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Original article

The top 100. Review of the most cited articles on pancreas and laparoscopy☆

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ABSTRACT

Introduction: The number of citations is considered as an indirect indicator of the merit of an article, journal or researcher, although it is not an infallible method to determine scientific quality. Our goal is to determine the characteristics of the articles most cited about pancreas and laparoscopy.

Methods: We performed a search of all articles published in any journal about pancreas and laparoscopy until September 2019 and selected the 100 most cited papers. We recorded number of citations, journal, year of publication, quartil, impact factor, institution, country, authors type of paper, type of surgery, topic and area.

Results: The top 100 citations account 10,970 citations in total. The journal with the most articles is *Surgical Endoscopy* and 2007 is the year with the highest number of articles in the top 100 citations. The percentage of publications from America and Europe are similar.

Case series is the most frequently paper, outcomes/morbidity is the most frequently discussed topic, and distal pancreatectomy is the most frequently type of surgery.

Conclusions: This bibliometric study on pancreas and laparoscopy is conditioned by the time factor, since laparoscopy has arrived later at pancreatic surgery, probably due to the morbidity and mortality associated with pancreatic surgery and the need for a high specialization in this field. The literature is recent and scarce. More and better-quality studies are needed in this field.

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Top 100. Revisión de los artículos más citados sobre cirugía laparoscópica del páncreas

Palabras clave:
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Artículo
Cita
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Páncreas
Laparoscopia

RESUMEN

Introducción: El número de citas se considera un indicador indirecto del mérito de un artículo, revista o investigador, aunque no es un método infalible para determinar la calidad científica. Nuestro objetivo es determinar las características de los artículos más citados sobre páncreas y laparoscopia.

Métodos: Realizamos una búsqueda de todos los artículos publicados en cualquier revista sobre páncreas y laparoscopia hasta septiembre de 2019 y seleccionamos los 100 artículos más citados. Registramos el número de citas, la revista, el año de publicación, el cuartil, el factor de impacto, la institución, el país, el tipo de artículo de los autores, el tipo de cirugía, el tema y el área.

Resultados: El top 100 suma 10.970 citas. La revista con más artículos es *Surgical Endoscopy* y 2007 es el año con el mayor número de artículos en el top 100. El porcentaje de publicaciones de América y Europa es similar. Las series de casos son el tipo de artículo más frecuente, los resultados/morbilidad es el tema más discutido y la pancreatectomía distal es el tipo de cirugía más frecuente.

Conclusiones: Este estudio bibliométrico sobre páncreas y laparoscopia está condicionado por el factor tiempo, ya que la laparoscopia ha llegado más tarde a la cirugía pancreática, probablemente debido a la morbimortalidad asociada a la cirugía pancreática y a la necesidad de una alta especialización en este campo. La literatura es reciente y escasa. Se necesitan más estudios y de mayor calidad en este campo.

Introduction

The number of citations on an article is a method to determine the impact of a researcher or publication in the scientific community, along with other indicators such as the impact factor.[1–8] The number of citations is considered an indirect indicator of the merit of an article, journal or researcher,[1,2,4,5] although it is not an infallible method to determine scientific quality.

Bibliometric studies allow us to know how scientific information is obtained, where it comes from and what its quality is. Recently, a series of articles on 'classic citations' (the most cited articles) has been published in various specialties to define the characteristics that a publication must have to be admitted to this select list.[1–5,7,9]

However, the bibliography referring to the pancreas and laparoscopy is very scarce, and a bibliometric study on the subject can allow us to know the current situation on the subject and investigate the quality of the articles published, as well as to identify the fields of knowledge where further investigation is required.

Our objective is to determine the characteristics of the most cited articles on the pancreas and laparoscopy.

Methods

We performed a search of all articles published in any journal on the pancreas and laparoscopy as of September 24, 2019, using the Thomson Reuters ISI Web of Science (WEB) application. Our search included the following terms: ((Pancreas)) AND ((Surgery)) AND ((Laparoscopy) OR (Video-Assisted Surgery) OR (Natural Orifice Endoscopic Surgery) OR (Robotic Surgical Procedures) OR (Hand-Assisted Laparoscopy)).

