'Loughlin PF, Kendoff DO: Robot-Assisted Unicompartmental Knee Arthroplasty. Journal of	4.32	4	82

	Arthroplasty 2010, 25(2):230-237.			
76	McAuley JP, Engh GA, Ammeen DJ: Revision of failed unicompartmental knee arthroplasty. Clinical Orthopaedics and Related Research 2001(392):279-282.	8.20	9	82
77	Walton NP, Jahromi I, Lewis PL, Dobson PJ, Angel KR, Campbell DG: Patient-perceived outcomes and return to sport and work: TKA versus mini-incision unicompartmental knee arthroplasty. The journal of knee surgery 2006, 19(2):112-116.	2.96	3	80
78	Carr A, Keyes G, Miller R, O'Connor J, Goodfellow J: Medial unicompartmental arthroplasty. A survival study of the Oxford meniscal knee. Clinical orthopaedics and related research 1993(295):205-213.	5.71	8	80
79	Ashraf T, Newman JH, Evans RL, Ackroyd CE: Lateral unicompartmental knee replacement - Survivorship and clinical experience over 21. Journal of Bone and Joint Surgery-British Volume 2002, 84B(8):1126-1130.	4.39	3	79
80	Weale AE, Murray DW, Crawford R, Psychoyios V, Bonomo A, Howell G, O'Connor J, Goodfellow JW: Does arthritis progress in the retained compartments after 'Oxford' medial unicompartmental arthroplasty? A clinical and radiological study with a minimum ten-year follow-up. Journal of Bone and Joint Surgery-British Volume 1999, 81B(5):783-789.	3.67	2	77
81	Schai PA, Suh JT, Thornhill TS, Scott RD: Unicompartmental knee arthroplasty in middle-aged patients: a 2- to 6-year follow-up evaluation. The Journal of arthroplasty 1998, 13(4):365-372.	3.45	1	76
82	Price AJ, Rees JL, Beard DJ, Gill RHS, Dodd CAF, Murray DM: Sagittal plane kinematics of a mobile-bearing unicompartmental knee arthroplasty at 10 years - A comparative in vivo fluoroscopic analysis. Journal of Arthroplasty 2004, 19(5):590-597.	4.75	5	76
83	Rajasekhar C, Das S, Smith A: Unicompartmental knee arthroplasty - 2-to 12-year results in a community hospital. Journal of Bone and Joint Surgery-British Volume 2004, 86B(7):983-985.	2.68	0	75
84	Blunn GW, Joshi AB, Lilley PA, Engelbrecht E, Ryd L, Lidgren L, Hardinge K, Nieder E, Walker PS: Polyethylene wear in unicondylar knee prostheses. 106 retrieved Marmor, PCA, and St Georg tibial components compared. Acta orthopaedica Scandinavica 1992, 63(3):247-255.	4.69	2	75
85	Fisher DA, Watts M, Davis KE: Implant position in knee surgery - A comparison of minimally invasive, open unicompartmental and total knee arthroplasty. Journal of Arthroplasty 2003, 18(7):2-8.	4.35	3	74
86	Borjesson M, Weidenhielm L, Mattsson E, Olsson E: Gait and clinical measurements in patients with knee	4.87	4	73

	osteoarthritis after surgery: a prospective 5-year follow-up study. Knee 2005, 12(2):121-127.			
87	Gulati A, Chau R, Pandit HG, Gray H, Price AJ, Dodd CAF, Murray DW: The incidence of physiological radiolucency following Oxford unicompartmental knee replacement and its relationship to outcome. Journal of Bone and Joint Surgery-British Volume 2009, 91B(7):896-902.	6.55	5	72
88	Marmor L: Unicompartmental arthroplasty of the knee with a minimum ten-year follow-up period. Clinical orthopaedics and related research 1988(228):171-177.	2.22	1	71
89	Sah AP, Scott RD: Lateral unicompartmental knee arthroplasty through a medial approach - Study with an average five-year follow-up. Journal of Bone and Joint Surgery-American Volume 2007, 89A(9):1948-1954.	4.38	1	70
90	Naudie D, Guerin J, Parker DA, Bourne RB, Rorabeck CH: Medial unicompartmental knee arthroplasty with the Miller-Galante prosthesis. Journal of Bone and Joint Surgery-American Volume 2004, 86A(9):1931-1935.	5.38	4	70
91	Baker P, Jameson S, Critchley R, Reed M, Gregg P, Deehan D: Center and Surgeon Volume Influence the Revision Rate Following Unicondylar Knee Replacement. Journal of Bone and Joint Surgery-American Volume 2013, 95A(8):702-709.	10.00	15	70
92	Epinette JA, Brunschweiler B, Mertl P, Mole D, Cazenave A, French Soc H, Knee: Unicompartmental knee arthroplasty modes of failure: Wear is not the main reason for failure: A multicentre study of 418 failed knees. Orthopaedics & Traumatology-Surgery & Research 2012, 98(6):S124-S130.	8.63	17	69
93	Chau R, Gulati A, Pandit H, Beard DJ, Price AJ, Dodd CAF, Gill HS, Murray DW: Tibial component overhang following unicompartmental knee replacement-Does it matter? Knee 2009, 16(5):310-313.	6.18	8	68
94	Tabor OB, Jr., Tabor OB, Bernard M, Wan JY: Unicompartmental knee arthroplasty: long-term success in middle-age and obese patients. Journal of surgical orthopaedic advances 2005, 14(2):59-63.	3.72	3	67
95	Isaac SM, Barker KL, Danial IN, Beard DJ, Dodd CA, Murray DW: Does arthroplasty type influence knee joint proprioception? A longitudinal prospective study comparing total and unicompartmental arthroplasty. Knee 2007, 14(3):212-217.	4.47	5	67
96	Fisher N, Agarwal M, Reuben SF, Johnson DS, Turner PG: Sporting and physical activity following Oxford medial unicompartmental knee arthroplasty. Knee 2006, 13(4):296-300.	4.79	5	67
97	Emerson RH, Hansborough T, Reitman RA, Rosenfeldt W, Higgins LL: Comparison of a mobile with a fixed-bearing	5.15	7	67

