The 100 Most-disruptive Articles in Plastic and Reconstructive Surgery and Sub-specialties (1954–2014)

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Background: Alternative bibliometrics have recently been the subject of significantly increased interest. The disruption index is a new bibliometric that was recently applied to surgery and urology and identifies papers that shift paradigms and eclipse previous research in a given field.

Methods: The 100 most-disruptive publications in the 14 most prominent plastic and reconstructive surgery and subspecialty journals were identified.

Results: We present the 100 most-disruptive studies as well as the 100 most-cited studies for comparison in n=14 of the most popular plastic and reconstructive surgery (and subspecialty) journals between 1954 and 2014. The 100 most-disruptive publications in these journals were more disruptive than 99.8% of all PubMed papers. Plastic and Reconstructive Surgery (PRS) had the most papers in the top 100 (n=64) followed by British Journal of Plastic Surgery (currently Journal of Plastic, Reconstructive & Aesthetic Surgery, n=15), and Journal of Oral and Maxillofacial Surgery (n=7). PRS had 9 of the top 10 papers. However, Clinics in Plastic Surgery had the highest average disruption score for all its published papers (0.0029). The correlation coefficient linking disruption scores and citation counts was 0.01 and 0.11, respectively. The most common decade represented in the top 100 was the 1980's (n=31) and the least common was the 2000's (n=9).

Conclusions: This is the first application of the disruption index to plastic and reconstructive surgery. The disruption score provides a unique ability to identify research that has shifted paradigms and driven the innovation that defines our specialty. (Plast Reconstr Surg Glob Open 2021;9:e3446; doi: 10.1097/GOX.0000000000003446; Published online 26 March 2021.)

INTRODUCTION

The field of plastic and reconstructive surgery has significantly evolved over the past several decades. The innovation that is part and parcel to the DNA of our specialty has driven constant progress in both clinical and basic science research. Research publications are an important aspect of academic productivity and can also influence professional accomplishments such as promotion, tenure, and respect of peers.1 Many different metrics have been utilized to quantify the impact of publications. Both historically and currently, the most commonly-utilized metric remains citation count.2,3 However, citation count has notable limitations and problems that prevent it from optimally identifying impactful work; for example, not all citations are positive and equal and it is a purely quantitative metric. In addition, older publications will inherently accumulate more citations over time than newer publications, skewing the true significance of citation count.

In response to the shortcomings of traditional measures of research impact, bibliometricians have developed new metrics to better capture the influence and impact of publications.1 One such metric is the “disruption index,” which seeks to measure the degree to which an article disrupts its field and induces a paradigm shift by introducing something new that eclipses attention to previous work upon which it has built.5,6 In other words, a disruptive article displaces the literature that it cited. Disruption scores range from −1 to +1, with positive scores (>0) corresponding to disruptive articles and negative (<0) corresponding to developmental articles (1.0 is a maximally disruptive
article). Disruptive articles tend to change established principles, whereas developmental studies tend to build upon those existing principles.5,6

As the volume of research within the field of plastic surgery continues to explode, quantifying the impact of various publications is critical to identify shifting paradigms and prioritize research and funding. Previous studies have identified impactful publications in plastic surgery using metrics such as citation count7,8 or the Altmetric score recently seen in Plastic and Reconstructive Surgery.9,10 Although recently applied to both surgery11 and urology,12 no studies have applied the disruption score (DS) metric to the plastic and reconstructive (and subspecialty) literature. The purpose of this study was to identify the most-disruptive publications, compare the disruption metric to citation count, and to quantify the most-disruptive journals in plastic and reconstructive surgery.

METHODS

A search of PubMed-indexed literature was performed in March 2020 to identify PubMed Identifiers (PMIDs) of all articles published in Plastic and Reconstructive Surgery (PRS), Annals of Plastic Surgery, British Journal of Plastic Surgery (currently Journal of Plastic, Reconstructive & Aesthetic Surgery), Journal of Oral and Maxillofacial Surgery, Journal of Craniofacial Surgery, Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery, Clinics in Plastic Surgery, Journal of Hand Surgery (American), Journal of Hand Surgery (European/British), Journal of Reconstructive Microsurgery, JAMA Facial Plastic Surgery, Aesthetic Surgery Journal, and Aesthetic Plastic Surgery. The PMIDs were then merged with a validated database of DSs (https://lingfeiwu.github.io/smallTeams/) for all articles indexed in PubMed published between 1954 and 2014.5

The DS for a focal article is the ratio of 2 numbers and is represented by the equation DS = (A−B)/(C+D). The numerator is the number of future publications that cited the focal article without also citing any of its references (A) minus the number of future publications that cited the focal article and at least one of its references (B). The denominator is the total number of times the focal article was cited (C) plus the number of future publications that cited at least one of the references of the focal article, but not the focal article itself (D).5 To illustrate the calculation of a figurative study’s DS, we present here a sample calculation. Assuming this study was later cited a total of 50 times, and that 40 of these citations did not also cite one of the citations of the index article but 10 studies did, the numerator would be 40−10 = 30. Assuming then that 30 future studies cited at least one of the references of the focal study but not the focal study itself, the denominator would be 50 + 30 = 80, resulting in a DS of 30/80 = 0.375.

After calculating the DS and identifying the most-disruptive articles, we then utilized the publicly available iCite tool (https://icite.od.nih.gov/) developed by National Institute of Health to obtain the number of times each article was cited. We ranked the articles in order of DS and selected out the top 100 for inclusion in this study. We also ranked all articles published by the included journals in the time period studied by the number of citations and selected out the top 100. A kernel density plot of all literature indexed in PubMed (1954–2014) was generated to characterize the distribution of DSs in the entire PubMed universe. We limited the study period up to the year 2014 for 2 reasons: first, a period of several years after publication date is needed to allow for future studies to cite a focal article and to calculate a DS, and second, the time period 1954–2014 were the years that were available in the publicly-available database utilized.5 Statistical analysis was performed utilizing R Statistical Software (version 4.0.0, Auckland, New Zealand). Figures and plots were created using the ggplot2 package available in R.14
Table 1. Details of the 100 Most-disruptive Articles in Plastic and Reconstructive Surgery and Sub-specialties (1954–2014)

| Rank | Title                                                                 | First Author       | Senior Author       | Year | Affiliation                                                                 | Journal                                      | Disruption Score | Citation Count | Study Design          |
|------|----------------------------------------------------------------------|--------------------|---------------------|------|----------------------------------------------------------------------------|----------------------------------------------|------------------|----------------|----------------------|
| 1    | Minimally invasive, limited incision breast surgery: passing fad or emerging trend? | Rod J. Rohrich     |                     | 2002 | University of Texas Southwestern Medical Center, Dallas, Tex.                | Plastic and Reconstructive Surgery           | 0.909090909 | 7               | Viewpoint            |
| 2    | The ultimate fate of freeze dried fascia: experience with its use in the correction of facial paralysis. | R. K. Snyderman    | T. E. Starzynski    | 1966 | Memorial Hospital for Cancer and Allied Diseases, New York, N.Y.            | Plastic and Reconstructive Surgery           | 0.888888889 | 8               | Case study           |
| 3    | A suction curette for removal of excessive local deposits of subcutaneous fat. | U. K. Kesselring   | R. Meyer            | 1978 | Lausanne, Switzerland                                                       | Plastic and Reconstructive Surgery           | 0.857142857 | 43              | Methodologies        |
| 4    | A new and reliable method of securing skin grafts to the difficult recipient bed. | A. M. Schneider    | L. C. Argenta       | 1998 | Wake Forest University School of Medicine, Winston-Salem, N.C.              | Plastic and Reconstructive Surgery           | 0.857142857 | 98              | Ideas and innovations/ methodologies |
| 5    | Body contouring by lipolysis: a 5-year experience with over 3000 cases. | Y. G. Illouz       |                     | 1983 | Paris, France                                                              | Plastic and Reconstructive Surgery           | 0.823741007 | 263             | Review               |
| 6    | The zig-zag volar-digital incision for flexor-tendon surgery.        | J. M. Bruner       |                     | 1967 | Des Moines, Iowa                                                            | Plastic and Reconstructive Surgery           | 0.81359322 | 61              | Methodologies        |
| 7    | Palatal fistulae following cleft palate surgery.                     | F. E. Abyholm      | G. Eskeland         | 1979 | Oslo, Norway                                                                | Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery | 0.81333333 | 52              | Review               |
| 8    | Spreader graft: a method of reconstructing the roof of the middle nasal vault following rhinoplasty. | J. H. Sheen        |                     | 1984 | UCLA, Los Angeles, Calif.                                                  | Plastic and Reconstructive Surgery           | 0.760869565 | 267             | Case study           |
| 9    | Reduction mammoplasty with a vertical dermal flap.                   | P. K. McKissock    |                     | 1972 | Torrance, Calif.                                                            | Plastic and Reconstructive Surgery           | 0.743842365 | 138             | Methodologies/ review |
| 10   | Internal fixation of certain fractures of the mandible by bone plating | J. A. Snell        | W. A. Dott          | 1969 | Melbourne, Australia                                                        | Plastic and Reconstructive Surgery           | 0.714285714 | 23              | Review               |
| 11   | “Outbreak” of hand injuries during Hajj festivities in Saudi Arabia. | M. M. Rahman       | M. M. AI-Qattan     | 1999 | King Saud University and King Fahad National Guard Hospital, Riyadh, Saudi Arabia | Annals of Plastic Surgery                  | 0.714285714 | 12              | Review               |
| 12   | The use of lingual flaps in repair of fistulas of the hard palate.   | J. Guerrer-Santos  | J. T. Altamirano    | 1966 | Guadalajara, Mexico                                                        | Plastic and Reconstructive Surgery           | 0.69248122 | 75              | Case study           |
| 13   | A new technique for reduction mammoplasty.                           | L. Ribeiro         |                     | 1975 | Rio de Janeiro, Brazil                                                      | Plastic and Reconstructive Surgery           | 0.69213866 | 104             | Methodologies        |
| 14   | Abnormal anatomy of the muscles of palatopharyngeal closure in cleft palates: anatomical and surgical considerations based on the autopsies of 18 unoperated cleft palates | M. Fára            | J. Dvorák           | 1970 | Prague, Czech                                                               | Plastic and Reconstructive Surgery           | 0.68627451 | 14              | Case study           |
| 15   | Micorsurgical reconstruction of the lingual nerve.                   | P. G. Mozsay       | R. A. Middleton     | 1984 | Department of Oral Surgery, University of the Pacific School of Dentistry, San Francisco, Calif. | Journal of Oral Maxillofacial Surgery        | 0.68           | 51              | Case study           |
| 16   | Analysis of 200 free flaps.                                         | T. Harashina       |                     | 1988 | Keio University Hospital, Tokyo                                             | British Journal of Plastic Surgery          | 0.672043011 | 100             | Review               |

