Injury, Int. J. Care Injured 48 (2017) 2625–2633

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Review

The top 100 cited of *injury*-international journal of the care of the injured: A bibliometric analysis

Peng Luo[a,c,e,*], Ding Xu[b,c], Jia Wu[d], Yi-Heng Chen[a], Roman Pfeifer[e,f], Hans-Christoph Pape[e]

[a] Department of Orthopedic Trauma Surgery, The second affiliated hospital and Yuying Children's hospital of Wenzhou Medical University, China
[b] Department of Orthopedic Trauma Surgery, Shangyu people's hospital of shaoxing city, China
[c] Department of Orthopedic Trauma Surgery, RWTH Aachen University, Germany
[d] Key Laboratory for Laboratory Medicine, Ministry of Education, Zhejiang Provincial Key Laboratory of Medical Genetics, School of Laboratory Medicine and Life Science, Wenzhou Medical University, China
[e] Department of Trauma Surgery, University of Zurich, Switzerland
[f] Harald Tscherne Research Lab, University of Zurich, Switzerland

ARTICLE INFO

Article history:
Received 12 May 2017
Received in revised form 26 August 2017
Accepted 7 October 2017

Keywords:
Citations
Injury
Classic papers
Bibliometric analysis

ABSTRACT

Background: With nearly 50 years' of development, *Injury* has become one of the leading journals in its specialty. The aim of this article is to identify, analyze the characteristics of the 100 most cited articles published by the journal to date.
Method: We searched the Thomson Reuters Web of Science Core Collection for citations of all articles published in *Injury* since its launch. For the Top 100 most frequently cited articles, title, author name, number of authors, publishing date, citation number, country of origin, institution, pages, number of reference, type of article, study topic, study design, funding source, and level of evidence of each clinical article were recorded and analyzed.
Results: Only 50 self-citations were found in 12436 total citations of the top100 articles, fifty-four articles exceeded 100 citations. Total citations of the Top 100 articles ranged from 77 to 599. The Top 100 articles were published between 1973 and 2012, the mean authorship and institution number per paper was 3.92 and 1.84 respectively. The mean page number was 8.26 and the mean reference number was 45.2. England, Germany and Switzerland ranked the top three countries of origin. Among the T100 articles, there were 50 clinical studies, 5 basic researches, and 45 reviews. The most common study type was case series, and most common topics were bone reconstruction, trauma and bone fracture. The most common level of evidence was level IV.
Conclusions: This study may help researchers to find out the important information on the classic articles and provides useful insights for the authors who want to publish their research in *Injury*.

Contents

* Corresponding author at: Department of Orthopedic Trauma Surgery, The second affiliated hospital and Yuying Children's hospital of Wenzhou Medical University, China.
E-mail address: luopeng19850019@163.com (P. Luo).

https://doi.org/10.1016/j.injury.2017.10.014
0020-1383/

Introduction

Injury has published 9599 articles since its foundation in 1969. With nearly 50 years' of development, focusing on all aspects of trauma care and accident surgery, the journal has become one of the leading journals in its specialty. It is not only the official journal of British Trauma Society, the Australasian Trauma Society, and the Saudi Orthopaedic Association in Trauma, but also affiliated with 12 international trauma societies. As the editors said, the aim of this journal is to facilitate the exchange of ideas, techniques and information among members of the trauma team all around the world.

Citation analysis is a method to determine the influence of an article in the scientific community and evaluates the impact factor (IF) of a journal [1]. A paper with greater citation history may be more valuable in its field [2]. *Injury* had an impact factor of 1.910 in 2015 (John Wiley & Sons, Inc., 2016) according to the Thomson Reuters Journal Citation Reports, which measures the frequency with which the 'average article' in a journal has been cited in a particular year or period (Thomson Reuters, 1994). *Injury* is ranked 8th out of 24 in Emergency medicine, 25th out of 74 in Orthopedics, and 24th out of 33 Critical care medicine based on its impact factor among SCI-listed journals.

The purpose of this study was to identify, analyze, and categorize the most frequently cited articles published by *Injury* since its launch.

Methods

Research strategy and data collection

We conducted the current citation analysis of all papers published in *Injury* since its foundation by using the Thomson Reuters Web of Science Core Collection (Philadelphia, Pennsylvania, USA) on 2nd May 2017. The results were sorted by using the option 'Times cited', which yielded a list of all the articles published in a journal ranked by citation number. The top 100 papers were identified, each article on the list was reviewed by two independent reviewers, via reading the abstracts acquired from Web of Science. The full texts were retrieved when it was necessary. We included all kinds of publications including original articles, review articles, and other reports.

Two independent authors reviewed the top 100 cited articles and the following data were extracted and analyzed: title, author name, number of authors, publishing date, citation number, country of origin, institution, pages, number of reference, type of article, study topic, study design, funding source, and level of evidence of each clinical article. The type of article was determined into different categories: clinical research, basic research, and review. Study designs were included randomised control trials (RCTs), prospective and retrospective observational cohort study, case control, case series and expert opinion. We also calculated the citation index that defined as citation number per year for each article. If there were authors from different countries or institution in one article, the original country or institution of the article was determined by using the country or institution the corresponding author belonged to. The level of evidence for clinical studies was evaluated based on the guidelines published by The Journal of Bone & Joint Surgery-American Volume [3]. Any different opinion in data collection was resolved by discussing with a third author.

Statistical analysis

The Spearman test was used to evaluate the strength and direction of the linear relationship between different variables (number of authors, number of institution, pages, number of reference, citation number and citation index) and publishing year of the top100 cited articles. Citation numbers in different Levels of evidence and types of articles were analyzed by ANOVA test. All data analyses were performed with SPSS 22.0 software (SPSS, Chicago, Illinois, USA). All probability values were two-tailed, and the threshold for significance was set at $p < 0.05$.