	unicompartmental knee implant. Clinical Orthopaedics and Related Research 2002(404):62-70.			
98	Chatellard R, Sauleau V, Colmar M, Robert H, Raynaud G, Brilhault J, Soc Orthopedie Traumatologie O: Medial unicompartmental knee arthroplasty: Does tibial component position influence clinical outcomes and arthroplasty survival? Orthopaedics & Traumatology-Surgery & Research 2013, 99(4):S219-S225.	9.57	12	67
99	Pennington DW, Swienckowski JJ, Lutes WB, Drake GN: Lateral unicompartmental knee arthroplasty - Survivorship and technical considerations at an average follow-up of 12.4 years. Journal of Arthroplasty 2006, 21(1):13-17.	2.24	0	65
100	Christensen NO: Unicompartmental prosthesis for gonarthrosis. A nine-year series of 575 knees from a Swedish hospital. Clinical orthopaedics and related research 1991(273):165-169.	4.64	2	65

Table 2: Journal in which the top-cited 100 articles were published

Journal	No. of articles	Total citations
Journal of Bone & Joint Surgery British Volume/ Bone & Joint Journal	25	3710
Clinical Orthopaedics & Related Research	22	2456
Journal of Arthroplasty	16	1693
Journal of Bone & Joint Surgery American Volume	13	1867
Knee	9	761
Acta Orthopaedica/ Acta Orthopaedica Scandinavica	5	486
Knee Surgery Sports Traumatology Arthroscopy	2	195
Journal of Knee Surgery	2	192
Orthopaedics & Traumatology-Surgery & Research	2	136
Lancet	1	175
Journal of the Southern Orthopaedic Association	1	130
American Journal of Sports Medicine	1	106
Journal of surgical orthopaedic advances	1	67

Table 3: First and corresponding authors with multiple articles in the most-cited list

First author	Country	No. of first authorships	Corresponding author	Country	No. of corresponding authorships
Price AJ	England	5	Price AJ	England	6
Pandit H	England	4	Murray DW	England	5
Berger RA	USA	3	Berger RA	USA	3
Weale AE	England	3	Weale AE	England	3
Argenson JNA	France	2	Ammeen DJ	USA	2
Beard DJ	England	2	Argenson JNA	France	2
Blunn GW	England	2	Beard DJ	England	2
Emerson RH	USA	2	Blunn GW	England	2
Hernigou P	France	2	Emerson RH	USA	2
Koskinen E	Finland	2	Engh GA	USA	2
Liddle AD	England	2	Hernigou P	France	2
Marmor L	USA	2	Marmor L	USA	2
Pennington DW	USA	2	Pandit H	England	2
Robertsson O	Sweden	2	Robertsson O	Sweden	2
Scott RD	USA	2	Scott RD	USA	2
Tabor OB	USA	2			

Table 4: Institutions from which more than 1 classic originated

Rank	Institution	No. of articles
1	Nuffield Orthopaedic Centre, Oxford, England	21
2	Brigham and Women's Hospital, Boston, Massachusetts, USA	5
3	Anderson Orthopaedic Research Institute, Alexandria, Virginia, USA	4
4	Department of Orthopaedic Surgery, Rush University Medical Centre, Chicago, USA	4
5	Department of Orthopedics, Lund University Hospital, Sweden	3
6	Avon Orthopaedic Centre, Southmead Hospital, Bristol, England	3
7	Saint John's Hospital and Health Center, Santa Monica, California, USA	2
8	Department of Orthopaedic Surgery, Hopital of St Marguerite, Aix Marseille University, France	2
9	Orton Orthopaedic Hospital, Helsinki, Finland	2
10	Texas Center for Joint Replacement, Plano, Texas, USA	2
11	Tri-city Orthopedics, Farmington Hills, MI USA	2

