Bibliometric Analysis on the Trend of the Computed Tomography (CT)-Related Studies in the Field of Forensic Science

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Abstract: The computed tomography (CT) technique has attracted much attention as a promising tool for non-invasive diagnosis and examination in the field of forensic science. The purpose of this study is to assess the trend in CT-related forensic studies through bibliometric methods and thus present a holistic idea about the application of CT in the field of forensic science of the past and present. A total of 2084 articles published in the Scopus index journals between 1978 and 2020 were analyzed using VOSviewer 1.6.15. A drastic increase in the number of CT-related articles was noticed in forensic science since the early 2000s. Switzerland, having the most productive institution (University of Zurich) and author (Michael J. Thali), contributed most to the increasing number of publications. Forensic Science International was the top journal, where approximately 12.5% of the articles (261 out of 2084) have been published. CT was frequently used for autopsy and diagnosis purposes, but recently its applicability has expanded to the field of forensic anthropology and personal identification. This research is expected to provide researchers using CT with not only an understanding about past research trends but also an insight about future research topics and potential collaborative opportunities.

Keywords: bibliometric analysis; computed tomography; forensic science; Scopus; VOSviewer

1. Introduction

There has long been an effort to devise non-invasive diagnostic techniques in the fields of medical and forensic sciences. The radiographs introduced by Conrad Roentgen in 1895 have opened the era of forensic radiology since the first postmortem radiographic examination in 1898 [1]. With the development of three-dimensional imaging techniques such as magnetic resonance imaging (MRI) and computed tomography (CT) in the late 20th century, forensic imaging has attracted much attention as a new non-invasive diagnostic tool as well as a new subfield of forensic science [2,3]. Compared to the radiographs, forensic imaging using cross-sectional techniques has advantages in that it allows for three-dimensional examination and visualization of complex structures in an easy and interactive way [1,4]. Indeed, the past two decades have seen a drastic development of CT techniques and subsequently a rapid growth in the application of CT in the forensic context [5].

The purpose of this study is to quantitatively assess the trend of CT-related forensic studies through bibliometric methods and thus present a holistic idea about the application of CT in the field of forensic science of the past and present. Bibliometric studies allow to track the frequencies and trends of scientific publications associated with a specific field/topic and the relationship of citations...
between the works in a systematic way [6,7]. Specific focus will be placed on the growth trend of this field in terms of the number of publications, most active journals with trend topics, and productive authors and countries. This research is expected to provide researchers using CT with not only an understanding about the past research trend but also an insight about future research topics and potential collaborative partners.

2. Materials and Methods

The Scopus indexed articles were searched using the Document Search function [8] on 4 November 2020. Four terms—“forensic” OR “medicolegal” OR “legal medicine” AND “computed tomography”—were used for document search so that any articles containing one of the three pairs of keywords (i.e., “forensic—computed tomography”, “medicolegal—computed tomography”, or “legal medicine—computed tomography”) in their title, abstract, and/or keywords could be detected. Document type was limited to “Articles and Reviews” so other types of publications such as book chapters, letters, conference papers, and surveys were excluded. The years of publication were not specified, and Ostertag et al.’s [9] work titled “Diagnostic possibilities of computerized tomography in forensic examination of cerebral traumatized persons” was marked as the earliest article. The citation information (e.g., authors, title, publication year, citation counts, and source), bibliographic information (e.g., affiliations and correspondence address), abstract and keywords, and reference information of all selected articles were exported in a comma-separated values (CSV) file format for further analyses. Informed consent was not required from the authors of the articles because the data were collected as secondary data lacking personal information.

Microsoft Excel was used to calculate descriptive statistics and annual growth rate (AGR) and to produce related plots. AGRs were calculated as follows, which represents the percentage rate of positive or negative growth of a product in a certain year compared to the previous year [10].

\[
AGR_i = \frac{N_i - N_{i-1}}{N_{i-1}} \times 100
\]

where \(N_i\): number of documents in the year \(i\).

