

The most-cited articles in dental, oral, and maxillofacial traumatology during 64 years

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Abstract – Background and aim: Citation analysis helps to identify the research trends within a research field and helps to identify the most frequently occurring parameters. The aim of this study was to identify the 100 most-cited articles in the field of dental, oral, and maxillofacial traumatology over the past 64 years. **Material and methods:** A comprehensive list of the most-cited articles in dental, oral, and maxillofacial trauma was compiled using ‘All Databases’ section of the ISI Web of Knowledge. Related articles were considered to be those articles in which part or all of the experiment or study was related to dental and/or oral and maxillofacial trauma. In case reports, if a part of a treatment plan was related to the topic, that article was considered to be relevant. The characteristics analyzed included number of citations, authors, journals, institution, country of origin, publication year, article type, study material, and topic. **Results:** The number of citations for each article ranged from 69 to 229. The journal *Dental Traumatology* was the most represented, followed by the journal *Oral and Maxillofacial Surgery*. Of the 100 articles, 83% were original articles, 15% were review articles, and 2% were case report/case series. Therapy and prognosis-related topics were the most common topics. Most articles came from institutions in the United States, followed by the Scandinavian countries. University Hospital of Copenhagen was the source of the highest number (34) of the most-cited articles; the same author wrote or co-wrote 22 of the 100 most-cited articles. **Conclusion:** The list of most-cited articles in the field of dental, oral, and maxillofacial traumatology gives a good scientometric picture of trauma research in the world. A large number of the most-cited articles are mainly from the field of dental traumatology and originate from a few research teams.

Citation analysis uses citation data to assess the impact of studies and articles, as illustrated by the number of references, a published article receives during a certain period of time (1). This analysis helps to identify research trends within the topic, and to pinpoint the most frequently occurring parameters, such as active authors, journal profiles, and other parameters (2). Although citation rates reflect the impact of an article on the scientific community, they do not necessarily reflect the quality of the article (3).

In 1987, Eugene Garfield, an American pioneer in the field of scientometry, cataloged citation ‘classics’ (studies that had been cited more than 100, and in some cases more than 400, times) from the *Journal of the American Medical Association* (4). Since then, this kind of analysis has been executed in various fields of medicine, including orthopedics (5), critical care (6), ophthalmology (7), dermatology (8), urology (9), anesthesiology (10), general surgery (11), and pain (12). In the field of dentistry, however, such assessment has been performed only in periodontology (13), endodontics (14), orthodontics (15), and general dentistry (16). To the author’s knowledge, there has been no such analysis for traumatology in the oral and maxillofacial field.

The aim of this work was to identify the most-cited articles in this field published over the past 64 years and to analyze the characteristics, including number of citations, authors, journals, institution, country of origin, publication year, article type, study material, and topic. The results can reveal useful and interesting information about scientific progress in the field of dental, oral, and maxillofacial trauma.

Materials and methods

To develop the list of most-cited articles in the field of dental, oral, and maxillofacial trauma published between January 1950 and May 2014, the search strategy was conducted in a predetermined manner (Box 1). This search used the ‘All Databases’ section of the ‘ISI Web of Knowledge’ database (<http://www.isiwebofknowledge.com>). Because some articles related to the dental, oral, and maxillofacial trauma may have been published in journals that were not necessarily detectable in the subgroup of ‘Dentistry, Oral Surgery & Medicine’ of the Journal Citation Report (JCR) was not confined to dental journals listed but all MEDLINE indexed journals in JCR.

Box 1. Search Strategy [Key Words for Search in Topic (Including Title, Abstract, and Keywords of Articles)]

Topic = (tooth OR teeth OR dent* OR odont* OR mouth OR oral OR facial OR maxill* OR mandib* OR alveol* OR Periodont* OR incis* OR canin* OR pre \$molar\$ OR molar\$ OR cuspid* OR bicuspid*) AND Topic = (trauma* OR injur* OR intrud* OR extrusi* OR extrud* OR avuls* OR ex\$articulation\$ OR luxat* OR fractur* OR fragment* OR lacerat* OR subluxat* OR concus* OR re\$plant* OR re\$implant* OR crack* OR splint* OR reduct* OR mouth\$guard OR (storage med*) OR ankylos* OR mobil*)

Searching by keywords yielded 845 902 articles, as shown in Box 1. All of the articles, listed in order of number of times cited (highest to lowest), were precisely and independently assessed by two experts (H. J. and A. S.) regarding their relevancy to the topic. In case of disagreement between these two experts, a third colleague (N. D.) was asked to give her opinion. Related articles were considered to be those articles in which part or all of the experiment or study was related to dental and/or oral and maxillofacial trauma. In case reports, if a part of a treatment plan was related to the topic, that article was considered to be relevant.

After these assessments, articles that were not relevant to dental, oral, and maxillofacial trauma were removed. Excluding duplicates and irrelevant articles yielded the 100 most-cited articles. These articles were then analyzed regarding the number of citations, authors, institution, country of origin, journals, publication year, article type, study material, and topic.

After identifying the list of most-cited articles using the 'All Databases' section of the 'ISI Web of Knowledge' database, the citations of these articles were determined. Web of Science, Google Scholar, and Scopus databases were used for further comparing.

