Systematic Review

Deep Venous Thrombosis After Knee Arthroscopy: A Systematic Review and Meta-Analysis

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Purpose: To establish a contemporary literature-based estimate of the incidence of deep venous thrombosis (DVT) after knee arthroscopic surgery. **Methods:** We performed a systematic review and meta-analysis of the English language literature to assess the efficacy of prophylaxis to prevent DVT after knee arthroscopic surgery. Only randomized controlled trials (RCTs) or prospective studies were considered. Studies were excluded if they were not original prospective studies concerning DVT detected by imaging after knee arthroscopic surgery. We calculated pooled proportions of postoperative DVT and proximal DVT. **Results:** Nine prospective uncontrolled studies and 4 RCTs were retrieved. Within them, the populations given low-molecular-weight heparin (LMWH) to prevent DVT had a 0.1% to 11.9% incidence of DVT, with an overall 36 DVTs identified (4 proximal), averaging 1.8%. One hundred thirty-six DVTs (29 proximal) were indicated in the populations without prophylaxis, and the DVT incidence varied from 1.8% to 41.2%, averaging 6.8%. Of the RCTs, the pooled risk ratio for DVT to develop was 0.180 (range, 0.065 to 0.499) for those who had LMWH as prophylaxis. An absolute risk reduction of 1.2%—from 1.5% to 0.3%—for the development of proximal DVT was observed. **Conclusions:** Compared with patients who did not receive prophylaxis, the pooled risk ratio for the development of DVT was 0.18 for those who had LMWH prophylaxis. The incidence of proximal DVT is very low after arthroscopic surgery regardless of receiving prophylaxis (4 of 2,184) or not (29 of 1,814). The rate of proximal DVT in total DVT occurrence can be markedly reduced from 21.3% (29 of 136) to 11.1% (4 of 36). **Level of Evidence:** Level IV. This study is a meta-analysis of RCTs and a systematic review of Level IV studies.

Deep venous thrombosis (DVT) is viewed as a relatively rare complication in knee arthroscopy. Clinically, it is difficult to diagnose and has the potential to develop into pulmonary embolism (PE). Clinical signs differ in patients with symptomatic DVT and patients with silent DVT. Common clinical signs of DVT could be a positive Homan test, unilateral leg swelling, local rise of skin temperature, or redness. Venography is the reference standard for the diagnosis of DVT, although it is invasive and expensive. Ultrasonography is a handy noninvasive method to detect DVT compared with venography. However, in several studies, sensitivity and specificity of ultrasonography in DVT diagnosis was 30% to 85% and 93% to 100%, respectively.[1-3] Moreover, the improvement with using this screening test renders its accuracy less consistent over time. Post-thrombotic syndrome (PTS) is common and often associated with substantial morbidity.[4-7] However, whether prophylaxis should be used in patients undergoing arthroscopic surgery is still controversial.[8,9] Reported DVT incidence after knee arthroscopy without anticoagulant drugs ranged from 1.5% to 41.2% in the literature.[8,9] Such varied evidence rendered clinicians hesitant in choosing prophylaxis for patients undergoing arthroscopic procedures. In a randomized controlled trial (RCT), Marlovits et al.[9] found that the DVT incidence after knee arthroscopic surgery could be effectively reduced to 2.8% with low-molecular-weight heparin (LMWH), compared with an incidence of 41.2% in the control group.

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With such varied evidence regarding the incidence of DVT, there is a need to fully understand the risk of DVT when appropriate prophylactic therapy is given perioperatively. In this study, any prophylaxis appearing in the literature to prevent DVT after knee arthroscopic surgery is assessed and presented. We establish a contemporary literature-based estimate of the incidence of DVT after knee arthroscopic surgery. We hypothesize that LMWH is efficient in reducing the incidence of DVT after knee arthroscopy.

Methods

We performed a meta-analysis of RCTs and a systematic review of prospective level IV studies identified in the English language literature to assess the efficacy of any prophylaxis to prevent DVT after knee arthroscopic surgery. A search of publications listed in MEDLINE, EMBASE, and the Cochrane Library from January 1, 1985 to January 30, 2013 was conducted. The following search strategy was used: (Thrombosis OR Thromboembolism OR thromboemboli OR emboli) AND (arthroscopy OR arthroscopic OR arthroscopically). Reference lists of all identified studies were also checked, and full articles were retrieved for all potentially relevant articles. Only RCTs or prospective studies were considered. Studies were excluded if they were not original prospective studies concerning DVT detected by imaging after knee arthroscopic surgery.

