The Most-Cited Works in Transanal Endoscopic Microsurgery: Bibliometric analysis of 50 most cited articles and trend in citation classics

Taiwo Akhigbe*,1, Sharib Khan*, Ihab Hraishawi*, Ming Chang*, Azab Mohammed*, Aisyah Zubaidi* and Jameel Meer*

*Department of General Surgery Altnagelvin Hospital Northern Ireland, United Kingdom.

ABSTRACT

Background The number of times that a published article is cited is one indicator of its scientific impact. There is an abundance of articles published on transanal endoscopic microsurgery [TEMs]. Bibliometric analyses are useful in determining most impactful studies within this field. This study aims to evaluate most cited works in transanal endoscopic microsurgery using bibliometric analysis in identifying most relevant research and newest trends. Methods: Transanal endoscopic microsurgery specific search using Harzing publish or Perish publicly assessable software that indexes citations from Google Scholar was performed in October 2017. Full length articles 50 most cited articles were reviewed based on the aim of this study. Results: After detailed search 980 articles with a total number of 49543 citations over the 43 year period were obtained. Further analysis performed to obtain 50 most cited works with a total of 6728. The top 10 most cited article obtained further. The top 50 papers included were cited on average of 320 times per year ranged 78 to 292. Publication date ranged from 1992 to 2013. Eleven of the 50 articles were from Germany, ten from the United States of America, over 20 from Europe. The journal publishing the highest number of the top 50 highly cited articles was Diseases of Colon & Rectum Journal of with 15 publications. The most corresponding authors were from colorectal speciality. Conclusion This current report provides the most up-to-date analysis of the most influential works in transanal endoscopic microsurgery research describing the trend of most cited works with its comprehensive list. None of the articles meant the citation classics criterion.

KEYWORDS Transanal endoscopic micrisurgery; bibliometric analysis; citation classic

Introduction

The bibliometric analysis highlights the key topics and studies which have led to the current understanding and treatment of a disease of interest. In this original article, we analyse the 50 most cited manuscripts in transanal endoscopic microsurgery. In 1983 G Buess introduced transanal endoscopic microsurgery (TEM) into clinical practice for local treatment of a rectal tumour [1]. This development of transanal endoscopic microsurgery (TEM) during the last 30 years has led to the evolution of the treatment in rectal neoplasms. TEM has revolutionised the technique and outcomes of transanal surgery. To our knowledge, this technique is currently the only one-port system in endoscopic surgery by which a direct endoluminal approach to the target organ by using a natural opening of the body becomes available. It is often difficult to quantify the significance of a given published work. However, one useful index of influence is the total number of citations accrue overtime by the published article if more than 400 citations referred to as citation classics[3]. Identifying these highly cited works is essential to clinicians and researcher for evidence-based practice and current research trend and focus.
in transanal endoscopic microsurgery. Also, citation classics represent the highest impact work in a specific field and offer insights to a high area of research within this field.

Group analysis of these articles will serve to understand the changing landscape and trend in this field over time termed bibliometric analyses, has been previously applied to few sub-specialties in neurosurgery such as epilepsy [4], pain [5] and skull base neurosurgery. Also, bibliometric citation analysis has also been used to determine the most influential scientific papers in medical fields including plastic surgery [6] dermatology [7] burns [8] and General surgery [9]. To date, no such study has been undertaken to determine the most cited papers in transanal endoscopic microsurgery. Analysis of these data provides insight into how our understanding of how TEMs has developed and how this information has changed research trend. This article aims to present a detailed and extensive bibliometric analysis of the most highly cited works related to transanal endoscopic microsurgery describing the changing trends and citation classics for investigators in this field.

**Methods Search strategy**

To identify highly cited works in transanal endoscopic microsurgery, we performed a generalised search using Harzing publish or perish [10], free accessible software search engine easily available to the public, it indexes raw citations from Google scholar with numerous journal articles and corresponding citation. The search was performed in May 2017 without restriction of publication date. Search term used was “transanal endoscopic microsurgery”. Also, a supplementary search was conducted using most cited authors name derived from previous search terms, authors included were Buess G, Middleton PF, Moore JS, Lezoche G and many more.