In calculating AGRs, only the articles published between 2000 and 2019 were included, during which drastic increase in publications was observed. The publications in 2020 were excluded from the AGR calculation because the number of publications at the time of data collection for this study could not represent that of the entire year.

VOSviewer 1.6.15 [11] was used for bibliometric analysis. VOSviewer is an open source computer program which makes it possible to perform bibliometric analyses and display two-dimensional maps based on the co-occurrences of the nodes/subjects [12]. One of the advantages of using VOSviewer for this purpose is that VOSviewer can analyze the bibliometric data exported from the major journal archives such as Scopus, Web of Science, and PubMed directly.

3. Results

3.1. Annual Trend of Publications

Per the Scopus document search, a total of 2084 CT-related articles have been published in the forensic field since the 1970s (Table 1). The numbers of published articles per year were below ten until 2002 and the sum of publications between 1978 and 2002 constitutes only 3.7% of the total publications (78 out of 2084). However, from the early 2000s, a drastic increase in the number of publications is noticed (Table 1 and Figure 1a). Since 2001, each year set a new record in the number of annual publications except for 2005, 2014, and 2018. More than 100 articles have been published every year since 2012; and 2017 was the first year during which more than 200 articles were published. The first quartile (25%) in the number of publications was reached in 2012. Yet, it took only three years for the second and third quartiles to be reached (2015 and 2018, respectively). Figure 1b shows a fluctuating
trend in AGR. The AGR indicates a relative growth of publications within a year compared to the previous year. For example, a positive AGR indicates that the number of publications in a certain year exceeded that of the previous year, and vice versa. Since 2000, there were three years with negative ARG’s (−42.9% in 2001, −5.0% in 2005, −3.5% in 2018) (Table 1 and Figure 1b). However, the differences in numbers of publications between those years and their preceding years were minimal (three in 2001–2000; one in 2005–2004; and seven in 2014–2013).

Table 1. The number and annual growth rate (AGR) of CT (computed tomography) -related articles in the Forensic section of Scopus between 1978 and 2020.

| Publication Year * | Number of Documents | Cumulative Total | Annual Growth Rate (%) ** |
|--------------------|---------------------|-----------------|--------------------------|
| 1978               | 1                   | 1               |                          |
| 1980               | 1                   | 2               |                          |
| 1981               | 1                   | 3               |                          |
| 1982               | 3                   | 6               |                          |
| 1983               | 1                   | 7               |                          |
| 1985               | 8                   | 15              |                          |
| 1986               | 4                   | 19              |                          |
| 1988               | 1                   | 20              |                          |
| 1989               | 1                   | 21              |                          |
| 1990               | 1                   | 22              |                          |
| 1992               | 2                   | 24              |                          |
| 1993               | 2                   | 26              |                          |
| 1994               | 6                   | 32              |                          |
| 1995               | 5                   | 37              |                          |
| 1996               | 6                   | 43              |                          |
| 1997               | 6                   | 49              |                          |
| 1998               | 7                   | 56              |                          |
| 1999               | 3                   | 59              |                          |
| 2000               | 7                   | 66              | 100.0                    |
| 2001               | 4                   | 70              | −42.9                    |
| 2002               | 8                   | 78              | 100.0                    |
| 2003               | 11                  | 89              | 37.5                     |
| 2004               | 20                  | 109             | 81.8                     |
| 2005               | 19                  | 128             | −5.0                     |
| 2006               | 37                  | 165             | 94.7                     |
| 2007               | 44                  | 209             | 18.9                     |
| 2008               | 51                  | 260             | 15.9                     |
| 2009               | 56                  | 316             | 9.8                      |
| 2010               | 66                  | 382             | 17.9                     |
| 2011               | 80                  | 462             | 21.2                     |
| 2012               | 107                 | 569             | 33.8                     |
| 2013               | 151                 | 720             | 41.1                     |
| 2014               | 151                 | 871             | 0.0                      |
| 2015               | 181                 | 1052            | 19.9                     |
| 2016               | 185                 | 1237            | 2.2                      |
| 2017               | 202                 | 1439            | 9.2                      |
| 2018               | 195                 | 1634            | −3.5                     |
| 2019               | 239                 | 1873            | 22.6                     |
| 2020               | 211                 | 2084            |                          |
| **Total**          |                     | 2084            |                          |

