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# Global research trends in ossification of posterior longitudinal ligament: a bibliometric and visualization study

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***Abstract:*** ***Objective:*** *The study of ossification of posterior longitudinal ligament (OPLL) is attracting increasing attention. This study aims to investigate the global status and trends in this field.* ***Methods:*** *The Web of Science-Science Citation Index Expanded searched the number of publications published by OPLL from January 1, 1900 to March 1, 2023. Source data were studied and indexed using bibliometric methods. For visualization studies, use VOSviewer version 1.6.19 software for co-authorship, co-occurrence analysis, bibliographic coupling and co-citation analysis, and analyze the overall trend of OPLL research in recent years.* ***Results:*** *A total of 1863 articles were found. The number of research and publications on OPLL worldwide is increasing every year. Japan has the highest contribution to global research in this area of OPLL, with the most citations and the highest H-Index. Lippincott Williams & Wilkins and Springer Nature had the highest number of publications. The Naval Medical University, Hirosaki University, Tokyo Medical Dental University, and Nagoya University are the four institutions that contribute the most. Research can be divided into three broad categories: mechanistic research, clinical research, and tissue engineering. Clinical research is predicted as the next hot topic in the field.* ***Conclusion:*** *Based on current global research trends, the number of OPLL-related publications is expected to increase. Japan is currently the largest contributor to research in this field. Most of the research work will focus on clinical studies such as laminoplasty for OPLL, which may be the next hot spot in OPLL research.*

***Keywords:*** *Ossification of posterior longitudinal ligament, Treat, Global trend, Bibliometrics, Visualized study*

## 1. Introduction

OPLL is most common in older Asian men [1]. There are many conditions associated with OPLL, such as diffuse idiopathic osteohyperosis, ankylosing spondylitis, and other spinal disorders [2]. Several factors have been reported to be associated with the formation and progression of OPLL, including genetic factors, hormone levels, surroundings, and lifestyle [3]. However, the specific pathogenesis of OPLL is unknown. Most patients with symptomatic OPLL present with neurologic deficits, such as those caused by spinal cord or radiculopathy [4]. Clinically, plain X-ray, CT and MR imaging are used to comprehensively evaluate the length of OPLL extension and spinal cord compression. The treatment of OPLL remains controversial, with each procedure having its own advantages and disadvantages, and the choice should be individualized based on the patient's condition, OPLL type, and surgeon's experience [5].

However, global trends regarding OPLL have not been fully studied [6]. Therefore, it is necessary to summarize the current state of OPLL research and predict promising keywords and trend trends [7]. As a core part of scientific research, publications are an important indicator of research contribution. Bibliometric analysis can provide information based on bibliographic databases and bibliometric characteristics for qualitative and quantitative assessment of trends in research activities over time [8]. It provides a way to grasp developments in a field and compare the contributions of scholars, journals, institutions and countries. Bibliometric analysis has also been used to develop policy and clinical practice guidelines [9]. In addition, this feasible approach has been successfully used to assess research trends in osteoarthritis, hypertension, diabetes, and injury, and to our knowledge, the quantity and quality of

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studies in the field of OPLL have not been reported [10]. Therefore, the purpose of this study is to evaluate the current state of research and global trends in OPLL therapy [11].

## 2. Materials and Methods

### *2.1. Data source*

Bibliometric analysis of data sources was performed based on the Web of Science -Science Citation Index Expanded (WOS), which is regarded as the best database for bibliometrics [12].

### *2.2. Search strategy*

In this study, the search terms were as follows: (TS= (ossification of the posterior longitudinal ligament) AND (Language=English) AND (Document type=paper)

### *2.3. Data Collection*

Complete details (including title, publication year, author name, country, publication journal name, affiliation, keywords and abstract) were obtained and analyzed from the WOS database and uploaded to Microsoft office mondo 2016. Two authors (WWW and LCS) independently filtered and extracted, entered and collected data. Data in Microsoft office mondo 2016 and GraphPadPrism 9 were manually cleaned and analyzed.

### *2.4. Bibliometric Analysis*

Bibliometric analysis has become an important tool for global analysis and surveys in various scientific fields, and analyzes a large amount of literature or research trends using mathematical and statistical methods [13]. WOS features have been used to describe the essential characteristics of the above qualified articles [14]. As an alternative to existing measures, the H-Index is the best way to quantify the impact of scientific research. The H-Index indicates that a scientist or country has published H articles and has been cited at least H times by other publications [15]. The logistic growth model: $f(x) = a/(1+eb-cx)$ has stable applicability and the ability to predict future trends [16]. A graph of the number of publications over time was created using GraphPadprism9 [17]. The independent variable x represents the year and the dependent variable f(x) represents the total number of publications. The number of annual publications, top 20 countries worldwide, authors, institutions, funding agencies, research directions, total citation frequency, journals, average citation frequency, and H-Index were all checked using Microsoft office mondo 2016 [18]. For visual analysis of publications, VOSviewer software (VOS) can be used, which was used in the past for bibliographic coupling, co-citation analysis, co-occurrence analysis and co-authorship analysis [19].