The Thomson Reuters ISI Web of Science application includes the following databases:

- Web of Science (1990-present)
- BIOSIS citations index (2006-present)
- BIOSIS Advances (1926-present)
- Current Contents Connect (1998-present)
- Derwent innovation index (1980–2009)
- KCI - Korean Journal Database (1980-present)
- MEDLINE® (1950-present)
- Russian Science Citation Index (2005-present)
- SciELO Citation Index (2002-present)

We selected the 100 most cited articles using the category 'times cited' in all databases (top 100 citations).

For each article, we evaluated: title, number of citations, journal, year of publication, quartile (Q), impact factor (IF) by year, institution of the first author, country (if it is multicenter, we chose the country of the first author), number of authors, name of the first author, type of article, topic, type of surgery and area.

We searched for Q/IF in the Journal Citation Report® (JCR) (https://jcr.incites.thomsonreuters.com/JCRJournalHomeAction.action) and selected them according to the year. If there was no online Q/IF for the year, we selected the first online Q/IF published in JCR (in parentheses).

We selected the institution of the first author and the country according to the hospital/country of work at the time of publication.

We classified the type of paper as original, randomized controlled studies (RCT), review, systematic review, meta-analysis, case series, cohort study, and a group called 'others', which included clinical cases, letters or descriptions of surgical techniques.

We classified the subject of the article as staging, morbidity, surgical technique, laparoscopic surgery vs. open surgery, outcomes/morbidity and experimental surgery.

The type of surgery was classified as pancreaticoduodenectomy (PD), total pancreatectomy, distal pancreatectomy (DP), robotic surgery, pancreatic surgery, palliative surgery, video-assisted retroperitoneal debridement (VARD) and 'no surgery', which referred to articles not related to surgical procedures.

The area of interest was divided into benign disease, acute pancreatitis, chronic pancreatitis, adenocarcinoma, neuroendocrine tumor, cystic neoplasia, intraductal papillary mucinous neoplasm (IPMN), neoplasms and benign/malignant lesions.

Results

After the search, a total of 2182 articles were analyzed. The total number of articles published varied from magazine to magazine, as some journals have been running longer than others.

The top 100 had a total of 10 970 citations (Table 1). The most cited article was about the first laparoscopic DP described by Gagner in 1994 and had 530 citations since its publication. The 3 most cited articles —Gagner 1994 with 530 citations, Mabrut 2005 with 328, and Gagner 1996 with 311— accounted for 1169 citations, which was more than 10% of the total in this top 100 (1169/10 970; 10.66%). The 27 most cited articles totaled 5527 citations (5527/10 970; 50.38% of the total).

According to the year, 2007 had 11 articles, representing 1081 citations, while 2010 was the year with the highest number of citations: 1256 citations and 9 articles (Fig. 1).

The journal with the most articles included in this top 100 was *Surgical Endoscopy* (30/100; 30%). Second, we find *Annals of Surgery* with 9, followed by *J Am Coll Surg* with 8. Four journals were responsible for 50% of the included articles (*Surg Endosc*

Table 1 – References included in the top 100 citations on the pancreas and laparoscopy.