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| Rank | Title                                                                 | First Author | Senior Author | Year | Affiliation                                                                 | Journal | Disruption Score | Citation Count | Study Design          |
|------|-----------------------------------------------------------------------|--------------|---------------|------|------------------------------------------------------------------------------|---------|------------------|-----------------|----------------------|
| 17   | The salutary effects of the bed on the survival of experimental flaps. | T. Kaufman   | J. W. Futrell | 1985 | ?                                                                            | Annals of Plastic Surgery | 0.666666667 | 28              |                    |
| 18   | Anesthesia for tongue flaps in infants.                               | L. Naik      | P. Sawant     | 1993 | Bombay, India                                                               | Plastic and Reconstructive Surgery | 0.666666667 | 2               | Comment/ methodologies |
| 19   | Intraoperative K-wire protection.                                     | R. Thangaraj | S. Singh      | 2010 | Birmingham, UK                                                              | British Journal of Plastic Surgery | 0.666666667 | 3               | Methodologies       |
| 20   | Minimizing the pain of local anesthesia.                             | K. A. Arndt  | J. M. Noe     | 2013 | Beth Israel Hospital/ Harvard Medical School, Boston, Mass.                  | Plastic and Reconstructive Surgery | 0.661764706 | 65              | Methodologies/ prospective cohort |
| 21   | Meralgia paresthetica: a complication of iliac bone procurement.      | A. M. Weikel | M. B. Habal   | 1977 | University of Florida/ Boston, Mass.                                         | Plastic and Reconstructive Surgery | 0.642857143 | 8               | Ideas and innovations/ Methodologies/ case series |
| 22   | A simple technique for locating the umbilicus in abdominoplasty.      | S. Hoffman   |              | 1989 | Mount Sinai School of Medicine, City University of New York, New York.        | Plastic and Reconstructive Surgery | 0.641975309 | 41              | Methodologies/ case series |
| 23   | The endoscopic breast augmentation: the transumbilical insertion of saline-filled breast implants. | G. W. Johnson | J. E. Christ | 1993 | Houston, Tex.                                                                | Plastic and Reconstructive Surgery | 0.641975309 | 41              | Methodologies/ case series |
| 24   | Use of off-label and non-approved drugs and devices in plastic surgery. | Rod J. Rohrich | Neal R. Reisman | 2003 | University of Texas Southwestern Medical School, Dallas, Tex.                | Plastic and Reconstructive Surgery | 0.631578947 | 14              | Viewpoint            |
| 25   | Vaginal reconstruction with gracilis myocutaneous flaps.              | J. B. McCraw | C. E. Horton  | 1976 | Lackland Airforce Base, Tex./ Eastern Virginia Medical School, Norfolk, Va. | Plastic and Reconstructive Surgery | 0.627071823 | 234             | Case report          |
| 26   | Anatomy and arteriography of cleft lips in stillborn children.       | M. Fára      |              | 1968 | Prague, Czech                                                                | Plastic and Reconstructive Surgery Journal of Oral Maxillofacial Surgery | 0.615384615 | 30              | Cadaveric study |
| 27   | Public attitudes toward oral surgery: results of a Gallup poll.       | J. Delfino   |              | 1968 | St. John’s Mercy Hospital, St. Louis, Mo.                                    | Plastic and Reconstructive Surgery | 0.615384615 | 15              | Survey              |
| 28   | Cell size and growth characteristics of cultured fibroblasts isolated from normal and keloid tissue. | J. D. Russell | W. S. Witt    | 1976 | McBurney Medical College, Nashville, Tenn.                                   | Plastic and Reconstructive Surgery | 0.613333333 | 40              | Basic science       |
| 29   | Unilateral galactocele following augmentation mammoplasty.            | E. D. Deloach | L. E. Ruf    | 1994 | Memorial Medical Center, Savannah, Ga.                                        | Annals of Plastic Surgery | 0.611111111 | 15              | Case report          |
| 30   | A retrospective study of 1,541 mandibular fractures.                  | P. N. Bochlogyros |            | 1985 | University of Miinster, Waldeyerstrasse, Miinster, West Germany              | Journal of Oral Maxillofacial Surgery | 0.61            | 72              | Review              |
| 31   | Johann Friedrich Dieffenbach (1794–1847).                            | R. M. Goldwyn |              | 1968 | Harvard Medical School, Boston, Mass.                                         | Plastic and Reconstructive Surgery | 0.6             | 7               | Historical review   |
| 32   | The role of cosmetic surgery in criminal rehabilitation.             | A. G. Schuring | R. E. Dodge Jr | 1967 | New Orleans, La.                                                             | Plastic and Reconstructive Surgery | 0.6             | 2               | Case-control study |
| 33   | A plea for reducing the number of positions for residency training in plastic surgery. | R. A. Young   |              | 1994 | Chesterfield, Missouri                                                        | Plastic and Reconstructive Surgery | 0.6             | 2               | Comment             |
| 34   | Frank Hastings Hamilton: a pioneer American plastic surgeon.         | Germania S. Baux | Joseph G. McCarthy | 2004 | University of California, San Francisco, Calif./ New York University Medical Center, New York | Plastic and Reconstructive Surgery | 0.6             | 4               | Historical review   |
| 35   | A radial forearm flap based on an extended dissection of the cephalic vein. The longest venous pedicle? Case report.  | Y. Nakayama  | T. Iino       | 1986 | University of Tsukuba, Sakura-mura, Niharihgun, Ibaraki, Japan                | British Journal of Plastic Surgery | 0.592592593 | 16              | Case report          |
| 36   | Congenital claw-like fingers and toes.                                | T. Egawa     |              | 1977 | ?                                                                            | Plastic and Reconstructive Surgery | 0.599909091 | 30              | Case report          |