## 3. Results

### *3.1. Trends in Global Publications*

#### *3.1.1. Total number of publications worldwide*

Results: Global Publication Trends Global Publication Numbers From January 1, 1900 to March 1, 2023, a total of 1863 articles met the search criteria. The majority of studies were published (2016-2022, 773, 41.49%), examining the number of publications per year. From 1900 to 2023, one notable trend can be seen is the increasing number of global publications per year. Furthermore, the relative research interest in this field has shown an upward trend over the past few years (Fig. 1a).

#### *3.1.2. Countries' contributions*

A total of 60 countries and territories contributed to this field. Among these countries, Japan published the most relevant articles (789 articles, 42.351%), followed by China (451 articles, 24.208%), the United States (271 articles, 14.546%), South Korea (196 articles, 10.521%) and Canada (53 papers, 2.845%) (Fig. 1b, C).

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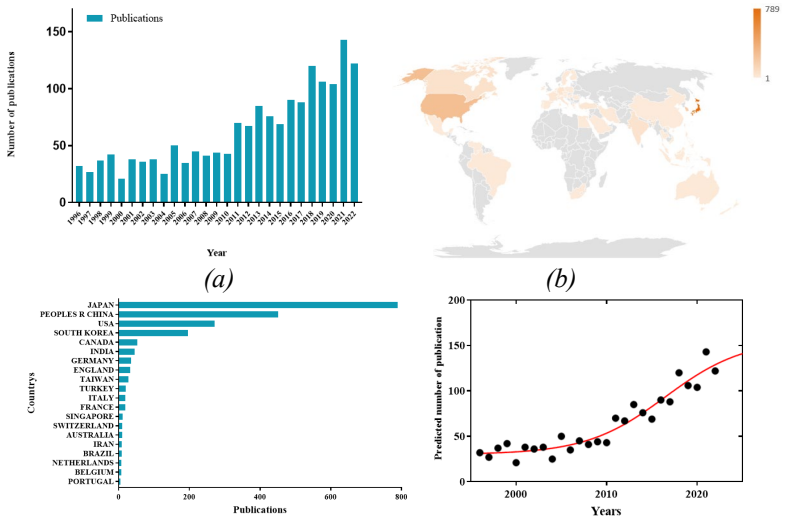
### *3.1.3. Global Publishing Trends*

Global Publications Trends uses a logistic regression model to create a time curve of publication numbers from which future trends can be predicted. Figure (1c) shows the model fitting curve [20] for predicting the growth trend of the number of global publications in the next few years.




*(a)* *(b)* *(c)* *(d)*

*(a) Total number of publications on OPLL and its associated research interests, (b) World Map of OPLL and Related Research, (c), Total number of OPLL-related publications in the top 20 countries, and (d) Fitting curve predicting trends in the number of global publications in the coming years*

*Figure 1: Global publication trends on OPLL and its related research*

## *3.2. Quality of publications in different countries*

### *3.2.1. Total Citation Frequency*

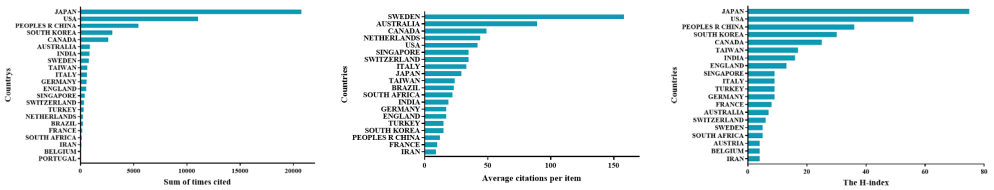
Publication quality: Total citation frequency for publications in different countries: Japan has the highest total citation frequency (20,749). The United States ranked second in total citation frequency (11055), followed by China (5443), South Korea (2988), and Canada (2623) (Figure 2a).

### *3.2.2. Average citation frequency*

Average citation frequency: Sweden publications have the highest average citation frequency (158.00). Australia ranked second on average citation frequency (88.70), followed by Canada (49.49), the Netherlands (44.20) and the United States (42.36) (Figure 2b).

### *3.2.3. H-Index*

The country with the highest H-Index is Japan (75), followed by the United States (56), South Korea (30), Canada (25) and Taiwan (17) (Figure 2C).




*(a)* *(b)* *(c)*

*(a) Total citation frequency of national publications on OPLL and its related research (b) Average citation frequency of national publications on OPLL and its related research (c) H-Index of national publications on OPLL and its related research*

*Figure 2: Quality of publications by country*

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### *3.3. Evaluation of global publications*

#### *3.3.1. Journal analysis*

The top-ranked journal for OPLL research was Spine (impact factor [IF]=3.269), with 261 publications. There are 101 articles in the European spine journal (IF=2.721), 89 articles in the Journal of neurosurgery-spine (IF=5.526), and 77 articles (IF=2.21) in World neurosurgery related to OPLL research. The top 20 journals with the most published research are shown in Figure 3a.