Results

Table 1 listed the top 100 articles, number of citations and citation index per article. Only 50 self-citations were found in 12436 total citations of the top100 articles, accounting for 0.4% of overall citations. Fifty-four articles exceeded 100 citations. The number of citations per article ranged from 77 to 599 times, and the mean citation number was 140.5 times. The mean citation index was 39.3 times, ranged from 1.89 to 43 times. The highest ranking article both in citation numbers and citation index was the one written by Giannoudis with 599 total citations and 43 citations per year [4]. The oldest article was written by Ruedi. Th, and published in 1973 [5], the most recently one was written by Kehoe. S and published in 2012 [6].

The top 100 articles were published between 1973 and 2012, with most articles published in the 2000 s group with 62 articles, followed by the 1990s with 18 articles and only 3 articles published in 1970s (Fig. 1). The most cited articles published in a single year were 2007 and 2008 with 12 articles each. The highest citation number was also found in the 2000s (8471 citations), while the 1970s contributed the lowest citation number (422 citations) (Fig. 2). No correlation was found between publishing year and number of citations ($r = 0.166$, $p = 0.099$). However, there was a positive correlation between publishing year and citation index ($r = 0.841$, $p < 0.001$). The mean number of pages and the mean references of Top 100 articles was 8.26 (3–42 pages) and 45.2 (4–213 references). Publishing year had a positive linear relationship with not only page number ($r = 0.247$ $p = 0.013$); but also reference number($r = 0.610$ $p < 0.001$).

A total of 325 authors were found in the top 100 articles. Seven were written by a single author and 18 were written by two co-authors. Mean authorship number was 3.93 per article, ranged from 1 to 25. Eight authors were represented three times in the top 100 list (Table 2). We found a positive trend between publishing year and the number of authors ($r = 0.235$, $p = 0.019$).

The top100 articles originated from 23 countries, with England ($n = 35$), Germany ($n = 17$), Switzerland ($n = 13$), and the USA ($n = 12$) holding the top four positions. Other countries with the top 100 publications were showed in Fig. 3. A total of 130 institutions were found in the top 100 articles. Then mean number of institutions per article was 1.84, ranged from 1 to 6. The top three corresponding institutions with the most productive articles in the top 100 articles were all from England, James's University Hospital with 8 publications, Leeds Teaching Hospitals with 6 publications, and Royal Infirmary of Edinburgh with 5 publications (Table 3). There was a significant correlation between publishing year and number of institutions ($r = 0.417$ $p < 0.001$).

Table 1
Bibliometric information among the top 100 cited articles.

Rank	Author	Title	Year	Total cited number	Citation index
1	Giannoudis PV, et al	Bone substitutes: An update.	2005	559	43
2	Court-Brown CM, et al	Epidemiology of adult fractures: A review.	2006	452	37.67
3	Keel M, et al	Pathophysiology of polytrauma.	2005	394	30.31
4	Dimitriou R, et al	Current concepts of molecular aspects of bone healing.	2005	343	26.38
5	Maegele M, et al	Early coagulopathy in multiple injury: An analysis from the German Trauma Registry on 8724 patients.	2007	305	27.73
6	Rutherford WH, et al	Symptoms at one year following concussion from minor head-injuries.	1979	241	6.18
7	Lenz A, et al	Systemic inflammation after trauma.	2007	228	20.73
8	Kwek EBK, et al	An emerging pattern of subtrochanteric stress fractures: A long-term complication of alendronate therapy?	2008	227	22.7
9	Giannoudis PV, et al	Fracture heating: The diamond concept.	2007	210	19.09
10	Morganti-K MC, et al	Modulation of immune response by head injury.	2007	201	18.27
11	Marsell R, et al	The biology of fracture healing.	2011	197	28.14
12	Ravikumar KJ, et al	Internal fixation versus hemiarthroplasty versus total hip arthroplasty for displaced subcapital fractures of femur – 13 year results of a prospective randomised study.	2011	197	28.14
13	Wagner M, et al	General principles for the clinical use of the LCP.	2003	165	11
14	Stoffel K, et al	Biomechanical testing of the LCP – how can stability in locked internal fixators be controlled?	2003	164	10.93
15	Gautier E, et al	Guidelines for the clinical application of the LCP	2003	159	10.6
16	Clayton RAE, et al	The epidemiology of musculoskeletal tendinous and ligamentous injuries.	2008	158	15.8
17	Hangody L, et al	Autologous osteochondral grafting-technique and long-term results.	2008	157	15.7
18	Sen MK, et al	Autologous iliac crest bone graft: Should it still be the gold standard for treating nonunions?	2007	151	13.73
19	Haleem S, et al	Mortality following hip fracture: Trends and geographical variations over the last 40 years.	2008	141	14.1
20	Kehoe S, et al	FDA approved guidance conduits and wraps for peripheral nerve injury: A review of materials and efficacy.	2012	140	23.33
21	Pelttari K, et al	The use of mesenchymal stem cells for chondrogenesis.	2008	135	13.5
22	Skinner P, et al	Displaced subcapital fractures of the femur- A prospective randomized comparison of internal-fixation hemiarthroplasty and total hip-replacement.	1989	132	4.55
23	Perren SM, et al	The concept of biological plating using the limited contact-dynamic compression plate(LC-DCP)-scientific back ground,design and application.	1991	131	4.85
24	Tsiridis E, et al	Molecular aspects of fracture healing: Which are the important molecules?	2007	129	11.73
25	Pfeifer R, et al	Patterns of mortality and causes of death in polytrauma patients-Has anything changed?	2009	126	14
26	Kon E, et al	Platelet-rich plasma: New clinical application A pilot study for treatment of jumper's knee.	2009	126	14
27	Dimitriou R, et al	Complications following autologous bone graft harvesting from the iliac crest and using the RIA: A systematic review.	2011	124	17.71
28	Ryan MD, et al	The epidemiology of fractures and fracture-dislocation of the cervical spine.	1992	123	4.73
29	Lindahl H.	Epidemiology of periprosthetic femur fracture around a total hip arthroplasty.	2007	118	10.73
30	Giannoudis PV.	Current concepts of the inflammatory response after major trauma: an update.	2003	118	7.87
31	Staubli AE, et al	TomoFix: a new LCP-concept for open wedge osteotomy of the medial proximal tibia – early results in 92 cases.	2003	116	7.73
32	Floccard B, et al	Early coagulopathy in trauma patients: An on-scene and hospital admission study.	2012	114	19
33	Lafontaine M, et al	Stability assessment of distal radius fractures.	1989	114	3.93
34	Simmermacher RKJ, et al	The AO/ASIF-proximal femoral nail (PFN): a new device for the treatment of unstable proximal femoral fractures.	1999	111	5.84
35	Dewar D, et al	Postinjury multiple organ failure.	2009	110	12.22
36	Rennie L, et al	The epidemiology of fractures in children.	2007	110	10
37	Roudsari BS, et al	The acute medical care costs of fall-related injuries among the US older adults.	2005	110	8.46
38	Deans GT, et al	Neck sprain- A major cause of disability following car accidents.	1987	108	3.48
39	Harris LG, et al	Staphylococci and implant surfaces: a review.	2006	107	8.92
40	Butt MS, et al	Comparison of dynamic hip screw and gamma-nail- A prospective, randomized controlled trial.	1995	106	4.61
41	Stewart HD, et al	Factors affecting the outcome of colles fracture-An anatomical and functional study.	1985	106	3.21
42	Hu FK, et al	Preoperative predictors for mortality following hip fracture surgery: A systematic review and meta-analysis.	2012	105	17.5
43	Simmermacher RKJ, et al	The new proximal femoral nail antirotation (PFNA (R)) in daily practice: Results of a multicentre clinical study.	2008	105	10.5
44	Brittberg M, et al	Autologous chondrocyte implantation-technique and long-term follow-up.	2008	105	10.5
45	Giannoudis PV, et al	Fracture heating in osteoporotic fractures: Is it really different? A basic science perspective.	2007	105	9.5
46	Schutz M, et al	Minimally invasive fracture stabilization of distal femoral fractures with the LISS: A prospective multicenter study – Results of a clinical study with special emphasis on difficult cases.	2001	105	6.18
47	Giannoudis PV, et al	Damage control orthopaedics in unstable pelvic ring injuries.	2004	104	7.43
48	Wrightson P, et al	Time off work and symptoms after minor head-injury.	1981	104	2.81
49	Jones E, et al	Mesenchymal stem cells and bone regeneration: Current status.	2011	103	14.71
50	Perez JV, et al	Death after proximal femoral fracture- an autopsy study.	1995	103	4.48
51	Keramaris NC, et al	Fracture vascularity and bone heating: A systematic review of the rote of VEGF.	2008	102	10.2