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| Rank | Title                                                                 | First Author          | Senior Author          | Year | Affiliation                                                                 | Journal                                                                 | Disruption Score | Citation Count | Study Design       |
|------|----------------------------------------------------------------------|-----------------------|------------------------|------|----------------------------------------------------------------------------|------------------------------------------------------------------------|------------------|-----------------|-------------------|
| 37   | Geometric considerations in the design of rotation flaps in the scalp and forehead region. | R. B. Ahuja           |                       | 1988 | New Delhi, India                                                           | Plastic and Reconstructive Surgery                                    | 0.580645161      | 22              | Methodologies    |
| 38   | Hooked forceps.                                                      | I. J. Peled           | A. P. Makepeace        | 1984 | ?                                                                           | Annals of Plastic Surgery                                             | 0.54128571       | 3               | Methodologies    |
| 39   | Some characteristics of endoscopic and radiological systems used in elaboration of the diagnosis of velopharyngeal incompetence. | R. W. Pigott          |                       | 1982 | Frenchay Hospital, Bristol and The University of Bristol, England          | British Journal of Plastic Surgery                                    | 0.571428571      | 25              | Methodologies/ comparative study |
| 40   | The wrestler’s ear.                                                  | J. C. Kelleher        | R. K. Dean             | 1967 | Toledo, Ohio                                                               | Plastic and Reconstructive Surgery                                    | 0.56217391       | 34              | Case study       |
| 41   | “Gate flap” for the total reconstruction of the lower lip.           | R. Fujimori           |                       | 1980 | ?                                                                           | British Journal of Plastic Surgery                                    | 0.55437826       | 50              | Longitudinal study |
| 42   | Longitudinal study of growth in bilateral cleft lip and palate, from infancy to adolescence. | H. Friede             | S. Prazansky           | 1972 | University of Chicago, Ill.                                                | Plastic and Reconstructive Surgery                                    | 0.54611628       | 36              | Review            |
| 43   | Review of long-term results in supportive treatment of facial paralysis. | B. S. Freeman         |                       | 1979 | Houston, Tex.                                                              | Plastic and Reconstructive Surgery                                    | 0.54166667       | 17              | Review/ comparative study |
| 44   | Replantation of the lower extremity.                                 | Z. W. Chen            | B. F. Zeng             | 1983 | Shanghai, People’s Republic of China                                       | Clinics in Plastic Surgery                                            | 0.538461538      | 22              | ?                 |
| 45   | The stretched scar: a clinical and histological study.              | B. C. Sommerlad       | J. M. Creasey          | 1978 | Canniesburn Hospital, Beardsen, Glasgow, England / Porton Down, Wiltshire, England | British Journal of Plastic Surgery                                    | 0.537037057      | 28              | Clinical trial   |
| 46   | Comparative reliability of nasal pharyngoscopy and videofluorography in the assessment of velopharyngeal incompetence. | S. W. Sinclair        | A. Bracka              | 1982 | Frenchay Hospital, Bristol, England | British Journal of Plastic Surgery                                    | 0.53125          | 17              | Review/ comparative study |
| 47   | A study of the supraorbital nerve.                                  | D. M. Knize           | L. B. Colen            | 1995 | University of Colorado, Denver, Colo.                                      | Plastic and Reconstructive Surgery                                    | 0.524752475      | 79              | Cadaveric study/ case study |
| 48   | An island flap from the first web space of the foot to cover plantar ulcers. | H. J. Buncke Jr       | L. B. Colen            | 1980 | San Francisco, Calif.                                                      | Plastic and Reconstructive Surgery                                    | 0.52173913       | 15              | Case report       |
| 49   | The four-flap Z-plasty.                                             | R. M. Woolf           | T. R. Broadbent        | 1972 | Salt Lake City, Utah                                                      | Plastic and Reconstructive Surgery                                    | 0.507462687      | 45              | Methodologies    |
| 50   | Facial injuries from automobile accidents: a study of 400 consecutive cases. | R. C. Schultz         | K. Pickrell            | 1970 | Duke University, Durham, N.C.                                             | Plastic and Reconstructive Surgery                                    | 0.504761905      | 34              | Review            |
| 51   | A swallowing characteristic noted in a glossectomy patient. Case report. | R. Massengill Jr      | J. A. Dowling          | 1968 | Brooke Army Medical Center, Fort Sam Houston, Tex.                         | Plastic and Reconstructive Surgery                                    | 0.5               | 12              | Case report       |
| 52   | Chondritis in the burned ear.                                       | J. A. Moncrief        |                       | 1983 | ?                                                                           | Plastic and Reconstructive Surgery                                    | 0.5              | 24              | Review/ retrospective study |
| 53   | The sonic digitizer: a rapid and accurate method to assess the size of experimental flaps. | T. Kaufman            | M. I. Siegel           | 1984 | ?                                                                           | Annals of Plastic Surgery                                             | 0.5              | 3               | Comparative study |
| 54   | A simple means of maintaining light handle sterility.                | R. S. Singer          | A. L. Sisk             | 1984 | Medical College of Georgia, Augusta, Ga.                                    | Journal of Oral Maxillofacial Surgery                                 | 0.5              | 1               | Methodologies    |
| 55   | A study of the outcome of the American Society for Aesthetic Plastic Surgery research grant program. | B. L. Cunningham      | G. H. Landis           | 1993 | University of Minnesota Medical School, Minn.                              | Plastic and Reconstructive Surgery                                    | 0.5              | 3               | Survey            |
| Rank | Title                                                                 | First Author          | Senior Author   | Year | Affiliation                           | Journal                                      | Disruption Score | Citation Count | Study Design               |
|------|----------------------------------------------------------------------|-----------------------|-----------------|------|---------------------------------------|----------------------------------------------|------------------|----------------|---------------------------|
| 56   | What age(s) for face lifts?                                          | V. S. Lambros         |                  | 1998 | Newport Beach, Calif.                 | Plastic and Reconstructive Surgery           | 0.5              | 3              | Comment                   |
| 57   | Who decides the breast augmentation parameter?                      | Richard V. Dowden     |                  | 2003 | Cleveland, Ohio                        | Plastic and Reconstructive Surgery           | 0.5              | 6              | Editorial                 |
| 58   | “Sandwich” dressing for pediatric hand surgery.                     | Nikes K. Patel        | James G. Hoehn   | 2009 | Albany Medical Center; Albany, N.Y.   | Plastic and Reconstructive Surgery           | 0.5              | 1              | Viewpoint/methodologies   |
| 59   | Graft lip-left palate closure: the unknown contributions of Harvey Cushing | Amir H. Dorafshar    | Richard J. Redett | 2010 | The Johns Hopkins Medical Institute, Baltimore, Md. | Plastic and Reconstructive Surgery | 0.5              | 2              | Case study                |
| 60   | Maxillary arch alignment in the bilateral cleft lip and palate infant, using pinned coxial screw appliance. | M. J. Black           | L. A. Sharzer    | 1978 | Melbourne, Australia                  | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 61   | How soon may the axial vessels of a surviving free flap be safely ligated? a study in pigs. | S. J. Mathes          | J. Bostwick III  | 1977 | Emory University School of Medicine, Atlanta, Ga. | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 62   | A rectus abdominis myocutaneous flap to reconstruct abdominal wall defects. | F. Prunés             | H. Asburn        | 1989 | Kern Medical Center, Bakersfield, Calif. | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 63   | A simplified stent dressing technique using elastic rubber bands.    | D. J. David           | A. Bagnall       | 1982 | North Adelaide, Australia              | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 64   | A comparison of absorbable and nonabsorbable suture materials for skin repair. | B. Guyuron            | C. Vaughan       | 1992 | Mt. Sinai Medical Center, Cleveland, Ohio | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 65   | Hidradenitis suppurativa—A clinical review.                         | J. D. Watson          |                  | 1985 | Cannies-burn Hospital, Beardsden, Glasgow, UK/Frenchay Hospital, Bristol, UK | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 66   | Mandibular lengthening by gradual distraction. Preliminary report.   | C. C. Snyder          | E. Z. Browne Jr  | 1973 | Veterans Administration Hospital, Salt Lake City, Utah | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 67   | Disruption Score | Citation Count | Study Design               |
|------|----------------------------------------------------------------------|-----------------------|-----------------|------|---------------------------------------|----------------------------------------------|------------------|----------------|---------------------------|
| 68   | Foreign body in the sphenoid sinus.                                  | C. Dimitriou          | C. Antoniadis    | 1992 | Thessaloniki, Greece                  | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 69   | The surgical face lift—rhytidectomy.                                | H. Conway             |                  | 1970 | Cornell University, New York, N.Y.   | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 70   | Critical reappraisal of Medical Research Council muscle testing for elbow flexion. | Michael C. MacAvoy    | David P. Green   | 2007 | Permanente Medical Group of South San Francisco, San Francisco, Calif. | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 71   | Indentation tonometry of breasts.                                   | H. Hayes Jr           | P. McLeod        | 1979 | University of Arkansas, Little Rock, Ark. | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 72   | Definition and classification of plastic surgery.                   | R. K. Sandhir         |                  | 1997 | Delhi, India                          | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 73   | Nipple or areolar reduction with simultaneous breast augmentation.  | R. A. Mladick         | B. I. Cohen      | 1971 | Norfolk General Hospital, Norfolk, Va. | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |
| 74   | The pocket principle: a new technique for the reattachment of a severed ear part. | H. Giele              |                  | 2002 | The Radcliffe Infirmary, Oxford, UK    | Plastic and Reconstructive Surgery           | 0.48372093       | 60             | Animal study             |

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| Rank | Title | First Author | Senior Author | Year | Affiliation | Journal | Disruption Score | Citation Count | Study Design |
|------|-------|--------------|---------------|------|-------------|---------|------------------|----------------|--------------|
| 76   | A practical guide to surgical loupes. | J. M. Baker | R. A. Meals | 1997 | University of California, Los Angeles School of Medicine, Los Angeles, Calif. | *Journal of Hand Surgery (American)* | 0.444444444 | 12 | Methodologies |
| 77   | Arthroscopy of the human temporomandibular joint. | J. P. McCain | | 1988 | University of Miami, Miami, Fla. | *Journal of Oral Maxillofacial Surgery* | 0.443962266 | 69 | Cadaveric study/case study |
| 78   | Reduction mammoplasty by the “B” technique. | P. Regnault | | 1974 | Montreal, Canada | Plastic and Reconstructive Surgery | 0.442307692 | 48 | Methodologies/case series |
| 79   | The effect of form and dimension on the management of the maxillary arch in unilateral cleft lip and palate conditions. | A. G. Huddart | | 1987 | Wordsley Hospital, Stourbridge, West Midlands, England | *Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery* | 0.4375 | 9 | Review |
| 80   | Precision rhinoplasty. Part I: The role of life-size photographs and soft-tissue cephalometric analysis. | B. Guyuron | | 1988 | Mount Sinai Hospital, Cleveland, Ohio | Plastic and Reconstructive Surgery | 0.435185185 | 55 | Methodologies |
| 81   | The distribution of lymph nodes in and around the parotid gland: an anatomical study. | M. E. McKean | I. A. McGregor | 1985 | Royal Infirmary, Glasgow and the Plastic Surgery Unit, Canniesburn Hospital, Glasgow, Los Angeles, Calif. | *British Journal of Plastic Surgery* | 0.433333333 | 56 | Cadaveric study |
| 82   | Silastic reconstruction of temporomandibular joint meniscus. | W. C. Hansen | B. W. Deshazo | 1969 | Plastic and Reconstructive Surgery | *Journal of Oral Maxillofacial Surgery* | 0.428571429 | 38 | Case study |
| 83   | The transtemporal approach to the nasal tip and dorsum: a new refinement in rhinoplasty. | N. S. Fuleihan | | 1998 | Boston University Medical Center, Boston, Mass. | Plastic and Reconstructive Surgery | 0.428571429 | 3 | Methodologies |
| 84   | Facial width problems associated with rigid fixation of mandibular fractures: case reports. | E. Ellis III | W. Tharanon | 1992 | University of Texas, Southwestern Medical Center, Dallas, Tex. | Plastic and Reconstructive Surgery | 0.424242424 | 20 | Case report/methodologies |
| 85   | Another method to lengthen the columella in the double cleft patient. | R. O. Brauer | D. W. Foerster | 1966 | Houston, Tex. | Plastic and Reconstructive Surgery | 0.424242424 | 11 | Methodologies/case study |
| 86   | Reanimation of lower lip reconstructed by flaps. | C. P. Sawhney | | 1986 | Chandigarh, India | *British Journal of Plastic Surgery* | 0.429076923 | 18 | Methodologies/case study |
| 87   | The influence of plastic surgery "reality TV" on cosmetic surgery patient expectations and decision making. | Richard J. Crockett | John A. Persing | 2007 | Yale University School of Medicine, New Haven, Conn. | Plastic and Reconstructive Surgery | 0.422222222 | 35 | Survey |
| 88   | Reversible, titrated deep sedation for major office surgery. | A. J. McDowell | D. R. Whitlow | 1977 | Burbank, Calif. | Plastic and Reconstructive Surgery | 0.416666667 | 6 | Consecutive case series |
| 89   | When to replant a fingertip after its complete amputation. | N. I. Elsahy | | 1977 | Medical College of Georgia, Augusta, Ga. | Plastic and Reconstructive Surgery | 0.416666667 | 31 | Comparative study |
| 90   | Use of temporal muscle flap for reconstruction after orbitomaxillary resections for cancer. | V. Y. Bakamjian | S. G. Souther | 1975 | Stanford University, California/Roosevelt Park Memorial Hospital, Buffalo, N.Y. | Plastic and Reconstructive Surgery | 0.415384615 | 61 | Case Study/methodologies |
| 91   | Inferior epigastric artery skin flaps without rectus abdominis muscle. | I. Koshima | S. Soeda | 1989 | University of Tsukuba, Ibaraki, Japan | *British Journal of Plastic Surgery* | 0.412451362 | 502 | Case report |
| 92   | Bilateral cleft lip and a primary forked flap: a preliminary report. | D. R. Millard | | 1967 | Miami, Fla. | Plastic and Reconstructive Surgery | 0.409836066 | 33 | Methodologies/case study |