#### *3.3.2. Sources of Funding*

(Figure 3b) depicts the top 20 funding sources. The National Natural Science Foundation of China supported 133 studies (ranked first), while the Ministry of Education, Culture, Sports, Science and Technology (76) (ranked second).

#### *3.3.3. Author*

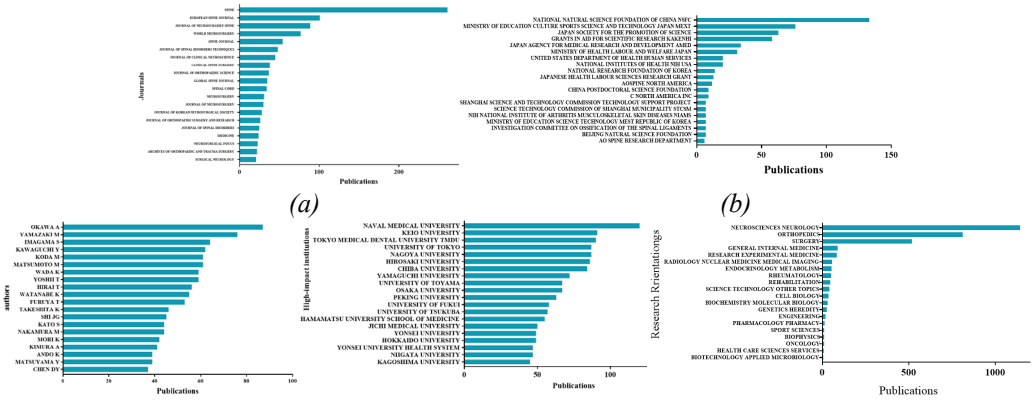
The top 20 authors published a total of 1070 articles, accounting for 57.43% of all publications in the field (Figure 3c). Okawa A published 87 articles on OPLL, Yamazaki M published 76, followed by Imagama S and Kawaguchi Y with 54 and 62 articles on OPLL, respectively.

#### *3.3.4. Publication Institutions*

The top 20 research institutions published a total of 1371 articles, accounting for 73.59% of all articles in the field (Figure 3D). The Naval Medical University and Keio University published 120 and 91 articles respectively.

#### *3.3.5. Research directions*

The distribution of research directions related to OPLL is shown in Figure 3e. Neurosciences Neurology, Orthopedics, Surgery, General Internal Medicine, and Research Experimental Medicine are the most popular areas of study.




*(a)* *(b)* *(c)* *(d)* *(e)*

*(a) Number of articles published in the top 20 journals on OPLL-related research, (b) Top 20 funding sources, number of articles published on OPLL-related research, (c) Number of articles published by the top 20 authors on OPLL research, (d) Number of articles published by the top 20 publishing institutions on OPLL-related research, (e) Top 20 articles on OPLL-related research directions*

*Figure 3: Assessment of OPLL global publications*

### *3.4. Bibliographic Coupling Analysis*

#### *3.4.1. Periodicals*

The journal name (defined as the minimum number of articles using a journal more than 5 times) in all articles was analyzed using VOSviewer (Fig. 4a). Fifty-nine identified journals emerged from the total link strength. The top five journals in terms of total link strength are as follows: Spine (total link strength = 97779 times), Journal of neurosurgery-spine (total link strength = 46883 times), European spine journal (total link strength = 43202 times), World neurosurgery (total link strength = 43202 times), link strength = 34205 times) and spine jouenal (total link strength = 30701 times).

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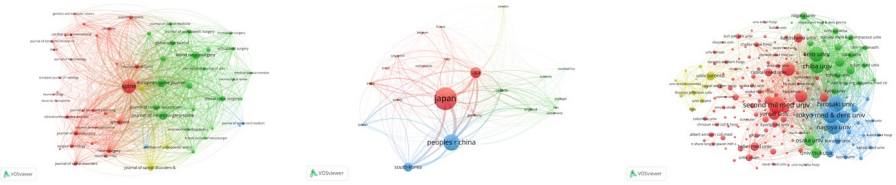
#### *3.4.2. Countries*

Twenty-two country articles (defined as the minimum number of articles where a country was used more than 5 times) were analyzed using VOSviewer (Fig. 4b). The top 5 countries in terms of total link strength are as follows: Japan (total link strength = 243725 times), China (total link strength = 190631 times), the United States (total link strength = 126559 times), South Korea (total link strength = 104129 times) and Canada (total link strength = 32952x).