Reference	First author	Number of citations
Surg Endosc. 1994;8(5):408–10	Gagner M	530
Surgery. 2005;137(6):597–605	Mabrut JY	328
Surgery. 1996;120(6):1051–4	Gagner M	311
Ann Surg. 2012;255(6):1048–59	Venkat R	293
Ann Surg. 2008;248(3):438–46	Kooby DA	293
Ann Surg. 1995;221(2):156–64	John TG	258
Arch Surg. 2010;145(1):19–23	Kendrick ML	247
Surg Endosc. 2010;24(7):1646–57	Giulianotti PC	246
J Am Coll Surg. 2012;215(6):810–9	Asbun HJ	235
Ann Surg. 1996;223(2):134–40	Conlon KC	226
J Am Coll Surg. 2010;210(5):779–85	Kooby DA	225
J Am Coll Surg. 2007;205(2):222–30	Palanivelu C	193
Ann Surg. 2007;246(1):77–82	Melotti G	188
Ann Surg. 1996;223(3):280–5	Cuschieri A	163
J Gastrointest Surg. 2007;11(12):1607–21	Fernández-Cruz L	161
Ann Surg. 2002;236(2):149–58	Park AE	161
Surg Endosc. 2006;20(7):1045–50	Dulucq JL	160
J Gastrointest Surg. 2004;8(4):493–501	Fernández-Cruz L	145
Surg Endosc. 2008;22(10):2261–8	Kim SC	143
World J Surg. 2008;32(5):904–17	Fernández-Cruz L	139
Surgery. 2000;128(3):386–91	Berends	132
J R Coll Surg Edinb. 1994;39(3):178–84	Cuschieri A	129
Surg Endosc. 2011;25(6):2004–9	Kang CM	127
J Am Coll Surg. 2010;211(4):503–9	Jayarama S	127
J Am Coll Surg. 1997;185(1):33–9	Callery MP	124
Br J Surg. 1995;82(8):1127–9	Fernandez del Castillo C	124
Surg Endosc. 2011;25(10):3364–72	Song KB	119
Gut. 1978;19(7):672–7	Cuschieri A	118
Arch Surg. 2010;145(9):817–25	Horvath K	117
J Gastrointest Surg. 2006;10(1):95–8	Velanovich V	117
Langenbecks Arch Surg. 2005;390(2):134–40	Ayav A	117
Surgery. 2015;157(1):45–55	Mehrabi A	116
Ann Surg. 1998;228(2):182–7	Minnard EA	116
J Hepatobiliary Pancreat Surg. 2009;16(6):731–40	Palanivelu C	115
Br J Surg. 1992;79(4):317–9	Shimi S	115
World J Surg. 2002;26(8):1057–65	Fernández Cruz L	113
Surg Endosc. 2008;22(5):1334–8	Eom BW	112

Table 1 (*Continued*)