Table 1 (*Continued*)

Rank	Author	Title	Year	Total cited number	Citation index
52	Maimaris C, et al	Whiplash injuries of the neck-A retrospective study.	1988	102	3.4
53	Court-Brown, et al	The epidemiology of open long bone fractures.	1998	100	5
54	Simpson A, et al	Sliding hip screws-Modes of failure.	1989	100	3.45
55	Drosse I, et al	Tissue engineering for bone defect heating: An update on a multi-component approach.	2008	97	9.7
56	Khan SK, et al	Timing of surgery for hip fractures: A systematic review of 52 published studies involving 291,413 patients.	2009	96	10.67
57	Riska EB, et al	Prevention of fat-embolism by early internal-fixation of fractures in patients with multiple injuries.	1976	96	2.29
58	Ahmad M, et al	Biomechanical testing of the locking compression plate: When does the distance between bone and implant significantly reduce construct stability?	2007	95	8.64
59	Adams CI, et al	Cigarette smoking and open tibial fractures.	2001	95	5.59
60	Trampuz A, et al	Diagnosis and treatment of infections associated with fracture-fixation devices.	2006	94	7.83
61	Worlock P, et al	The prevention of infection in open fractures-An experimental study of the effect of fracture stability.	1994	92	3.83
62	Edwards DJ, et al	Fractures of the distal clavicle-A case for fixation.	1992	91	3.5
63	Sommer C, et al	First clinical results of the Locking Compression Plate (LCP).	2003	89	5.93
64	Bohner M.	Calcium orthophosphates in medicine: from ceramics to calcium phosphate cements.	2000	89	4.94
65	Zyto K.	Non-operative treatment of comminuted fractures of the proximal humerus in elderly patients	1998	89	4.45
66	Calori GM, et al	The use of bone-graft substitutes in large bone defects: Any specific needs?	2011	88	12.57
67	Misra A, et al	Complex proximal humeral fractures in adults – a systematic review of management.	2001	87	5.12
68	Giannoudis PV, et al	The diamond concept – open questions.	2008	86	8.6
69	Schmidmaier G, et al	Prophylaxis and treatment of implant-related infections by antibiotic-coated implants: a review.	2006	86	7.17
70	Schmelzeisen R, et al	Navigation-aided reconstruction of medial orbital wall and floor contour in cranio-maxillofacial reconstruction.	2004	85	6.07
71	Rammelt S, et al	Calcaneus fractures: facts, controversies and recent developments.	2004	85	6.07
72	Rammelt S, et al	Fractures of lower end of tibia into ankle joint-Results 9 years after open reduction and internal-fixation.	1973	85	1.89
73	Nowak J, et al	The aetiology and epidemiology of clavicular fractures – A prospective study during a two-year period in Uppsala, Sweden.	2000	84	4.67
74	Krettek C, et al	Intraoperative control of axes, rotation and length in femoral and tibial fractures.	1998	84	4.2
75	Bielby R, et al	The role of mesenchymal stem cells in maintenance and repair of bone.	2007	83	7.55