* Years with no publications are not presented; ** Only the AGRs between 2000 and 2019 are presented.
3.2. Productive Countries

CT-related forensic studies have been conducted by the authors from 104 countries. Table 2 and Figure 2 show top 16 countries that have produced 40 or more articles. Switzerland was the most productive country in terms of the number of publications ($n = 335$) as well as the number of citations ($n = 6662$) followed by United States (# articles = 259; # citations = 4775).
Table 2. Countries that have published 40 or more CT-related articles in the Forensic section of Scopus between 1978 and 2020.

| Country         | Number of Documents | Number of Citations |
|-----------------|--------------------|---------------------|
| Switzerland     | 335                | 6662                |
| United States   | 259                | 4775                |
| Japan           | 224                | 2278                |
| Germany         | 207                | 3534                |
| United Kingdom  | 186                | 2719                |
| Italy           | 173                | 2005                |
| France          | 144                | 1625                |
| Australia       | 106                | 1692                |
| China           | 90                 | 393                 |
| Turkey          | 79                 | 686                 |
| India           | 71                 | 381                 |
| Brazil          | 51                 | 308                 |
| The Netherlands | 47                 | 396                 |
| Denmark         | 45                 | 522                 |
| Malaysia        | 42                 | 174                 |
| Egypt           | 40                 | 253                 |

Figure 2. Color map showing the countries that have published 40 or more CT-related articles in the Forensic section of Scopus between 1978 and 2020.

The co-authorship analysis shows that Switzerland, the United States, the United Kingdom, Italy, and Germany were the top 5 countries in terms of the collaborative network (Figure 3). The size of the circles and thickness of the lines in Figure 3 indicate the total link strength of a country and the strength of network between two countries, respectively. Based on the strength and pattern of the network, four clusters could be found out of 16 countries: (i) Australia, Brazil, Denmark, The Netherlands, the United Kingdom, and the United States, (ii) Egypt, India, Japan, Malaysia, and Turkey, (iii) Germany, Italy, and Switzerland, and (iv) China and France.
3.3. Productive Institutions and Authors

A total of 5929 authors from 5194 institutions have contributed to CT-related forensic studies. Tables 3 and 4 list the authors and institutions that have published 30 or more articles. Among the 27 authors in Table 4, Michael J. Thali is the only one who authored more than 100 articles. Among the 16 institutions that produced 30 or more articles, six institutions are located in Switzerland; two in Australia, France, Japan, and the United Kingdom; and one in China and Germany. It was also noted that all the top three institutions—University of Zurich (# articles = 159), University of Bern (# articles = 136), and UniversitätsSpital Bern (# articles = 87)—are located in Switzerland.

Table 3. Authors who have published 30 or more CT-related articles in the Forensic section of Scopus between 1978 and 2020.

