Anterior cruciate ligament studies in south-east asia over the past 10 years: A systematic review

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ABSTRACT

Purpose: There was numerous articles that discussed about anterior cruciate ligament (ACL). There was no study that wrapped up all about ACL in South-east asia country. This study aims to apply bibliometric tools to orthopaedic publications on ACL in South-east asia country.

Methods: We searched English full text with keyword “ACL” OR “Anterior Cruciate Ligament” AND “injury” OR “tear” OR “rupture” that published from January 1st 2010 to December 31st 2019 on PubMed, EMBASE, and Cochrane Library. We included article with at least one author affiliation in the South-east asia country.

Results: A total of 12,570 articles were analyzed, and 64 articles were included. Study type analysis revealed that clinical research (n = 28; 43.7%) was the most frequent study type. The Journal of Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA) and Orthopaedic Journal of Sports Medicine had the highest number of publications in general (n = 6; 9.4%). Sholahuddin Rhatomy (n = 4) was the top author with highest number in the first author order and Lingaraj Krishna (n = 12) was the top author with highest number of published article. Most of studies (n = 32; 50.0%) were published in high index journal with impact factor >1.0.

Conclusion: ACL articles in South-east asia had high quality publication that proved by high impact journal publisher. There has been a steady increase in the article number since 2010 in South-east asia. This article quantifies the increased interest and could act as a baseline for future studies to compare.

1. Introduction

There have been numerous researches about anterior cruciate ligament (ACL). ACL is discussed among knee surgeon because it is the most common injured of knee ligament [1]. Researchers attempted to provide the evidence based in diagnosis, treatment, prevention, prognosis, and rehabilitation technique in ACL injured patient [2].

The publications trends about this ligament is increased by year around the world. There is no data that provides all about ACL publications especially in South-east asia country. Organizing information in an effective way mandates the use of the best evidence for decision making in ACL care holistically. This study aims to apply bibliometric tools to orthopaedic publications on ACL in South-east asia country between 2010 and 2019.

2. Methods

We search in Pubmed, EMBASE, and Cochrane Library using keyword “ACL” OR “Anterior Cruciate Ligament” AND “injury” OR “tear” OR “rupture”. We added english fulltext and 10 years publications in filter searching engine. The search result in a total of 12,570 articles from 2009 until 2019. We included the articles that discussed about anterior cruciate ligament and at least one author with the affiliation country in South-east asia. All original articles including molecular study, laboratory study, animal study, cadaveric study, imaging study, clinical study, systematic review, review articles, and other study that published between January 1st 2010 until December 31st 2019 were included. We excluded the book sections, conference presentations, guidelines, commentaries, or personal review. The PRISMA guidelines for conducting the review were followed [3] (Fig. 1).

All abstract were screened independently by two reviewers to
determine whether it met eligibility criteria. The full articles of eligible studies were reviewed and included into the study for further data extraction and analysis. We analyzed the number of published articles by year, top journals with the highest number of publications, top author with highest number of published article in the first order author, top author with highest number of published article, top country with the highest number of published articles, the most cited articles and type of study. The published journals were divided by impact factor (IF) into low (IF below 1) and high (IF of 1 and above) impact journal. Information of a country was collected. Data was analyzed using Microsoft Excel and SPSS version 25.0 and visualized with tables and graphs.

3. Results

A total of 64 articles on ACL studies were performed in South-east asia region between 2010 until 2019. The average number of publications is 6 articles per year. The highest published articles was in 2019 with 17 articles and the lowest published article was in 2010 with 0 article. The trend of ACL publications have positive increment values but unsteady (Graph 1).

The journal of knee surgery, sports traumatology, arthroscopy

**Table 1**

| No | Journal name                                             | Number of articles |
|----|----------------------------------------------------------|--------------------|
| 1  | Knee surgery, sports traumatology, arthroscopy           | 6                  |
| 1  | Orthopaedic journal of sports medicine                  | 6                  |
| 3  | Arthroscopy: the journal of arthroscopic & related surgery | 3                  |
| 3  | The knee                                                | 3                  |
| 3  | The journal of knee surgery                             | 3                  |
| 3  | Malaysian orthopaedic journal                           | 3                  |
| 3  | Journal of the Medical Association of Thailand - Chotmaihet thanghaet | 3 |
| 3  | International journal of surgery open                   | 3                  |

**Graph 1.** Number of articles by year.

**Graph 2.** Number of articles by country.

**Fig. 1.** PRISMA flow chart of the article selection process.

**Fig. 2.** Number of articles by country.
which he was the first order author (Table 3). Author with the first order number of articles (n = 6; 9.4%) (Table 1). The country with the highest number of published article was Singapore (n = 25; 52.1%), followed by Indonesia (n = 19; 29.7%), and Thailand (n = 12; 18.7%) (Graph 2). Article by Tiamklang et al. [4] had the highest number of citation with 19; 29.7%), and Thailand (n = 12; 18.7%) (Graph 2). Article by Tiamklang et al. [4] had the highest number of citation with 153 times (Table 2). Sholahuddin Rhatomy from Department of Orthopaedics and Traumatology, Dr. Soeradjit Tirtonegoro General Hospital, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta, Indonesia was the author with the highest number of published article in the first order author. Most of articles were published in Q1 journal (n = 40; 46.9%), followed by Q3 (n = 11; 17.2%), Q2 (n = 7; 10.9%), and Q4 (n = 6; 12.5%).

