

Systematic Review

Venous Thromboembolism Events After Hip Arthroscopy: A Systematic Review

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Purpose: The purpose of this systematic literature review focused on hip arthroscopy was to (1) report the venous thromboembolism (VTE) event incidence in patients who receive VTE prophylaxis and those who do not, (2) report how VTE prophylaxis is currently being administered, and (3) report operative and patient-related risk factors for VTE identified in the literature. **Methods:** The electronic databases MEDLINE, Embase, and PubMed were searched from database inception to October 10, 2016, and screened in duplicate for relevant studies. Data were collected regarding VTE prophylaxis, traction use, surgical time, VTE incidence, patient and operative factors, and postoperative weight bearing and rehabilitation. Study quality was assessed in duplicate with the Methodological Index for Non-Randomized Studies criteria. **Results:** Outcome analyses included 14 studies that involved 2,850 patients (2,985 hips). The weighted mean follow-up period was 19 ± 8 months, ranging from 7 days to 103 months. The weighted mean age was 40.7 ± 7 years, ranging from 6 to 82 years, and 39.6% of patients were male patients. The overall weighted proportion of VTE events after hip arthroscopy found in 14 included studies was 2.0% (95% confidence interval, 0.01%-4.1%), with 25 VTE events. Several studies reported patient risk factors, which included increased age, increased body mass index, prolonged traction time, and use of oral contraceptives. **Conclusions:** The use and efficacy of VTE prophylaxis are highly under-reported within hip arthroscopy. The low incidence of VTE events found in this review (2.0%) suggests that prophylaxis may not be necessary in low-risk patients undergoing hip arthroscopy; however, the true rate may be under-reported. Current literature suggests that prophylaxis is typically not prescribed. Early mobility and postoperative rehabilitation may also help to further mitigate the risk of VTE events, but use of these strategies needs further prospective evaluation. **Level of Evidence:** Level IV, systematic review of Level II through IV studies.

Lower limb arthroscopic procedures have long been perceived as procedures with a relatively low risk of complications, particularly in comparison with open procedures such as knee and hip arthroplasty.¹ However, arthroscopic procedures have also been associated with the development of venous thromboembolism (VTE) events including pulmonary embolism (PE) and

deep vein thrombosis (DVT).^{2,3} Within knee arthroscopy, the reported incidence of VTE with prophylaxis ranges from 0.1% to 11.9%.⁴ This is significantly lower than that of more invasive procedures such as total knee arthroplasty, for which the VTE event rate has been reported to range from 40% to 84%.⁵ Although prophylaxis guidelines have been developed for hip

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The authors report the following potential conflict of interest or source of funding: M.S. receives support from ISAKOS, ISHA. Paid board membership. Medacta, ConMed, Smith & Nephew, Biomimedica. Consultant. Smith & Nephew, ConMed. Fellowship grant. Medacta, Smith & Nephew, ConMed. Education consultant. Hip brace. Patent submitted. Hip distraction device. Patent submitted with Stanford. Williams and Wilkins, WB Saunders. Book royalties. Howmedica/Stryker. Shoulder anchor. Smith & Nephew. Hip anchor. DJO. Shoulder sling. F.R. receives support from Stryker. Consultancy for

Course Organization on Anterior Hip Approach in Italy and Europe 2016. Smith & Nephew. Lecture at the "Hip Revision Master Class," Bologna, October 21, 2016. Bayer. Presentation at SIOT Symposia on Risk Management after Orthopedic Surgery, Rome, November 24, 2014. Full ICMJE author disclosure forms are available for this article online, as [supplementary material](#).

Received January 30, 2017; accepted July 5, 2017.

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0749-8063/1791/36.00

<http://dx.doi.org/10.1016/j.arthro.2017.07.006>

arthroplasty and knee arthroplasty, thus far, none have been developed for lower limb arthroscopic procedures, despite their increasing use. As a result, several systematic reviews have sought to inform optimal prophylaxis in knee arthroscopy and have examined whether prophylaxis is necessary given a low reported incidence.⁴ A recent review on DVT within knee arthroscopy by Sun et al.⁴ concluded that prophylaxis may in fact reduce total DVT occurrence. Within hip arthroscopy, for which the reported VTE incidence rate is similar to that of knee arthroscopy, there has yet to be a similar investigation into how prophylaxis is used and its influence on the VTE event rate.

