The Journal of Arthroplasty 29 (2014) 453–457

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

The 50 Highest Cited Papers in Hip and Knee Arthroplasty

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ARTICLE INFO

Article history:
Received 4 June 2013
Accepted 21 July 2013

Keywords:
hip arthroplasty
knee arthroplasty
perioperative management
bibliographic analysis

ABSTRACT

The 50 highest cited articles related to hip and knee arthroplasty were searched in Thomson ISI Web of Science®. The 50 highest cited articles had up to 2495 citations. The top 10 papers according to absolute number were cited 580 times at least. Most papers were published in the *Journal of Bone and Joint Surgery American Volume* ($n = 22$). Eight countries contributed to the list with most contributions from the United States ($n = 30$). The majority of papers were published since 1990 ($n = 27$). Studies focusing on the clinical outcome of hip arthroplasty dominate the literature in orthopedic arthroplasty in respect to absolute citations numbers. In the last decade however, papers on perioperative management have been published that show a high citation frequency.

Arthroplasty is an orthopedic subspecialty that aims to restore function in primary or secondary diseased joints of the musculoskeletal system. These include various anatomical sites including large joints of the hip, knee or shoulder or smaller joints, for example, the joints of the fingers. First attempts to reconstruct joints date back to the late 19th century [1]. Since the 1950s after the introduction of the first implants for hip or knee arthroplasty much research and advancement has been made in the field [2,3]. In the meantime arthroplasties pose standard procedures in orthopedic surgery. The results of the research that was done in the past decades can be found in various orthopedic or general scientific journals that publish scientific papers related to the advancements in the field.

A citation is a reference or a quotation from published scientific work in books, book chapters or articles [4]. The number of citations of a published scientific work has been used as a parameter to evaluate the level of its influence and importance. The number of citations of published scientific articles may not be the only variable in determining the importance of scientific work in its field, but it allows to define "citations classics" that could be used, for example, for educational purposes. Furthermore, the number of citations directly influences the impact factor of a journal, a general accepted factor that determines its quality and importance [4].

Analyses of most cited papers have been performed in various medical specialties or subspecialties including anaesthesiology, gynecology, urology, plastic surgery, pain management or critical care medicine [5–11]. In two recent analyses the 100 most cited scientific articles were analyzed in the whole field of orthopedics including all subspecialties [12,13]. Additionally, in some orthopedic subspecialties analyses of the most cited papers—"citation classics"—have been carried out [14–18]. However, no such study has been done on "arthroplasty."

The purposes of the present study are to determine scientific articles in the field of hip and knee arthroplasty that have been cited most frequently by other authors and to establish a ranking of the 50 highest cited papers in the field by using the Thomson ISI Web of Science® Database.

Materials and Methods

Search Strategy

In December 2012, Thomson ISI Web of Science® was searched for the following search terms "Joint Replacement," "Replacement," "Total Hip Replacement," "Total Knee Replacement," "Hip Replacement," "Knee Replacement," "Arthroplasty," "Total Hip Arthroplasty," "Total Knee Arthroplasty," "Hip Arthroplasty," "Knee Arthroplasty," "Reconstruction," "Implant" and "Prosthesis." Secondly, in addition to the first search each top ranked journal (highest 20% according to the Thomson ISI Journal Citations Reports® Science Edition 2011) from the "Orthopedics" category was searched for the highest cited articles according to the above-mentioned search terms. This category includes journals from general to subspecialty-specific journals including clinical or basic science. Furthermore the two recent analyses of the top 100 highest cited papers were studied [12,13]. The search output was then recorded and ranked according to the number of highest citations. All papers dealing with hip and knee arthroplasty, including its

The Conflict of Interest statement associated with this article can be found at http://dx.doi.org/10.1016/j.arth.2013.07.022.

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0883-5403/2903-0001$36.00/0 – see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.arth.2013.07.022

perioperative and postoperative management were included in this study. Only papers focusing on material science were excluded. In cases with an identical absolute number of citations, the papers that had a higher citation density (see below) were ranked higher. A list of the 50 highest cited articles was established. The search and analysis was done by a board-certified orthopedic surgeon (G.H.) and a resident in orthopedic surgery (L.A.H.).

Data Analyses

Each of the 50 highest cited articles was reviewed and the following data were extracted: article title, journal title, publication year and origin of corresponding author. Each paper was assigned to a single country in accordance with the corresponding author's address because the corresponding author is usually primarily and mainly responsible for the whole study project [19]. To evaluate the relative impact of a published paper, the citation density ("Number of citations/years since publication") was calculated as described before [15].

Furthermore each article was analyzed and in case of a clinical study a level of evidence was attributed based on the guidelines for clinical articles by the *Journal of Bone and Joint Surgery American Volume* [20].

Five categories were established including *Clinical Science & Outcome*, *Basic Science*, *Perioperative Management*, *Epidemiology* and *Review & Guideline*. The papers were analyzed and attributed to one of these categories.

Results

The 50 highest cited articles in hip and knee arthroplasty were cited from 347 to 2495 times. The top 10 papers according to absolute numbers were cited at least 580 times. The 50 highest cited papers according to the absolute number of citations can be seen in Table 1. The top 10 highest cited papers according to citation density can be seen in Table 2.

Table 1
The Fifty Highest Cited Papers in Hip and Knee Arthroplasty.