Results

Only four papers required review by an independent colleague, the details of the search are shown in Flowchart 1. The 100 most-cited articles are presented in descending order according to their citation counts in Table 1. The most-cited article (using the 'All Databases' section of the 'ISI Web of Knowledge' database) was cited 229 times.

Journals and publication year

The articles came from 33 distinct journals (Table 2). Most articles were published in journals related to dentistry, oral and maxillofacial surgery, and plastic surgery. The journal with the most trauma articles was *Dental Traumatology* (22%) (The journal changed its name from *Endodontics & Dental Traumatology* in 2001; results for articles under the name were included in the totals). The second rank was for the *Journal of Oral and Maxillofacial Surgery* (9%), *International Journal of Oral Surgery* (6%), and the journal *Oral Surgery, Oral Medi-*

cine, Oral Pathology, Oral Radiology, and Endodontology accounted for 5%. *Plastic and Reconstructive Surgery*, a solely medical journal, accounted for 5%. A few of the 100 most-cited articles were published in other, solely medical, journals such as *British Medical Journal, British Journal of Plastic Surgery, Journal of the American Medical Association, Journal of Trauma-Injury, Infection and Critical Care, Accident Analysis and Prevention, American Journal of Sports Medicine, Archives of Otolaryngology-Head & Neck Surgery, Journal of Cranio-Maxillofacial Surgery*, and *Accident Analysis and Prevention*. None of these journals reached higher than 2%.

The most-cited articles related to the topic were published from 1952 to 2007. The years 1990 and 1996 were the dates with the greatest number of most-cited articles ($n = 6$ for each one), followed by 1985 and 1999 ($n = 5$ for each one).

Authors, centers/institutes, and countries of origin

Authors of the most-cited articles are shown in Table 3. One author participated in 22 of the 100 most-cited articles. For calculating the participation in an article, all co-authors of the article were included.

The center/institute with the highest number of most-cited articles was University Hospital of Copenhagen in Denmark (Table 4).

The most frequent countries of origin were United States (32%); Denmark (24%), and Sweden (17%) (Table 5).

Methodological variables

Most of the top-cited articles (83%) were original research, whereas 15% were review/meta-analysis and 2% were case report/case series. Articles regarding the classification of traumatic injuries (two articles) and guidelines for the treatment of traumatic injuries (also two articles) were considered to be review articles.

Table 6 indicates the study material of the most-cited articles. Patients were the study material in 76% of the most-cited articles, whereas 9% were animal studies and 3% were *in vitro/ex vivo* studies.

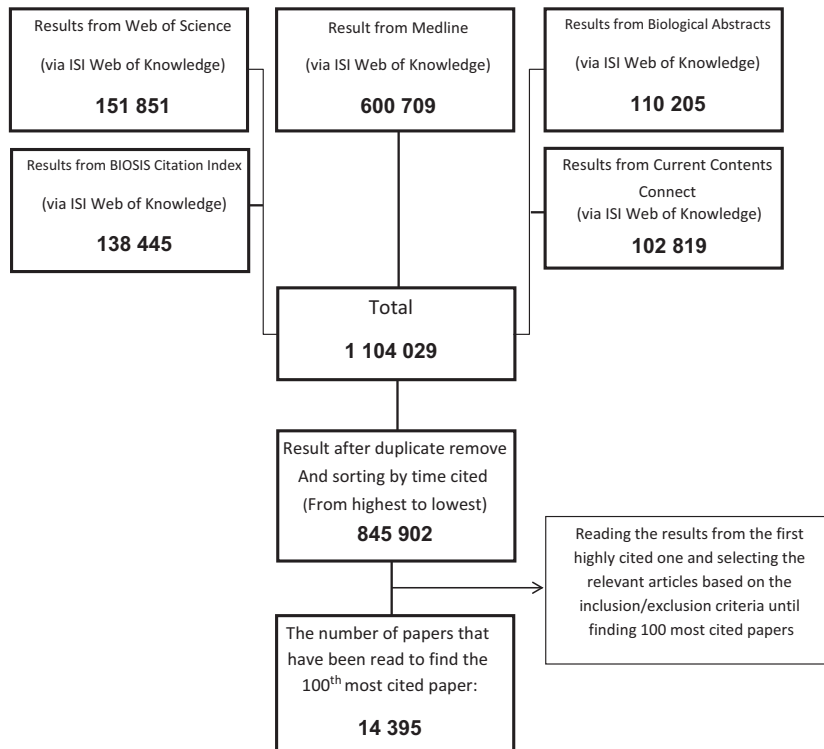
Regarding the topic of the most-cited articles, 31% were related to therapy and another 31% were related to prognosis (Table 7).

Article disciplines and kinds of tissues affected by trauma

Dental trauma was the topic of 57 articles, whereas oral and maxillofacial trauma was the topic of 43 articles, showing that dental trauma is discussed more often than the latter among the most-cited 100 articles. Oral and maxillofacial trauma consisted of 30 articles on bone fractures and 13 on soft-tissue injuries.

Discussion

The results of the present study show that the research activities in the field of dental, oral, and maxillofacial traumatology have mainly been focused on dental traumatology. The finding that a majority of the articles



Flowchart 1. The details of the search.

have been published in one journal is not surprising; it simply indicates that there is only journal solely devoted to publications on dental, oral, and maxillofacial trauma. Another finding of this study was the huge impact from a select few centers doing most of the research in this field. There is a need for more centers doing research in this field around the world and for global cooperation in multicenter studies where criteria for registration and the setting of core outcome goals are defined. The International Association of Dental Traumatology has recently taken important initiatives in this direction (www.iadt-dentaltrauma.org).