#### *3.4.3. Institutions*

Institutional articles (defined as the minimum number of articles used more than 5 times by an institution) identified in 181 institutions were analyzed using VOSviewer (Fig. 4c). The top 5 institutions with total link strength are as follows: Tokyo Medical and Dental University (total link strength = 111400 times), Nagoya University (total link strength = 101257 times), Keio University (total link strength = 99352 times), Hirosaki University (total link strength = 92717 times) and Chiba University (total link strength = 76692 times).




*(a)* *(b)* *(c)*

*(a) Network diagram of 59 journals on OPLL-related research, (b) Network diagram of 22 countries on OPLL-related research, (c) Network diagram of 181 institutions related to OPLL-related research*

*Figure 4: Bibliographic coupling analysis of OPLL studies*

### *3.5. Co-author analysis*

#### *3.5.1. Author*

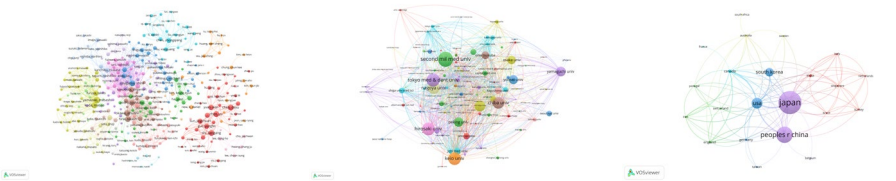
Co-author analysis showed that the relevance of a project depended on the number of papers it co-authored; 407 authors (defined as the minimum number of articles used by one author more than 5 times) were analyzed using VOSviewer (Figure 5a). The top five authors for total link strength are as follows: Imagama, Shiro (total link strength = 384x), Kawabata, Shigenori (total link strength = 334x), Wada, Kanichiro (total link strength = 326x), Yamazaki, Masashi (total link strength = 298x), and Matsuyama, Yukihiro (total link strength = 281x).

#### *3.5.2. Institutions*

Studies of 181 institutions (defined as the minimum number of articles used by institutions more than 5 times) were analyzed using VOSviewer (Figure 5b). The top five institutions for total link strength are Nagoya University (total link strength = 576x), Hirosaki University (total link strength = 566x), Tokyo Medical and Dental University (total link strength = 555x), Keio University (total link strength = 507x), and Jichi Medical University (total link strength = 412x).

#### *3.5.3. Country*

Publications (defined as the minimum number of articles used more than 5 times in a country) were analyzed using VOSviewer (Figure 5c). The top five countries for total link strength are the United States (total link strength = 158x), Japan (total link strength = 105x), Canada (total link strength = 85x), China (total link strength = 84x), and the United Kingdom (total link strength = 44x).




*(a)* *(b)* *(c)*

*(a) 407 co-author analysis plots on OPLL studies, (b) OPLL collaborative analysis plots on 181 institutions, and (c) OPLL research plots on 22 country collaborations*

*Figure 5: Co-authored analysis of the OPLL study*

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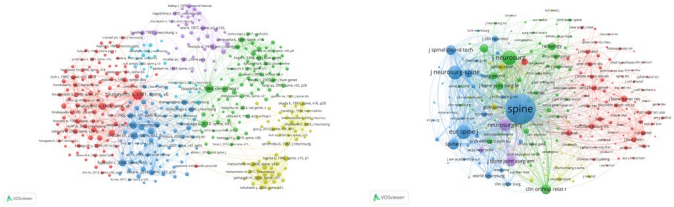
### *3.6. Co-citation analysis*

#### *3.6.1. Articles*

According to co-citation analysis, the correlation between things depends on the number of common references in which they appear. VOSviewer was used to analyze 377 articles (defined as the minimum number of articles with more than 20 references used) (Figure 6a). The following are the first five studies with high total link strengths: Hirabayashi k, 1981, Spine, V6, P354, doi 10.1097/00007632-198107000-00005; Tsuyama n, 1984, Clin orthop relat r, P71; Iwasaki m, 2002, J neurosurg, V96, P180, doi10.3171/spi.2002.96.2.0180; Iwasaki m, 2007, Spine, V32, P647, doi 10.1097/01.brs.0000257560.91147.86 and Fujiyoshi t, 2008, Spine, V33, Pe990, doi 10.1097/brs.0b013e318188b300;

#### *3.6.2. Journals*

Use VOSviewer to co-cite journal names (defined as the minimum number of citations of a co-cited journal with more than 20 citations). As shown in (Figure 6b), 232 identified journals appeared in the total link strength. The top 5 journals for total link strength are as follows: Spine (total link strength = 207150x), Journal of neurosurgery-Spine (total link strength = 53277x), European spine journal (ratio to total link strength = 52635x), World neurosurgery (total link strength = 52491x) and Spine Journal (total link strength = 34869x).