Reference	First author	Number of citations
Surg Endosc. 2004;18(3):407–11	Edwin B	107
J Gastrointest Surg. 2011;15(7):1151–7	Zureikat AH	105
Surg Endosc. 2005;19(8):1028–34	Dulucq JL	103
HPB (Oxford). 2012;14(11):711–24	Jin T	100
J Laparoendosc Adv Surg Tech A. 2003;13(1):33–6	Melvin WS	95
Aust N Z J Surg. 1996;66(6):414–6	Sussman LA	94
Am J Surg. 2009;198(3):445–9	Cho A	91
Surg Endosc. 2007;21(4):579–86	Pierce RA	90
J Hepatobiliary Pancreat Sci. 2013;20(4):421–8	Nakamura M	89
Gut. 1995;36(5):778–80	Rhodes M	85
Pancreas. 2012;41(7):993–1000	Pericleous S	84
J Gastrointest Surg. 2010;14(11):1804–12	DiNorcia J	84
Endoscopy. 2007;39(10):881–7.	Ryou M	84
World J Surg. 2004;28(12):1239–47	Assalia A	81
Surg Endosc. 2010;24(7):1533–41	Kang CM	80
Surg Endosc. 2004;18(3):402–6	Shimizu S	78
Surg Endosc. 2003;17(2):201–6	Tagaya N	78
Pancreas. 2010;39(2):160–4	Narula VK	77
Surg Endosc. 1994;8(1):57–60	Soper NJ	74
J Am Coll Surg. 2015;220(5):831–8	Dokmak S	73
Arch Surg. 2004;139(3):270–4	Jaroszewski DE	73
Pancreas. 2008;36(2):113–9	Bucher P	72
Surg Endosc. 2007;21(3):373–7	Palanivelu C	72
Ann Oncol. 2006;17(2):189–99	Stefanidis D	71
J Am Coll Surg. 2008;206(3):445–50	White R	70
Surg Endosc. 2002;16(9):1358–61	Fabre JM	68
J Hepatobiliary Pancreat Surg. 2009;16(1):35–41	Nakamura Y	67
Asian J Surg. 2012;35(1):1–8	Sui CJ	65
Surg Endosc. 2012;26(2):402–7	Mehta SS	64
J Am Coll Surg. 2009;209(6):758–65	Borja-Cacho D	64
Cancer J. 2012;18(6):571–6	Kendrick ML	62
Surgery. 2001;130(6):1086–91	Iihara M	62
Surg Endosc. 2007;21(12):2326–30	Pryor A	61
World J Surg. 2002;26(10):1297–300	Gramatica L	61
Surg Endosc. 2000;14(12):1131–5	Lo CY	61
Surg Endosc. 1992;6(3):147–9	Fletcher DR	61
Surg Endosc. 2011;25(2):572–6	Didieu A	60
Ann Surg Oncol. 2009;16(10):2825–33	Weber Sm	60
Surg Today. 2007;37(7):535–45	Takaori K	60
Surg Endosc. 2012;26(5):1220–30	Fox AM	59
Surgery. 2007;142(3):405–9	Sa Cunha AS	59
Semin Laparosc Surg. 1998;5(3):168–79	Cuschieri A	59
Br J Surg. 2009;96(2):185–90	Isla A	58
J Gastrointest Surg. 2004;8(8):1068–71	Shoup M	58
Surg Endosc. 2011;25(4):1101–6	Kang CM	57
Surg Endosc. 2007 Dec;21(12):2262–7	Palanivelu C	57
Surg Endosc. 2007 Jan;21(1):103–8	Sa Cunha AS	56
World J Gastroenterol. 2012;18(16):1959–67	Xie K	55
J Surg Oncol. 2012;105(4):387–92	Butturini G	55
Pancreas. 2009;38(8):867–75	Navaneethan U	55
Pancreas. 2011;40(8):1264–70	Giulianotti PC	53
Br J Surg. 2010;97(6):902–9	Rosok BI	53
Adv Surg. 2009;43:283–300	Merchant NB	53
Surg Endosc. 2005;19(3):369–73	Ellsmere J	53
Surg Laparosc Endosc Percutan Tech. 2008;18(4):340–3	Matsumoto T	52
Am J Surg. 2006;191(4):549–52	Orsenigo E	52
Surg Endosc. 2004;18(2):297–302	Lo CY	52
Acta Chir Hung. 1997;36(1–4):359–61	Tihanyi TF	52
World J Surg. 2006;30(10):1916–9	Toniato A	51
Surg Endosc. 2002;16(6):996–1003	Fernández-Cruz L	51
Surg Endosc. 1999;13(11):1065–9	Röthlin MA	51
Ann Surg. 2008;247(6):938–44	Rotellar F	50
Surg Endosc. 1999;13(3):239–45	Catheline JM	50

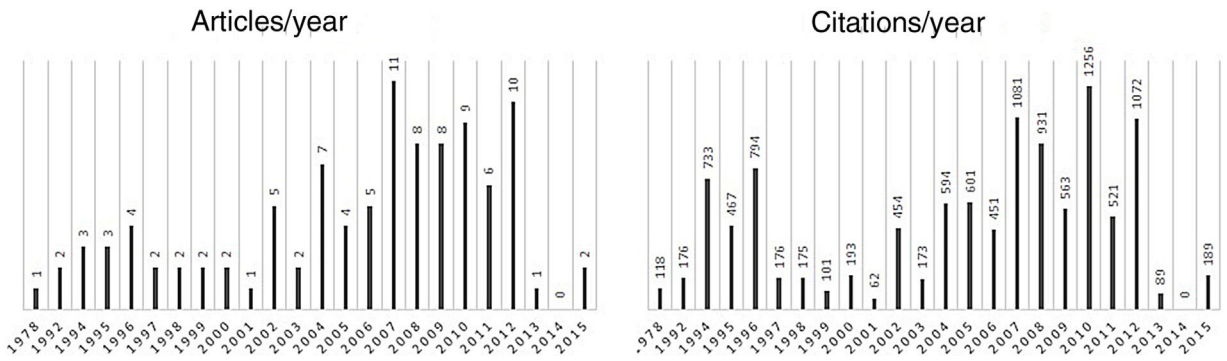

Fig. 1 – Number of articles and citations per year in the top 100 citations on the pancreas and laparoscopy.