This search was field sensitive [4] rather than field specific, that is to say, articles related to transanal endoscopic microsurgery, rectal surgery and other health-related publications. Inclusion criteria were articles relevant to the field of transanal endoscopic microsurgery and published in peer-reviewed journal. We included clinical articles, systematic reviews, meta-analysis and non-systematic reviews (narrative reviews). The full-length articles with citation of 50 and above in the field of transanal endoscopic microsurgery research were obtained and extensively reviewed. Articles related to aneurysmal subarachnoid haemorrhage were excluded. The full-length articles of 50 most cited works were obtained and reviewed.

**Data coding and Analysis**

Rigorous collection of 50 most cited articles with specific data collected from each article for some citations, publication year, and the name of first author, the title of the article, speciality and country of the corresponding author at the time of publication. The data on most cited articles are ranked in descending order by citation numbers.

**Results**

After detailed and rigorous analyses of 980 articles with a total number of 49543 citations over a 43 year period were obtained. Further analysis performed to obtain 50 most cited works. The top 10 most cited article are presented in Table 1 full list of the 50 most cited articles can be found in Supplementary Table 1. The top 50 papers included with a total of 6728 citations were cited on average of 320 times per year ranged 75 to 292. Publication date ranged from 1992 to 2013. The most frequently cited article (292 citations) was published by Buess et al. (Table 3) in 1992 in the America Journal of Surgery titled “Techniques and results of transanal endoscopic microsurgery”. He was the first to perform transanal endoscopic microsurgery in Germany.

Eleven of the 50 articles were from Germany, ten from the United States of America, over 20 from the rest of Europe (Table 2). The journal publishing the highest number of the top 50 highly cited articles was Disease of Colon & Rectum journal with 15 publications. Journal publishing two or more than highly cited works are presented in Table 3. Gerhard Buess and Emanuele Lezoche were the most prolific primary authors in top 50 cited articles with five papers each [Table 4]. The most corresponding authors were from colorectal speciality. There was no citation classics (article cited more than 400 times) in any of the articles up to recent times in transanal endoscopic microsurgery.

**Discussion:**

In this study, we identified 50 most cited articles in field transanal endoscopic microsurgery research. Bibliometric analyses do not necessarily provide an evaluation of the quality of research or its impact on clinical practice, but they portray historical account of research publication with its changing landscapes of a scientific question and significant trend of knowledge that has been accumulated over the time. Trends in highly cited works allow projections and planning for future focus of high-impact and landmark research in a particular field.

The highly cited article is one of the indicators of most influential work in a given field hence it’s imperative for clinicians and academic community to be familiar with these articles as a template for evidence-based practice and platform for further research. This study identified only one randomised control trial in the top 50 most cited articles and had been termed the first-ever randomised controlled trial of transanal endoscopic microsurgery versus laparoscopic total mesorectal excision after neoadjuvant therapy. This shows that lots of research still needed in transanal endoscopic microsurgery (Figure 1).