(Continued)
Table 2. Details of the 100 Most-cited Articles in Plastic and Reconstructive Surgery and Sub-specialties (1954–2014)

| Rank | Title                                                                 | First Author          | Senior Author       | Year | Affiliation                                                                 | Journal                                                                 | Disruption Score | Citation Count | Study Design     |
|------|----------------------------------------------------------------------|-----------------------|---------------------|------|----------------------------------------------------------------------------|------------------------------------------------------------------------|------------------|----------------|-----------------|
| 93   | Naso-orbital fractures and traumatic deformities of the medial canthus.| J. M. Converse        | B. Smith             | 1966 | New York University, New York, N.Y.                                        | Plastic and Reconstructive Surgery                                    | 0.4099909095     | 27             | Methodologies/case study |
| 94   | Successful treatment of some fibrous envelope contractures around breast implants. | B. S. Freeman               |                     | 1972 | Houston, Tex.                                                             | Plastic and Reconstructive Surgery                                    | 0.4078947375     | 14             | Methodologies/case series |
| 95   | Surgical skin-marking techniques.                                     | M. S. Granick          | E. W. Jones          | 1987 | Pittsbug, Pa.                                                             | Plastic and Reconstructive Surgery                                    | 0.4057971011     | 25             | Animal Study/methodologies |
| 96   | Coverage of exposed bone by muscle transposition and skin grafting.   | L. O. Vasconez         | J. McCraw            | 1974 | Emory University, Atlanta, Ga.                                             | Plastic and Reconstructive Surgery                                    | 0.4041943822     | 44             | Review/methodologies |
| 97   | Incidence of the Robin Anomalad (Pierre Robin syndrome).               | P. G. Bush             | A. J. Williams       | 1985 | Royal Liverpool Children's Hospital, Liverpool, UK                         | Plastic and Reconstructive Surgery                                    | 0.4040404040     | 93             | Review/analysis   |
| 98   | Fractures of the mandible: a review of 580 cases.                     | R. A. Olson            | D. B. Osbon          | 1982 | University of Iowa, Iowa                                                   | Journal of Oral and Maxillofacial Surgery                             | 0.4023668648     | 142            | Review           |
| 99   | The honor and responsibility of teaching in plastic surgery.          | J. W. May Jr.          | S. C. Young          | 1991 | Massachusetts General Hospital, Boston, Mass.                              | Plastic and Reconstructive Surgery                                    | 0.4              | 6              | Editorial        |
| 100  | A case of an intratendinous ganglion.                                 | S. C. Young            | A. Freiber            | 1985 | University of Toronto, Toronto, Ontario, Canada                           | Journal of Hand Surgery (American)                                    | 0.4              | 14             | Case report      |

Table 1. Continued

| Rank | Title                                                                 | First Author          | Senior Author       | Year | Affiliation                                                                 | Journal                                                                 | Disruption Score | Citation Count | Study Design     |
|------|----------------------------------------------------------------------|-----------------------|---------------------|------|----------------------------------------------------------------------------|------------------------------------------------------------------------|------------------|----------------|-----------------|
| 93   | Naso-orbital fractures and traumatic deformities of the medial canthus. | J. M. Converse        | B. Smith             | 1966 | New York University, New York, N.Y.                                        | Plastic and Reconstructive Surgery                                    | 0.166480239      | 147            | Methodologies/case study |
| 94   | Successful treatment of some fibrous envelope contractures around breast implants. | B. S. Freeman               |                     | 1972 | Houston, Tex.                                                             | Plastic and Reconstructive Surgery                                    | 0.301264679      | 1228           | Methodologies/case series |
| 95   | Surgical skin-marking techniques.                                     | M. S. Granick          | E. W. Jones          | 1987 | Pittsbug, Pa.                                                             | Plastic and Reconstructive Surgery                                    | 0.008281315      | 1057           | Animal Study/methodologies |
| 96   | Coverage of exposed bone by muscle transposition and skin grafting.   | L. O. Vasconez         | J. McCraw            | 1974 | Emory University, Atlanta, Ga.                                             | Plastic and Reconstructive Surgery                                    | 0.014590132      | 1024           | Review/methodologies |
| 97   | Incidence of the Robin Anomalad (Pierre Robin syndrome).               | P. G. Bush             | A. J. Williams       | 1985 | Royal Liverpool Children's Hospital, Liverpool, UK                         | Plastic and Reconstructive Surgery                                    | 0.097110215      | 93             | Review/analysis   |
| 98   | Fractures of the mandible: a review of 580 cases.                     | R. A. Olson            | D. B. Osbon          | 1982 | University of Iowa, Iowa                                                   | Journal of Oral and Maxillofacial Surgery                             | 0.4              | 6              | Editorial        |
| 99   | The honor and responsibility of teaching in plastic surgery.          | J. W. May Jr.          | S. C. Young          | 1991 | Massachusetts General Hospital, Boston, Mass.                              | Plastic and Reconstructive Surgery                                    | 0.4              | 14             | Case report      |
| 100  | A case of an intratendinous ganglion.                                 | S. C. Young            | A. Freiber            | 1985 | University of Toronto, Toronto, Ontario, Canada                           | Journal of Hand Surgery (American)                                    | 0.4              | 14             | Case report      |
Table 2. Continued

| Rank | Citation | Title | First Author | Senior Author | Year | Affiliation | Journal | DS | Citation Count |
|------|----------|-------|--------------|---------------|------|-------------|---------|----|----------------|
| 9    | 9        | Fibula free flap: a new method of mandible reconstruction. | D. A. Hidalgo | 1989 | Division of Plastic and Reconstructive Surgery, Memorial Sloan-Kettering Cancer Center, New York, N.Y. | Plastic and Reconstructive Surgery | -0.016783974 | 694 |
| 10   | 10       | The vascular territories (angiosomes) of the body: experimental study and clinical applications. | G. I. Taylor, J. H. Palmer | 1987 | Royal Melbourne Hospital, and Department of Anatomy, University of Melbourne Australia | British Journal of Plastic Surgery | 0.021912351 | 687 |
| 11   | 11       | Functional evaluation of complete sciatic, peroneal, and posterior tibial nerve lesions in the rat. | J. R. Bain, D. A. Hunter | 1989 | University of Toronto, Ontario, Canada | Plastic and Reconstructive Surgery | -0.0101983 | 649 |
| 12   | 12       | The free vascularized bone graft. A clinical extension of microvascular techniques. | G. I. Taylor, E. F. Ham | 1975 | Melbourne, Australia | Plastic and Reconstructive Surgery | 0.021912351 | 687 |
| 13   | 13       | The free thigh flap: a new free flap concept based on the septocutaneous artery. | Y. G. Song, Y. L. Song | 1984 | Beijing, People’s Republic of China | British Journal of Plastic Surgery | 0.021912351 | 687 |
| 14   | 14       | Have we found an ideal soft-tissue flap? An experience with 672 anterolateral thigh flaps. | Fu-Chan Wei, Chi-Hung Lin | 2002 | Chang Gung Memorial Hospital, Taipei, Taiwan | Plastic and Reconstructive Surgery | -0.13681592 | 543 |
| 15   | 15       | “Components separation” method for closure of abdominal-wall defects: an anatomic and clinical study. | O. M. Ramirez, A. L. Dellar | 1990 | Johns Hopkins University School of Medicine, Baltimore, Md. | Plastic and Reconstructive Surgery | 0.26073481 | 536 |
| 16   | 16       | Breast reconstruction with a transverse abdominal island flap. | C. R. Hartmann, P. W. Black | 1982 | Atlanta, Ga. + Medical College of Virginia, Richmond, Va. | Plastic and Reconstructive Surgery | 0.270416025 | 526 |
| 17   | 17       | Deep inferior epigastric perforator flap for breast reconstruction. | R. J. Allen, E. T. Reece | 1994 | Louisiana State University Medical Center, Stanley S. Scott Cancer Center, New Orleans | Plastic and Reconstructive Surgery | -0.101567398 | 520 |
| 18   | 18       | American Association of Oral and Maxillofacial Surgeons position article on bisphosphonate-related osteonecrosis of the jaws—2009 update. | Salvatore L. Ruggiero, Bhoomi Mehrtra | 2009 | Division of Oral and Maxillofacial Surgery, Stony Brook School of Dental Medicine, Long Island Jewish Medical Center, New Hyde Park, N.Y. | Journal of Oral Maxillofacial Surgery | -0.035806452 | 517 |
| 19   | 19       | Inferior epigastric artery skin flaps without rectus abdominis muscle Osteoradionecrosis: a new concept of its pathophysiology. | I. Koshima, S. Soeda | 1989 | University of Tsukuba, Ibaraki, Japan | British Journal of Plastic Surgery | 0.41251362 | 502 |
| 20   | 20       | Osteoradionecrosis: a new concept of its pathophysiology. | R. E. Marx | 1993 | Wilford Hall USAF Medical Center, San Antonio, Tex. | Journal of Oral Maxillofacial Surgery | 0.267496112 | 497 |
| 21   | 21       | American Association of Oral and Maxillofacial Surgeons position article on medication-related osteonecrosis of the jaw—2014 update. | Salvatore L. Ruggiero | 2014 | Stony Brook School of Dental Medicine, Hofstra North Shore-LIJ School of Medicine, New York Center for Orthognathic and Maxillofacial Surgery, Lake Success, N.Y. | Journal of Oral Maxillofacial Surgery | -0.00134372 | 487 |
| 22   | 22       | Platelet quantification and growth factor analysis from platelet-rich plasma: implications for wound healing. | Barry L. Eppley, Joel Higgins | 2004 | Indiana University School of Medicine, Indianapolis | Plastic and Reconstructive Surgery | 0.019706499 | 464 |
| 23   | 23       | Facial recontouring with lipostructure. | S. R. Coleman | 1997 | New York, N.Y. | Clinics in Plastic Surgery | -0.040733198 | 460 |
| 24   | 24       | Structural fat grafting: more than a permanent filler. | Sydney R. Coleman | 2006 | New York University School of Medicine, New York | Plastic and Reconstructive Surgery | -0.008598131 | 456 |
| 25   | 25       | The pectoralis major myocutaneous flap. A versatile flap for reconstruction in the head and neck. | S. Ariyan | 1979 | Yale University, New Haven, Conn. | Plastic and Reconstructive Surgery | 0.321628095 | 450 |
| 26   | 26       | Healing of bone defects by guided tissue regeneration. | C. Dahlén, S. Nyman | 1988 | Gothenburg University, Sweden | Plastic and Reconstructive Surgery | 0.037960123 | 442 |
| 27   | 27       | Clinical treatment of radiotherapy tissue damage by liposarctate transplant: a healing process mediated by adipose-derived adult stem cells. | Gino Rigotti, Andrea Sharbati | 2007 | Ospedale Maggiore di Verona, Verona, Italy | Plastic and Reconstructive Surgery | 0.01683164 | 441 |