30, *Ann Surg* 9, *J Am Coll Surg* 8, *Surgery* 6, *J Gastrointest Surg* 6). The remaining journals were *Pancreas* with 5 articles, *World J Surg* with 5, *Br J Surg* with 4, *Arch Surg* with 3, *Gut* with 2, *J Hepatobiliary Pancreat Surg* with 2, and *Am J Surg* with 2 other articles. There are 18 other journals with a single publication in this top 100 citations. The IF of all the articles included in this top 100 citation list was 212.7, and 78% of the articles were published in Q1 journals.

When classified by country, 35 publications (35%) were from the USA, followed by France with 9, the United Kingdom and Japan with 8, and Spain with 6. If we classify countries by continent, the percentages of publications from America and Europe were similar (39% vs 36%, respectively), with the largest dispersion of publications in Europe. Asia was responsible for 22% of the publications in this top 100 (Japan 8, China 5, Korea 5, India 4) and Oceania for the remaining 3%.

When we looked at the first author's place of work, 14 hospitals totaled 40 publications and 4691 citations. The Memorial Sloan-Kettering Cancer Center was the medical center with the most bibliographic references included in this top 100 list, while Mayo Clinic was the hospital with the highest number of citations. As for the first author, there were only 3 authors with more than one article in this ranking. Fernández-Cruz L, whose work takes place at the Hospital Clínic de Barcelona, had 5 publications with a total of 609 citations (5 case series), Cuschieri A had 4 publications with

Table 2 – Number of articles and citations by hospital and first author in the top 100 citations on the pancreas and laparoscopy. 'Others' include hospitals with only one article in this top 100.

Hospital	Articles	Citations
Memorial Sloan-Kettering Cancer Center	5	597
Mayo Clinic	4	617
Hospital Clínic, Barcelona	4	448
Gem Hospital	4	437
Ninwells Hospital and Medical School, University of Dundee	4	466
Washington University School of Medicine	4	281
University of Illinois, Chicago	2	299
Emory University School of Medicine	2	518
Ohio State University	2	172
Massachusetts General Hospital	2	177
Ohio State University	2	172
Saint Eloi Hospital	2	132
Ulsan University College of Medicine and Asan Medical Center	2	262
Queen Mary Hospital, Hong Kong	2	113
Others	59	6279
First author	**Articles**	**Citations**
Fernández-Cruz L	5	609
Cuschieri A	4	469
Palanivelu C	4	437
Kang CM	3	264
Dulucq JL	2	263
Gagner M	2	841
Giulianotti PC	2	299
Kendrick ML	2	309
Kooby DA	2	518
Lo CY	2	113
Sa Cunha AS	2	115

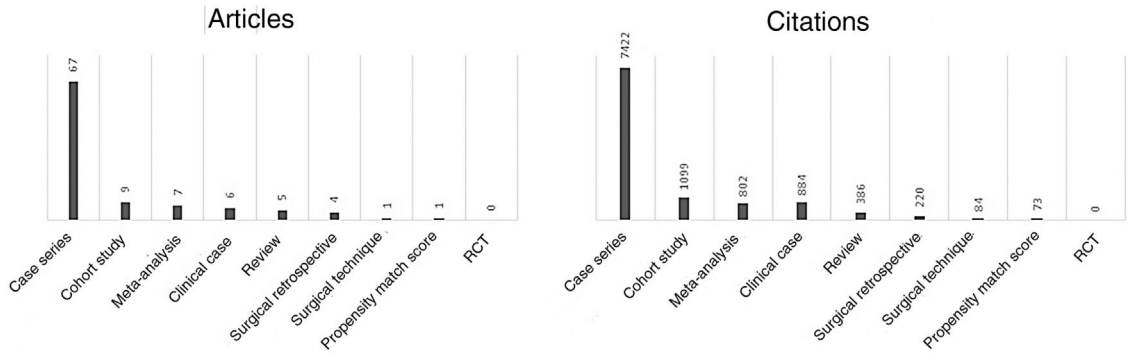

Fig. 2 – Number of publications and citations by type of paper in the top 100 citations on the pancreas and laparoscopy.