The number of citations is one way to measure the impact of research. If an article has great value to others, it will usually be cited in subsequent articles related to its topic. In this way, the number of citations of an important, recognized, and prestigious article is increased. Tracking the number of citations can be achieved by various databases, including the ISI Web of Knowledge, Web of Science, Scopus, Google Scholar, and others (10, 17–22). Because there seems to be no published data regarding the most-cited articles in the field of dental, oral, and maxillofacial trauma, the main aim of this study was to find and evaluate related journals and articles and to assess the major parameters. Analysis of these articles provides a historical perspective on scientific progress in the field of dental, oral, and maxillofacial trauma and shows the trends in the research in this field. It can take decades for the number of citations for an article to build up to a high value; for this reason, one must be aware of the historical perspective when interpreting the results. The results should therefore be seen as the identification of articles that have become ‘classic’ in the trauma field

over the past decades. Publications in the last 10 years have little chance of reaching the list of the top 100 most-cited articles. In spite of this challenge, 14 of the articles were written during the last decade. For example, rank 14 in Table 1 is held by an article published in 2007, but it has been cited 146 times in only 7 years. This emphasizes the effect of an article’s topic on the number of times it is cited (11, 14, 18). In recent decades, there has been research published from new trauma research centers and from countries that were not previously represented on the most-cited list, so the picture will most likely change in the future depending on geographically related research activities. However, this will take some time before the number of citations will reach high enough citations to be listed on the top 100 list.

The top 100 most-cited articles in the field of dental, oral, and maxillofacial trauma were cited between 69 and 229 times when the assessment was performed using the criterion ‘All Databases’ of the ISI Web of Knowledge. This number varied, however, when other databases were used: it varied between 20 and 269 times using SCOPUS, between 70 and 218 times using Web of Science, and between 67 and 473 times using Google Scholar. The variation in the results obtained by various databases shows that the selection of database in scientometry is very important for obtaining valuable results. Scopus currently only measures citations starting in 1996, which is a major deficiency for determining the most-cited articles, although it plans in the near future to extend citation-counting to earlier than 1996. Google Scholar includes in its list of citations in books, dissertations, and other works, in addition to scientific articles, which may be a weakness

Table 1. The 100 most-cited articles in dental, oral, and maxillofacial traumatology

Rank	Article	No. of citations by All Databases of the ISI Web of Knowledge	No. of citations by Web of Science	No. of citations by SCOPUS	No. of citations by Google Scholar
1	Andreasen, JO, et al. (1995). 'Replantation of 400 avulsed permanent incisors .4. Factors related to periodontal-ligament healing'. <i>Endodontics & Dental Traumatology</i> 11 (2): 76–89.	229	218	269	455
2	Andreasen, JO, Ravn JJ (1972). 'Epidemiology of traumatic dental injuries to primary and permanent teeth in a Danish population sample'. <i>International Journal of Oral Surgery</i> 1 (5): 235–239.	224	218	242	413
3	Andreasen, JO (1970). 'Etiology and pathogenesis of traumatic dental injuries. A clinical study of 1,298 cases'. <i>Scandinavian Journal of Dental Research</i> 78(4): 329–342.	217	213	226	473
4	Tronstad, L (1988). 'Root resorption – etiology, terminology and clinical manifestations'. <i>Endodontics & Dental Traumatology</i> 4(6): 241–252.	202	196	226	396
5	Andreasen, JO, Hjørtting-Hansen E (1966). 'Replantation of teeth. I. Radiographic and clinical study of 110 human teeth replanted after accidental loss'. <i>Acta Odontologica Scandinavica</i> 24(3): 263–286.	200	199	118	404
6	Ellis E, et al. (1985). '10 years of mandibular fractures – an analysis of 2,137 cases'. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics</i> 59(2): 120–129.	200	197	Not found	388
7	Andreasen JO. (1981). 'effect of extra-alveolar period and storage media upon periodontal and pulpal healing after replantation of mature permanent incisors in monkeys'. <i>International Journal of Oral Surgery</i> 10(1): 43–53.	183	176	162	331
8	Zide MF, Kent JN (1983). 'Indications for open reduction of mandibular condyle fractures'. <i>Journal of Oral and Maxillofacial Surgery</i> 41(2): 89–98.	169	156	128	344
9	Trabert KC, et al. (1978). 'Tooth fracture—a comparison of endodontic and restorative treatments'. <i>Journal of Endodontics</i> 4(11): 341–345.	165	161	119	293
10	Gassner R, et al. (2003). 'Cranio-maxillofacial trauma: a 10 year review of 9543 cases with 21067 injuries'. <i>Journal of Cranio-Maxillofacial Surgery</i> 31(1): 51–61.	162	151	Not found	354
11	Frank AL (1966). 'Therapy for divergent pulpless tooth by continued apical formation'. <i>Journal of the American Dental Association</i> 72(1): 87–93.	153	149	119	354
12	Cvek M (1992). 'Prognosis of luxated nonvital maxillary incisors treated with calcium hydroxide and filled with gutta-percha – a retrospective clinical-study'. <i>Endodontics & Dental Traumatology</i> 8(2): 45–55.	150	145	Not found	318
13	Andreasen JO, Kristerson L (1981). 'The effect of limited drying or removal of the periodontal-ligament – periodontal healing after replantation of mature permanent incisors in monkeys'. <i>Acta Odontologica Scandinavica</i> 39(1): 1–13.	148	145	128	286
14	Flores MT, et al. (2007). 'Guidelines for the management of traumatic dental injuries. II. Avulsion of permanent teeth'. <i>Dental Traumatology</i> 23(3): 130–136.	146	138	160	268
15	Andreasen, JO (1975). 'Effect of splinting upon periodontal healing after replantation of permanent incisors in monkeys'. <i>Acta Odontologica Scandinavica</i> 33(6): 313–323.	145	144	70	233
16	Getter L, et al. (1972). 'Biodegradable intraosseous appliance in treatment of mandibular fractures'. <i>Journal of Oral Surgery</i> 30(5): 344–348.	144	141	75	245
17	Grippio JO (1991). 'Abfractions: a new classification of hard tissue lesions of teeth'. <i>Journal of Esthetic Dentistry</i> 3(1): 14–19.	143	139	171	315
18	Andreasen FM, Pedersen BV (1985). 'Prognosis of luxated permanent teeth the development of pulp necrosis'. <i>Endodontics and Dental Traumatology</i> 1(6): 207–220.	142	138	161	262