The correlation between citation number and influence is a topic that may provide an area of further research. It would be of value to establish whether these publications have been in any way integrated into modern colorectal surgical training programs and curricula.
| Rank | Citation | First Author | Title                                                                 | Journal                                      | Country   |
|------|----------|--------------|----------------------------------------------------------------------|----------------------------------------------|-----------|
| 1    | 292      | G. Buess     | Techniques and results of transanal endoscopic microsurgery          | America Journal of Surgery                  | Germany   |
| 2    | 284      | P.F Middleton| Transanal endoscopic microsurgery: A systematic review               | Diseases of the Colon & Rectum              | Australia |
| 3    | 261      | J.S Moore    | Transanal endoscopic microsurgery is more effective than traditional excision for resection of rectal masses | Diseases of the Colon & Rectum              | USA       |
| 4    | 259      | G. Lezoche   | Prospective randomised study with a 5-year minimum follow-up evaluation of transanal endoscopic microsurgery versus laparoscopic total mesorectal excision after neoadjuvant therapy | Surgical Endoscopy                          | Italy     |
| 5    | 246      | W.Lee        | Transanal endoscopic microsurgery and radical surgery for T1 and T2 rectal cancer | Surgical endoscopy and other Interventional techniques | South Korea |
| 6    | 242      | A. Heintz    | Comparison of results after transanal endoscopic microsurgery and radical resection of T1 carcinoma of the rectum | Surgical Endoscopy                          | Germany   |
| 7    | 231      | G. Buess     | Techniques of endoscopic microsurgery                                | Surgical Endoscopy                          | Germany   |
| 8    | 200      | E. Lezoche   | The long-term result in patients with T2-T3 N0 distal rectal cancer undergoing radiotherapy before transanal endoscopic microsurgery | British Journal of Surgery                  | Italy     |
| 9    | 173      | G. Buess     | Clinical results of transanal endoscopic microsurgery               | Surgical Endoscopy                          | Germany   |
| 10   | 173      | N. Dermatines| Transanal endoscopic microsurgical excision of rectal tumours; Indications and Results | World Journal of Surgery                    | Switzerland |
Table 2 Journal (with more than two articles) in most cited articles in Transanal Endoscopic Microsurgery (TEM)

| Journal                                      | Number of Articles |
|----------------------------------------------|--------------------|
| Diseases of Colon & Rectum                   | 15                 |
| Surgical Endoscopy                           | 10                 |
| British Journal of Surgery                   | 4                  |
| Surgical endoscopy and other Interventional  | 3                  |
| techniques                                    |                    |
| International Journal of Colorectal disease  | 3                  |
| America Journal of Surgery                   | 2                  |
| World Journal of Surgery                     | 2                  |

Figure 2: Publication trend over the years

There are several limitations of our studies synonymous with most bibliometric studies including the possibility of missing highly cited work as a result of a single database search strategy. Articles absence from the list of most cited works is not an indicator of inferior impact to clinical practice. Citation provides a global indicator of landmark publication in a specific field, and this serves as a significant guide for essential and essential literature for researchers. Newer articles, arguably, have less time to attain citations than older articles. Previous bibliometric studies have suggested a period of at least five years after publication before using citation status as a measure of impact [11, 12]. Also the results of this study are potentially limited by the presence of several forms of bias. In particular, certain articles may receive multiple citations as a consequence of institutional, self-citation or language bias.