DVTs and PEs can generally be attributed to 3 factors identified in the Virchow triad: hypercoagulability, endothelial dysfunction, and/or hemodynamic changes (stasis).^{6,7} These factors may be further influenced by operative, postoperative, and patient-related factors. Operative factors can include prolonged surgical time and traction time, whereas patient factors may include obesity, prothrombotic conditions, smoking, use of oral contraceptives, malignancy, and metabolic or cardiovascular disturbances. Finally, postoperative factors can include weight-bearing and mobility restrictions.⁷

Current literature on VTE events related to hip arthroscopy suggests a low reported incidence of VTE events. However, many previous studies have relied on symptomatic presentations in the reporting of the VTE incidence, with reported rates ranging from 1.4% to 3.7%.^{8,9} A recent prospective study by Mohtadi et al.,¹⁰ which used ultrasound, postoperatively found an overall higher incidence of DVT, at 4.4%, which included asymptomatic presentations. Within orthopaedic surgery, the risk of PE from asymptomatic proximal venous thrombosis (of popliteal or more proximal veins) has been reported to be about 25%, wherein a fatal PE occurs in 1% to 2% of patients in this group.^{11,12} Given the increasing use of hip arthroscopy, as well as the morbidities and deaths associated with both asymptomatic and symptomatic VTE, it is important to elucidate the incidence of these events and the role of prophylaxis in their prevention. Furthermore, improved identification of surgical and patient-related risk factors that may lead to VTE events may also aid in informing prophylaxis management.

The purpose of this systematic literature review focused on hip arthroscopy was to (1) report the VTE event incidence in patients who receive VTE prophylaxis and those who do not, (2) report how VTE prophylaxis is currently being administered, and (3) report operative and patient-related risk factors for VTE identified in the literature. The hypothesis of this article was that VTE events would be rare reported

complications after hip arthroscopy that would occur in patients with identifiable risk factors.

Methods

Design and Eligibility Criteria

The research question and study eligibility criteria for this systematic review were established a priori. The patient population included male and female patients of all ages who underwent hip arthroscopy. The primary outcome measure was a VTE event in patients who received prophylaxis versus those who did not. The inclusion criteria were (1) all levels of evidence; (2) studies published in English, (3) studies conducted in humans that indicated whether VTE prophylaxis was or was not used, and (4) studies that reported whether VTE events occurred or did not occur. The exclusion criteria were (1) nonsurgical treatment studies (conservative treatment, technique articles without outcomes, and so on) and (2) studies in which the outcomes for the exact same patient population were reported in multiple articles (the most recent article was included).

Search Strategy

A systematic search strategy previously described by us was used.^{13,14} One reviewer (S.E.) searched 3 online databases (Embase, MEDLINE, and PubMed) for literature related to hip arthroscopy. The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were followed in the development of this study. The search was conducted on October 10, 2016, and retrieved articles from database inception to search date. To be more inclusive, the following key terms were used in a broad-based search: "hip" and "arthroscopy." The search results were merged, and duplicates were removed. The search strategy is outlined in [Appendix Table 1](#) (available at www.arthroscopyjournal.org).

Study Screening

Two reviewers (C.E.H. and S.E.) independently screened titles, abstracts, and full texts of retrieved studies. Discrepancies during the title and abstract screening stages were resolved by automatic inclusion to ensure thoroughness. Discrepancies during full-text screening were resolved through consensus between the reviewers. If a consensus could not be reached, a senior reviewer (D.D.) assisted to resolve the discrepancy. In addition, abstracts from American Orthopaedic Society for Sports Medicine; International Society of Arthroscopy, Knee Surgery & Orthopaedic Sports Medicine; European Society of Sports Traumatology, Knee Surgery and Arthroscopy; and American Academy of Orthopaedic Surgeons proceedings from 2011 to 2016 were also screened for relevant information. The references of included

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