Table 1. Continued

Rank	Article	No. of citations by All Databases of the ISI Web of Knowledge	No. of citations by Web of Science	No. of citations by SCOPUS	No. of citations by Google Scholar
19	Haug RH, et al. (1990). 'An epidemiologic survey of facial fractures and concomitant injuries'. <i>Journal of Oral and Maxillofacial Surgery</i> 48(9): 926–932.	141	136	165	295
20	Andreasen JO, Hjorting-Hansen E (1966). 'Replantation of teeth. II. Histological study of 22 replanted anterior teeth in humans'. <i>Acta Odontologica Scandinavica</i> 24(3): 287–306.	135	133	59	240
21	Cawood JI (1985). 'Small plate osteosynthesis of mandibular fractures'. <i>British Journal of Oral & Maxillofacial Surgery</i> 23(2): 77–91.	131	127	78	228
22	Andreasen, JO, et al. (1990). 'A long-term study of 370 autotransplanted premolars .2. Tooth survival and pulp healing subsequent to transplantation'. <i>European Journal of Orthodontics</i> 12(1): 14–24.	130	128	133	226
23	Cvek M (1978). 'A clinical report on partial pulpotomy and capping with calcium hydroxide in permanent incisors with complicated crown fracture'. <i>Journal of Endodontics</i> 4(8): 232–237.	130	129	122	273
24	Andreasen, JO, et al. (1990). 'A long-term study of 370 autotransplanted premolars .3. Periodontal healing subsequent to transplantation'. <i>European Journal of Orthodontics</i> 12(1): 25–37.	129	126	126	210
25	Kujala UM, et al. (1995). 'Acute injuries in soccer, ice hockey, volleyball, basketball, judo, and karate – analysis of national registry data'. <i>British Medical Journal</i> 311(7018): 1465–1468.	127	121	141	223
26	Attewell RG, et al. (2001). 'Bicycle helmet efficacy: a meta-analysis'. <i>Accident Analysis and Prevention</i> 33(3): 345–352.	118	120	139	236
27	Stenvik A, Mjor IA (1970). 'Pulp and dentine reactions to experimental tooth intrusion – a histologic study of initial changes'. <i>American Journal of Orthodontics</i> 57(4): 370–385.	115	117	82	207
28	Olson RA, et al. (1982). 'Fractures of the mandible – a review of 580 cases'. <i>Journal of Oral and Maxillofacial Surgery</i> 40(1): 23–28.	115	123	99	263
29	Ingber JS. (1976). 'Forced eruption .2. Method of treating nonrestorable teeth – periodontal and restorative considerations'. <i>Journal of Periodontology</i> 47(4): 203–216.	115	118	79	204
30	Andreasen JO, et al. (1995). 'Replantation of 400 avulsed permanent incisors .1. Diagnosis of healing complications'. <i>Endodontics & Dental Traumatology</i> 11(2): 51–58.	114	121	147	191
31	Byers MR, Narhi MVO (1999). 'Dental injury models: Experimental tools for understanding neuroinflammatory interactions and polymodal nociceptor functions'. <i>Critical Reviews in Oral Biology & Medicine</i> 10(1): 4–39.	111	112	115	180
32	Manson PN, et al. (1985). 'Midface fractures – advantages of immediate extended open reduction and bone-grafting'. <i>Plastic and Reconstructive Surgery</i> 76(1): 1–10.	108	110	74	209
33	Bastone EB, et al. (2000). 'Epidemiology of dental trauma: A review of the literature'. <i>Australian Dental Journal</i> 45(1): 2–9.	108	113	144	227
34	Murray PE, et al. (2007). 'Regenerative endodontics: A review of current and a call for action'. <i>Journal of Endodontics</i> 33(4): 377–390.	107	111	152	247
35	Andreasen JO, et al. (1995). 'Replantation of 400 avulsed permanent incisors .2. Factors related to pulpal healing'. <i>Endodontics & Dental Traumatology</i> 11(2): 59–68.	104	106	131	198
36	James RB, et al. (1981). 'Prospective-study of mandibular fractures'. <i>Journal of Oral Surgery</i> 39(4): 275–281.	104	105	68	173
37	Ellis E, Dean J (1993). 'Rigid fixation of mandibular condyle fractures'. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics</i> 76(1): 6–15.	104	105	107	180

