The Incidence of Venous Thromboembolism (VTE) After Hip Arthroscopy

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Abstract

Purpose: The purpose of this study was to determine the incidence of venous thromboembolism (VTE) after hip arthroscopy.

Methods: Over the course of 13 months, four surgeons that routinely perform hip arthroscopy participated in a protocol to screen all patients postoperatively for deep venous thrombosis (DVT) using bilateral venous duplex ultrasound at or about the 2 week postoperative time point. All patients were assessed and stratified for VTE risk prior to surgery. Mechanical intraoperative and postoperative chemoprophylaxis were not administered. Perioperative factors, such as weightbearing status after surgery, traction time, and anesthesia type, were recorded.

Results: We identified 139 eligible patients (average age 37.7, SD = 12.0) that underwent hip arthroscopy. The incidence of symptomatic VTE was 1.4 percent (2/139). Of the entire patient pool, 81 obtained a follow-up ultrasound. There were no cases of asymptomatic deep vein thrombosis (DVT). There were two symptomatic venous thromboembolic events noted; one DVT and one pulmonary embolus. One patient had no risk factors; the other was overweight and routinely took oral contraceptives. Amongst the patient cohort, the mean BMI was 25.9 (SD = 4.8). The mean traction time was 58.9 minutes (SD = 23.1). Most patients (71%) were partial weightbearing after the procedure.

Conclusion and Clinical Relevance: In patients undergoing hip arthroscopy, the rate of postoperative VTE was low, despite the use of prolonged axial traction and surgical proximity to the pelvic veins. Although patients should be counseled preoperatively regarding the risk of VTE, we believe that routine use of pharmacologic prophylaxis is not indicated following hip arthroscopy if patients are properly risk stratified prior to surgery and found to be at low risk for VTE.

Lower extremity arthroscopic procedures have been associated with the development of deep vein thrombosis (DVT) and venous thromboembolism (VTE). These may be secondary to a variety of factors, such as venous endothelial cell damage, a potential hypercoagulable state, and the impedance of blood flow or venous stasis (Virchow’s triad). These physiologic conditions may be influenced by patient factors, such as inherited pro-thrombotic conditions, metabolic or cardiovascular disturbances, oral contraceptive use, malignancy, or obesity. Given the increasing numbers of hip arthroscopies performed every year and a growing interest in surgical management of hip disorders, such as labral tears and femoroacetabular impingement (FAI), it is becoming increasingly important to identify and prevent potential sources of morbidity, such as DVT or VTE. Recently, Salvo and colleagues, in the first study specifically examining venous thromboembolism (VTE) after hip arthroscopy, cited the rate of symptomatic DVT to be 3.7%.

Pulmonary emboli and contralateral limb deep venous thromboses have also been reported.2,3 These complications can be potentially life-threatening and require significant pharmacologic treatment and close medical follow-up. The rate of asymptomatic DVT, however, is not known. Given the proximity of the femoral and glutal veins to arthroscopy portals, likely compression of these veins with traction on the perineal post, as well as prolonged traction on the limbs during these procedures, we feel that the rate...
of thrombosis may be underestimated, and that there will be a significant percentage of patients that have clinically asymptomatic DVT.

**Methods**

This retrospective study was approved by our Institutional Review Board (IRB). From August 2010 to August 2011, four board-certified orthopaedic surgeons that routinely perform hip arthroscopy instituted a quality-assurance protocol using routine lower extremity duplex venous ultrasound to screen all postoperative hip arthroscopy patients for a perioperative deep venous thrombosis. This protocol was initiated after two symptomatic DVTs were previously identified in postoperative hip arthroscopy patients.

All hip arthroscopies were performed by one of four surgeons (T.Y., R.M., S.B., and R.D.) on one of two standard hip traction tables (HANA, Mizuho OSI, Union City, CA, Smith and Nephew, Memphis, TN). A well-padded hip arthroscopy perineal post, measuring approximately 9 inches in diameter, was positioned centrally. Under general anesthesia, gentle axial traction was placed across bilateral lower extremities to stabilize the pelvis about the post (Fig. 1). Additional fine traction was placed across the operative hip to allow for distraction of the hip joint, which was confirmed fluoroscopically, such that the hip joint could accommodate visualization and working portals.

At the first postoperative visit, which occurred within 2 weeks of the procedure, patients were referred for venous Doppler ultrasound of bilateral extremities, and the results noted. Charts were reviewed, and medical history, DVT risk factors (Table 1), demographics, and presence of postoperative DVT or venous thromboembolism were recorded. It should be noted that DVT risk factors and medical histories are routinely assessed preoperatively in our institution’s risk stratification algorithm for perioperative VTE; these factors are listed in Table 2. Any patient that was given chemoprophylaxis postoperatively was excluded from the study.

Perioperative factors, such as traction time, anesthesia time, and weightbearing status after surgery, were also assessed. Regarding the ultrasound, we assessed 1. the presence or absence of VTE, 2. the time between the surgical procedure and the ultrasound, 3. if DVT or VTE was present or the veins involved, and 4. if the patient had an event, how the patient was treated. All patients that had a positive study were referred for an urgent medical evaluation and pharmacologic anticoagulation was promptly instituted.