Figures

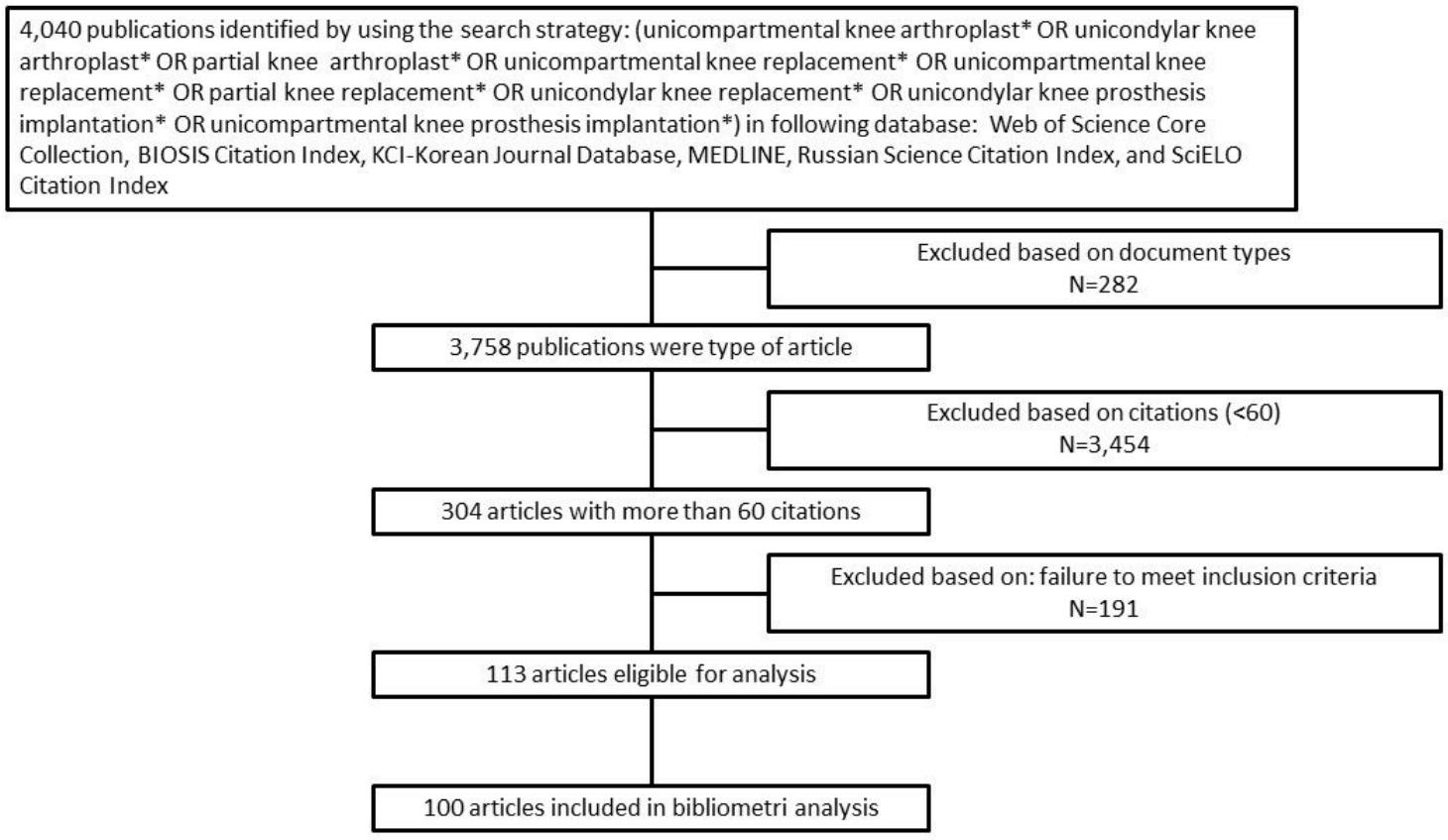

Figure 1

Flowchart showing the process of article identification.