Table 1. Continued

Rank	Article	No. of citations by All Databases of the ISI Web of Knowledge	No. of citations by Web of Science	No. of citations by SCOPUS	No. of citations by Google Scholar
38	Andreasen JO (1981). 'Periodontal healing after replantation and auto-transplantation of incisors in monkeys'. <i>International Journal of Oral Surgery</i> 10(1): 54–61.	103	105	82	188
39	Tessier P (1973). 'The conjunctival approach to the orbital floor and maxilla in congenital malformation and trauma'. <i>Journal of Maxillofacial Surgery</i> 1(1): 3–8.	103	105	59	157
40	MacLennan WD (1952). 'Consideration of 180 cases of typical fractures of the mandibular condylar process'. <i>British journal of plastic surgery</i> 5(2): 122–128.	103	108	133	193
41	Marcenes W, et al. (1999). 'Epidemiology of traumatic injuries to the permanent incisors of 9–12-year-old schoolchildren in Damascus, Syria'. <i>Endodontics & Dental Traumatology</i> 15(3): 117–123.	102	105	114	195
42	Gruss JS, Mackinnon SE (1986). 'Complex maxillary fractures – role of buttress reconstruction and immediate bone-grafts'. <i>Plastic and Reconstructive Surgery</i> 78(1): 9–22.	102	105	80	190
43	Ravn JJ (1974). 'Dental injuries in Copenhagen schoolchildren, school years 1967–1972'. <i>Community Dentistry and Oral Epidemiology</i> 2(5): 231–245.	99	100	82	158
44	Andreasen JO (1980). 'A time-related study of periodontal healing and root resorption activity after replantation of mature permanent incisors in monkeys'. <i>Swedish Dental Journal</i> 4(3): 101–110.	98	98	71	181
45	Cortes MID, et al. (2002). 'Impact of traumatic injuries to the permanent teeth on the oral health-related quality of life in 12–14-year-old children'. <i>Community Dentistry and Oral Epidemiology</i> 30(3): 193–198.	97	99	61	203
46	Lindahl L, Hollender L (1977). 'Condylar fractures of mandible .2. Radiographic study of remodeling processes in temporomandibular-joint'. <i>International Journal of Oral Surgery</i> 6(3): 153–165.	97	100	70	164
47	Flores MT, et al. (2007). 'Guidelines for the management of traumatic dental injuries. I. Fractures and luxations of permanent teeth'. <i>Dental Traumatology</i> 23(2): 66–71.	96	101	112	207
48	Cameron MH, et al. (1994). 'Mandatory bicycle helmet use following a decade of helmet promotion in Victoria, Australia – an evaluation'. <i>Accident Analysis and Prevention</i> 26(3): 325–337.	95	95	96	176
49	Andreasen JO (1970). 'Luxation of permanent teeth due to trauma. A clinical and radiographic follow-up study of 189 injured teeth'. <i>Scandinavian Journal of Dental Research</i> 78(3): 273–286.	95	98	80	206
50	Posnick JC, et al. (1993). 'Pediatric facial fractures – evolving patterns of treatment'. <i>Journal of Oral and Maxillofacial Surgery</i> 51(8): 836–844.	94	103	121	221
51	Proffit WR, et al. (1980). 'Early fracture of the mandibular condyles – frequently an unsuspected cause of growth disturbances'. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> 78(1): 1–24.	94	96	78	178
52	Rafter M (2005). 'Apexification: a review'. <i>Dental Traumatology</i> 21(1): 1–8.	92	102	132	278
53	Dahlstrom L, et al. (1989). '15 years follow-up on condylar fractures'. <i>International Journal of Oral and Maxillofacial Surgery</i> 18(1): 18–23.	91	94	81	67
54	Trope M (2002). 'Clinical management of the avulsed tooth: Present strategies and future directions'. <i>Dental Traumatology</i> 18(1): 1–11.	90	91	110	188
55	Czochrowska EM, et al. (2002). 'Outcome of tooth transplantation: Survival and success rates 17–41 years posttreatment'. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> 121(2): 110–119.	90	92	105	178