76	Schurink GWH, et al	The value of physical examination in the diagnosis of patients with blunt abdominal trauma: A retrospective study.	1997	83	3.95
77	Calori GM, et al	Application of rhBMP-7 and platelet-rich plasma in the treatment of long bone non-unions A prospective randomised clinical study on 120 patients.	2008	81	8.1
78	Johnson EO, et al	Regeneration and repair of peripheral nerves.	2005	81	6.23
79	Chawda MN, et al	Predicting outcome after multiple trauma: which scoring system?	2004	81	5.79
80	Armstrong CP, et al	The fractured scapula-importance and management based on a series of 62 patients.	1984	81	2.38
81	Gennarelli TA, et al	AIS 2005: A contemporary injury scale.	2006	80	6.67
82	Borg T, et al	Percutaneous plating of distal tibial fractures Preliminary results in 21 patients.	2004	80	5.71
83	Houshian S, et al	The epidemiology of achilles tendon rupture in a Danish county.	1998	80	4
84	Muller LP, et al	Radiation exposure to the hands and the thyroid of the surgeon during intramedullary nailing.	1998	80	4
85	Harrington IJ, et al	Replacement of the radial head in the treatment of unstable elbow fractures.	1981	80	2.16
86	Hankenson KD, et al	Angiogenesis in bone regeneration.	2011	79	11.29
87	Tzioupis C, et al	Prevalence of long-bone non-unions.	2007	79	7.18
88	Hunt PA, et al	Emergency thoracotomy in thoracic trauma – a review.	2006	79	6.58
89	Redfern DJ, et al	Fractures of the distal tibia: minimally invasive plate osteosynthesis.	2004	79	5.64
90	Shen WJ, et al	Plate fixation of fresh displaced midshaft clavicle fractures.	1999	79	4.16
91	Mayou R, et al	Outcome of 'whiplash' neck injury.	1996	79	3.59
92	Poigenfurst J, et al	Plating of fresh clavicular fractures-Results of 122 operations.	1992	79	3.04
93	Osborn PM, et al	Direct retroperitoneal pelvic packing versus pelvic angiography: A comparison of two management protocols for haemodynamically unstable pelvic fractures.	2009	78	8.67
94	Steinwachs MR, et al	Marrow stimulation techniques.	2008	78	7.8
95	Diefenbeck M, et al	Prophylaxis and treatment of implant-related infections by local application of antibiotics.	2006	78	6.5
96	Lawrence TM, et al	The current hospital costs of treating hip fractures.	2005	78	6
97	Haynes RC, et al	Failure of femoral head fixation: a cadaveric analysis of lag screw cut-out with the gamma locking nail and AO dynamic hip screw.	1992	78	3.71
98	Bredahl C, et al	Mortality after hip fracture-Results of operation within 12 h of admission.	1992	78	3
99	Mereddy P, et al	The AO/ASIF proximal femoral nail antirotation (PFNA): A new design for the treatment of unstable proximal femoral fractures.	2009	77	8.56
100	Hildebrand F, et al	Damage control: extremities.	2004	77	5.5

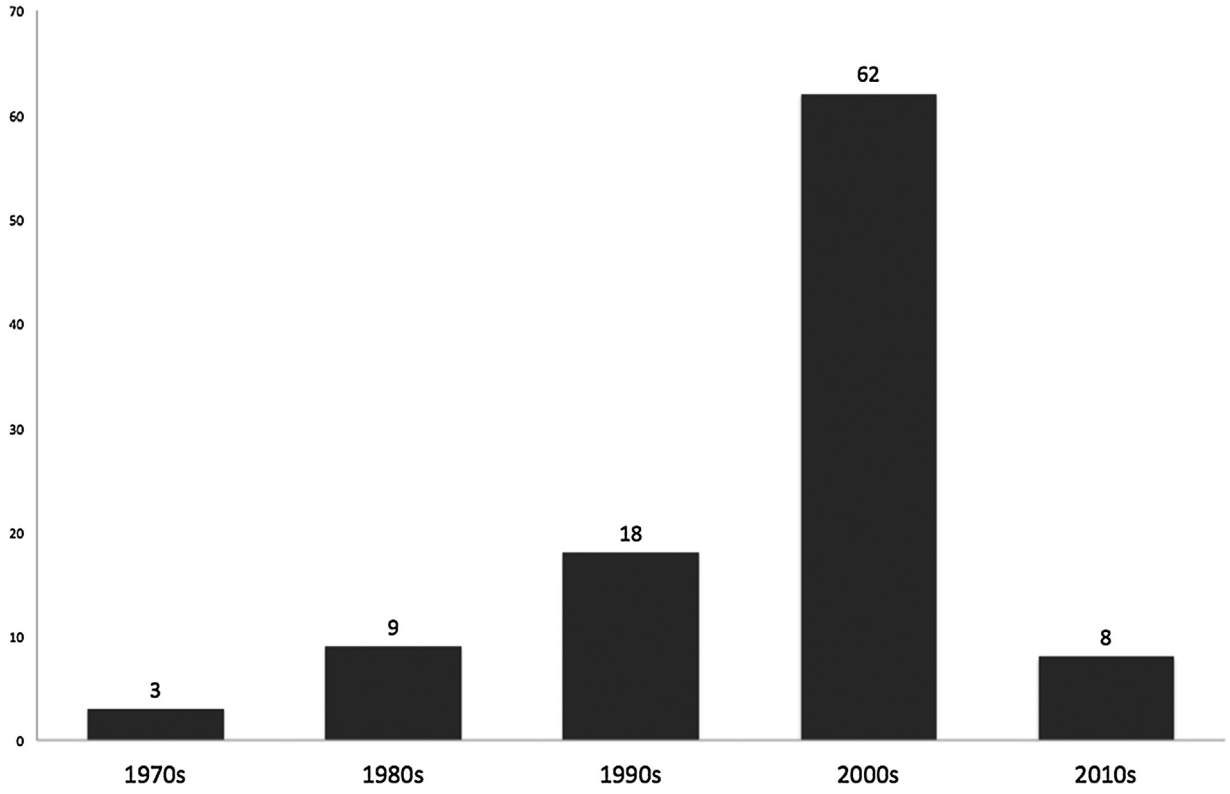

Fig. 1. Numbers of articles published during different periods.