*(a)* *(b)*

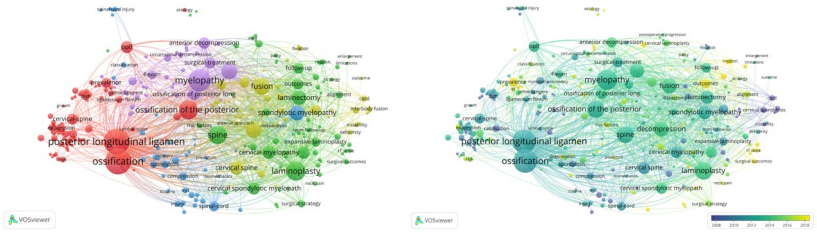
*(a) Network diagram of commonly cited references in the field, and (b) Network diagram of journals commonly cited in the field*

*Figure 6: Co-citation network diagram of OPLL*

### *3.7. Co-occurrence analysis*

The purpose of co-occurrence analysis is to discover research directions and hot topics (defined as the minimum number of keyword uses more than 9 times), and even important for the research direction of development science. As shown in (Figure 7a), the 288 identified keywords were categorized into three clusters, roughly as follows: "Mechanism Research", "Tissue Engineering" and "Clinical Research" (Figure 7a). In the "Mechanism Research" cluster, common keywords are: posterior longitudinal ligament, ossification of posterior longitudinal ligament, OPLL, and cervical spine. For the "tissue engineering" cluster, the main keywords are: intervertebral fusion, fixation, decompression. For the "Clinical Research" cluster, the main keywords are: laminectomy, discectomy, vertebral body resection, cervical laminoplasty.

These results suggest that the most prominent areas in the study of ossification of posterior longitudinal ligament include the above three directions.




*(a)* *(b)*

*(a) Keyword network diagram in OPLL research (b) Keyword average occurrence frequency distribution network plot*

*Figure 7: Co-occurrence analysis of the OPLL study*

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VOSviewer color-coded keywords based on the average time they appear across all indexed publications (Figure 7b). Blue indicates that the keyword appears earlier, and yellow indicates that the keyword appears later. Prior to 2016, the early stages of research, most research focused on "mechanistic research," "clinical research," and "tissue engineering." The latest trends suggest that a third cluster, "clinical research," will receive a lot of attention in the future.

## 4. Discussions

### *4.1. Global publication status and quality*

The research trends of OPLL references and visual analysis can show the progress of the current research field and make predictions [21]. Therefore, this study aimed to assess the contributing countries, institutions, funding agencies and research priorities of OPLL research [22].

Recent advances in the field of OPLL therapy are an exciting and rapidly developing area of research [23]. As shown in this study, the number of publications published each year has increased significantly. Furthermore, research interest on OPLL has increased dramatically in the past few years. A total of 60 countries published relevant research in this field. Based on the current data, we projected the number of future publications, with more studies with an in-depth understanding of OPLL published in the coming years. The current optimistic results will in turn enable the researchers to carry out further high-quality studies.

### *4.2. OPLL Research Trends*

According to the results of country contribution analysis, Japan has the most publications, and Hirabayashi K, 1981, Spine, V6, P354, DIO 10.1097/00007632-198107000-00005 contributed the most. The National Natural Science Foundation of China and the Ministry of Education, Culture, Sports, Science and Technology rank first and second respectively in terms of the number of papers published in terms of research direction and funding. Japan makes the most important contribution to OPLL research in terms of total number of published papers, total citation frequency and H-Index, and the world may be considered a pioneer and leader on this topic. China ranks second in terms of overall publications. On the other hand, Japan ranks first in overall citation frequency and first in H-Index. The fact that China's academic scoring system tends to focus on quantity rather than quality may explain why the discrepancies in the quantity and quality of publications lead researchers and doctors to rush to submit articles and ignore research quality. China's gradually expanding research funding will greatly improve the quality of publications (National Natural Science Foundation of China: ranking first 133 7.139%) to keep up with the quality of global publications in this field [24].

When there is a citation from a third book in the references of two books, this is known as bibliographic coupling. We established similarity links between different articles in this work using bibliography coupling analysis from three perspectives: journal, institution and country. The core research journals of OPLL are Spine, Journal of neurosurgery-spine, European spine journal, World neurosurgery, and Spine journal. And the aforementioned journals are more likely to report the latest research advances in the field. At the same time, Spine and Journal of neurosurgery-spine are the journals with the most papers, indicating that this journal is at the forefront of international OPLL research. Nagoya University has the highest total link strength and is considered a leading institution in OPLL research. The top three institutions with the most published articles are all from Japan, which is consistent with Japan's leading position in this field. Almost all of the top 20 institutions are from the top five countries. Therefore, it can be seen that the establishment of first-class research institutions plays an indispensable role in improving the academic level of a country. As shown in (Fig. 3d), Imagama, Shiro and Kawabata, Shigenori are among the most important contributors, and we should closely monitor their further research and the latest progress of newly published articles in OPLL research. Co-authorship of papers is of great significance to the advancement of science: research innovation, knowledge sharing and improving the quality of scientific research. A co-authorship analysis method evaluates collaborations between different countries, institutions and authors. Authors, institutions and countries with higher total link strength are more willing to cooperate. For example, Imagama, Shiro, Nagoya University and Japan are the best choices for our joint efforts. The purpose of this co-citation analysis is to determine the impact of a study based on the number of times it is cited. The current findings show that the landmark studies of OPLL have a high overall citation frequency and provide many meaningful references. It is well known that Spine and Journal of neurosurgery-spine are the most widely mentioned

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in this topic.