Table 1. Continued

Rank	Article	No. of citations by All Databases of the ISI Web of Knowledge	No. of citations by Web of Science	No. of citations by SCOPUS	No. of citations by Google Scholar
56	Andreasen JO, Hjorting E (1967). 'Intraalveolar root fractures – radiographic and histologic study of 50 cases'. <i>Journal of Oral Surgery</i> 25(5): 414–426.	88	91	85	190
57	Worsaae N, Thorn JJ (1994). 'Surgical versus nonsurgical treatment of unilateral dislocated low subcondylar fractures – a clinical-study of 52 cases'. <i>Journal of Oral and Maxillofacial Surgery</i> 52(4): 353–360.	87	93	92	156
58	Kling M, et al. (1986). 'Rate and predictability of pulp revascularization in therapeutically reimplanted permanent incisors'. <i>Endodontics and Dental Traumatology</i> 2(3): 83–89.	85	86	101	173
59	Trope M, Friedman S (1992). 'Periodontal healing of replanted dog teeth stored in viaspan, milk and hank balanced salt solution'. <i>Endodontics & Dental Traumatology</i> 8(5): 183–188.	84	88	96	166
60	Heithersay GS (1973). 'Combined endodontic-orthodontic treatment of transverse root fractures in region of alveolar crest'. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics</i> 36(3): 404–415.	84	85	55	186
61	Lorentzon R, et al. (1988). 'Incidence, nature, and causes of ice hockey injuries – a 3-year prospective-study of a swedish elite ice hockey team'. <i>American Journal of Sports Medicine</i> 16(4): 392–396.	84	84	90	139
62	Fuss Z, et al. (2003). 'Root resorption – diagnosis, classification and treatment choices based on stimulation factors'. <i>Dental Traumatology</i> 19(4): 175–182.	84	89	103	230
63	Kaban LB, et al. (1977). 'Facial fractures in children – analysis of 122 fractures in 109 patients'. <i>Plastic and Reconstructive Surgery</i> 59(1): 15–20.	83	88	69	168
64	Ellis E, Walker LR (1996). 'Treatment of mandibular angle fractures using one noncompression miniplate'. <i>Journal of Oral and Maxillofacial Surgery</i> 54(7): 864–871.	81	86	94	161
65	Andreasen JO, et al. (2002). 'Effect of treatment delay upon pulp and periodontal healing of traumatic dental injuries – a review article'. <i>Dental Traumatology</i> 18(3): 116–128.	80	84	97	147
66	Glendor U, et al. (1996). 'Incidence of traumatic tooth injuries in children and adolescents in the county of Vastmanland, Sweden'. <i>Swedish Dental Journal</i> 20(1–2): 15–28.	80	81	89	129
67	McGraw BL, Cole RR (1990). 'Pediatric maxillofacial trauma – age-related variations in injury'. <i>Archives of Otolaryngology-Head & Neck Surgery</i> 116(1): 41–45.	80	83	85	148
68	Luce EA, et al. (1979). 'Review of 1,000 major facial fractures and associated injuries'. <i>Plastic and Reconstructive Surgery</i> 63(1): 26–30.	79	81	55	141
69	Kaste LM, et al. (1996). 'Prevalence of incisor trauma in persons 6 to 50 years of age: United States, 1988–1991'. <i>Journal of Dental Research</i> 75: 696–705.	79	79	87	123
70	Lindahl L (1977). 'Condylar fractures of mandible .1. Classification and relation to age, occlusion, and concomitant injuries of teeth and teeth-supporting structures, and fractures of mandibular body'. <i>International Journal of Oral Surgery</i> 6(1): 12–21.	79	81	72	173
71	Gomez E, et al. (1996). 'Incidence of injury in Texas girls' high school basketball'. <i>American Journal of Sports Medicine</i> 24(5): 684–687.	79	81	92	138
72	Malmgren O, et al. (1982). 'Root resorption after orthodontic treatment of traumatized teeth'. <i>American Journal of Orthodontics and Dentofacial Orthopedics</i> 82(6): 487–491.	79	84	88	196
73	Walker RV (1960). 'Traumatic mandibular condylar fracture dislocations. Effect on growth in the <i>Macaca rhesus</i> monkey'. <i>American Journal of Surgery</i> 100: 850–863.	78	79	33	117