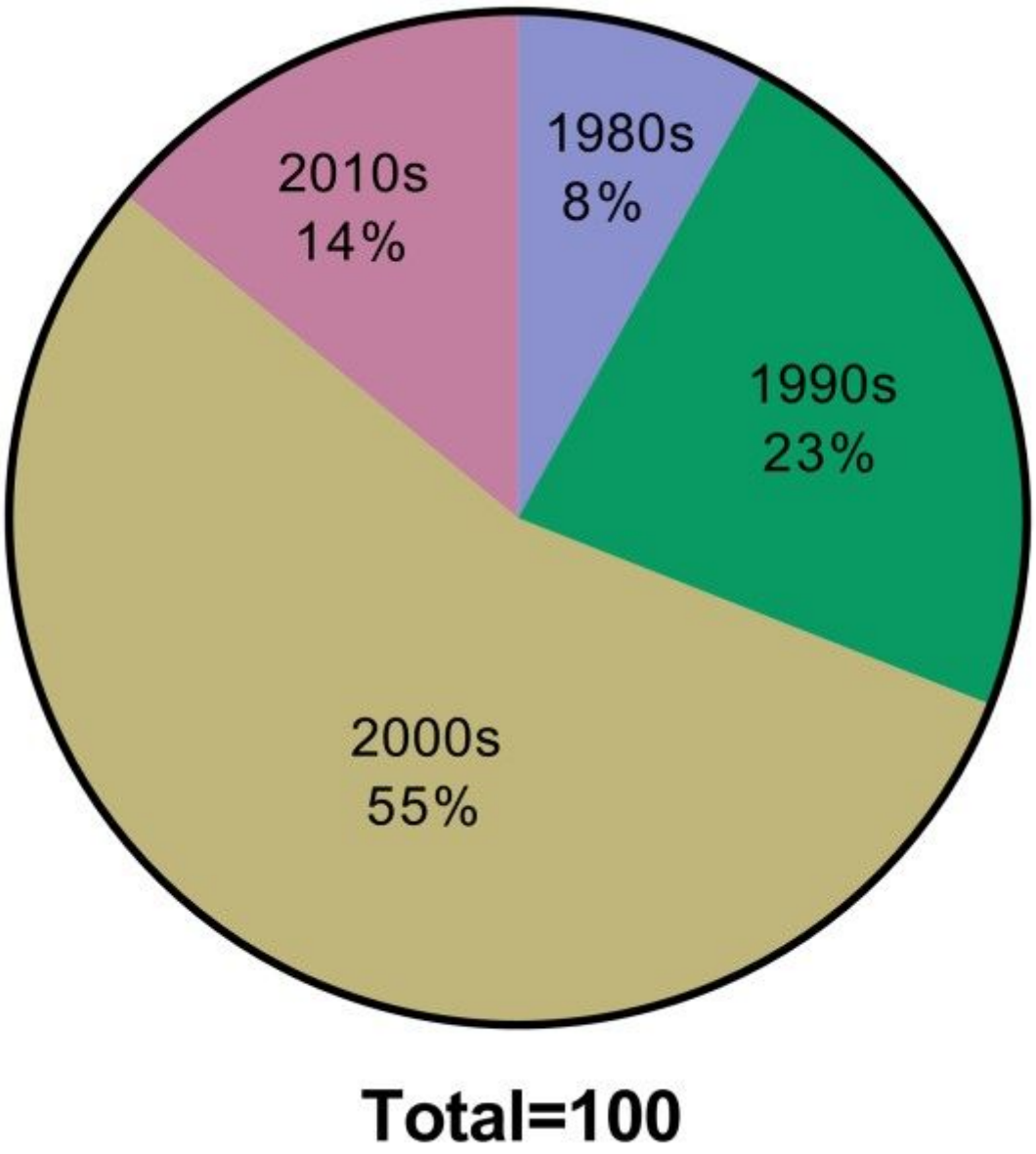

Figure 2

Pie chart showing the time distribution in percentage of the 100 most cited articles in UKA. Majority of these articles were published in 2000s (55%, n=55).

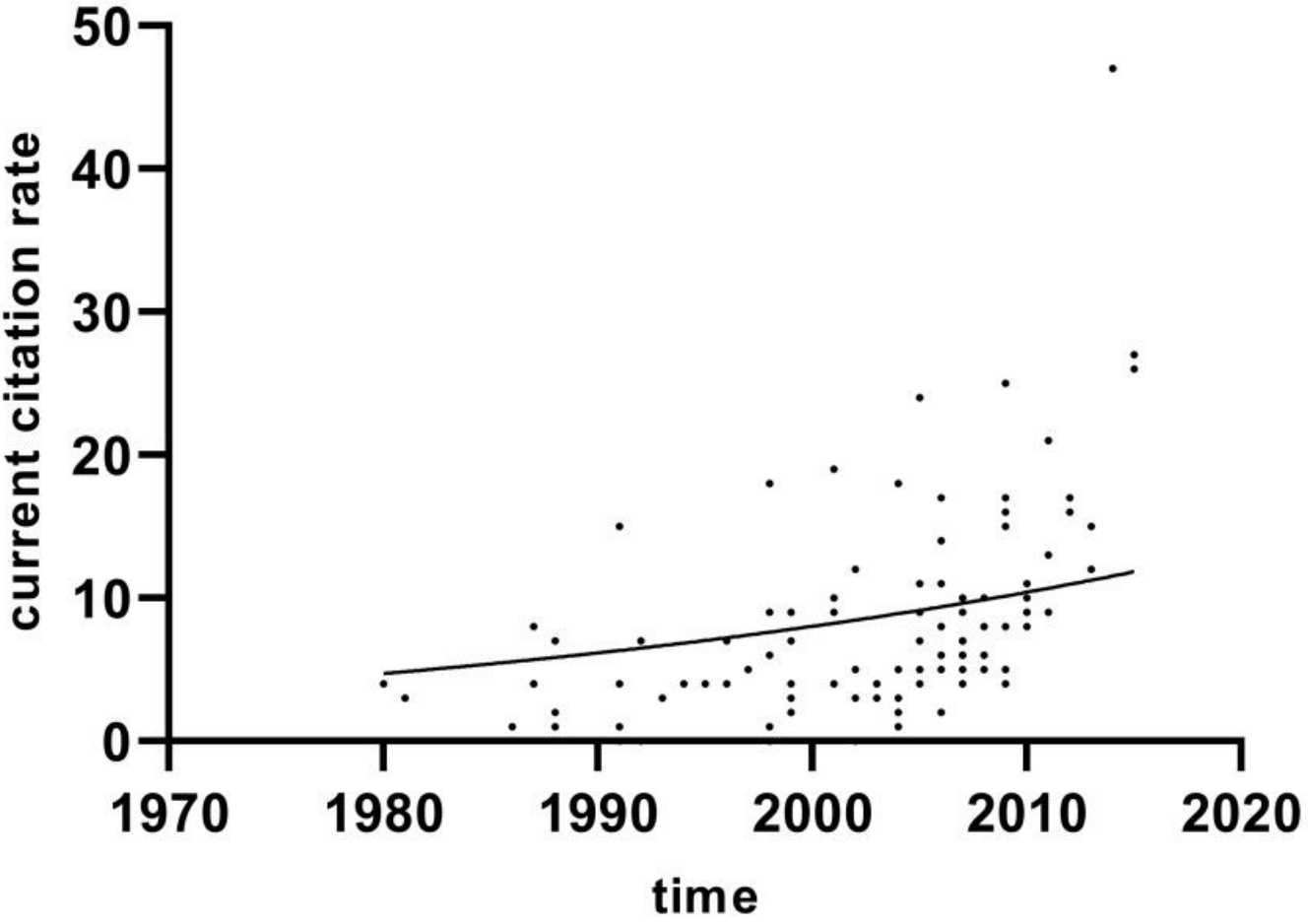

Figure 3

Current citation rate (y-axis) with publication time (x-axis) of the article trend.