![Figure 1 A](image1.png) **A**, Hip distraction table (Smith and Nephew, Memphis, TN). **B**, Traction forces are generated distally and applied through the feet. Note the large traction post placed securely in the groin.
Inclusion criteria included all patients that underwent a hip arthroscopic procedure in the time specified. Exclusion criteria included patients under the age of 18 that could not provide informed consent themselves, pregnant women, patients undergoing active treatment for malignancy (patients in remission were included in the study), as well as patients undergoing active treatment for VTE. Patients that completed an appropriate course of anticoagulation for prior thromboembolism were included in the study.

Results
We identified 144 patients between August 2010 and August 2011 that underwent hip arthroscopy at our institution. Of these patients, five were excluded from the study as they were deemed at high risk for developing VTE and given chemoprophylaxis with either low molecular weight heparin (LMWH) or 325 mg of aspirin. This left a total of 139 patients eligible for the study. Of these patients, 61% were female, and 39% were male. The average age was 37.7 years (SD = 12.0). Patient demographics and positive preoperative risk factors for VTE are listed in Tables 1 and 2, respectively. The mean body mass index (BMI) was 25.9 kg/m² (SD = 4.8). The percent of patients that were considered to be obese was 18.9%, using a limit of 30 kg/m² as the standard. One patient had a prior history of DVT in the distant past and had finished a course of therapeutic anticoagulation. Eleven patients had a positive family history for VTE. Twelve patients were current smokers, and 16 female patients were currently receiving pharmacologic contraception. Regarding perioperative factors, 134 patients (96%) received general anesthesia while 5 patients received spinal anesthesia. The mean time of general anesthesia was 101.6 minutes, and the average traction time was 58.9 (SD = 23.1) minutes. The majority of patients (99/139, 71.2%) were made partial weightbearing postoperatively. Twenty-two patients (15.8%) were weightbearing as tolerated, 12 patients (8.6%) were foot-flat or toe-touch weightbearing, and 6 patients were non-weightbearing (4.3%).

Of the entire cohort, 81 patients (58.3%) received a follow-up bilateral lower extremity deep venous ultrasound to rule out DVT. The most common reasons for patients not obtaining the ultrasound was insurance plan denial and refusal by the patient due to time constraints associated with the procedure. All patients attended their first clinical follow up. The average time between surgery and the follow-up ultrasound was 16.12 days (SD = 10.72). Overall, the incidence of symptomatic DVT was 1.4% (2/139). There were no cases of asymptomatic venous thromboembolism in the patients that received the ultrasound exam.

The first case of VTE was in a 28-year-old female who underwent left hip arthroscopy, and cam and pincer osteoplasty with labral repair. Fourteen days postoperatively, she began experiencing ipsilateral leg pain. Duplex ultrasound revealed acute, occlusive DVTs of the popliteal vein, femoral vein, 2 of 2 peroneal veins, and two gastrocnemial veins. Both posterior tibial veins had evidence of acute, non-occlusive DVTs. Traction time during the procedure was 52 minutes, and she was partial weightbearing after the procedure. Her BMI was elevated (31.7), and she had stopped taking oral contraceptives the day prior to the procedure. She had no other risk factors for the development of DVT. She was successfully treated pharmacologically.

The second case of VTE was in a 30-year-old female who underwent right hip arthroscopy, cam and pincer osteoplasty with labral repair. She received general anesthesia, and the total traction time was 50 minutes. She was toe-touch weightbearing after the procedure and had no pre-existing risk factors for VTE. Twelve days postoperatively, the patient began experiencing tachypnea and shortness of breath. Workup revealed acute pulmonary emboli in the segmental branches of the left upper and lower lung lobes. Lower extremity ultrasound showed no evidence of an acute DVT. She was treated with long-term Coumadin®.

Discussion
This retrospective study provides evidence to the increasing body of literature showing VTE to be a cause of postoperative morbidity in patients undergoing hip arthroscopy.
Contrary to our hypothesis, the rate of asymptomatic VTE in our series was zero. However, two patients experienced symptomatic perioperative VTE leading to significant morbidity and the requirement for long-term pharmacologic anticoagulation. In the 6 months following the completion of this study, two more patients that underwent hip arthroscopy had a symptomatic deep venous thrombosis.

Thromboembolic events following knee arthroscopy have been well documented. A recent meta-analysis assessing six studies yielded a total DVT incidence of 9.9% in patients without pharmacologic prophylaxis, with a proximal DVT incidence of 2.1%. Reports of vascular complications following hip arthroscopy, however, are scarce. Clarke and colleagues, in their prospective study of 1,054 consecutive hip arthroscopies, had no reports of deep venous thrombosis or pulmonary embolism. Philippon and coworkers recorded no cases of venous thromboembolism after 2 years of follow-up in 112 hip arthroscopies. McCarthy and Lee commented on one case of deep venous thrombosis in the setting of factor V-Leiden deficiency. In their series of 194 patients, Souza and colleagues identified one postoperative case of deep venous thrombosis in a young woman without risk factors. A case of fatal pulmonary embolism associated with hip arthroscopy after a traumatic injury has also been described. Alaia and Davidovitch documented the occurrence of a postoperative DVT in the contralateral lower extremity, which the investigators attributed to possible compression of the pelvic veins from the perineal post as well as intrinsic venous changes secondary to prolonged traction on the lower extremities. Arterial complications have also been described, with a recent report of occlusion of the peroneal, posterior tibial, and anterior tibial arteries at the level of the operative ankle joint, as well as the formation of a pseudoaneurysm and permanent sciatic nerve deficits following iatrogenic severance of the inferior gluteal artery.