A total of 50 clinical studies, 5 basic researches, and 45 reviews were identified in the top 100 articles. No significant difference was found between type of article and citation number (F = 2.474, p = 0.090). In the 50 clinical studies, case series (n = 28) was the leading type, followed by retrospective observational studies (n = 12), randomized controlled clinical trial (RCT, n = 4), prospective observational studies (n = 2), expert opinion (n = 3), and case-control studies (n = 1). Fig. 4 showed the topics of the top 100 articles, led by bone reconstruction with 45 articles, followed by trauma with 20 articles and bone fracture with 14 articles.

Only ten researches in Top 100 had a funding support, including 2 basic researches, 4 clinical researches and 4 reviews. All of them were published after 2004, except one published in 1994. Eight of them received the public foundations, one received support from commercial companies, and one was supported by both of public and commercial funding.

With regards to level of evidence, Level IV (62%, n = 31) was the most frequent level of evidence among the clinical studies, followed by 24% level II, 6% level V, 4% level I, and 4% level III. The total citation number ranged from 173 to 3128 among different levels. The most citation number was found in level IV with 3128 times, and the least citation number was found in level III with 173 times(Table 4). And there was no statistical difference between different level of evidence and citation number (F = 1.262 p = 0.299).

Discussion

Bibliometric analysis is a tool that can quantify the characteristics and scholarly impact of citation classics [7]. Understanding the characteristics of highly cited studies in one journal may help authors who wish to submit and publish effectively [8]. We should note that it is inappropriate to evaluate the value of a publication or journal simply based on citation rating as the number of citations could be influenced by many factors [7], such as whether authors speak English [9] or even their gender [10]. Even with these disadvantages, however, it remains the most widely accepted method to assess the merits of a paper or journal currently [11].

Recently, several authors have reported the citation analysis of top-cited articles in specific orthopedic journals [12–14]. *Injury* has offered a significant contribution to the field of medicine through its numerous high-quality articles since its launch. Our aim is to conduct the similar study to identify and analyze the top 100 cited articles published in this journal.

Our results showed the self-citation rates in *Injury* were very low with only 0.4% of overall citations, removing doubts of potential citation inflation. The top 100 cited articles in *Injury* were published between 1973 and 2012, and the most productive period was 2000s. The present result is consistent with the recent citation analyses [12–14]. We found 70 of the Top 100 articles were published after 2000. The most highest total citations number was found in 2000s with 8471 citations. A decline trend of total citations was found in 2010s with 950 citations, supporting the theory that high-quality papers were needed time to be cited widely [14]. In addition, Baltussen et al. also reported the highest citation number per year of an article often occurred 3 to 10 years after publication [15]. We know that date of publishing could affect citation numbers. Articles with a longer publishing period are likely to attain more citations, purely because of their longer citable period [7,16]. In order to overcome this shortage, we also counted the number of citations per year, defined as citation index. The distribution of the total citation number in different periods

remained basically consistent with that of citation index. Actually our results showed there was no correlation between publishing year and number of citations ($r = 0.166$, $p = 0.099$), indicating that the citation numbers may not simply be affected by only publishing date.

Twenty-three countries contributed to the top 100 list of highest cited papers in *Injury*. The top three were all from Europe, and the fourth rank was the USA. These results were different from most other studies where the United States had the highest number of most cited papers because they have abundant financial resources available to the scientific community [17–19]. The reason may explain by that most of the societies or institutions affiliated to *Injury* were from Europe, researchers from these countries wish to submit or publish their studies in this journal. Besides, American authors tend to publish and cite local papers [20,21]. In contrast, Asian countries contributed only two articles in the Top100 cited articles, indicating that the disparity of scientific publications between developing and developed area remains significant [16]. It is also interesting that publishing year had a positive linear relationship with number of authors and institutions, which was probably due to the increased cooperation of the authors and research institutions from different place recently. Another interesting fact is that the number of page and references per article on average is increasing. These results may be due to the more formal methodology and report format of articles published in *Injury*, and the increasing number of open articles or more availability to authors during the research process and manuscript preparation [22]. Only ten studies received funding support, eight of them received the public foundations and nine of them were published after 2004, indicating that the pubic foundations have begun to play a role since 2004 in the scientific field of *Injury*, but it still needs to increase financial resources to improve the further researches.

Among the Top100 cited articles, half of them were clinical studies, which indicated clinical studies were more popular than basic science researches. It is consistent with the situation in the global community [23,24]. We found 45% of the Top 100 cited articles were review articles, different from other studies that reviews accounted for only a small part [12–14]. It may due to the reason that *Injury* plays an important educational role among the trauma surgeons in the world. Some authors reported that reviews receive more citations than articles because of their broadness and ease of information access [25]. However, in our study, there was no significant difference among different types of articles and

Table 2
Authors with more than three top 100 cited articles.