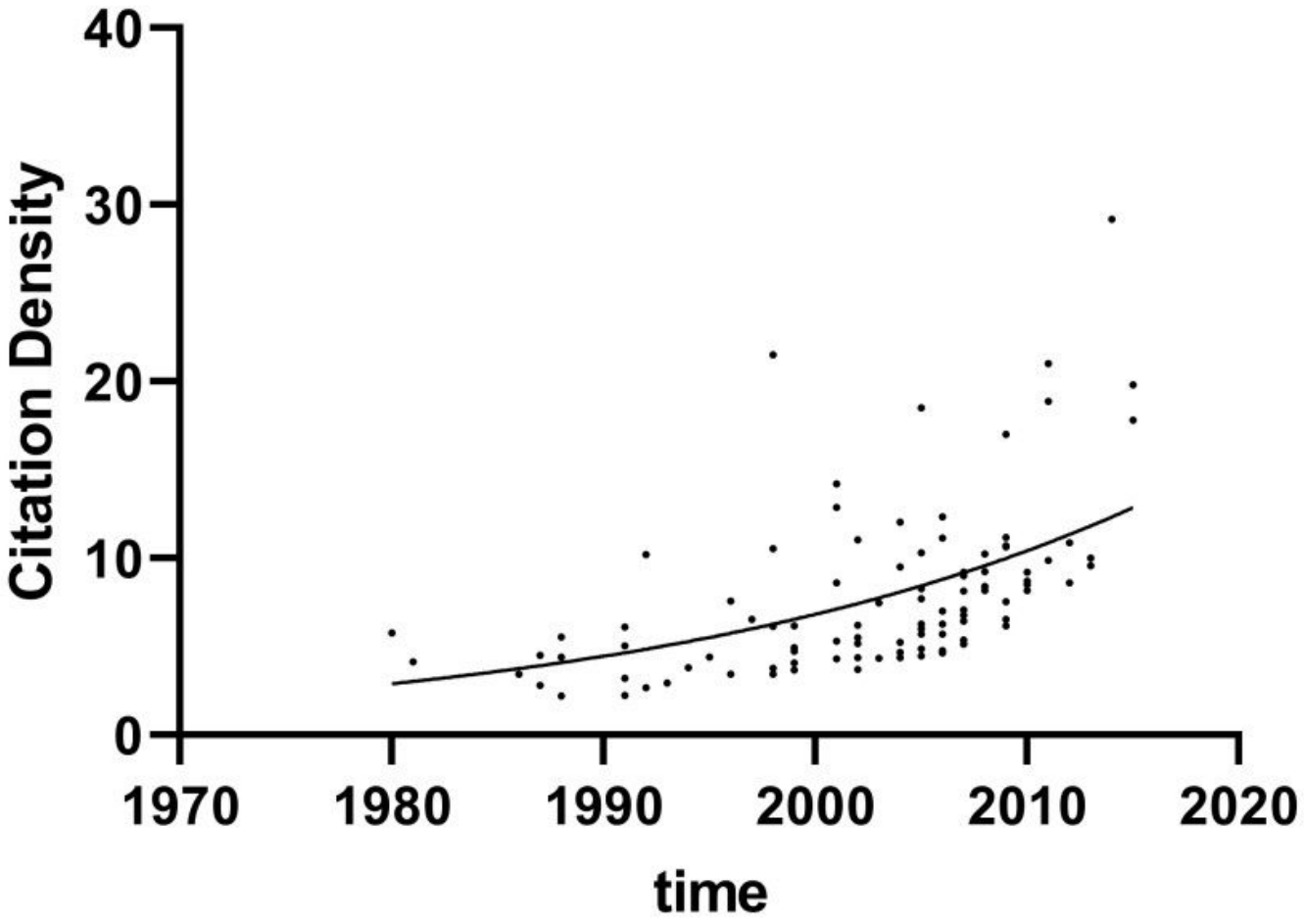

Figure 4

Citation density (y-axis) with publication time (x-axis) of the article trend.