Salvo and associates have recently provided initial insight into the rate of postoperative DVT in those undergoing hip arthroscopy and reported a symptomatic rate of 3.7% in 81 patients, with all confirmed cases of DVT occurring in the operative leg. Each patient reported calf pain on the first postoperative follow-up at 8 days. One patient was taking oral contraceptives; the other patients had no risk factors. Two of the three patients were non-weightbearing, and the operative traction time was less than 2 hours for each patient. In this study, however, ultrasonography was only performed in patients with clinical concern for DVT.

Due to the paucity of literature regarding VTE and hip arthroscopy, there has been no direct evidence regarding increased risk following hip arthroscopy in the setting of oral contraceptive (OC) use. However, the increased risk of developing VTE associated with OC use has been well documented and can be extrapolated to hip arthroscopies. The one female patient that experienced a postoperative DVT in the series by Salvo used OCs. Likewise, one of the two patients in our series routinely took OCs, as did the patient described previously with a postoperative contralateral DVT. Of the four women described in these three cohorts, three were using OCs. It is postulated that these drugs cause an increase in prothrombotic factors, a decrease in anti-thrombotic factors, and have equivocal effects on fibrinolysis. These changes in the coagulation pathway may explain why females using OCs have an increased risk of developing VTE.

The recognition of VTE as a postoperative complication is of paramount importance. Although a deep venous thrombosis in itself may not be life-threatening, its predilection for showering clot to the lung (pulmonary embolism) is a well-known cause of mortality. Approximately 90% of pulmonary emboli originate from preformed clots in the lower extremities, and it has been recently shown that patients with combined DVT and PE have higher mortality rates than those patients with PE alone. There are several limitations to this study. First, although all of our patients were available for follow-up, only 58.3% of patients obtained the requested postoperative ultrasound with the main reasons for lack of compliance being insurance coverage or patient refusing the exam. Although unlikely, it is possible that a significant number of clinically asymptomatic patients that did not receive an ultrasound could have had a silent thromboembolic event. Second, the small numbers of this study may not provide the true incidence of VTE following these procedures. Lastly, it is entirely possible that certain thromboembolic events were not adequately assessed by venous duplex ultrasound, although the weighted mean sensitivity and specificity of venous ultrasound in detecting DVT are both above 90%. Others have also shown duplex ultrasound and color Doppler sensitivities for detecting isolated calf vein thrombosis to be greater than 90%. The evaluation of pelvic thromboses may prove problematic, however, and some believe that ultrasound is limited in its ability to identify isolated pelvic thromboses. The presence of isolated DVT confined to the pelvic veins has been reported to be between 2% and 20.7%. Of the seven patients that underwent ultrasound for MRI-proven pelvic DVT, Spritzer and colleagues found none of these patients to have an ultrasound that was positive for acute DVT. Patient factors may also limit these examinations. These include, but are not limited to, inability of the patient to cooperate with positioning for the examination, the presence of extrinsic factors (bandages, wounds, etc.), or intolerance to compression or ultrasound testing by the technician. Unfortunately, the ideal diagnostic procedure for DVT, a CT venogram is not an acceptable screening examination. CT venograms are not appropriate for routine screening, as they expose patients to a considerable amount of radiation and bear the risks implicit with the injection of intravenous iodinated contrast. Addition of CT venography increases the gonadal radiation dose 500-fold in women and 2,000-fold in men compared to the dose from CT pulmonary angiography alone. Magnetic resonance venography, which alleviates the risk of computed tomography, may not be available in
all institutions and might be difficult to arrange in the acute time that is needed to diagnose and begin treatment of VTE.

**Conclusion**

In conclusion, we found the incidence of symptomatic venous thromboembolism in our patient cohort to be low (1.4%), and no patients in our study had a documented asymptomatic deep venous thrombosis. Given the recent increases in reports of these complications after routine hip arthroscopy, we feel it is warranted to counsel patients preoperatively regarding the small incidence of postoperative VTE. In addition, all patients undergoing hip arthroscopies must be assessed for risk factors and stratified for development of VTE. All patients deemed at an elevated risk for developing VTE should be given pharmacologic prophylaxis. Future research is warranted to determine if mechanical prophylaxis intraoperatively (i.e., sequential compression devices) or postoperative pharmacologic prophylaxis can reduce the incidence of this potentially morbid complication.

**Disclosure Statement**

None of the authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony. None of the authors have a financial or proprietary interest not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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