Table 1. Continued

Rank	Article	No. of citations by All Databases of the ISI Web of Knowledge	No. of citations by Web of Science	No. of citations by SCOPUS	No. of citations by Google Scholar
74	Cvek M, et al. (1990). 'Effect of topical application of doxycycline on pulp revascularization and periodontal healing in reimplanted monkey incisors'. <i>Endodontics & Dental Traumatology</i> 6(4): 170–176.	78	84	90	151
75	Buonocor MG, Davila J (1973). 'Restoration of fractured anterior teeth with ultraviolet-light polymerized bonding materials – new technique'. <i>Journal of the American Dental Association</i> 86(6): 1349–1354.	77	77	20	89
76	Tessier P. (1971). 'Total osteotomy of middle third of face for faciostenosis or for sequelae of le fort-iii fractures'. <i>Plastic and Reconstructive Surgery</i> 48(6): 533–541.	76	77	22	103
77	McDermott FT, et al. (1993). 'The effectiveness of bicyclist helmets – a study of 1710 casualties'. <i>Journal of Trauma-Injury Infection and Critical Care</i> 34(6): 834–845.	76	77	80	135
78	Andreasen FM, et al. (1989). 'Prognosis of root-fractured permanent incisors – prediction of healing modalities'. <i>Endodontics & Dental Traumatology</i> 5(1): 11–22.	75	80	86	158
79	Takenoshita Y, et al. (1990). 'Comparison of functional recovery after nonsurgical and surgical-treatment of condylar fractures'. <i>Journal of Oral and Maxillofacial Surgery</i> 48(11): 1191–1195.	74	78	68	131
80	Vanhoof RF, et al. (1977). 'Different patterns of fractures of facial skeleton in 4 European countries'. <i>International Journal of Oral Surgery</i> 6(1): 3–11.	74	78	53	131
81	Gher ME, et al. (1987). 'Clinical survey of fractured teeth'. <i>Journal of the American Dental Association</i> 114(2): 174–177.	73	74	64	133
82	Hiltz J, Trope M (1991). 'Vitality of human lip fibroblasts in milk, hanks balanced salt solution and viaspan storage media'. <i>Endodontics & Dental Traumatology</i> 7(2): 69–72.	73	76	78	144
83	Olgart L, et al. (1988). 'Laser Doppler flowmetry in assessing vitality in luxated permanent teeth'. <i>International Endodontic Journal</i> 21(5): 300–306.	73	74	74	114
84	Iizuka T, et al. (1991). 'Infection after rigid internal-fixation of mandibular fractures – a clinical and radiologic study'. <i>Journal of Oral and Maxillofacial Surgery</i> 49(6): 585–593.	73	74	61	115
85	Haug RH, Foss J (2000). 'Maxillofacial injuries in the pediatric patient'. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics</i> 90(2): 126–134.	72	77	106	200
86	Zerman N, Cavalleri G (1993). 'Traumatic injuries to permanent incisors'. <i>Endodontics & Dental Traumatology</i> 9(2): 61–64.	71	73	85	128
87	Bochlogyros PN (1985). 'A retrospective study of 1,521 mandibular fractures'. <i>Journal of Oral and Maxillofacial Surgery</i> 43(8): 597–599.	71	72	46	132
88	Barrett EJ, Kenny DJ (1997). 'Avulsed permanent teeth: a review of the literature and treatment guidelines'. <i>Endodontics & Dental Traumatology</i> 13(4): 153–163.	71	74	96	176
89	Andreasen JO, Ravn JJ (1971). 'The effect of traumatic injuries to primary teeth on their permanent successors part 2 a clinical and radiographic follow-up study of 213 teeth'. <i>Scandinavian Journal of Dental Research</i> 79(4): 284–294.	71	72	61	129
90	Thompson DC, et al. (1996). 'Effectiveness of bicycle safety helmets in preventing serious facial injury'. <i>Jama-Journal of the American Medical Association</i> 276(24): 1974–1975.	71	74	77	113
91	Borum MK, Andreasen JO (1998). 'Sequelae of trauma to primary maxillary incisors. I. Complications in the primary dentition'. <i>Endodontics & Dental Traumatology</i> 14(1): 31–44.	71	74	95	154

Table 1. Continued

Rank	Article	No. of citations by All Databases of the ISI Web of Knowledge	No. of citations by Web of Science	No. of citations by SCOPUS	No. of citations by Google Scholar
92	Andreasen JO, et al. (1971). 'The effect of traumatic injuries to primary teeth on their permanent successors part 1 a clinical and histologic study of 117 injured permanent teeth'. <i>Scandinavian Journal of Dental Research</i> 79(4): 219–283.	71	72	62	129
93	Iida S, et al. (2001). 'Retrospective analysis of 1502 patients with facial fractures'. <i>International Journal of Oral and Maxillofacial Surgery</i> 30(4): 286–290.	71	75	97	178
94	Petti S, Tarsitani G (1996). 'Traumatic injuries to anterior teeth in Italian schoolchildren: Prevalence and risk factors'. <i>Endodontics & Dental Traumatology</i> 12(6): 294–297.	71	72	83	144
95	Ellis E (1999). 'Treatment methods for fractures of the mandibular angle'. <i>International Journal of Oral and Maxillofacial Surgery</i> 28(4): 243–252.	71	75	80	154
96	Benson BW, et al. (1999). 'Head and neck injuries among ice hockey players wearing full face shields vs half face shields'. <i>Jama-Journal of the American Medical Association</i> 282(24): 2328–2332.	71	71	85	105
97	Hussain K, et al. (1994). 'A comprehensive analysis of craniofacial trauma'. <i>Journal of Trauma-Injury Infection and Critical Care</i> 36(1): 34–47.	71	75	95	157
98	Kroon FHM, et al. (1991). 'The use of miniplates in mandibular fractures – an invitro study'. <i>Journal of Cranio-Maxillofacial Surgery</i> 19(5): 199–204.	70	75	67	158
99	Hagan EH, Huelke DF (1961). 'An analysis of 319 case reports of mandibular fractures'. <i>Journal of Oral Surgery, Anesthesia, and Hospital Dental Service</i> 19: 93–104.	69	70	Not found	127
100	Gassner R, et al. (1999). 'Prevalence of dental trauma in 6000 patients with facial injuries – Implications for prevention'. <i>Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontology</i> 87(1): 27–33.	69	71	90	143

Table 2. Journals in which most-cited articles were published

Journal name	Number of articles
<i>Dental Traumatology</i> (Previous name: <i>Endodontics & Dental Traumatology</i>)	22
<i>Journal of Oral and Maxillofacial Surgery</i>	9
<i>International Journal of Oral Surgery</i>	6
<i>Plastic and Reconstructive Surgery</i>	5
<i>Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology</i>	5
<i>Scandinavian Journal of Dental Research</i>	4
<i>American Journal of Orthodontics and Dentofacial Orthopedics</i> (Previous name: <i>American Journal of Orthodontics</i>)	4
<i>Acta Odontologica Scandinavica</i>	4
<i>Journal of Oral Surgery</i>	3
<i>Journal of the American Dental Association</i>	3
<i>International Journal of Oral and Maxillofacial Surgery</i>	3
<i>Journal of Endodontics</i>	3
<i>Other journals</i>	20

if scientific value is going to be judged; the results of this database should therefore be regarded with some precautions. In this study, the 'All Databases' section