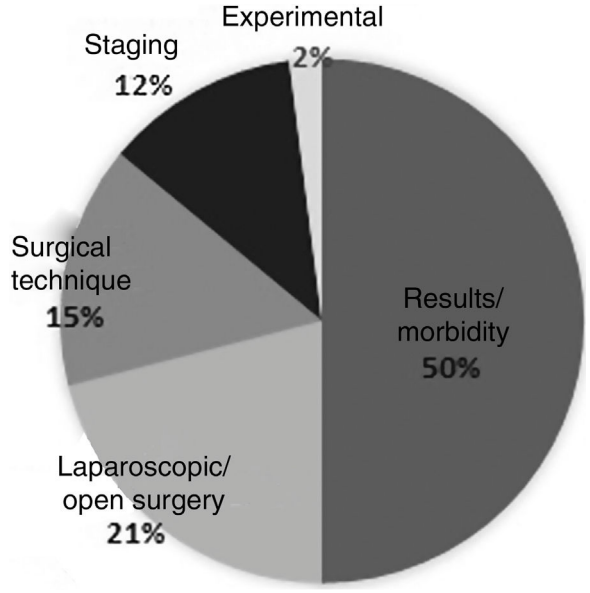

Fig. 3 – Articles by topic in the top 100 citations on the pancreas and laparoscopy.

469 citations (2 case series, one review, and one retrospective surgical study) and Palanivelu C had 4 articles with 437 citations (4 case series) (Table 2).

As for article type, 67 publications included in the top 100 citations were case series, making this the most frequently cited article type (7422 citations). Seven papers were meta-analyses, totaling 802 citations (5 published in 2012, one in 2013 and one in 2015, including 3 from China). Of these 7 meta-analyses, 6 compared open vs. laparoscopic DP and the other compared DP and PD. RCT were not included in the top 100 citations (Fig. 2).

Results/morbidity represent the most frequently studied topic in this top 100 (5218 citations and 50% of publications), followed by the comparison between laparoscopic and open surgery (21% of publications, 2278 citations) (Fig. 3). Benign/malignant lesions were the area of interest with the highest number of publications in the top 100 on the pancreas and laparoscopy, while there were no documents on IPMN (Table 3).

Excluding 12 documents about laparoscopic staging (Fig. 3), the types of surgery are listed in Table 2. Thirty-three articles refer to DP, with 3488 citations, followed by 30 articles on pancreatic surgery in general; meanwhile, there are no references on total pancreatectomy.

Discussion

The number of citations used as references in other articles is usually used as a measure of the impact of scientific studies and to validate author contributions.[1,4,6,9,10] Some authors claim that, once the ideas have been generally accepted, the more classical articles[1–6] are no longer cited. However, others argue that the number of citations of an article reflects the length of its academic life, and especially the IF of the journal in which it was published.[4,9]

Table 3 – Number of articles and citations according to type of surgery and area of interest in the top 100 citations on the pancreas and laparoscopy.

Area of interest	Articles	Citations
Benign/malignant lesions	44	5129
Neuroendocrine tumor	15	1358
Adenocarcinoma	13	1475
Benign disease	10	1498
Neoplasms	8	773
Chronic pancreatitis	4	348
Acute pancreatitis	3	244
Cystic neoplasms	1	145
IPMN	0	0
Type of surgery	**Articles**	**Citations**
Distal pancreatectomy	33	3488
Pancreatic surgery	30	2928
Pancreaticoduodenectomy	10	1822
Robotic surgery	7	717
Palliative surgery	4	312
VARD	3	244
NR	1	129
Total pancreatectomy	0	0

IPMN: intraductal papillary mucinous neoplasm; NR: no reference; VARD: video-assisted retroperitoneal debridement.