We calculated pooled proportions of postoperative DVT and proximal DVT. Identified DVT was classified as proximal if it involved the iliac, superficial femoral, or popliteal veins, with or without calf vein thrombosis, and as distal if it was isolated to the calf veins (e.g., posterior tibial, anterior tibial, or peroneal veins). Meta-analysis was performed using data collected from retrieved RCTs, whereas uncontrolled studies were presented narratively. Quality of RCTs were determined using the Jadad score plus allocation concealment. We used the Mantel-Haenszel method and a random-effects model according to the method of DerSimonian and Laird.[10,11] We evaluated heterogeneity using I^2 statistics,[12] interpreting a value of I^2 less than 50% as substantial heterogeneity. When I^2 statistics indicated substantial heterogeneity using a fixed-effects model, we considered intracluster homogeneity as not assessed. We thus used a random-effects model.

Results

The search strategy retrieved 157 articles. In all, 144 articles were excluded. In total, 9 prospective uncontrolled studies[13-21] and 4 RCTs[8,9,22,23] were retrieved (Fig 1).

Table 1 shows the characteristics of the trials and corresponding prophylaxis. No study using methods other than LMWH as prophylaxis was retrieved. The 13 trials comprised 3,998 patients and compared LMWH prophylaxis studies with controls (4 studies) in knee arthroscopic surgery. LMWH was used in 6 study populations (n = 2,184) as prophylaxis, whereas 9 studies included populations (n = 1,814) that did not receive prophylaxis. The study population ranged from 48 to 1,761 patients, with a predominance of women in 12 studies. Examination for DVTs after surgery was performed after 3 to 90 postoperative days with venography (4 studies) or ultrasonography (8 studies), or both (one study).

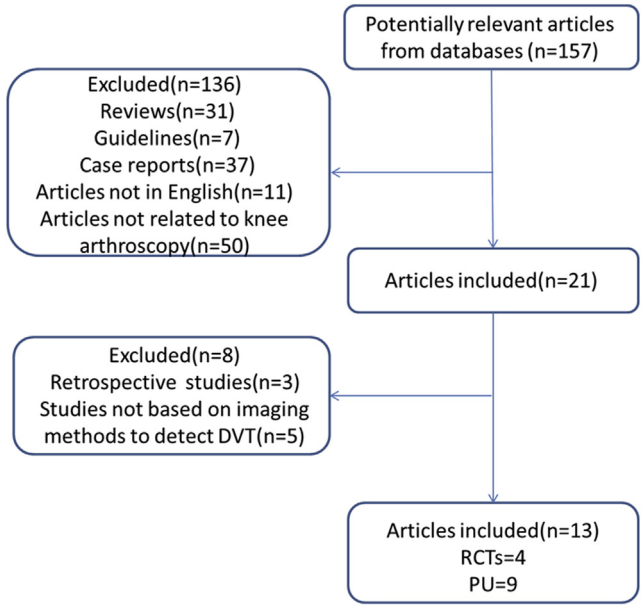

Fig 1. Flow diagram of study selection (PU, prospective uncontrolled trial; RCT, randomized controlled trial).

With all 13 studies combined, the populations receiving LMWH to prevent DVT had a 0.1% to 11.9% DVT incidence, with an overall 36 DVTs identified (4 proximal [11.1%]), averaging 1.8%. One hundred thirty-six DVTs (29 proximal [21.3%]) were indicated in the populations without prophylaxis, and the DVT incidence varied from 1.8% to 41.2%, averaging 6.8% (Table 2).

Characteristics of included RCTs are given in Table 3. Compared with patients not receiving prophylaxis, the pooled risk ratio for the development of DVT was 0.180 (95% confidence interval [CI], 0.065 to 0.499) for those who had LMWH as prophylaxis (Table 4). Of 4 RCTs, proximal DVT was observed in only 2 studies, making a meta-analysis not applicable. However, an absolute risk reduction of 1.2%—from 1.5% to 0.3%—in the development of proximal DVT was observed, whereas the absolute risk reduction for total DVT occurrence was 9.6% (Table 5).

Discussion

The retrieved DVT incidence from RCTs in our study indicate that compared with patients who did not