(Continued)
| Rank | Title                                                                 | First Author                          | Senior Author                      | Year | Affiliation                                                                 | Journal                                                                 | DS            | Citation Count |
|------|----------------------------------------------------------------------|---------------------------------------|------------------------------------|------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------|----------------|
| 28   | International clinical recommendations on scar management.           | Thomas A. Mustoe                      | Ulrich E. Ziegler                  | 2002 | Northwestern University School of Medicine, Chicago, Ill.                    | Plastic and Reconstructive Surgery                                      | -0.045637877 | 427            |
| 29   | Development of a new patient-reported outcome measure for breast surgery: the BREAST-Q. | Andrea L. Pusic                      | Stefan J. Cano                     | 2009 | Memorial Sloan-Kettering Cancer Center, New York, N.Y.                      | Plastic and Reconstructive Surgery                                      | 0.041296061  | 415            |
| 30   | The radial forearm flap: a versatile method for intra-oral reconstruction. | D. S. Soutar                          | I. A. McGregor                     | 1983 | Glasgow, Scotland                                                            | Plastic and Reconstructive Surgery                                      | 0.294749403  | 411            |
| 31   | On the nature of hypertrophic scars and keloids: a review.           | F. B. Niessen                         | M. Kon                             | 1999 | University Hospital of Groningen, The Netherlands                           | Plastic and Reconstructive Surgery                                      | -0.008386118 | 409            |
| 32   | Reliability and validity testing of the Michigan Hand Outcomes Questionnaire. | K. C. Chung                           | R. A. Hayward                       | 1998 | University of Michigan Medical Center, Ann Arbor                            | Journal of Hand Surgery (American)                                      | -0.000243694 | 399            |
| 33   | Cell-assisted lipotransfer for cosmetic breast augmentation: supportive use of adipose-derived stem/stromal cells. | Kotaro Yoshimura                      | Kyonori Harii                       | 2008 | University of Tokyo School of Medicine, Tokyo, Japan                        | Plastic and Reconstructive Surgery                                      | -0.029148409 | 397            |
| 34   | The patient and observer scar assessment scale: a reliable and feasible tool for scar evaluation. | Lieneke J. Draaijers                  | Paul P. M. van Zuijlen             | 2004 | Beverwijk, the Netherlands                                                  | Plastic and Reconstructive Surgery                                      | 0.008187687  | 369            |
| 35   | Oral bisphosphonate-induced osteonecrosis: risk factors, prediction of risk using serum CTX testing, prevention, and treatment. | Robert E. Marx                        | Juan J. Ulloa                       | 2007 | Division of Oral and Maxillofacial Surgery, University of Miami Miller School of Medicine, Miami, Fla. | Journal of Oral Maxillofacial Surgery                                  | -0.035548666 | 362            |
| 36   | Donor-site morbidity after harvesting rib and iliac bone.             | S. W. Laurie                          | J. E. Murray                       | 1984 | Harvard Medical School, Boston, Ma.                                         | Plastic and Reconstructive Surgery                                      | 0.350591716  | 361            |
| 37   | The osteocutaneous scapular flap for mandibular and maxillary reconstruction. | W. M. Swartz                          | R. Acland                          | 1986 | University of Pittsburg, Pittsburg, Pa.                                     | Plastic and Reconstructive Surgery                                      | 0              | 339            |
| 38   | The donor site morbidity of free DIEP flaps and free TRAM flaps for breast reconstruction. | N. Blondeel                           | G. Matton                          | 1997 | University Hospital Gent, Belgium                                           | Plastic and Reconstructive Surgery                                      | -0.035577677 | 337            |
| 39   | Membranous versus endochondral bone: implications for craniofacial reconstruction. | J. E. Zins                            | L. A. Whitaker                     | 1983 | Philadelphia, Pa.                                                           | Plastic and Reconstructive Surgery                                      | 0.117415976  | 333            |
| 40   | Nature and frequency of bisphosphonate-associated osteonecrosis of the jaws in Australia. | Tony Mavrokokki                      | Alastair Goss                      | 2007 | Adelaide Dental Hospital and University of Adelaide, Adelaide, South Australia. | Journal of Oral Maxillofacial Surgery                                  | -0.041290449 | 327            |
| 41   | Platelet gel: an autologous alternative to fibrin glue with applications in oral and maxillofacial surgery. | D. H. Whitman                        | Tony Mavrokokki                    | 1997 | David Grant Medical Center, Travis Air Force Base, Calif.                   | Journal of Oral Maxillofacial Surgery                                  | 0.165679809  | 323            |
| 42   | Cranio-maxillofacial trauma: a 10-year review of 9543 cases with 21,067 injuries. | D. M. Green                           | Robert Gassner                     | 2003 | Department of Oral and Maxillofacial Surgery, University of Innsbruck, Austria | Journal of Cranio-maxillofacial Surgery                                | -0.007759457 | 319            |
| 43   | Autologous stem cells (adipose) and fibrin glue used to treat widespread traumatic calvarial defects: case report. | Stefan Lendeckel                      | Hans-Peter Howaldt                 | 2004 | Justus-Liebig-University Medical School, Giessen, Germany                    | Journal of Cranio-maxillofacial Surgery                                | -0.008742911 | 315            |
| 44   | A paradigm shift in U.S. Breast reconstruction: increasing implant rates. | Claudia R. Albornoz                   | B. A. Toth                         | 1996 | Memorial Sloan-Kettering Cancer Center, New York, N.Y.                       | Plastic and Reconstructive Surgery                                      | -0.001450526 | 310            |
| 45   | Distraction osteogenesis in maxillofacial surgery using internal devices: review of five cases. | Claudia R. Albornoz                   | B. A. Toth                         | 1996 | California Pacific Medical Center, San Francisco, Calif.                     | Plastic and Reconstructive Surgery                                      | -0.035775128 | 307            |

(Continued)
| Rank | Title                                                                 | First Author | Senior Author | Year | Affiliation                                                                 | Journal                                      | DS          | Citation Count |
|------|-----------------------------------------------------------------------|--------------|---------------|------|----------------------------------------------------------------------------|----------------------------------------------|------------|----------------|
| 46   | Transplantation of chondrocytes utilizing a polymer-cell construct to produce tissue-engineered cartilage in the shape of a human ear. | Y. Cao       | C. A. Vacanti | 1997 | Department of Surgery, Children's Hospital, Boston, Mass.                   | Plastic and Reconstructive Surgery           | 0.088682432| 302            |
| 47   | Skin island flaps supplied by the vascular axis of the sensitive superficial nerves: anatomic study and clinical experience in the leg. | A. C. Masquelet | G. Wolf       | 1992 | Hôpital Avicenne, Paris, France                                             | Plastic and Reconstructive Surgery           | -0.004977876| 300            |
| 48   | Breast reconstruction after mastectomy using the temporary expander.  | C. Radovan    |               | 1982 | Encino, California                                                           | Plastic and Reconstructive Surgery           | 0.398921833| 298            |
| 49   | Free gracilis muscle transplantation, with microneurovascular anastomoses for the treatment of facial paralysis. A preliminary report. | K. Harii      | S. Torii      | 1976 | Tokyo, Japan                                                                | Plastic and Reconstructive Surgery           | 0.240137221| 296            |
| 50   | Complications in postmastectomy breast reconstruction: two-year results of the Michigan Breast Reconstruction. | Amy K. Alderman | Julie C. Lowery | 2002 | The University of Michigan Medical Center, Ann Arbor, Mich.                 | Plastic and Reconstructive Surgery           | 0.019320453| 296            |
| 51   | One hundred free DIEP flap breast reconstructions: a personal experience. | P. N. Blondeel |               | 1999 | University Hospital Gent, Belgium                                           | British Journal of Plastic Surgery           | -0.081786942| 296            |
| 52   | A 25-year perspective of peripheral nerve surgery: evolving neuroscientific concepts and clinical significance. | G. Lundborg   |               | 2000 | Malmö University Hospital, Sweden                                          | Journal of Hand Surgery (American)           | -0.005474551| 293            |
| 53   | A 10-year retrospective review of 758 DIEP flaps for breast reconstruction. Mandibular lengthening by gradual distraction. Preliminary report. | Paul S. Gill  | Robert J. Allen | 2004 | Louisiana State University Health Sciences Center, New Orleans, La.         | Plastic and Reconstructive Surgery           | -0.058704453| 292            |
| 54   | Mandibular lengthening by gradual distraction. Preliminary report. | C. C. Snyder  | E. C. Browne Jr. | 1973 | Veterans Administration Hospital, Salt Lake City, Utah                     | Plastic and Reconstructive Surgery           | 0.474725275 | 290            |
| 55   | Clinical nerve reconstruction with a bioabsorbable polyglycolic acid tube. | S. E. Mackinnon | A. L. Dellow  | 1990 | University of Toronto Sunnybrook Medical Center, Ontario                   | Plastic and Reconstructive Surgery           | -0.04        | 289            |
| 56   | The subunit principle in nasal reconstruction. | G. C. Burget | F. J. Menick      | 1985 | Chicago, Ill.                                                              | Plastic and Reconstructive Surgery           | 0.246604317| 288            |
| 57   | Synthetic polymers seeded with chondrocytes provide a template for new cartilage formation. | C. A. Vacanti | J. P. Vacanti | 1991 | Massachusetts General Hospital, Boston                                      | Plastic and Reconstructive Surgery           | 0.006523499 | 287            |
| 58   | Structural fat grafts: the ideal filler? | S. R. Coleman |               | 2001 | Manhattan Eye, Ear, and Throat Hospital, New York, N.Y.                    | Clinics in Plastic Surgery                   | -0.028795812| 287            |
| 59   | Mandibular elongation and remodeling by distraction: a farewell to major osteotomies. | F. Molina     | F. Ortiz       | 1995 | Universidad Nacional Autónoma de Mexico, Mexico City | Plastic and Reconstructive Surgery           | -0.119821542| 286            |
| 60   | A prospective study of microvascular free-flap surgery and outcome. | R. K. Khouri  | C. Wallemark   | 1998 | Miami Hand Center, Fla.                                                    | Plastic and Reconstructive Surgery           | 0.001478561| 283            |
| 61   | Vacuum-assisted closure: micodeformations of wounds and cell proliferation. | Vishal Saxena | Dennis P. Orgill | 2004 | Massachusetts Institute of Technology, Cambridge, Mass.                    | Plastic and Reconstructive Surgery           | -0.020012129| 279            |
| 62   | Growth factor levels in platelet-rich plasma and correlations with donor age, sex, and platelet count. | Gernot Weberich | Walter E. Hitzler | 2002 | Johannes Gutenberg University Mainz, Germany                                  | Journal of Cranio-Maxillofacial Surgery       | -0.0101010  | 278            |
| 63   | Fat grafting to the breast revisited: safety and efficacy. | Sydney R. Coleman | Alexis P. Saboeiro | 2007 | New York University School of Medicine, New York, N.Y.                    | Plastic and Reconstructive Surgery           | -0.006464884| 274            |
| 64   | Foreign body reactions to resorbable poly(L-lactide) bone plates and screws used for the fixation of unstable zygomatic fractures. | E. J. Bergsma  | W. G. de Brujin | 1995 | University Hospital, Groningen, the Netherlands                            | Journal of Oral and Maxillofacial Surgery     | 0.023038157 | 271            |