Rank	Author	Number of article
1	Giannoudis PV	13
2	Court Brown CM	5
3	Pape HC	4
4	Tsiridie E	3
5	Krettek C	3
6	Einhorn TA	3
7	Calori GM	3
8	Wagner M	3

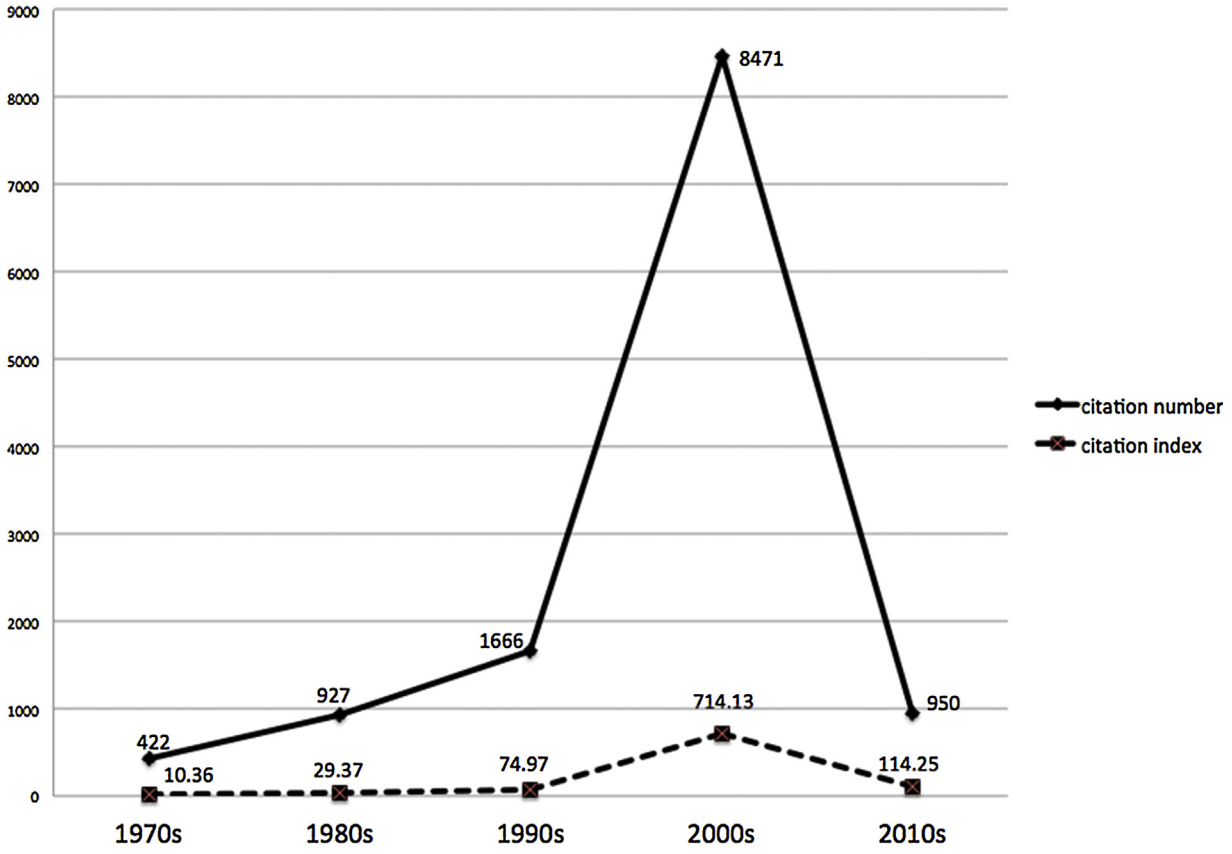

Fig. 2. Numbers of citations during different periods.