Rank	Article	Absolute Number of Citations	Level of Evidence
1	Harris WH. Traumatic arthritis of hip after dislocation and acetabular fractures—treatment by mold arthroplasty—an end-result study using a new method of result evaluation. *J Bone Joint Surg Am* 1969; 51:737	2495	IV
2	Brooker AF, Bowerman JW, Robinson RA, Riley LH. Ectopic ossification following total hip-replacement—incidence and a method of classification. *J Bone Joint Surg Am* 1973; 55:1629	1475	IV
3	Gruen TA, Mcneice GM, Amstutz HC. Modes of failure of cemented stem-type femoral components—radiographic analysis of loosening. *Clin Orthop Relat Res* 1979; 141:17	1443	IV
4	Delee JG, Charnley J. Radiological demarcation of cemented sockets in total hip-replacement. *Clin Orthop Relat Res* 1976; 121:20	1205	IV
5	Engh CA, Bobyn JD, Glassman AH. Porous-coated hip-replacement—the factors governing bone ingrowth, stress shielding, and clinical-results. *J Bone Joint Surg Br* 1987; 69:45	753	IV
6	Goldring SR, Schiller AL, Roelke M, Rourke CM, Oneill DA, Harris WH. The synovial-like membrane at the bone-cement interface in loose total hip replacements and its proposed role in bone lysis. *J Bone Joint Surg Am* 1983; 65:575	701	N/A
7	Schmalzried TP, Jasty M, Harris WH. Periprosthetic bone loss in total hip-arthroplasty—polyethylene wear debris and the concept of the effective joint space. *J Bone Joint Surg Am* 1992; 74:849	699	N/A
8	Ewald FC. The knee-society total knee arthroplasty roentgenographic evaluation and scoring system. *Clin Orthop Relat Res* 1989; 248:9	646	IV
9	Daubigne RM, Postel M. Functional results of hip arthroplasty with acrylic prosthesis. *J Bone Joint Surg Am* 1954; 36:451	614	IV
10	Stauffer RN. 10-year follow-up-study of total hip-replacement—with particular reference to roentgenographic loosening of the components. *J Bone Joint Surg Am* 1982; 64:983	580	IV
11	Bergmann G, Graichen F, Rohlmann A. Hip-joint loading during walking and running, measured in 2 patients. *J Biomech* 1993; 26:969	555	N/A
12	Insall JN, Ranawat CS, Aglietti P, Shine J. Comparison of 4 models of total knee-replacement prostheses. *J Bone Joint Surg Am* 1976; 58:754	553	III
13	Livermore J, Ilstrup D, Morrey B. Effect of femoral-head size on wear of the polyethylene acetabular component. *J Bone Joint Surg Am* 1990; 72:518	549	IV
14	Bartel DL, Bicknell VL, Wright TM. The effect of conformity, thickness, and material on stresses in ultrahigh molecular-weight components for total joint replacement. *J Bone Joint Surg Am* 1986; 68:1041	546	N/A
15	Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Joint Surg Am* 2007; 89:780	527	N/A
16	Sutherland CJ, Wilde AH, Borden lS, Marks KE. A 10-year follow-up of 100 consecutive Muller curved-stem total hip-replacement arthroplasties. *J Bone Joint Surg Am* 1982; 64:970	511	IV
17	Lewinnek GE, Lewis JL, Tarr R, Compere CL, Zimmerman JR. Dislocations after total hip-replacement arthroplasties. *J Bone Joint Surg Am* 1978; 60:217	508	IV
18	Bergmann G, Deuretzbacher G, Heller M, Graichen F, Rohlmann A, Strauss J, Duda GN. Hip contact forces and gait patterns from routine activities. *J Biomech* 2001; 34:859	504	N/A
19	Johnston RC, Fitzgerald RH, Harris WH, Poss R, Muller ME, Sledge CB. Clinical and radiographic evaluation of total hip-replacement—a standard system of terminology for reporting results. *J Bone Joint Surg Am* 1990; 72:161	500	N/A
20	Chandler HP, Reineck FT, Wixson RL, Mccarthy JC. Total hip-replacement in patients younger than 30 years old—a 5-year follow-up-study. *J Bone Joint Surg Am* 1981; 63:1426	496	IV
21	Zhang W, Moskowitz RW, Nuki G, Abramson S, Altman RD, Arden N, Bierma-Zeinstra S, Brandt KD, Croft P, Doherty M, Dougados M, Hochberg M, Hunter DJ, Kwoh K, Lohmander LS, Tugwell P. OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage* 2008; 16:137	491	N/A
22	Willert HG, Semlitsch M. Reactions of articular capsule to wear products of artificial joint prostheses. *J Biomed Mater Res* 1977; 11:157	483	N/A
23	Harris WH, Mccarthy JC, Oneill DA. Femoral component loosening using contemporary techniques of femoral cement fixation. *J Bone Joint Surg Am* 1982; 64:1063	478	IV
24	Zimmerli W, Trampuz A, Ochsner PE. Current concepts: prosthetic-joint infections. *N Engl J Med* 2004; 351:1645	458	N/A
25	Barrack RL, Mulroy RD, Harris WH. Improved cementing techniques and femoral component loosening in young-patients with hip-arthroplasty—a 12-year radiographic review. *J Bone Joint Surg Br* 1992; 74:385	439	IV