### *4.3. Research focus of OPLL*

We discovered research directions and hot issues in this field using co-occurrence analysis. Create a co-occurrence network graph using all terms in the study title and abstract. (Fig. 7a) shows three research directions, including "mechanism research", "tissue engineering" and "clinical research". These studies can help clarify directions for future research. Keywords such as discectomy, corpectomy, intervertebral fusion, fixation, decompression were more prevalent and featured prominently in the co-occurrence network diagram [25]. Therefore, additional high-quality studies of OPLL are performed, indicating that these three aspects are still required. The overlay visualization map is similar to the co-occurrence map, with the colors (Fig. 7b) denoting the year of publication describing the study, but the items are colored differently, corresponding to the time of occurrence, this method gives the exact direction for tracking studies. Based on the findings, risk factors in clinical research could be the next hot topic in the field. Based on the results, risk factors, surgical methods, and surgical effects may become popular directions for research on OPLL, especially those research directions involving OPLL in recent years, and the term surgical method appears widely. Therefore, clinical research on OPLL may be the main focus of this field [26].

### *4.4. Advantages and limitations*

Although this study evaluates the research status and trends of several therapeutic modalities in the treatment of OPLL through visual analysis, the following items regarding limitations must be mentioned [27]. English Language Studies is based on the Web of Science -Science Citation Index Expanded data source. Non-English literature may be omitted, resulting in language bias. Also, there may be discrepancies between the real world and current results. For example, some recently published high-quality papers may not be highlighted due to low citation frequency shortly after publication. Therefore, we still need to pay attention to the latest primary research and other non-English research in our daily research work.

## 5. Conclusion

This study shows a global trend in OLL [28]. Japan is the largest contributor to research and is a leader in global research in this field [29]. Spine has the most publications related to this issue. We can predict that more studies on OLL will be published in the coming years. In particular, the clinical research of OLL will receive more attention and become the next hot spot in the future [30].

## References

*[1] Wu, J.; Chen, Y.; Huang, W. Ossification of the Posterior Longitudinal Ligament in Cervical Spine: Prevalence, Management, and Prognosis. NEUROSPINE 2018, 15 (1), 33–41. https: // doi. org/ 10. 14245/ ns.1836084.042.*

*[2] Kim, T.; Kim, T.; Jun, J.; Joo, K.; Uhm, W. Prevalence of Ossification of Posterior Longitudinal Ligament in Patients with Ankylosing Spondylitis. JOURNAL OF RHEUMATOLOGY 2007, 34 (12), 2460–2462.*

*[3] Yan, L.; Gao, R.; Liu, Y.; He, B.; Lv, S.; Hao, D. The Pathogenesis of Ossification of the Posterior Longitudinal Ligament. AGING AND DISEASE 2017, 8 (5), 570–582. https: // doi. org/ 10. 14336/ AD. 2017. 0201.*

*[4] Schmidt, M.; Quinones-Hinojosa, A.; Rosenberg, W. Cervical Myelopathy Associated with Degenerative Spine Disease and Ossification of the Posterior Longitudinal Ligament. SEMINARS IN NEUROLOGY 2002, 22 (2), 143–148. https://doi.org/10.1055/s-2002-36537.*

*[5] Wang, G.; Cui, T.; Yang, C.; Wang, L. Effect of Anterior and Posterior Operations on Surgical Parameters and Postoperative Complications in Patients with Ossification of the Posterior Longitudinal Ligament. International Journal of Clinical and Experimental Medicine 2020, 13 (9), 6616–6625.*

*[6] Wu, X.; Lin, R.; Ding, D.; Ding, X.; Fan, Z.; Wang, T.; Chen, G.; Sun, Y.; Lin, Y.; Wang, H.; Yin, M.; Yan, Y. Global Trends of the Research on Ossification of Posterior Longitudinal Ligament in Thoracic Spine: A Bibliometric and Visualization Study. World Neurosurgery 2022, 168, E1–E11. https://doi.org/10.1016/j.wneu.2022.07.012.*

ISSN 2618-1584 Vol. 5, Issue 5: 1-10, DOI: 10.25236/FMSR.2023.050501

*[7] Kim, D.; Lee, C.; Ko, Y.; Yang, S.; Kim, C.; Park, S.; Chung, C. The Clinical Implications and Complications of Anterior Versus Posterior Surgery for Multilevel Cervical Ossification of the Posterior Longitudinal Ligament; An Updated Systematic Review and Meta-Analysis. NEUROSPINE 2019, 16 (3), 530–541. https://doi.org/10.14245/ns.1938326.163.*