(Continued)
| Rank | Title                                                                 | First Author          | Senior Author          | Year | Affiliation                        | Journal                           | DS       | Citation Count |
|------|----------------------------------------------------------------------|-----------------------|------------------------|------|-----------------------------------|----------------------------------|---------|----------------|
| 65   | Spreader graft: a method of reconstructing the roof of the middle nasal vault following rhinoplasty. | J. H. Sheen           |                       | 1984 | UCLA, Los Angeles, Calif.         | Plastic and Reconstructive Surgery | 0.760869565 | 267            |
| 66   | Anatomic variations and technical problems of the anterolateral thigh flap: a report of 74 cases. | Y. Kimata              | K. Harii               | 1998 | National Cancer Center Hospital East, Kashiwa, Chiba, Japan | Plastic and Reconstructive Surgery | -0.18245614 | 267            |
| 67   | Functional wrist motion: a biomechanical study.                       | A. K. Palmer           | R. Glisson             | 1985 | Upstate Medical Center, Syracuse, N.Y. | Journal of Hand Surgery (American) | 0.184087363 | 266            |
| 68   | Volar fixation for dorsally displaced fractures of the distal radius: a preliminary report. | Jorge L. Orbay         | Diego L. Fernandez     | 2002 | Miami Hand Center, Miami, Fla.    | Journal of Hand Surgery (American) | -0.072820513 | 266            |
| 69   | The vascular territories of the superior epigastric and the deep inferior epigastric systems. | J. B. Boyd             | R. Corlett             | 1984 | Melbourne, Australia               | Plastic and Reconstructive Surgery | -0.04839342 | 264            |
| 70   | Body contouring by lipolysis: a 5-year experience with over 3000 cases. | Y. G. Illouz           |                       | 1983 | Paris, France                     | Plastic and Reconstructive Surgery | 0.823741007 | 263            |
| 71   | Immediate bilateral breast reconstruction with implants and inferolateral AlloDerm slings. | Karl H. Breuing        | Stephen M. Warren      | 2005 | Brigham and Women’s Hospital, Harvard Medical School, Boston, Mass. | Plastic and Reconstructive Surgery | -0.00222464 | 259            |
| 72   | A randomized prospective study of polyglycolic acid conduits for digital nerve reconstruction in humans. | R. A. Weber             | D. P. Mass             | 2000 | Scott & White Memorial Hospital and Clinic, Temple, Tex. | Plastic and Reconstructive Surgery | -0.078142857 | 259            |
| 73   | Historical review and present status of free fat graft autotransplantation in plastic and reconstructive surgery. | E. Billings Jr         | J. W. May Jr           | 1989 | Massachusetts General Hospital, Boston | Plastic and Reconstructive Surgery | 0.010935252 | 253            |
| 74   | Keloid pathogenesis and treatment.                                     | Ali Al-Attar           | Steven P. Davison      | 2006 | Georgetown University Medical Center, Washington, D.C. | Plastic and Reconstructive Surgery | -0.01314012 | 252            |
| 75   | A new concept in the treatment of osteoradionecrosis.                  | R. E. Marx             |                       | 1983 | Wilford Hall USAF Medical Center, Lackland ABF, Tex. | Journal of Oral Maxillofacial Surgery | -0.097577959 | 250            |
| 76   | Implant-based breast reconstruction using acellular dermal matrix and the risk of postoperative complications. | Yoon S. Chun           | Elof Eriksson          | 2010 | Harvard Medical School, Brigham and Women’s Hospital/Faulkner Hospital, Boston, Mass. | Plastic and Reconstructive Surgery | -0.176151762 | 248            |
| 77   | Distant transfer of an island flap by microvascular anastomoses. A clinical technique. | R. K. Daniel            | G. I. Taylor           | 1973 | Melbourne, Australia               | Plastic and Reconstructive Surgery | 0.147027027 | 244            |
| 78   | The frequency and epidemiology of hand and forearm fractures in the United States. | K. C. Chung            | S. V. Spilson          | 2001 | The University of Michigan Medical Center, Ann Arbor, Mich. | Journal of Hand Surgery (American) | 0.135831382 | 241            |
| 79   | Free anterolateral thigh flaps for reconstruction of head and neck defects. | I. Koshiba              | S. Ohta               | 1993 | Department of Plastic and Reconstructive Surgery, Kawasaki Medical School, Okayama, Japan | Plastic and Reconstructive Surgery | -0.08673621 | 241            |
| 80   | Volar fixed-angle plate fixation for unstable distal radius fractures in the elderly patient. Modified skin incisions for masticotomy: the need for plastic surgical input in preoperative planning. | Jorge L. Orbay         | Diego L. Fernandez     | 2004 | Miami Hand Center, Miami, Fla.    | Journal of Hand Surgery (American) | -0.098630157 | 240            |
| 81   | Human histology and persistence of various injectable filler substances for soft tissue augmentation. | B. A. Toth             | P. Lappert            | 1991 | Pacific Presbyterian Medical Center, San Francisco, Calif. | Plastic and Reconstructive Surgery | 0.134067952 | 239            |
| 82   | Fibular osteoseptocutaneous flap: anatomic study and clinical application. | Gottfried Lemperle      | Ulrich Charrier        | 2003 | University of California, San Diego, Calif. | Aesthetic Plastic Surgery         | -0.012070006 | 239            |
| 83   | Fibular osteoseptocutaneous flap: anatomic study and clinical application. | F. C. Wei              | M. S. Noordhoff        | 1986 | Taipei, Taiwan                    | Plastic and Reconstructive Surgery | -0.005925967 | 238            |