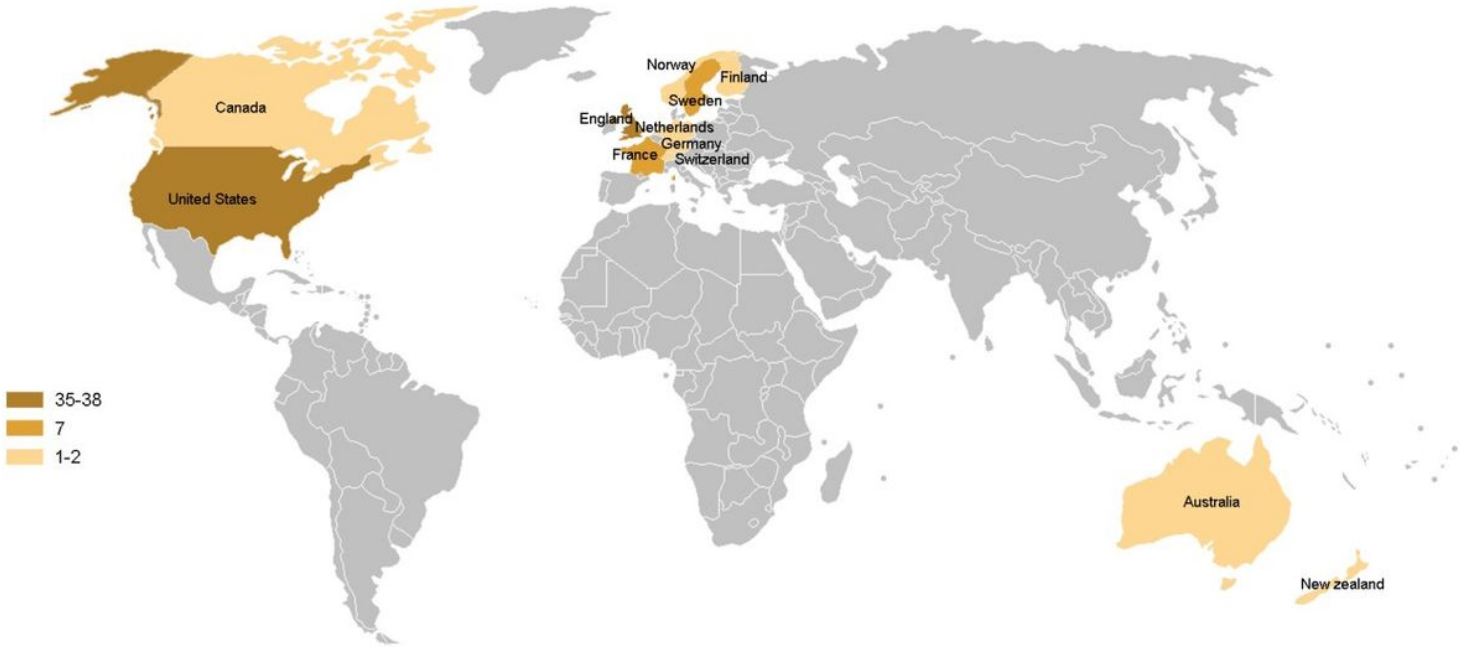

Figure 5

The distribution world map of the 100 most cited articles. The map showed that almost all the articles came from two regions: North America and Europe. Only 3 articles scattered in other areas: Australia and New Zealand. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

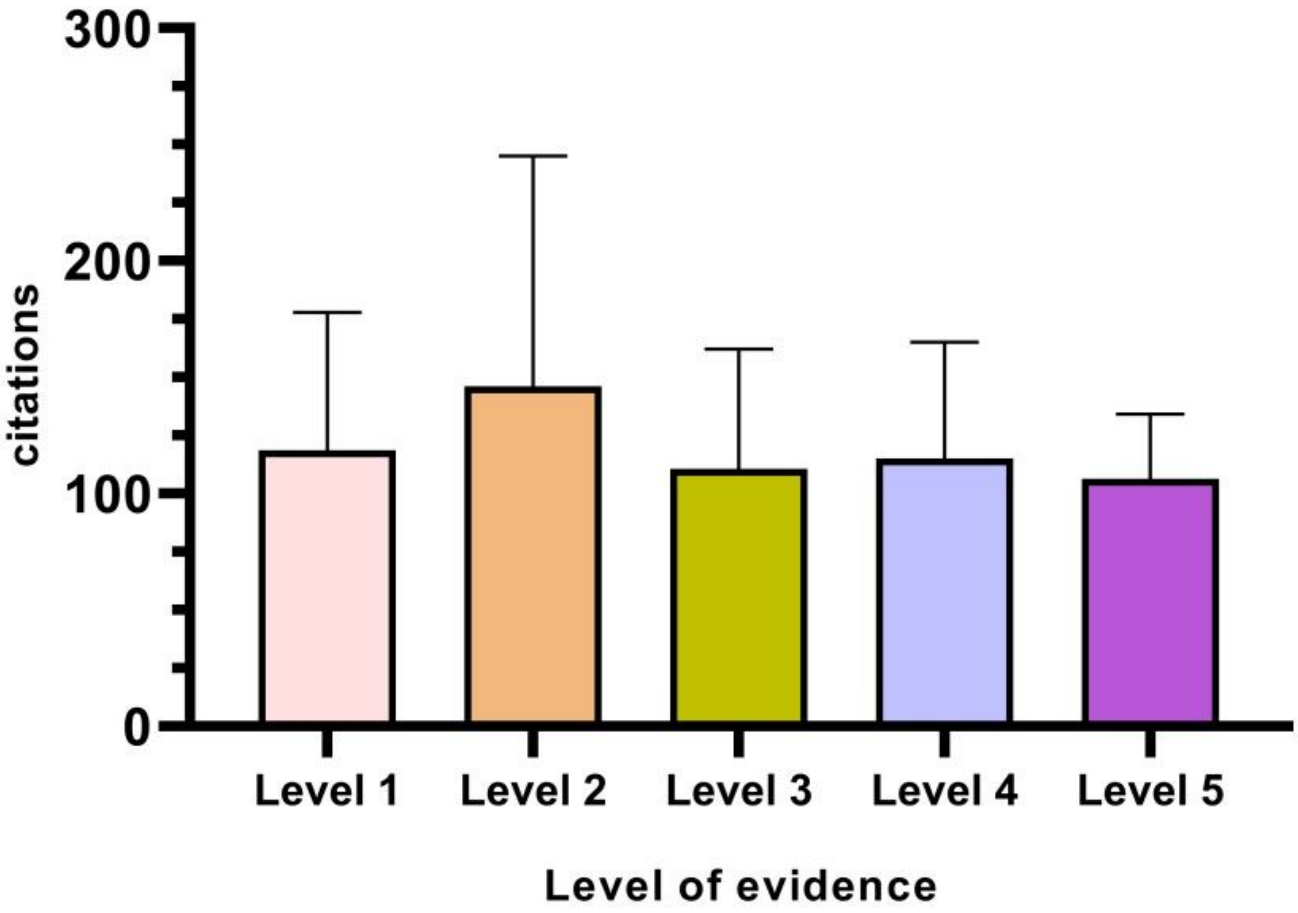

Figure 6

Mean citation per article based on level of evidence. One-way ANOVA found no significant difference in citations per article among the various levels of evidence.