Conclusion

Transanal endoscopic microsurgery remains an area of tremendous but slow academic interest and colorectal surgeons’ interest in this field has been slow. This is reflected in the trend and quantity of published work. Also, there has been a significant shift in clinical practice towards endoscopic microsurgical treatment due to better and improved technologies.
| Rank | Citation | First Author          | Title                                                                 | year | Journal                                      | Country   |
|------|----------|-----------------------|-----------------------------------------------------------------------|------|----------------------------------------------|-----------|
| 1    | 292      | G. Buess              | Techniques and results of transanal endoscopic microsurgery          | 1992 | America Journal of Surgery                  | Germany   |
| 2    | 284      | P.F Middleton         | Transanal endoscopic microsurgery: A systematic review              | 2005 | Disease of Colon & Rectum                  | Australia |
| 3    | 261      | J.S Moore             | Transanal endoscopic microsurgery is more effective than traditional excision for resection of rectal masses | 2008 | Disease of Colon & Rectum                  | USA       |
| 4    | 259      | G. Lezoche            | Prospective randomised study with a 5-year minimum follow-up evaluation of transanal endoscopic microsurgery versus laparoscopic total mesorectal excision after neoadjuvant therapy | 2008 | Surgical Endoscopy                          | Italy     |
| 5    | 246      | W. Lee                | Transanal endoscopic microsurgery and radical surgery for T1 and T2 rectal cancer | 2003 | Surgical endoscopy and other Interventional techniques | South Korea |
| 6    | 242      | A. Heintz             | Comparison of results after transanal endoscopic microsurgery and radical resection of T1 carcinoma of the rectum | 1998 | Surgical Endoscopy                          | Germany   |
| 7    | 231      | G. Buess              | Techniques of endoscopic microsurgery                               | 1988 | Surgical Endoscopy                          | Germany   |
| 8    | 200      | E. Lezoche            | The long-term result in patients with T2-T3 N0 distal rectal cancer undergoing radiotherapy before transanal endoscopic microsurgery      | 2005 | British Journal of Surgery                  | Italy     |
| 9    | 173      | G. Buess              | Clinical results of transanal endoscopic microsurgery              | 1998 | Surgical Endoscopy                          | Germany   |
| 10   | 173      | N. Dermatines         | Transanal endoscopic microsurgical excision of rectal tumours; Indications and Results | 2001 | World Journal of Surgery                    | Switzerland |
|   |   |   | A surgical cure for early rectal carcinoma and adenoma: Transanal endoscopic microsurgery (using ultrasound or electrosurgery) compared to conventional local or radical resection |
|---|---|---|---|---|---|
|   |   |   |   |   |   |
|   |   |   | Transanal endoscopic microsurgery versus conventional transanal excision for patients with early rectal cancer |
|   |   |   |   |   |   |
|   |   |   | Transanal endoscopic microsurgery resection of rectal tumours; outcomes and recommendations |
|   |   |   |   |   |   |
|   |   |   | Intraperitoneal excision by transanal endoscopic microsurgery does not increase short-term complications. |
|   |   |   |   |   |   |
|   |   |   | Transanal endoscopic microsurgery versus mesorectal excision of T1 rectal adenocarcinoma with curative intention. |
|   |   |   |   |   |   |
|   |   |   | Anorectal sphincter function and rectal barostat study in patients following transanal endoscopic microsurgery. |
|   |   |   |   |   |   |
|   |   |   | Transanal endoscopic microsurgery excision |
|   |   |   |   |   |   |
|   |   |   | Transanal endoscopic microsurgery: Initial experience from three centres in the United Kingdom. |
|   |   |   |   |   |   |
|   |   |   | Transanal endoscopic microsurgery; A prospective evaluation of functional results. |
| 20 | 135 | T. Borschitz | The influence of histopathological criteria on the long-term prognosis of locally excised PT1 rectal carcinomas: Results of local excision (Transanal endoscopic microsurgery) and immediate reoperation. | 2006 | Disease of Colon & Rectum | Germany |
| 21 | 133 | F. Bretagnol | Local excision of rectal tumour by transanal endoscopic microsurgery | 2007 | British Journal of Surgery | UK |
| 22 | 129 | N.D Floyd | Transanal endoscopic microsurgical resection of PT1 rectal tumours. | 2006 | Diseases of Colon & Rectum | USA |
| 23 | 125 | E. Lezoche | Long-term results of patients with PT2 cancer treated with radiotherapy and transanal endoscopic microsurgical excision | 2002 | World Journal of Surgery | Italy |
| 24 | 122 | L.E. Smith | Transanal endoscopic microsurgery | 1996 | Disease of the Colon & Rectum | USA |
| 25 | 117 | M.E Kreis | Functional results after transanal endoscopic microsurgery | 1996 | Disease of the Colon & Rectum | Germany |