(Continued)
| Rank | Title                                                                 | First Author        | Senior Author | Year | Affiliation                                                                 | Journal                              | DS          | Citation Count |
|------|----------------------------------------------------------------------|---------------------|---------------|------|----------------------------------------------------------------------------|--------------------------------------|------------|----------------|
| 84   | Myogenic differentiation by human processed lipoaspirate cells.       | Hiroshi Mizuno      | Marc H. Hedrick | 2002 | University of California-Los Angeles School of Medicine                    | Plastic and Reconstructive Surgery   | -0.008084971 | 238            |
| 85   | Temporomandibular joint arthrocentesis: a simplified treatment for severe, limited mouth opening | D. W. Nitzan        | G. A. Martinez | 1991 | Hebrew University-Hadassah School of Dental Medicine, Jerusalem, Israel      | Journal of Oral and Maxillofacial Surgery | -0.007383479 | 238            |
| 86   | Vaginal reconstruction with gracilis myocutaneous flaps.              | J. B. McCraw        | C. E. Horton   | 1976 | Norfolk, Va.                                                               | Plastic and Reconstructive Surgery   | 0.627071823  | 234            |
| 87   | Relative antigenicity of components of a vascularized limb allograft.  | W. P. Lee           | A. J. Weiland  | 1991 | Johns Hopkins University School of Medicine, Baltimore, Md.                 | Plastic and Reconstructive Surgery   | -0.001562907 | 233            |
| 88   | Cleft palate repair by double opposing Z-plasty.                     | L. T. Furlow Jr     | S. L. Spear    | 1986 | Gainesville, Fla.                                                          | Plastic and Reconstructive Surgery   | -0.017902813 | 232            |
| 89   | Acellular dermis-assisted breast reconstruction.                      | Maurice Y. Nahabedian | Paul N. Manson | 2002 | Johns Hopkins Medical Institutions, Baltimore, Md.                          | Plastic and Reconstructive Surgery   | -0.088586051 | 229            |
| 90   | Breast Reconstruction with the free TRAM or DIEP flap: patient selection, choice of flap, and outcome. | E. G. Wilkins        | K. W. Shaheen  | 2000 | University of Michigan Health System, Ann Arbor                            | Plastic and Reconstructive Surgery   | -0.000883246 | 227            |
| 91   | Prospective analysis of psychosocial outcomes in breast reconstruction: one-year postoperative results from the Michigan reconstruction outcome study. | P. Tessier          |                | 1971 | Paris, France                                                              | Plastic and Reconstructive Surgery   | 0.071197411  | 226            |
| 92   | The definitive plastic surgical treatment of the severe facial deformities of craniofacial dysostosis. Crouzon's and Apert's diseases. | R. E. Holmes        |                | 1979 | University of Texas, Dallas, Tex.                                           | Plastic and Reconstructive Surgery   | 0.078222778  | 224            |
| 93   | Bone regeneration within a coralline hydroxyapatite implant.          | J. C. MacDermid      | J. H. Roth     | 2000 | St. Joseph's Health Centre, London, Ontario, Canada                         | Journal of Hand Surgery (American)   | -0.012585812 | 223            |
| 94   | The vascular anatomy of rectus abdominis musculocutaneous flaps based on the deep superior epigastric system. | A. J. DeFranzo      | R. G. Teasdall | 2001 | Wake Forest University School of Medicine, Winston-Salem, N.C.               | Plastic and Reconstructive Surgery   | -0.062587904 | 223            |
| 95   | Keloids and hypertrophic scars: a comprehensive review.               | Patricia B. Burns    | Kevin C. Chung | 2011 | University of Michigan Health System, Ann Arbor, Mich.                     | Plastic and Reconstructive Surgery   | 0.000240154  | 222            |
| 96   | The levels of evidence and their role in evidence-based medicine.     | W. B. Rockwell      | H. F. Ehrlich  | 1989 | Massachusetts General Hospital, Boston, Mass.                               | Plastic and Reconstructive Surgery   | -0.012576867 | 222            |
| 97   | The vascular anatomy of rectus abdominis musculocutaneous flaps based on the deep superior epigastric system. | H. K. Moon           | G. I. Taylor   | 1988 | Cleveland Clinic Foundation, Ohio                                           | Plastic and Reconstructive Surgery   | -0.065380282 | 222            |
| 98   | Transplantation of purified autologous fat: a 3-year follow-up is disappointing. | R. A. Ersek         |                | 1991 | Southwest Texas State University                                           | Plastic and Reconstructive Surgery   | 0.134969325  | 221            |
| 99   | Reconstruction of the mandible with osseous free flaps: a 10-year experience with 150 consecutive patients. | P. G. Cordeiro      | Q. Y. Hu       | 1999 | Memorial Sloan-Kettering Cancer Center, New York, N.Y.                      | Plastic and Reconstructive Surgery   | -0.031496063 | 215            |
RESULTS

A kernel plot for the DSs of the 12,742,382 PubMed-indexed articles (1954–2014) across all specialties is shown in Figure 1. For our analysis, a total of $n = 53,507$ articles were identified, $n = 15,759$ in PRS, $n = 6,276$ in Annals of Plastic Surgery, $n = 5467$ in British Journal of Plastic Surgery (currently Journal of Plastic, Reconstructive & Aesthetic Surgery), $n = 7843$ in Journal of Oral and Maxillofacial Surgery, $n = 1770$ in Journal of Craniomaxillofacial Surgery, $n = 3496$ in Journal of Craniofacial Surgery, $n = 1937$ in Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery, $n = 1104$ in Clinics in Plastic Surgery, $n = 3691$ in Journal of Hand Surgery (American), $n = 2463$ in Journal of Hand Surgery (European/British), $n = 406$ in Aesthetic Surgery Journal, $n = 450$ in JAMA Facial Plastic Surgery, $n = 1225$ in Journal of Reconstructive Microsurgery, and $n = 1620$ in Aesthetic Plastic Surgery. The 100 most-disruptive articles in plastic and reconstructive surgery and sub-specialties are presented in Table 1. For comparison, the top 10 most-cited articles in these journals is presented in Table 2. The top five including nine of the top 10 most-disruptive articles were published in PRS. Additionally 21 of the top 30, and 64 of the total list of 100 appeared in the same journal. The second-most articles on the list appeared in British Journal of Plastic Surgery (currently Journal of Plastic, Reconstructive & Aesthetic Surgery) ($n = 15$), third-most in Journal of Oral and Maxillofacial Surgery ($n = 7$), fourth-most in Annals of Plastic Surgery ($n = 6$), followed by Journal of Hand Surgery (American) ($n = 3$), Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery ($n = 2$), Journal of Hand Surgery (European/British) ($n = 1$), Clinics in Plastic Surgery ($n = 1$), and Journal of Craniofacial Surgery ($n = 1$) (Table 3). There were no articles from either Journal of Reconstructive Microsurgery, Journal of Craniofacial Surgery, JAMA Facial Plastic Surgery, Aesthetic Plastic Surgery or Aesthetic Surgery Journal in the top 100. The top 100 most-disruptive publications in these journals were more disruptive than 99.8% of all PubMed articles. Citation counts of the 100 most-disruptive articles ranged from 1 to 502 (mean = 44.9 citations). The correlation coefficient linking DSs and citation counts was 0.01 and 0.11 among all articles, and the 100 most-disruptive articles, respectively.

Figure 2 displays a scatterplot of DSs by citation count for all plastic surgery articles, and Figure 3 displays a kernel density plot of DSs by journal. Mean DSs by journal are presented in Table 4. The highest mean DS was in Clinics in Plastic Surgery and PRS. The average PRS, Annals of Plastic

Table 3. Number of Articles in the Top 100 Most-disruptive Articles by Journal

| Journal                                | No. Articles in Top 100 |
|----------------------------------------|-------------------------|
| 1. Plastic and Reconstructive Surgery  | 64                      |
| 2. British Journal of Plastic Surgery  | 15                      |
| 3. Journal of Oral and Maxillofacial Surgery | 7                  |
| 4. Annals of Plastic Surgery           | 6                       |
| 5. Journal of Hand Surgery (American)  | 3                       |
| 6. Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery | 2 |
| 7. Journal of Hand Surgery (European/British) | 1                   |
| 8. Clinics in Plastic Surgery          | 1                       |
| 9. Journal of Craniofacial Surgery     | 1                       |
| 10. Aesthetic Surgery Journal          | 0                       |
| 11. Aesthetic Plastic Surgery          | 0                       |
| 12. Journal of Craniofacial Surgery    | 0                       |
| 13. JAMA Facial Plastic Surgery        | 0                       |
| 14. Journal of Reconstructive Microsurgery | 0                   |

Fig. 2. Scatterplot of citation counts by DSs for all plastic surgery articles.

Fig. 3. Distribution of disruption scores by individual journal (1954–2014). Negative values indicate developmental articles, and positive values indicate disruptive articles. Note: British Journal of Plastic Surgery is currently Journal of Plastic, Reconstructive & Aesthetic Surgery.
Surgery, British Journal of Plastic Surgery (currently Journal of Plastic, Reconstructive & Aesthetic Surgery), Journal of Oral and Maxillofacial Surgery, Journal of Craniofacial Surgery, Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery, Clinics in Plastic Surgery, Journal of Hand Surgery (American), Journal of Hand Surgery (European/British), Aesthetic Surgery Journal, JAMA Facial Plastic Surgery, Journal of Reconstructive Microsurgery, and Aesthetic Plastic Surgery article was more disruptive than 81%, 33%, 42%, 22%, 36%, 38%, 77%, 88%, 10%, 12%, 38%, 26%, 34%, and 23% of all PubMed articles, respectively.

Figure 4 displays publication year histogram for the top 100 most-disruptive articles. The most common decade represented was the 1980s (n = 31), and the least common was 2000s (n = 9). The mean DS for the 1960s, 1970s, 1980s, 1990s, and the 2000s was 0.59, 0.55, 0.53, 0.55, and 0.55, respectively. With respect to study types, there are notable differences between the focus of the most-disruptive and the most-cited articles. The most common study types in the most-disruptive list were methodological studies (n = 32), case reports/series (n = 31), and reviews (n = 19), whereas for the most-cited list, they were case reports/series (n = 33), reviews (n = 17), and novel surgical techniques (n = 9).

**DISCUSSION**

This is the first study to apply the disruption index to the field of plastic and reconstructive surgery. We present in the current study a list of the top 100 most-disruptive studies appearing in 14 of the most popular journals in plastic surgery (1954–2014). In our analysis, we found that DSs correlated poorly with citation count. This findings underscores that the disruption metric may capture unique characteristics of paradigm-shifting studies that may be overlooked when favoring citation count. This list contains some of the most infamous and practice-altering articles in the history of our specialty.

The most-disruptive article appearing on the list, “Minimally Invasive, Limited Incision Breast Surgery: Passing Fad or Emerging Trend?” was published by Rod J. Rohrich in *PRS* in 2002.15 This “Cosmetic Viewpoint” starts by quoting Albert Einstein: “Problems cannot be solved at the same level of awareness that created them” and discusses what were at the time recent trends in minimally invasive breast surgery, breast liposuction, and limited incision mastopexy/breast reduction.

The second-most disruptive article published in 1966 in *PRS* was “The Ultimate Fate of Freeze Dried Fascia: Experience with its Use in the Correction of Facial Paralysis.”16 In this report, Snyderman et al discussed their positive experience in 15 patients treated with freezedried fascia for facial palsy. To that point, the use of fresh autologous fascia was standard until the authors benefited from the advent of a tissue bank in 1953 at the Memorial Sloan Kettering Cancer Center.