4. Discussions

The most important findings from this systematic review were that most of Asean authors have good quality of research clinical research (Table 6), followed by cross sectional study 28.6%. In this systematic review, Asean author submitted their study in high index journal with impact factor more than 1.0 (n = 32, 50.0%) and there were some articles that submitted in unindexed journal publisher (n = 7; 10.9%). Most of articles were published in Q1 journal (n = 40; 46.9%), followed by Q3 (n = 11; 17.2%), Q2 (n = 7; 10.9%), and Q4 (n = 6; 12.5%).

Table 2
Top 10 most cited articles.

| No. | Article title                                                                 | Number of citation |
|-----|------------------------------------------------------------------------------|--------------------|
| 1   | Double-bundle versus single-bundle reconstruction for anterior cruciate ligament rupture in adults [4]. | 153                |
| 2   | The importance of patient sex in the outcomes of anterior cruciate ligament reconstructions: A systematic review and meta-analysis [2]. | 65                 |
| 3   | Accuracy of MRI in the diagnosis of meniscal tears in patients with chronic ACL tears. | 44                 |
| 4   | Association between matrix metalloproteinase-3 polymorphism and anterior cruciate ligament ruptures [6]. | 43                 |
| 5   | Biomechanical analysis of knee laxity with isolated anteromedial or posterolateral bundle-deficient anterior cruciate ligament [7]. | 29                 |
| 6   | Increased compliance with supervised rehabilitation improves functional outcome and return to sport after anterior cruciate ligament reconstruction in recreational athletes [8]. | 22                 |
| 7   | Medium-term (5-year) comparison of the functional outcomes of combined anterior cruciate ligament and posterolateral corner reconstruction compared with isolated anterior cruciate ligament reconstruction [9]. | 20                 |
| 8   | One-leg hop kinematics 20 years following anterior cruciate ligament rupture: Data revisited using functional data analysis [10]. | 19                 |
| 9   | The effect of leg dominance and landing height on ACL loading among female athletes [11]. | 17                 |
| 10  | Diagnosis of ligamentous and meniscal pathologies in patients with anterior cruciate ligament injury: comparison of magnetic resonance imaging and arthroscopic findings [12]. | 16                 |

Table 3
Top author with highest number of published article in the first order author.

| No | Orthopaedic Center | Investigator | Number of Publications |
|----|--------------------|--------------|-----------------------|
| 1  | Department of Orthopaedics and Traumatology, Dr. Soeradjit Tirtonegoro General Hospital, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta, Indonesia | Sholahuddin Rhatomy | 4                     |
| 2  | Yong Loo Lin School of Medicine, National University of Singapore (NUS), Singapore | Si Heng Sharon Tan | 3                     |
| 3  | Division of Sports and Surgery, Department of Orthopaedic Surgery, National University Hospital, National University Health System, Singapore | Lingiara J Krisna | 2                     |
| 4  | Department of Orthopaedic and Traumatology, National University of Singapore (NUS), Singapore | Muhammad Sakti | 2                     |
| 5  | Department of Orthopaedic Surgery, National University Hospital Sports Center, National University Health System, NUHS Tower Block, Singapore | Bryan Koh Thean Howe | 3                     |
| 6  | Medical Rehabilitation Department, Dr. Soetomo General Hospital, Surabaya, Indonesia | Damayanti Tini Duh | 3                     |
| 7  | Department of Orthopaedics and Traumatology, Dr. Saiful Anwar General Hospital, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia | Edi Mustamir | 3                     |
| 8  | Department of Orthopaedic Surgery, Singapore General Hospital, Singapore | Hamid Rahmatullah Bin Abdul Razak | 3                     |
| 9  | Soeradjit Tirtonegoro Sport Center and Research Unit, Dr. Soeradjit Tirtonegoro General Hospital, Klaten, Indonesia | Riky Setiyawan | 3                     |
| 10 | Yong Loo Lin School of Medicine, National University of Singapore (NUS), Singapore | Si Heng Sharon Tan | 3                     |
Annals of Medicine and Surgery 60 (2020) 61–65

research centers should be encouraged. International collaborations with guidance from more established countries are expected to produce more articles that can enliven the research database. Other countries are hoped to follow the lead of Singapore, the country with the highest number of published articles. It is evident that the development of technology, particularly with the many choices of autograft, is crucial. The awareness of the need for new and more effective methods of diagnosis, imaging study, and surgical technique is also important.