Table 3. Authors of the 100 most-cited articles (including all coauthors of an article)

Author	Number of 100 most-cited articles
Andreasen JO	22
Andreasen FM	5
Trope M	5
Borum MK	4
Cvek M	4
Ellis E 3rd	4
Andersson L	3
Jacobsen HL	3
Lindahl L	3
Schwartz O	3
Ravn JJ	3
Others	41 (Collectively)

of the ISI Web of Knowledge was selected as the main database because it can measure citations in scientific articles in a vast span of time between 1950 and today. All Databases of the ISI Web of Knowledge include Web of Science Core Collection, Biological Abstract, Biosis Citation Index, Current Content Connect, Data Citation Index, Derwent Innovation Index, FSTA—the food science resource, Inspec, KCI-Korean Journal Database, MEDLINE, SciELO Citation Index, and Zoological Record. However, only Web of Science

Table 4. The centers/institutes with most-cited articles

Institute name	Number of articles
University Hospital of Copenhagen, Denmark	34
Karolinska Institute, Sweden	6
University of Texas, USA	6
University of North Carolina, USA	4
Eastman Institute, Sweden	4
University of Toronto, Canada	3
Albert Einstein Medical Center, USA	2

Table 5. Country of origin of 100 most-cited articles

Country	Number of articles
USA	32
Denmark	24
Sweden	17
Australia	5
Canada	4
England	4
Finland	3
Switzerland	3
Austria	2
Chile	2
Others	4 (Collectively)

Core Collection, Biological Abstract, Biosis Citation index, Current Content Connect, and MEDLINE found articles and other databases had no founded article. The above databases are not dependent to a special language; however, all of the 100 most-cited articles were in English.

The mean citation in the field of dental/jaw trauma is lower than the rates observed in most other medical fields. This indicates that the dental, oral, and maxillofacial research field is comparatively small. Dental trauma research has been a more active field than has research in oral and maxillofacial trauma. This situation can easily change, since so few researchers in the world are active in this field, with the majority of publications driven by a select few individuals and institutions.

In this study, similarly to results found in most other studies (6, 12, 14), the majority of the most-cited articles originated from the institutions in the United States, which relates both to the size of the country and to the high number of institutions and research centers there. In spite of the small populations of the Scandinavian countries, researchers in those countries have shown a comparatively high level of activity in dental, oral, and maxillofacial trauma research during the study period.

Besides the aforementioned time delay in citations, there are other limitations in this type of study that should be discussed. For example, using a broad search strategy, more than 25 000 articles were retrieved that required manual review by the researchers to remove those articles that did not focus on the topic at hand. This manual review process may have resulted in personal bias, which could have an impact on the final data gathered. Other limitations are those related to

Table 6. Study material of most-cited articles

Study material	Number of articles
Patients	76
Animals (ranks number 7, 13, 15, 16, 38, 44, 59, 73, and 74)	9
<i>In vitro/Ex vivo</i> (ranks number 31, 82, and 98)	3
Not applicable (ranks number 4, 8, 9, 11, 14, 17, 29, 34, 47, 52, 62, and 70)	12

Table 7. Topic of most-cited articles

Topic	Number of articles
Therapy (ranks number 7, 8, 9, 11, 13, 15, 16, 21, 23, 29, 32, 37, 39, 42, 44, 50, 51, 52, 54, 57, 58, 60, 64, 74, 75, 76, 84, 88, 95, 98, and 99)	31
Prognosis (ranks number 1, 5, 6, 10, 12, 18, 20, 22, 24, 27, 35, 36, 38, 45, 46, 49, 53, 55, 59, 65, 67, 72, 73, 78, 79, 82, 89, 91, 92, 93, and 94)	31
Epidemiology (ranks number 2, 19, 25, 33, 40, 41, 43, 56, 61, 63, 66, 68, 69, 70, 71, 80, 81, 87, and 97)	19
Prevention (ranks number 26, 48, 77, 90, 96, and 100)	6
Diagnosis (ranks number 30, 62, and 83)	3
Pathogenesis (ranks number 3 and 4)	2
Combined (ranks number 14, 17, 28, 31, 34, 47, 85, and 86)	8

the self-citations (where authors cite their own work), or articles from journals publishing their own works. Regarding the concern of self-citation in this study and for determining the effect of self-citation on the results, the first 10 articles regarding the number of self-citation in each one were analyzed. The self-citation in these articles was 0–9.4% which seems to have no effect on the results.

To the best of our knowledge, this report is the first to find and analyze the most-cited articles in the field of dental, oral, and maxillofacial trauma. Given the number of victims who sustain such trauma in the world today, the authors feel that more globally coordinated research work should be implemented in the dental, oral, and maxillofacial trauma field to address this gap. Another potential benefit of this manuscript may also be to identify classic studies with high impact in the field of traumatology to the oral maxillofacial region, to be included in courses.

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