| 26 | 114 | P.G Doornebosch | Treatment of recurrence after transanal endoscopic microsurgery (TEM) for PT1 rectal cancer | 2010 | Disease of the Colon & Rectum | Netherlands |
| 27 | 106 | E.J.R De Graaf | Transanal endoscopic microsurgery is superior to transanal excision of rectal adenocarcinoma | 2011 | Colorectal Disease | Netherlands |
| 28 | 106 | T.J Saclarides | Transanal endoscopic microsurgery: A single surgeon experience | 1998 | Archive of Surgery | USA |
| 29 | 101 | F. Stipa | Outcomes for early rectal cancer managed with transanal endoscopic microsurgery. | 2006 | Surgical endoscopy and other Interventional techniques | Italy |
| Page | Item | Author(s) | Title | Year | Journal | Country |
|------|------|-----------|-------|------|---------|---------|
| 30   | 100  | M.E Allaix| Long-term functional result and quality of life after transanal endoscopic microsurgery | 2011 | British Journal of Surgery | Italy |
| 31   | 100  | E. Lezoche| Transanal endoscopic versus total mesorectal laparoscopic resection of T2-N0 low rectal cancers after neoadjuvant treatment; a prospective randomised trial with a 3-year minimum follow up period | 2005 | Surgical Endoscopy and Other Interventional Techniques | Italy |
| 32   | 98   | P. Palma  | Transanal endoscopic microsurgery: Indication and result after 100 cases | 2004 | Colorectal Disease | Germany |
| 33   | 97   | G. Buess  | Transanal endoscopic microsurgery | 1993 | Journal of the Royal College of Surgeons of Edinburgh | Germany |
| 34   | 96   | M.E Allaix| Transanal endoscopic microsurgery for rectal neoplasm; the experience of 300 consecutive cases | 2009 | Diseases of Colon & Rectum | Italy |
| 35   | 95   | G.F Buess | Transanal endoscopic microsurgery | 2001 | Surgical Oncology Clinics of North America | Germany |
| 36   | 93   | S. Maslekar| Transanal endoscopic microsurgery for carcinoma of the rectum | 2007 | Surgical Endoscopy | UK |
| 37   | 93   | P. Neary  | Transanal endoscopic microsurgery: A viable operative alternative in selected patients with rectal lesion | 2003 | Annals of Surgical Oncology | UK |
| 38   | 92   | D. Lev-chelouche| Transanal endoscopic microsurgery: Experience with 75 rectal neoplasms. | 2000 | Diseases of Colon & Rectum | Israel |
| 39   | 91   | M. Guerrieri| Transanal endoscopic microsurgery for the treatment of selected patients with distal cancer: 15 years’ experience | 2008 | Surgical Endoscopy | Italy |
| Page | N. | Author(s)         | Title of Study                                                                 | Year | Journal                          | Country   |
|------|----|-------------------|---------------------------------------------------------------------------------|------|----------------------------------|-----------|
| 40   | 91 | E.J.R De Graaf    | Transanal endoscopic microsurgery for rectal cancers                           | 2002 | European Journal of Cancer       | Netherlands|
| 41   | 91 | R.O Perez         | Transanal endoscopic microsurgery for residual cancer(Ypt0-2) following neoadjuvant chemoradiation therapy; another word of caution | 2013 | Diseases of Colon & Rectum      | Brazil    |
| 42   | 90 | T. Kinoshita      | Transanal endoscopic microsurgery in the treatment of rectal carcinoid tumour   | 2007 | Surgical Endoscopy               | Japan     |
| 43   | 89 | R.O Perez         | Transanal endoscopic microsurgery for residual rectal cancer after neoadjuvant chemoradiation therapy is associated with significant immediate pain and hospital readmission | 2011 | Diseases of Colon & Rectum      | Brazil    |
| 44   | 85 | S. Maslekar       | Cost analysis of transanal endoscopic microsurgery for rectal tumours.         | 2007 | Colorectal Disease               | UK        |
| 45   | 83 | J.H Marks         | Transanal endoscopic microsurgery for the treatment of rectal cancers: comparison of wound complication rate with or without neoadjuvant radiation therapy | 2009 | Surgical Endoscopy               | USA       |
| 46   | 79 | P.G Doornebosch   | Impact of transanal endoscopic on functional outcome and quality of life       | 2008 | International journal of colorectal disease | Netherlands|
| 47   | 79 | P.G Doornebosch   | Cost analysis of transanal endoscopic microsurgery for rectal tumours.         | 2007 | Colorectal disease               | Netherlands|
| 48   | 78 | S.Said            | Transanal endoscopic microsurgery in large sessile adenomas of the rectum      | 1995 | Surgical Endoscopy               | Germany   |
| 49   | 77 | T.J Saclarides    | Transanal endoscopic microsurgery                                              | 1999 | Diseases of Colon & Rectum      | USA       |
| 50   | 75 | E. Lezoche        | Is transanal endoscopic microsurgery a valid treatment for rectal tumours?     | 1996 | Surgical endoscopy               | Italy     |
Authors’ Statements

Competing Interests
The authors declare no conflict of interest.

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