This bibliometric study on pancreas and laparoscopy is influenced by the time factor, since laparoscopy has come later to pancreatic surgery and this topic has recently begun to be studied. Thus, only 19 articles were published before the year 2000.

Since the first article included in this bibliometric study published in 1978 by Cuschieri on laparoscopy in the diagnosis of pancreatic cancer, the most cited article type was a series of cases from the USA about the outcome/morbidity of DP, including benign and malignant lesions.

Surgical Endoscopy was the journal with the most articles included in this list of the 100 most cited. Thus, articles on pancreas and laparoscopy tend to be published in more specialized journals than in general ones.

Regarding the article type, we should highlight the presence of 7 meta-analyses on this list, with no RCT included in the top 100, which shows the notably dissimilar relationship between meta-analyses and RCT in this field of study. After reviewing the meta-analyses included in the list, most of them included non-randomized comparative studies, which were also included in this list. Six out of the 7 compared open vs. laparoscopic DP and 3 were from China, where there is a boom in this type of publications. Recently, some relevant RCT have been published, such as the 2018 Poves et al. study at the Hospital del Mar in Barcelona,[11] which made a comparison between laparoscopic and open PD. They reported a shorter hospital stay and more favorable results with laparoscopy, with no differences in resected lymph nodes or resection margins, but only 15 citations to date. The De Rooij et al. study[12] about the LEOPARD trial in 2019 reported that minimally invasive DP reduces functional recovery time in left pancreatic tumors, with less delay in gastric emptying and a better quality of life (cited 19 times). Furthermore, in 2019 van Hilst et al. published a pan-European propensity score comparing minimally invasive DP with open DP and concluded that RCT are needed to confirm the oncological safety of minimally invasive DP.[13] In view of the lack of relevant and scientifically robust studies, there are new studies aimed at filling this gap, such as the LEOPARD 2 trial registered in March 2016 by the Dutch Pancreatic Cancer Group (cited 19 times),[14] and the COSMOS-DP trial in Japan registered in July 2016 (cited once).[15]

Regarding the area of interest, there are no publications on total pancreatectomy or IPMN. Therefore, this bibliometric study can help us identify deficient areas that could be the subject of further studies.

In our study, USA was the first-ranked country, with 35 papers in the top 100 citations on the pancreas and laparoscopy. However, when we compared other bibliometric studies on surgery not related to the pancreas,[1,10] our study showed a lower predominance of the US over the rest of the world.

Our article is a bibliometric study conducted with a classic criterion, the number of citations, which is a measurement that allows us to know how scientific information is obtained, where it comes from and what its quality is. The main problem is that citation counts have a lag period before the true impact of an article can be determined. It takes approximately 2–3 years after publication for an article to reach its citation peak,[16,17] which delays the determination of the impact of an article. Although traditional measures remain the norm for assessing the long-term impact of research, today the digital revolution has had a major influence on all professional fields and on how this impact is measured – a natural consequence of digitalization that also affects the dissemination of medical research and knowledge. With this, new alternative measures have emerged, collectively called 'altmetrics', such as downloads, social media (Facebook®, Twitter®, LinkedIn®, Pinterest® o YouTube®), digital resources like blogs or news media, professional networks or bibliography tools, as a non-traditional means of assessing the visibility of a publication, a reflection of popularity and short-term social debate.

In this debate between traditional and new measures, the destination of the publications must also be taken into account, since access to online platforms is open to the general public. Thus, an article can arouse great interest in readers but generate little academic impact because the readers are mostly members of the general public and not medical professionals. Therefore, we should consider how the availability of a document influences its impact. Articles published in open-access online journals are widely available for public consumption and increase their visibility through various communication channels,[18] while those published in journals requiring payment target the academic world. Therefore, in this technological age, other digital factors must be considered to evaluate the impact of a researcher or an article in addition to the number of citations.

Laparoscopic surgery has arrived late to the pancreas, probably due to the morbidity and mortality associated with pancreatic surgery and the need for high specialization in this field. This means that the information available is recent and limited. More and higher quality studies are needed in this field.

Conflict of interests

The authors have no conflict of interests to declare.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ciresp.2020.05.001.

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