| Author     | Number of Occurrence | Number of Citations | Author     | Number of Occurrence | Number of Citations |
|------------|----------------------|---------------------|------------|----------------------|---------------------|
| Thali M.J. | 180                  | 4453                | Dirnhofer R.| 43                   | 2633                |
| Iwase H.   | 61                   | 631                 | Dedouit F. | 41                   | 599                 |
| Ampanozi G.| 60                   | 663                 | Motomura A.| 41                   | 356                 |
| Gascho D.  | 57                   | 382                 | Rutty G.N. | 41                   | 933                 |
| Makino Y.  | 57                   | 500                 | Thali M.   | 40                   | 888                 |
| Jackowski C.| 55                 | 2364                | Torimitsu S.| 40                   | 335                 |
| Schweitzer W.| 53                 | 770                 | Morgan B.  | 37                   | 890                 |
| Flach P.M. | 49                   | 505                 | Bolliger S.A.| 35                   | 677                 |
| Telmon N.  | 49                   | 698                 | Yen K.     | 33                   | 1497                |
| Grabherr S.| 48                   | 928                 | Aghayev E. | 30                   | 1404                |
| Ruder T.D. | 46                   | 766                 | Hatch G.M. | 30                   | 498                 |
| Inokuchi G.| 45                   | 390                 | Ross S.    | 30                   | 985                 |
| Yajima D.  | 44                   | 530                 | Verhoff M.A.| 30                   | 444                 |
| Chiba F.   | 44                   | 348                 |            |                      |                     |
Table 4. Institutions that have produced 30 or more CT-related articles in the Forensic section of Scopus between 1978 and 2020.

| Institution                                      | Number of Documents | Country       |
|-------------------------------------------------|---------------------|---------------|
| University of Zurich                            | 159                 | Switzerland   |
| University of Bern                              | 136                 | Switzerland   |
| UniversitätsSpital Bern                         | 87                  | Switzerland   |
| Chiba University                                | 59                  | Japan         |
| Victorian Institute of Forensic Medicine        | 50                  | Australia     |
| University of Tokyo                             | 46                  | Japan         |
| Hopital de Rangueil                             | 46                  | France        |
| UniversitätsSpital Zurich                       | 45                  | Switzerland   |
| Monash University                                | 44                  | Australia     |
| Universitätsklinikum Hamburg-Eppendorf und Medizinische Fakultät | 40        | Germany       |
| University of Leicester                         | 40                  | United Kingdom|
| Leicester Royal Infirmary                        | 39                  | United Kingdom|
| Université de Lausanne UNIL                      | 38                  | Switzerland   |
| Anthropologie Moléculaire et Imagerie de Synthèse| 35                  | France        |
| Centre Hospitalier Universitaire Vaudois         | 31                  | Switzerland   |
| Ministry of Justice, China                       | 31                  | China         |

3.4. Leading Journals

Out of 408 journals selected by the Scopus search, only 23 journals have published ten or more CT-related forensic studies (Table 5). Forensic Science International is ranked as the most active journal in terms of the number of publications \( (n = 261) \) as well as the number of citations \( (n = 5241) \), which is followed by the International Journal of Legal Medicine \( (# \text{ articles} = 200; # \text{ citations} = 3424) \).

Table 5. Journals that have published ten or more CT-related articles in the Forensic section of Scopus between 1978 and 2020.