*[8] Zhao, T.; Zhang, Y.; Dai, Z.; Zhang, J.; Zhang, L.; Huang, Y.; Shao, H.; Kang, Y.; Ge, M.; Reidler, J. Bibliometric and Visualized Analysis of Scientific Publications on Ossification of the Posterior Longitudinal Ligament Based on Web of Science. WORLD NEUROSURGERY 2021, 149, E231–E243. https://doi.org/10.1016/j.wneu. 2021.02.045.*

*[9] Ellul, T.; Bullock, N.; Abdelrahman, T.; Powell, A.; Witherspoon, J.; Lewis, W. The 100 Most Cited Manuscripts in Emergency Abdominal Surgery: A Bibliometric Analysis. INTERNATIONAL JOURNAL OF SURGERY 2017, 37, 29–35. https://doi.org/10.1016/j.ijsu.2016.12.006.*

*[10] Xing, D.; Zhao, Y.; Dong, S.; Lin, J. Global Research Trends in Stem Cells for Osteoarthritis: A Bibliometric and Visualized Study. INTERNATIONAL JOURNAL OF RHEUMATIC DISEASES 2018, 21 (7), 1372–1384. https://doi.org/10.1111/1756-185X.13327.*

*[11] Highsmith, J.; Dhall, S.; Haid, R.; Rodts, G.; Mummaneni, P. Treatment of Cervical Stenotic Myelopathy: A Cost and Outcome Comparison of Laminoplasty versus Laminectomy and Lateral Mass Fusion. JOURNAL OF NEUROSURGERY-SPINE 2011, 14 (5), 619–625. https: // doi. org/ 10. 3171/ 2011. 1. SPINE10206.*

*[12] Yang, K.; Pei, L.; Wen, K.; Zhou, S.; Tao, L. Investigating Research Hotspots and Publication Trends of Spinal Stenosis: A Bibliometric Analysis During 2000-2018. FRONTIERS IN MEDICINE 2021, 8. https://doi.org/10.3389/fmed.2021.556022.*

*[13] Wu, J.; Niu, Z.; Li, X.; Huang, L.; Nielsen, P.; Liu, X. Understanding Multi-Scale Spatiotemporal Energy Consumption Data: A Visual Analysis Approach. ENERGY 2023, 263. https: // doi. org/ 10. 1016/ j.energy.2022.125939.*

*[14] Mao, X.; Guo, L.; Fu, P.; Xiang, C. The Status and Trends of Coronavirus Research A Global Bibliometric and Visualized Analysis. MEDICINE 2020, 99 (22). https: // doi. org/ 10. 1097/ MD. 0000000000020137.*

*[15] Poirrier, M.; Moreno, S.; Huerta-Canepa, G. Robust H-Index. SCIENTOMETRICS 2021, 126 (3), 1969–1981. https://doi.org/10.1007/s11192-020-03857-z.*

*[16] Culliford, D.; Maskell, J.; Judge, A.; Cooper, C.; Prieto-Alhambra, D.; Arden, N.; COASt Study Grp. Future Projections of Total Hip and Knee Arthroplasty in the UK: Results from the UK Clinical Practice Research Datalink. OSTEOARTHRITIS AND CARTILAGE 2015, 23 (4), 594–600. https://doi.org/10.1016/j.joca. 2014.12.022.*

*[17] Mao, X.; Chen, C.; Wang, B.; Hou, J.; Xiang, C. A Global Bibliometric and Visualized Analysis in the Status and Trends of Subchondral Bone Research. MEDICINE 2020, 99 (22). https: // doi. org/ 10. 1097/ MD.0000000000020406.*

*[18] Chen, R.; Jiang, Y.; Lu, L.; Wang, P.; Huang, D.; Wang, J.; Liu, Z.; Qin, S.; Yin, F. Bibliometric Analysis of Research Trends in Stem Cell Therapy for Knee Osteoarthritis over the Period 2001-2021. FRONTIERS IN CELL AND DEVELOPMENTAL BIOLOGY 2022, 10. https: // doi. org/ 10. 3389 /fcell. 2022. 996273.*

*[19] Wang, K.; Xing, D.; Dong, S.; Lin, J. The Global State of Research in Nonsurgical Treatment of Knee Osteoarthritis: A Bibliometric and Visualized Study. BMC MUSCULOSKELETAL DISORDERS 2019, 20 (1). https://doi.org/10.1186/s12891-019-2804-9.*

*[20] McCabe, F.; Dalton, D.; McCabe, J. Does Country of Origin Influence Research Outcomes in Operative Interventions for Lumbar Spinal Stenosis? EUROPEAN SPINE JOURNAL 2021, 30 (4), 846–854. https://doi.org/10.1007/s00586-020-06691-2.*