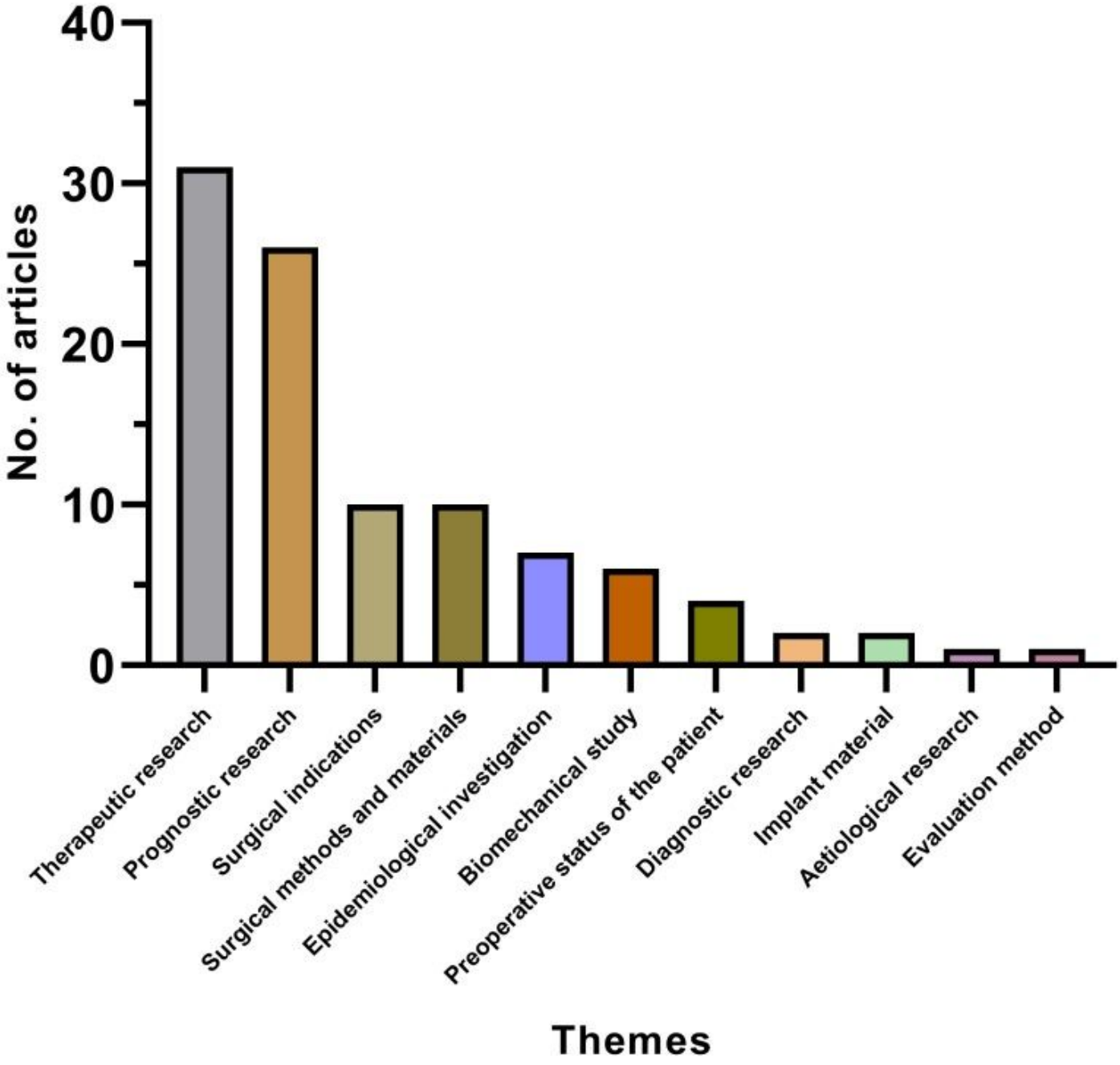

Figure 7

The themes distribution of all the 100 articles. The most frequently mentioned theme was therapeutic research (n = 31), followed by prognostic research (n = 26).