| Journal                                        | Number of Documents | Number of Citations |
|------------------------------------------------|---------------------|---------------------|
| Forensic Science International                  | 261                 | 5241                |
| International Journal of Legal Medicine         | 200                 | 3424                |
| Journal of Forensic Radiology and Imaging       | 156                 | 876                 |
| Journal of Forensic Sciences                    | 146                 | 2865                |
| Legal Medicine                                  | 146                 | 1430                |
| Forensic Science, Medicine, and Pathology       | 98                  | 1122                |
| Journal of Forensic and Legal Medicine          | 65                  | 621                 |
| American Journal of Forensic Medicine and Pathology | 58            | 670                 |
| Rechtsmedizin                                   | 43                  | 207                 |
| Indian Journal of Forensic Medicine and Toxicology | 37              | 1                   |
| Journal of Forensic Medicine                    | 30                  | 24                  |
| Romanian Journal of Legal Medicine              | 29                  | 55                  |
| Radiologia Medica                               | 25                  | 337                 |
| Australian Journal of Forensic Sciences         | 24                  | 48                  |
| Forensic Imaging                                | 24                  | 10                  |
| Academic Forensic Pathology                     | 19                  | 32                  |
| Egyptian Journal of Forensic Sciences           | 15                  | 80                  |
| European Radiology                              | 12                  | 620                 |
| Medicine, Science, and the Law                  | 12                  | 52                  |
| Plos One                                        | 12                  | 78                  |
| Revue de Medecine Legale                        | 12                  | 9                   |
| American Journal of Physical Anthropology       | 10                  | 142                 |
| Seminars in Ultrasound, CT, and MRI             | 10                  | 83                  |
Figure 4 displays the citation network among the top ten journals where 30 or more articles have been published. The size of the circles in Figure 4 denotes the total link strength (i.e., the relative frequency of a journal’s citations by other journals). Obviously, the articles published in *Forensic Science International* have been most frequently cited by most of the other journals. It was also noted that the *Journal of Forensic Radiology and Imaging*, one of the young journals with its first issue published in 2013, ranked third and sixth in the number of publications and citations, respectively (Table 5). Based on the frequency and pattern of citations among the top ten journals, four clusters could be found: [i] Am J Forensic Med Pathol, Forensic Sci Int, Indian J Med Forensic Med Toxicol, J Forensic Legal Med, J Forensic Sci, [ii] Forensic Sci Med Pathol, J Forensic Radiol Imaging, [iii] Int J Legal Med, Rechtsmedizin, and [iv] Legal Med.

Figure 4. Network visualization map of citation analysis among top ten journals. The size of circles and fonts denotes the total number of documents published in the journals; the thickness of lines indicates the relative frequency of citations between two journals; and the color indicates the clusters of journals.

3.5. Keywords

Out of 3998 keywords, there were 27 keywords that have appeared 30 or more times in the CT-related forensic studies (Table 6). Based on the strength and pattern of co-occurrence/link of the keywords, four clusters could be found (Table 6). The keywords in the same cluster tended to occur together in the articles. The result of the co-occurrence test is displayed on the map in Figure 5, where the size of circles and the thickness of lines denote the relative number of publications and the relative frequency of co-occurrence between two keywords, respectively. When the time of publication is taken into account, it was noted that the keywords colored in yellow such as “Forensic Anthropology”, “Postmortem CT”, “Cone Beam CT”, and “Micro CT” have appeared relatively recently.

Table 6. Keywords that have appeared in 30 or more CT-related articles in the Forensic section of Scopus between 1978 and 2020. The keywords in the same cluster tended to have appeared together.

| Keyword | Number of Occurrence | Total Link Strength | Cluster |
|---------|----------------------|---------------------|---------|
| Computed Tomography/CT | 420 | 544 | 2 |
| Postmortem Computed Tomography/Postmortem CT/PMCT | 293 | 338 | 3 |
| Forensic Anthropology | 245 | 318 | 1 |
| Forensic Radiology | 220 | 358 | 3 |
| Forensic Science | 215 | 379 | 1 |
Table 6. Cont.

| Keyword                                                      | Number of Occurrence | Total Link Strength | Cluster |
|--------------------------------------------------------------|----------------------|---------------------|---------|
| Virtopsy/Virtual Autopsy                                     | 195                  | 338                 | 3       |
| Autopsy                                                      | 162                  | 220                 | 2       |
| Forensic Pathology                                           | 123                  | 167                 | 2       |
| Cone Beam CT                                                 | 82                   | 103                 | 1       |
| Age Estimation                                               | 81                   | 121                 | 1       |
| Sex Estimation/Sex Determination                             | 79                   | 126                 | 1       |
| Forensic Imaging                                             | 66                   | 98                  | 3       |
| Forensic Medicine                                            | 62                   | 59                  | 2       |
| Forensic                                                     | 59                   | 66                  | 2       |
| Magnetic Resonance Imaging                                   | 54                   | 93                  | 3       |
| Postmortem Imaging                                           | 53                   | 106                 | 3       |
| Identification                                               | 50                   | 79                  | 1       |
| Forensic Anthropology Population Data                        | 49                   | 59                  | 1       |
| Sexual Dimorphism                                            | 44                   | 72                  | 1       |
| Radiology                                                     | 42                   | 74                  | 2       |
| Forensic Dentistry                                           | 37                   | 50                  | 1       |
| Postmortem                                                   | 36                   | 69                  | 2       |
| Micro CT                                                     | 36                   | 28                  | 4       |
| Multidetector CT                                             | 34                   | 42                  | 1       |
| CT Scan                                                      | 34                   | 24                  | 2       |
| Forensic Odontology                                          | 32                   | 55                  | 1       |
| Forensic Autopsy                                             | 30                   | 26                  | 3       |