The number of journal increment in ACL field is associated with the development of new methods in ACL reconstruction, not only in single articles but also in systematic reviews. The increment in number of publications in recent years indicates an increase in interest in the topic of ACL.

5. Conclusions

There have been a large number of ACL publications among ASEAN authors over the past 10 years with high impact journal publications. Data mining based on PubMed results provided the useful information on the hot topic on ACL and led other authors to follow the mimicking research. The increment in number of publications in recent years indicates an increase in interest in the topic of ACL.

Ethical approval

This is review article, no need ethical approval.

Sources of funding

The authors declare that this study had no funding resource.

Author contribution

Sholahuddin Rhatomy and Riky Setyawan conceived the study. Sholahuddin Rhatomy and Riky Setyawan collected data. Sholahuddin Rhatomy and Riky Setyawan analyzed data. Sholahuddin Rhatomy and Riky Setyawan prepared and drafted the manuscript. Sholahuddin Rhatomy and Riky Setyawan edited the manuscript. Sholahuddin Rhatomy and Riky Setyawan reviewed the manuscript.

Registration of research studies

We have registered our study with unique identifying number: reviewregistry967.

URL: https://www.researchregistry.com/browse-the-registry#registryofsystematicreviewsmeta-analyses/registryofsystematicreviewsmeta -analysesdetails/5f3b1f96411b080015b5af42/

Guarantor

Sholahuddin Rhatomy, MD.

Consent

Written informed consent was obtained from all of the patients for publication of this case report and accompanying images. A copy of the written consent is available for review by the corresponding author of this journal on request.

Table 5
Type of study by year.

| Year | Laboratory Study | Animal Study | Molecular Study | Biomechanics Study | Clinical Imaging Study | Surgical Technique | Case Reports | Clinical Research | Meta-Analysis & Systematic Review | Review Article | Total |
|------|------------------|--------------|-----------------|--------------------|-----------------------|-------------------|--------------|------------------|-------------------------------|----------------|-------|
| 2010 | 0                | 0            | 0               | 0                  | 0                     | 0                 | 0            | 0                | 0                             | 0              | 0     |
| 2011 | 1                | 0            | 0               | 0                  | 0                     | 0                 | 0            | 0                | 0                             | 0              | 1     |
| 2012 | 0                | 0            | 1               | 0                  | 0                     | 2                 | 1            | 1                | 0                             | 0              | 5     |
| 2013 | 0                | 0            | 0               | 0                  | 0                     | 1                 | 0            | 0                | 0                             | 0              | 2     |
| 2014 | 0                | 0            | 0               | 0                  | 0                     | 0                 | 0            | 0                | 0                             | 0              | 0     |
| 2015 | 0                | 0            | 1               | 0                  | 0                     | 2                 | 0            | 4                | 0                             | 0              | 0     |
| 2016 | 0                | 0            | 0               | 0                  | 0                     | 1                 | 0            | 1                | 0                             | 0              | 0     |
| 2017 | 2                | 0            | 1               | 0                  | 1                     | 2                 | 4            | 0                | 1                             | 0              | 0     |
| 2018 | 1                | 0            | 0               | 0                  | 0                     | 0                 | 8            | 0                | 0                             | 0              | 0     |
| 2019 | 1                | 0            | 1               | 0                  | 0                     | 1                 | 1            | 9                | 1                             | 1              | 17    |
| Total| 6                | 1            | 8               | 4                  | 4                     | 7                 | 28           | 3                | 3                             | 64             |       |

Table 6
Clinical study research.

| Year | Case Series | Cross Sectional | Case Control | Cohort | Randomized Controlled Clinical Trial |
|------|-------------|-----------------|--------------|--------|-------------------------------------|
| 2010 | 0           | 0               | 0            | 0      | 0                                   |
| 2011 | 0           | 0               | 0            | 0      | 0                                   |
| 2012 | 1           | 0               | 0            | 0      | 0                                   |
| 2013 | 0           | 0               | 1            | 0      | 0                                   |
| 2014 | 0           | 0               | 0            | 0      | 0                                   |
| 2015 | 0           | 0               | 1            | 0      | 0                                   |
| 2016 | 0           | 1               | 0            | 0      | 0                                   |
| 2017 | 0           | 2               | 0            | 0      | 0                                   |
| 2018 | 0           | 2               | 1            | 3      | 2                                   |
| 2019 | 0           | 3               | 0            | 5      | 1                                   |
| Total| 1           | 8               | 3            | 13     | 3                                   |
Availability of data and material

Data will be provided by request.

Declaration of competing interest

No potential conflict of interest relevant to this article was reported.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2020.10.014.

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