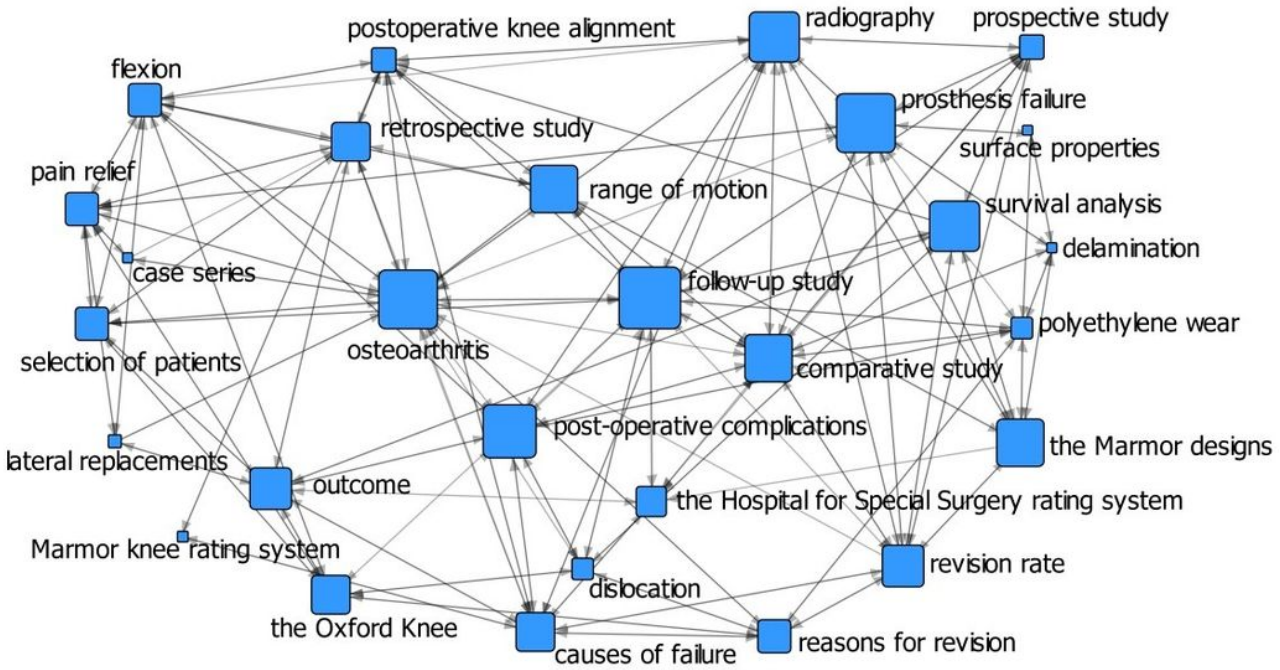

Figure 8

Degree centrality analysis in the 1980s and 1990s (31 articles). It showed that “follow-up study, prosthesis failure, osteoarthritis, survival analysis and radiography” had a high degree of centrality.

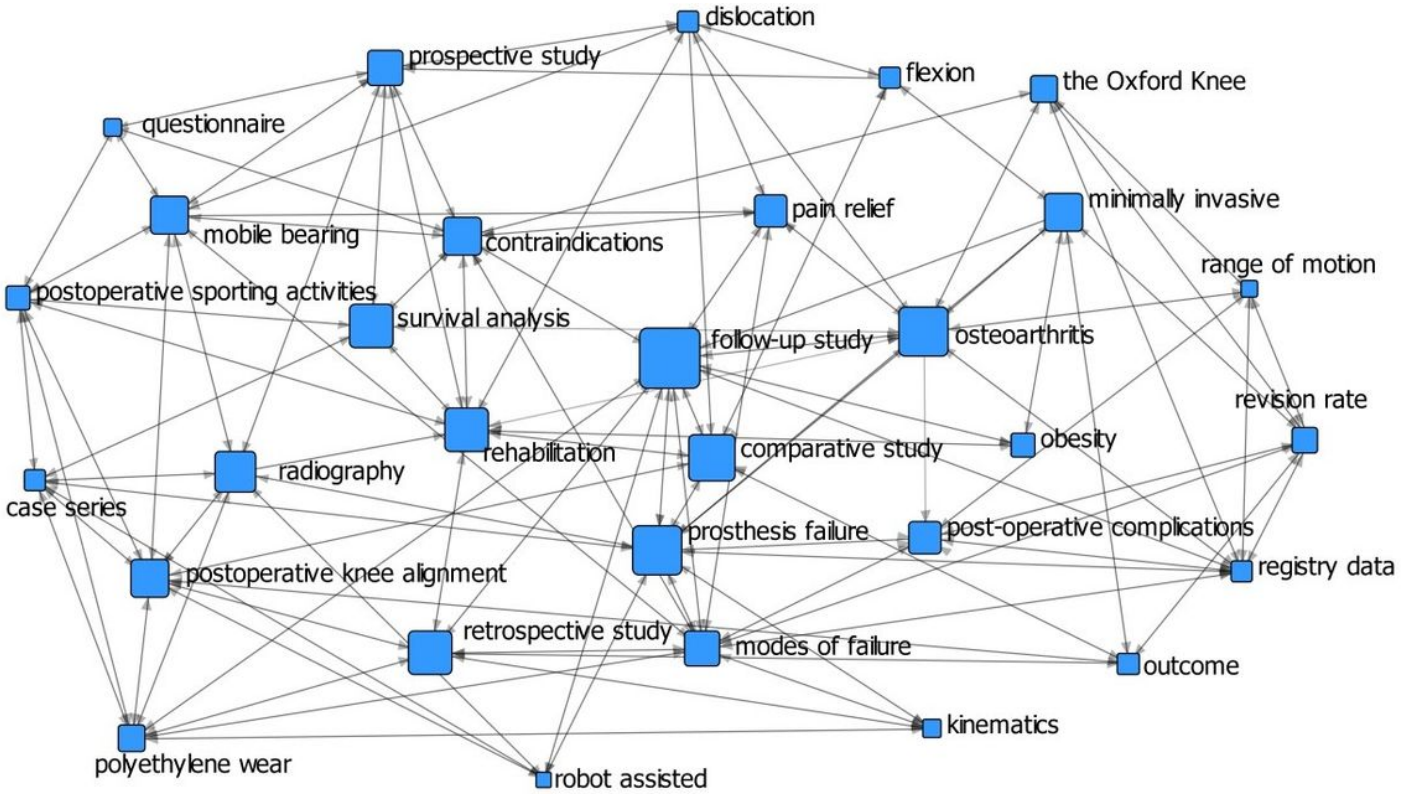

Figure 9

Degree centrality analysis in the 2000s and 2010s (69 articles). It showed that “osteoarthritis, prosthesis failure, survival analysis, rehabilitation, comparative study and contraindications” had a high degree of centrality.