Figure 5. Overlay visualization map of co-occurrence analysis among top 27 keywords. The size of circles and fonts denotes the relative number of documents; the thickness of lines indicates the relative frequency of co-occurrence between two keywords; and the color indicates the clusters of journals. The number of frequencies of the keywords has increased from purple to yellow (purple–blue–green–yellow).
4. Discussion

Bibliometric analysis allows for a quantitative, systematic, and objective assessment on the publications in a field, which helps researchers to have an understanding about the past and current state of the field as well as a holistic insight on its future direction [6,7,10]. Among the earliest topics for the bibliometric analyses was forensic science where the publications of diverse subdisciplines of forensic science in Europe were examined [13,14]. The establishment of digital journal archives (e.g., Scopus, Web of Science, and PubMed) and development of computer software that can analyze the archived data (e.g., VOSviewer) makes the process of bibliometric analysis straightforward and time-efficient. Thus, recent years have seen increasing bibliometric analyses in various fields, e.g., [6,7,15,16].

One of the notable findings in the current study is the rapid increase in the number of articles, particularly since the early 2000s (Table 1). In 2003, Thali and colleagues [4] emphasized and encouraged the utility of imaging techniques such as CT and MRI in the field of forensic science. Interestingly, this year was the first year during which more than ten CT-related forensic articles were published (n = 11), and the increasing trend has continued except for 2005, 2014, and 2018. The AGR has fluctuated between 2000 and 2019; however, except for 2001, 2005, and 2018, there were no years with negative AGRs. In other words, the number of publications for most of the past 20 years exceeded (or was the same as) that of the preceding year (Table 1). In 2017, the number of annual publications exceeded 200 for the first time (n = 202) and the increasing trend is likely to continue in 2020 as well (n = 211 as of 4 November 2020).

Switzerland and United States ranked first and second in both the number of publications (n = 335 and n = 259, respectively) and citations (n = 6662 and n = 4775, respectively) (Table 2). Japan ranked third in the number of publications (n = 224), but Germany ranked third in terms of the number of citations (n = 3534). Cluster analysis in Figure 3 shows which countries have close collaborative relationships. Demir et al. [6] state that geographic location is an important factor in terms of collaborations between countries. However, the result of the current study did not show a clear relationship between the geographic locations and collaborative network of the countries. For example, eight European countries in Figure 3 were divided into four different clusters, and China and France were in the same cluster. It is beyond the scope of the current study to investigate the underlying factors affecting the international collaborations, but it would be a significant topic for future research.

The leading role of Switzerland in the CT-related forensic studies was also evident in the list of most productive institutions (Table 4). Six out of 16 institutions in Table 4, including the top three institutions, are located in Switzerland. Moreover, approximately 23.8% of the articles (496 out of 2084) have been produced by these six Swiss institutions. The rest of the institutions are located in Australia, China, France, Germany, Japan, and the United Kingdom. Interestingly, any institutions from the United States or Italy, which ranked second and sixth in the number of publications, were not listed in Table 4. This is possibly because the large number of publications in the United States (n = 259) and Italy (n = 173) have been produced by diverse research groups rather than by a small number of leading groups.