*[21] Le, H.; Wick, J.; Van, B.; Klineberg, E. Ossification of the Posterior Longitudinal Ligament: Pathophysiology, Diagnosis, and Management. JOURNAL OF THE AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS 2022, 30 (17), 820–830. https://doi.org/10.5435/JAAOS-D-22-00049.*

*[22] Wu, J.; Chen, Y.; Huang, W. Ossification of the Posterior Longitudinal Ligament in Cervical Spine: Prevalence, Management, and Prognosis. NEUROSPINE 2018, 15 (1), 33–41. https: // doi. org/ 10. 14245/ ns.1836084.042.*

*[23] Sun, X.; Wang, Y.; Sun, J.; Xu, X.; Kong, Q.; Chen, Y.; Yang, H.; Liu, Y.; Guo, Y.; Shi, G.; Chen, X.; Chen, D.; Shen, Y.; Hao, D.; Shen, H.; Zhu, Q.; Yuan, W.; Jia, L.; Shi, J. Consensus Statement on Diagnosis and Treatment of Cervical Ossification of Posterior Longitudinal Ligament from Asia Pacific Spine Society (APSS) 2020. JOURNAL OF ORTHOPAEDIC SURGERY 2020, 28 (3). https: // doi. org/ 10. 1177/2309499020975213.*

*[24] Davies, B.; Mowforth, O.; Wood, H.; Karimi, Z.; Sadler, I.; Tetreault, L.; Milligan, J.; Wilson, J.; Kalsi-Ryan, S.; Furlan, J.; Kawaguchi, Y.; Ito, M.; Zipser, C.; Boerger, T.; Vaccaro, A.; Murphy, R.; Hutton, M.; Rodrigues-Pinto, R.; Koljonen, P.; Harrop, J.; Aarabi, B.; Rahimi-Movaghar, V.; Kurpad,*

ISSN 2618-1584 Vol. 5, Issue 5: 1-10, DOI: 10.25236/FMSR.2023.050501

*S.; Guest, J.; Wilson, J.; Kwon, B.; Kotter, M.; Fehlings, M. Improving Awareness Could Transform Outcomes in Degenerative Cervical Myelopathy [AO Spine RECODE-DCM Research Priority Number 1]. GLOBAL SPINE JOURNAL 2022, 12 (1_SUPPL), 28S-38S. https: // doi. org/ 10. 1177/21925682211050927.*

*[25] Kawaguchi, Y.; Nakano, M.; Yasuda, T.; Seki, S.; Suzuki, K.; Yahara, Y.; Makino, H.; Kobayashi, K.; Kanamori, M.; Kimura, T. Clinical Impact of Ossification of the Posterior Longitudinal Ligament Progression After Cervical Laminoplasty. CLINICAL SPINE SURGERY 2019, 32 (3), E133–E139. https://doi.org/10.1097/BSD.0000000000000747.*

*[26] Sakai, K.; Okawa, A.; Takahashi, M.; Arai, Y.; Kawabata, S.; Enomoto, M.; Kato, T.; Hirai, T.; Shinomiya, K. Five-Year Follow-up Evaluation of Surgical Treatment for Cervical Myelopathy Caused by Ossification of the Posterior Longitudinal Ligament A Prospective Comparative Study of Anterior Decompression and Fusion With Floating Method Versus Laminoplasty. SPINE 2012, 37 (5), 367–376. https://doi.org/10.1097/BRS.0b013e31821f4a51.*

*[27] Motegi, H.; Yamazaki, M.; Goto, S.; Mikata, A.; Moriya, H. Proliferating Cell Nuclear Antigen in Hypertrophied Spinal Ligaments - Immunohistochemical Localization of Proliferating Cell Nuclear Antigen in Hypertrophied Posterior Longitudinal Ligament of the Cervical Spine. SPINE 1998, 23 (3), 305–310. https://doi.org/10.1097/00007632-199802010-00004.*

*[28] Tetreault, L.; Nakashima, H.; Kato, S.; Kryshtalskyj, M.; Nagoshi, N.; Nouri, A.; Singh, A.; Fehlings, M. A Systematic Review of Classification Systems for Cervical Ossification of the Posterior Longitudinal Ligament. GLOBAL SPINE JOURNAL 2019, 9 (1), 85–103. https: // doi. org/ 10. 1177/ 2192568217720421.*

*[29] Matsunaga, S.; Sakou, T. Ossification of the Posterior Longitudinal Ligament of the Cervical Spine Etiology and Natural History. SPINE 2012, 37 (5), E309–E314. https: // doi. org/ 10. 1097/ BRS. 0b013e318241ad33.*

*[30] Mori, K.; Imai, S.; Kasahara, T.; Nishizawa, K.; Mimura, T.; Matsusue, Y. Prevalence, Distribution, and Morphology of Thoracic Ossification of the Posterior Longitudinal Ligament in Japanese. SPINE 2014, 39 (5), 394–399. https://doi.org/10.1097/BRS.0000000000000153.*