The third-most disruptive article by Ulrich and Meyer “A Suction Curette for Removal of Excessive Local Deposits of Subcutaneous Fat” appeared in *PRS* in 1978 and was the first documented report on the use of liposuction.17 This study described the authors’ transition from what was at the point the standard method of removal of localized fat deposits by curette through a small incision in select areas (eg, trochanteric lipodystrophy) to their use of a stainless steel suction curette (devised by Ulrich) to “treat fat deposits elsewhere (eg, stomach, thighs, calves, knees).” This report appeared a few years after Arpad and

| Table 4. Mean DSs by Journal |
|-----------------------------|
| Journal | Mean DSs |
| Clinics in Plastic Surgery | 0.0029 |
| Plastic and Reconstructive Surgery | 0.0005 |
| Scandinavian Journal of Plastic and Reconstructive Surgery | 0.00005 |
| Surgery and Hand Surgery | |
| British Journal of Plastic Surgery | −0.0015 |
| Aesthetic Surgery Journal | −0.0018 |
| Journal of Craniofacial Surgery | −0.0018 |
| Journal of Reconstructive Microsurgery | −0.0021 |
| Journal of Oral and Maxillofacial Surgery | −0.0025 |
| Annals of Plastic Surgery | −0.0025 |
| JAMA Facial Plastic Surgery | −0.0039 |
| Aesthetic Plastic Surgery | −0.0048 |
| Journal of Hand Surgery (European/British) | −0.0049 |
| Journal of Hand Surgery (American) | −0.010 |
| Journal of Oral and Maxillofacial Surgery | −0.0124 |
Giorgio Fischer first started using a blunt suction-assisted cannula to treat fat deposits of the outer thighs.16

The fourth-most disruptive study is the 1998 study by Schneider, Morykwas, and Argenta “A New and Reliable Method of Securing Skin Grafts to the Difficult Recipient Bed.”19 This PRS study described their experience with the Vacuum Assisted Closure device (KCI: San Antonio, Tex.) for skin graft to wound bed apposition in place of the traditional tie-over bolster method.

The fifth-most disruptive study is also the fourth-most cited on the list. This 1985 PRS study by Illouz titled “Body Contouring by Lipolysis: A 5-Year Experience with Over 3000 Cases” presented the author’s experience with liposuction body contouring and subsequent surgical correction of the deformity resulting from overlying skin contraction.20

It is also worth noting that the sixth-most disruptive 1967 study by Brunner describing “The Zig-Zag Volar-Digital Incision for Flexor Tendon Surgery” has for over 50 years been the incision-of-choice for flexor tendon and volar digital exposure.21 Other notable works appearing in the top 10 include a 1979 large-volume review of palatal fistulae by Abyholm et al (“Palatal Fistulae Following Cleft Palate Surgery” in Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery22), the first description in 1984 by Sheen of the now ubiquitous spreader graft in rhinoplasty (“Spreader Graft: A Method of reconstructing the Roof of the Middle Nasal Vault Following Rhinoplasty” in PRS23), McKissock’s 1972 description of his now eponymous breast reduction technique (“Reduction Mammaplasty with a Vertical Dermal Flap” in PRS24), and finally the 1969 Australian study by Snell and Dott advocating for widespread use of plating in mandibular fractures (“Internal Fixation of Certain Fractures of the Mandible by Bone Plating” in PRS25).

The most-cited study (n = 502 citations, 91st on the list of most-disruptive studies) is the 1989 case report by Koshima et al entitled “Inferior Epigastric Artery Skin Flaps Without Rectus Abdominis Muscle” published in the British Journal of Plastic Surgery (currently Journal of Plastic, Reconstructive & Aesthetic Surgery).26 This now infamous article was the first description of the deep inferior epigastric artery perforator (DIEP) flap, which has since become the gold-standard for autologous free flap breast reconstruction at many centers around the world. The current authors would like to stress that all articles in the top 100 are highly disruptive studies. Although, in theory, the number one article on the list is more disruptive than the fifth, which are both more disruptive than all the studies appearing lower, the list is meant to be viewed as a body rather than as a consecutive ranking. The study by Koshima et al26 is one of the most revolutionary studies in the history of plastic surgery, and because it was identified at the top 100, the current authors believe that this is evidence of the merit of this novel bibliometric. Moreover, although many of the articles appearing in the most-disruptive list also carried high citation counts, many did not (n = 25 articles had <10 citations). This finding is similar to the study by Becerra et al investigating disruption in academic surgery, in which 23 of their top 100 also had <10 citations.

The most common decade of disruption in the top 100 was the 1980s, with 31 articles at the top 100. Although the World Wars and the following decades certainly were integral in the development of plastic surgery,27 the 1980s saw an explosion of innovation in part due to technological advances in plastic surgery and surgery more generally.28 However, notably, the 1980s had the lowest average DS (0.53), with the 1960s having the highest average DS (0.59) of the decades included in our analysis. The 2000s had the fewest appearances on the list of top 100 with 9 articles, although, as previously discussed, the most-disruptive article was published in 2002 by Rohrich.15

The list of the most-disruptive articles also contains a broad diversity of topics and study designs. In fact, the broad range of topics was so variable that it precluded analysis. However, data on study design are presented with the most common type of study on the disruptive list—methodological studies (n = 32), whereas that for the most-cited list was case report/series (n = 33). Although case reports/series were also relatively common on the disruptive list (n = 31), there were very few methodological studies appearing in the most-cited list (n = 6). Although one may expect a list of the most paradigm-shifting studies in plastic surgery to feature a long list of high level of evidence randomized controlled trials, our results are similar to the results of other studies, including the Nature study by Wu et al,7 which initially investigated the disruption bibliometric. They concluded that small teams disrupt, but large teams develop. In both the most-disruptive and most-cited lists in the current study, a large number of case series and case reports seem to highlight this phenomenon: that these types of studies may report on novel concepts that serve to introduce a topic/finding to the wider surgical community and then serves as a foundation for larger, higher level of evidence studies to investigate novel findings. The current authors would also like to stress that the disruption metric is not synonymous with the dictionary definition of the word disruption, which carries its own connotations and may lead to misinterpretation of this bibliometric. Rather, we recommend the reader to focus on the definition of disruption, as outlined in the Methods section and the equation described. Furthermore, although some highly disruptive studies may change clinical practice, many do not. The mean feature of the disruption index is identifying articles that supplant previous literature on a given topic. Moreover, although some of these studies changed clinical practice, all of the highly-disruptive articles share the characteristic that they shifted paradigms in a given topic, as evidenced by shifting citations from previous literature to the index study after publication.

The DS serves as an alternative and complimentary tool to the citation count, which although simple and pragmatic, may not capture all scopes of innovation for quantifying scholarly impact. With the continued explosion of scientific literature, bibliometric measurements have become increasingly important to analyze
and rank academic productivity. Academic plastic surgery is an exceedingly competitive field and bibliometric measurements are frequently also used for promotion. Although citation count or bibliographic indices derived thereof (h-index and g-index) are often used as a proxy for scholarly impact, these metrics have notable limitations. Several recent studies have investigated alternative bibliometrics in plastic surgery, including the Altmetric score. Shiah et al compared the Altmetric score with “traditional” citation-based metrics such as the Hirsch index (H-index) and concluded that the Altmetric score has a weak positive correlation with conventional bibliometrics. Another recent study by Ruan et al investigated the relationship among the Altmetric score, Mendeley reader score, citation count, and downloads in PRS, and described the merits of the Altmetric score but discouraged its use as a stand-alone bibliometric.

This study carries several limitations. Our analysis was conducted in 14 plastic and reconstructive surgery journals. Thus, articles published in other plastic surgery journals, or high-impact journals such as general surgery or medicine are excluded. Additionally, DOIs and citation counts, like all bibliometrics, change over time as new scientific literature is published, and this analysis provides a snapshot in time of the current bibliometrics. Additionally, older studies are theoretically favored by this metric (as with other metrics) as they have had more time to aggregate citations. The favoring effect is likely counterbalanced by the fact that outdated studies eventually are less likely to be read or cited due to the dramatic changes that surgery is constantly undergoing. Despite these limitations, this study provides an important contribution to the plastic surgery literature by providing a repository of disruptive plastic surgery articles that may have otherwise been overlooked using traditional bibliometric tools. Future work will focus on comparing the disruption index with other alternative metrics such as Altmetric score, H-index, Mendeley reader score, and download counts.

CONCLUSIONS

We present the 100 most-disruptive articles in 14 of the most popular plastic surgery journals published between 1954 and 2014, utilizing a novel bibliometric index. A detailed analysis of these studies, including correlation to citation counts and analysis of publication years, is also presented. To our knowledge, this is the first application of the disruption metric to plastic surgery and its sub-specialties. This review provides a unique perspective on the seminal research studies that shifted paradigms and pushed forward surgical innovations that have made plastic surgery what it is today. We hope this perspective will provide plastic, reconstructive, and subspecialty surgeons an understanding of how current and historical innovations have made a lasting impact on the field of plastic surgery and provide insight into how current and future studies may further shape the field in ways we have yet to observe.
19. Schneider AM, Morykwas MJ, Argenta LC. A new and reliable method of securing skin grafts to the difficult recipient bed. Plast Reconstr Surg. 1998;102:1195–1198.

20. Illouz YG. Body contouring by lipolysis: a 5-year experience with over 3000 cases. Plast Reconstr Surg. 1983;72:591–597.

21. Bruner JM. The zig-zag volar-digital incision for flexor-tendon surgery. Plast Reconstr Surg. 1967;40:571–574.

22. Abyholm FE, Borchgrevink HH, Eskeland G. Palatal fistulae following cleft palate surgery. Scand J Plast Reconstr Surg. 1979;13:295–300.

23. Sheen JH. Spreader graft: a method of reconstructing the roof of the middle nasal vault following rhinoplasty. Plast Reconstr Surg. 1984;73:230–239.

24. McKissock PK. Reduction mammoplasty with a vertical dermal flap. Plast Reconstr Surg. 1972;49:245–252.

25. Snell JA, Dott WA. Internal fixation of certain fractures of the mandible by bone plating. Plast Reconstr Surg. 1969;43:281–286.

26. Koshima I, Soeda S. Inferior epigastric artery skin flaps without rectus abdominis muscle. Br J Plast Surg. 1989;42:645–648.

27. Battle R. Plastic surgery in the two world wars and in the years between. J R Soc Med. 1978;71:844–848.

28. Riskin DJ, Longaker MT, Gertner M, et al. Innovation in surgery: a historical perspective. Ann Surg. 2006;244:686–693.

29. Borgman CL, Furner J. Scholarly communication and bibliometrics. Annu Rev Inform Sci Technol. 2002;36:3–72.

30. Gast KM, Kuzon WM Jr, Waljee JF. Bibliometric indices and academic promotion within plastic surgery. Plast Reconstr Surg. 2014;134:838e–844e.