Approximately 43.6% of the CT-related forensic studies (909 out of 2084 articles) have been published in five journals (Forensic Science International, International Journal of Legal Medicine, Journal of Forensic Radiology and Imaging, Journal of Forensic Sciences, and Legal Medicine) with the total number of citations of 13,836 (Table 5). Forensic Science International ranked first in both the number of publications (n = 261) and number of citations (n = 5241). Indeed, the co-citation analysis map in Figure 4 displays the Forensic Science International in the center, which indicates that the articles in the journal have been cited by most of the other journals. Similar results were obtained from previous bibliometric studies in the fields of legal medicine [6] and forensic anthropology [16], where Forensic Science International was listed as the most influential journal.

The keyword analysis revealed four clusters, of which centers (i.e., the keywords with the greatest total link strength of each cluster) were “Forensic Anthropology”, “Postmortem Computed
Tomography”, “Autopsy”, and “Computed Tomography”. This result indicates that CT has been primarily used in two forensic subfields: forensic pathology/medicine and forensic anthropology. Since the development of X-ray CT in 1974, the CT technique has been constantly applied to forensic pathological studies and case reports [9]. The continuous effort to develop advanced techniques at higher resolution has led to a more common application of virtual autopsy (virtopsy) in medical examiners’ offices nowadays [17,18]. This trend not only resulted in a plentiful production of articles to validate the utility of CT compared to traditional autopsy or other types of imaging techniques, e.g., [19–21], but also expanded the applicability of CT (e.g., estimation of pupae’s developmental age [22]; reconstruction of bloodstain in fabric [23]; determination of non-human skeletal remains [24]). Recently, the need to establish new and efficient processing protocols has increased in the field where CT is applied, e.g., [25]. In the field of forensic anthropology, the CT technique has been introduced relatively recently as shown in the keyword analysis (Figure 5); however, the number of forensic anthropological studies using CT has increased rapidly. Particularly, there has been increasing efforts to develop new models for sex and age estimation using CT, e.g., [26–28], to validate the accuracy of osteometric measurements in the CT scans, e.g., [29,30], and to automate the analysis processes where CT is involved, e.g., [31,32]. In addition, Cone Beam CT has been frequently used to measure the thickness of facial soft tissues and contributed to the field of facial reconstruction and personal identification, e.g., [31,33].

As to the application of VOSviewer for a bibliometric analysis, Demir et al. [6] pointed out two limitations which the current study could also not avoid: a risk of self-citation and a risk of excluding publications written in a non-English language from the analyses. In addition, since the scope of publications analyzed by VOSviewer is determined primarily by the keywords entered during the Document Search process, there is a possibility that a bibliometric study may not include all publications of a targeted field. To avoid this issue, a careful selection of keywords will be required. In this regard, this study used four keywords (“forensic”, “legal medicine”, “medicolegal”, and “computed tomography”) to include as many related publications as possible. Lastly, some information presented by VOSviewer may slightly differ from what they actually are because VOSviewer analyzes data as the authors of the original publications literally provided. For example, if an author working in a university hospital used the names of the university and the hospital in two different papers as his/her affiliation, there is no way for VOS viewer to notice it. A careful inspection and verification of the information as well as an effort to avoid these limitations will be necessary in the future research.

5. Conclusions

The use of CT in the forensic context has increased drastically since the early 2000s, which caused the plentiful production of articles. This increasing trend appears to continue as more researchers and institutions include the CT technique in their works and research. At the same time, the scope of CT-related research will likely expand to more diverse subfields of forensic science, which will result in a fruitful production of publications with a variety of topics. In this regard, the current study will be particularly helpful to the researchers who have recently initiated CT-related research by providing them with a holistic insight into the research trend as well as a source of potential collaborations (i.e., productive countries, institutions and authors).

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