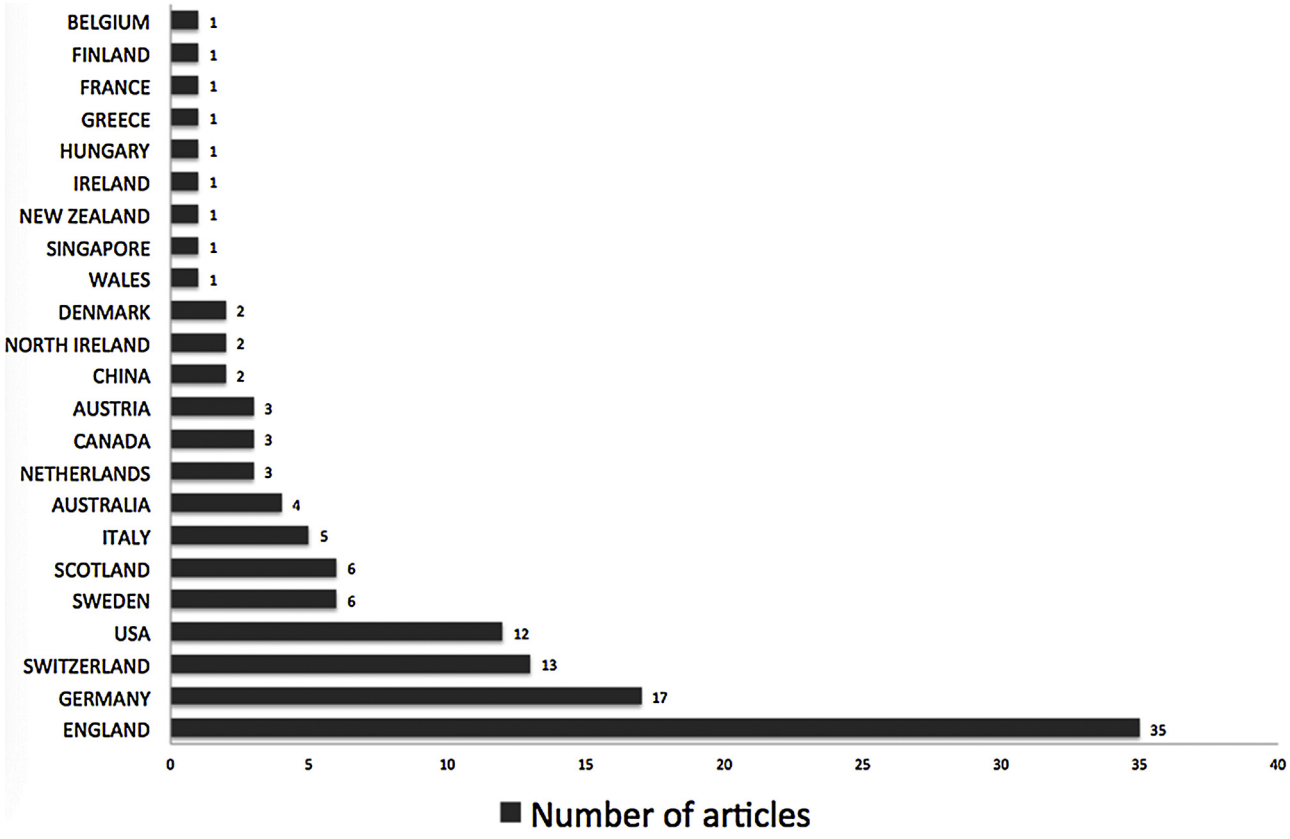

Fig. 3. Countries of origin of the top 100 cited articles.

Table 3
Corresponding institution with more than two top 100 cited articles.

Rank	Institution	Number of article	Citation number
1	James's University Hospital, England	8	1052
2	Leeds Teaching Hospitals, England	6	706
3	Royal Infirmary of Edinburgh, England	5	743
4	Royal Victoria Hospital, England	2	706
5	Kantonsspital, Switzerland	2	248
6	Goteborg University, Sweden	2	223
7	John Radcliffe Hospital, England	2	192
8	James Cook University Hospital, England	2	174
9	Uppsala University Hospital, Sweden	2	164
10	Hannover Medical School, Germany	2	161

citation number. This study showed that among various research areas, the most frequently cited studies related to bone reconstruction, trauma and bone fracture.

The most common design of clinical studies in our research was case series (56%), while RCTs was only accounted for 8%. According to the level of evidence grading, 62% of the clinical studies were Level IV evidence studies with, and only 4% were Level IV evidence studies. This founding was similar with other bibliometric studies [7,14,18]. No significant difference was observed between different level of evidence and citation number.

This study also has some limitations. First, citation number could not completely reflect the impact of one article although it has been used widely [16]. Second, the authors may tended to cite papers from the journals in which they hoped to publish their research [26]. Despite these limitations, our study provided some insights into the characteristics of researches and citation of articles published in *Injury* during its development.

Conclusion

This study represents a bibliometric analysis of the most cited papers published in *Injury*. We identified, analyzed, and categorized the characteristics of the most frequently cited articles since the journal was launched. We found that regional differences exist with an emphasis on those published out of England. We also reconfirm some "classic" articles exist that are independent of the time of publication and have been cited throughout. We feel that this data provides useful insights for the authors who want to publish their research in *Injury*.

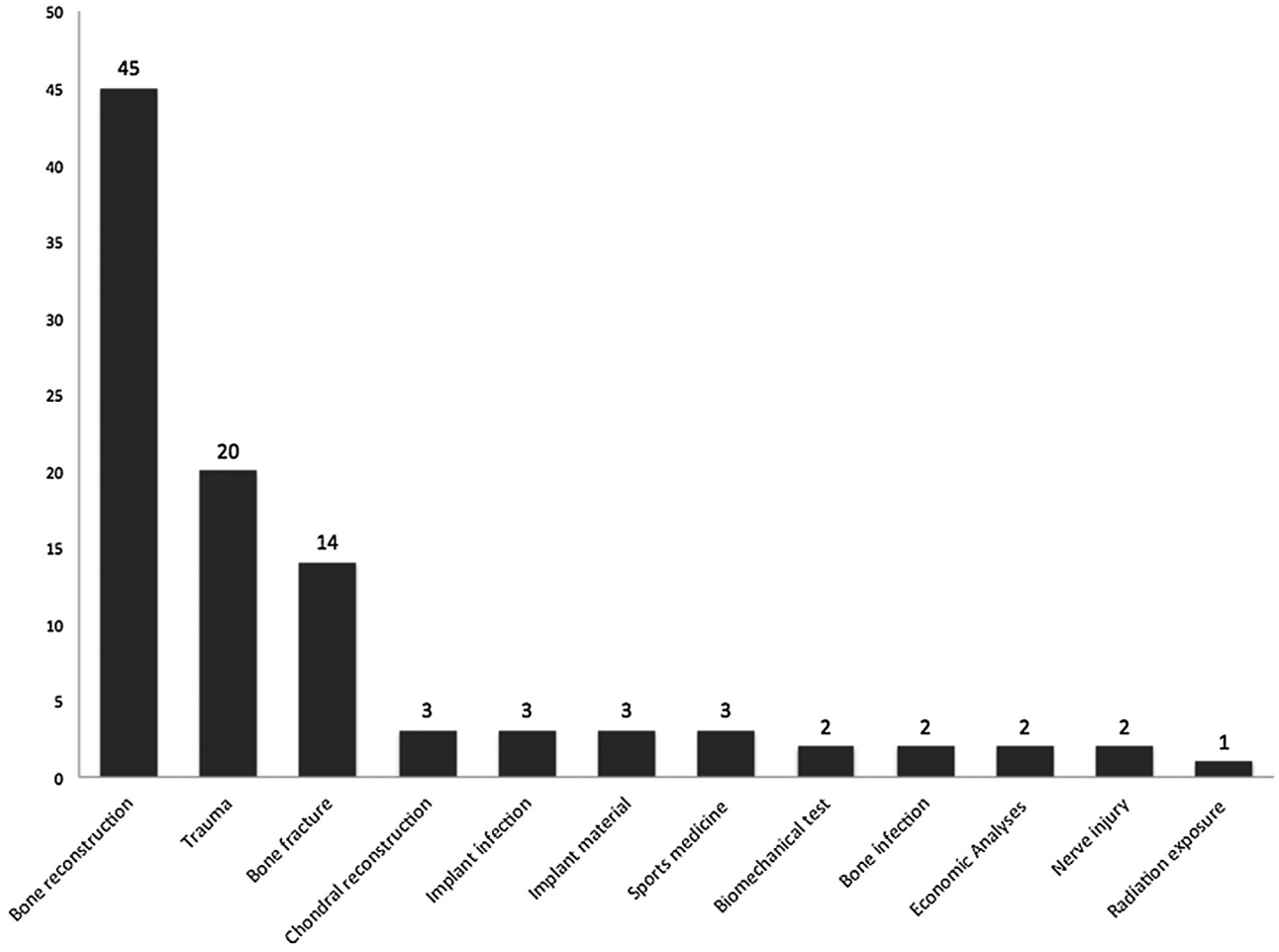

Fig. 4. Topics of the top 100 cited articles.

Table 4
Level of evidence of top 100 cited articles.

Level of evidence	Number of article	Citation number
Level I	2	210
Level II	12	1589
Level III	2	173
Level IV	31	3128
Level IV	3	380

Conflicts of interest

None.

Funding

None.

Acknowledgement

None

References

[1] Moed HF. New developments in the use of citation analysis in research evaluation. Arch Immunol Ther Exp (Warsz) 2009;57:13–8.
[2] Eyre-Walker A, Stoletzki N. The assessment of science: the relative merits of post-publication review, the impact factor, and the number of citations. PLoS Biol 2013;11:e1001675.
[3] Wright JG, Swiontkowski MF, Heckman JD. Introducing levels of evidence to the journal. J Bone Joint Surg Am. 20038: 85-A:1-3.
[4] Giannoudis PV, Dinopoulos H, Tsiridis E. Bone substitutes: an update. Injury Int J Care Injured 2005;36:20–7.
[5] Ruedi T. Fractures of lower end of tibia into ankle joint – results 9 years after open reduction and internal-fixation. Injury Int J Care Injured 1973;5:130–4.
[6] Kehoe S, Zhang XF, Boyd D. FDA approved guidance conduits and wraps for peripheral nerve injury: a review of materials and efficacy. Injury Int J Care Injured 2012;43:553–72.
[7] Liu YH, Wang SQ, Xue JH, Liu Y, Chen JY, Li GF, et al. Hundred top-cited articles focusing on acute kidney injury: a bibliometric analysis. BMJ Open 2016;6: e011630.
[8] Allen L, Jones C, Dolby K, Lynn D, Walport M. Looking for landmarks: the role of expert review and bibliometric analysis in evaluating scientific publication outputs. PLoS One 2009;4:e5910.
[9] Paris G. De leo G, menozzi P, gatto M: region-based citation bias in science. Nature 1998;396:210.
[10] Baldi S. Normative versus social constructivist processes in the allocation of citations: a network-Analytic model. Am Sociol Rev 1998;63:829–46.
[11] Adam D. The counting house. Nature 2002;415:726–9.
[12] Mehlman CT, Wenger DR. The top 25 at 25: citation classics in the Journal of Pediatric Orthopaedics. J Pediatr Orthoped 2006;26:691–4.
[13] Elgafy HK, Miller JD, Hashmi S. Ericksen S. top 20 cited spine journal articles, 1990–2009. World J Orthop 2014;5:392–7.
[14] Mavrogenis AF, Megaloikonomos PD, Panagopoulos GN, Mauffrey C, Quaile A, Scarlat MM. Best one hundred papers of International Orthopaedics: a bibliometric analysis. Int Orthop 2017;41:689–97.
[15] Baltussen A, Kindler CH. Citation classics in critical care medicine. Intensive Care Med 2004;30:902–10.
[16] Huang W, Wang L, Wang B, Yu L, Yu X. Top 100 cited articles on back pain research: a citation analysis. Spine (Phila Pa 1976) 1976;2016(41):1683–92.
[17] Nason GJ, Tareen F, Mortell A. The top 100 cited articles in urology: an update. Can Urol Assoc J 2013;7:E16–24.

[18] Holzer LA. Holzer G. The 50 highest cited papers in hip and knee arthroplasty. J Arthroplasty 2014;29:453–7.
[19] Tam WW, Wong EL, Wong FC, Hui DS. Citation classics: top 50 cited articles in 'respiratory system'. Respirology 2013;18:71–81.
[20] Campbell FM. National bias: a comparison of citation practices by health professionals. Bull Med Libr Assoc 1990;78:376–82.
[21] Link AM. US and non-US submissions: an analysis of reviewer bias. JAMA 1998;280:246–7.
[22] Zeleznik D, Blazun Vosner H, Kokol PA. Bibliometric analysis of. J Adv Nurs 1976 2015.
[23] Ponce FA, Lozano AM. Highly cited works in neurosurgery: part I: the 100 top-cited papers in neurosurgical journals. J Neurosurg 2010;112:223–32.
[24] Baldwin K, Namdari S, Donegan D, Kovatch K, Ahn J, Mehta S. 100 most cited articles in fracture surgery. Am J Orthopedics (Belle Mead, NJ) 2013;42:547–52.
[25] Teixeira MC, Thomaz SM, Michelan TS, Mormul RP, Meurer T, Fasolli JV, et al. Incorrect citations give unfair credit to review authors in ecology journals. PLoS One 2013;8:e81871.
[26] Seglen PO. Why the impact factor of journals should not be used for evaluating research. BMJ (Clin Res Ed) 1997;314:498–502.