Incidence of Venographically Proved Deep Vein Thrombosis After Knee Arthroscopy

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Background: Deep vein thrombosis is a common, important complication of major orthopedic surgery, particularly knee arthroplasty. Knee arthroscopy is performed more frequently and in younger patients than knee arthroplasty. However, the true risk of deep vein thrombosis in patients who undergo this procedure is unknown.

Objective: To determine the incidence of deep vein thrombosis after knee arthroscopy in a large cohort of patients.

Methods: Consecutive patients scheduled for knee arthroscopy were eligible for the study. Enrolled study patients received no thromboprophylaxis. They were discharged home the day of surgery and underwent unilateral contrast venography approximately 1 week after their operation. The primary outcome measure was the incidence of venous thromboembolism. Risk factors for deep vein thrombosis were evaluated.

Results: Among the 184 patients who had adequate venography, deep vein thrombosis was detected in 33 (17.9%; 95% confidence interval, 12.7%-24.3%). Of these, 9 were proximal (4.9%; 95% confidence interval, 2.3%-9.1%). No patient died and no patient presented with clinically suspected pulmonary embolism. Of 33 patients, only 20 (60.6%) with deep vein thrombosis had symptoms while 13 (39.4%) were asymptomatic. The risk of deep vein thrombosis was significantly higher among patients who had a tourniquet applied for more than 60 minutes.

Conclusions: The results of our study demonstrate that 17.9% of patients develop deep vein thrombosis after knee arthroscopy (most being either proximal or extensive). It is reasonable to perform a randomized trial to determine whether the incidence of deep vein thrombosis can be safely reduced in patients undergoing knee arthroscopy.

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PATIENTS AND METHODS

PATIENTS

The study was approved by the institutional review board of both hospitals. Consecutive patients scheduled for knee arthroscopy between October 1994 and December 1995 at Hôpital du St-Sacrement and Jeffery Hale Hospital in Quebec City, Quebec, were potentially eligible for the study. Arthroscopies were performed at the 2 hospitals by the same 5 orthopedic surgeons. Patients were excluded if they were pregnant, younger than 18 years, had a history of more than 1 episode of deep vein thrombosis or pulmonary embolism, or if there was a contraindication to contrast venography (eg, allergy to contrast medium).

INTERVENTION

Patients were screened for eligibility in a preoperative orthopedic clinic by their orthopedic surgeon and the study nurse. Informed consent was then sought from eligible patients after the study had been explained. Between 1 and 12 weeks later, they underwent outpatient arthroscopic surgery of the knee. Consistent with usual practice in our institution, none of the study participants received thromboprophylaxis. The following information was recorded by the orthopedic surgeon during arthroscopy: type of procedure performed, type of anesthesia used, duration of surgery, and duration of application of a tourniquet on the operative leg. They were instructed to contact the study nurse or physician immediately if symptoms compatible with deep vein thrombosis or pulmonary embolism occurred before the scheduled visit. After the surgery, they were instructed not to bear weight on the operated leg for 24 to 48 hours but after that to bear weight as tolerated.

At the 1-week follow-up visit (postoperative days 6-10), patients were evaluated by their orthopedic surgeons and asked specifically about symptoms of deep vein thrombosis or pulmonary embolism occurred before the scheduled visit. After the surgery, they were instructed not to bear weight on the operated leg for 24 to 48 hours but after that to bear weight as tolerated.

In an informal review of data from our institution, 14 (3%) of 450 patients returned with symptomatic deep vein thrombosis. From these data, we postulated that deep vein thrombosis after knee arthroscopy might be a more significant problem than previously thought. Because the procedure is performed frequently and the population is young, the burden of illness, in terms of pulmonary embolism and postphlebitic syndrome, could be extremely important. Therefore, to determine the incidence of deep vein thrombosis after knee arthroscopy, we performed contrast venography in 184 patients 1 week after the procedure. The results of this study show that deep vein thrombosis is relatively common in this patient population.

OUTCOME MEASURES

The outcome measures were deep vein thrombosis, pulmonary embolism, and death. Venography was considered adequate if the entire deep venous system (except for the anterior tibial veins) was visualized to at least the level of the common femoral vein. Deep vein thrombosis was diagnosed when an intraluminal filling defect was seen on at least 2 views. Thrombosis 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 (posterior tibial, anterior tibial, or peroneal). Thrombus sizes were measured in all instances. Pulmonary embolism was diagnosed if the lung scan showed a high probability. All venograms and lung scans were reviewed by a panel of 3 experts blinded to the clinical status of the patients and to the previous interpretation of the radiologist. To evaluate if there was a tendency to overdiagnose deep vein thrombosis by the panel, the percentage of agreement between the official report of the venogram and the panel interpretation was determined.

STATISTICAL ANALYSIS

The proportion of patients with deep vein thrombosis (overall and proximal) and the corresponding exact 95% confidence intervals (CIs) were calculated. To determine whether clinical factors, such as age, sex, personal or family history of deep vein thrombosis, type of anesthesia used, type of procedure performed, duration of application of a tourniquet, duration of surgery, and duration of immobilization, influence the risk of deep vein thrombosis, the mean frequencies of the variables were compared in the subgroups of patients with and without deep vein thrombosis. Data were compared between the 2 groups using the Student t test, χ2 test, or Fisher exact test.

RESULTS

PATIENTS

During the 15 months of the study, 342 patients were scheduled for knee arthroscopy in the 2 participating hos-
hitals. Sixty patients were excluded for the following reasons: allergy to contrast medium (11 patients), follow-up in another hospital (10 patients), pregnancy (1 patient), age younger than 18 years (1 patient), and refusal to participate (37 patients).

Therefore, 282 patients were eligible and consenting and of these, 214 had unilateral venography attempted and 68 did not have a venogram; 35 patients refused the venogram after their arthroscopy although they had previously agreed to the test, 28 venograms could not be performed for administrative reasons, and 5 patients forgot their follow-up visit.

Among the 214 unilateral venograms attempted, 184 (86.0%) were evaluated as adequate; in 13 patients a vein could not be cannulated and 17 were considered inadequate. Therefore, the patient study population included 184 patients (137 men and 47 women) with a mean (±SD) age of 43.2±12.2 years. The baseline characteristics of the patient population were similar to those of the 98 patients with no available venogram, except for a longer duration of tourniquet application and fewer symptoms in the latter group.

OUTCOME MEASURES

Among the 184 patients who had adequate venography, deep vein thrombosis was detected in 33 (17.9%; 95% CI, 12.7%-24.3%). Of these, 9 were proximal (4.9%; 95% CI, 2.3%-9.1%). Of the 24 patients with calf vein thrombi, 7 patients had thrombi that were greater than 20 cm in length, 7 had thrombi between 10 and 20 cm, 2 had thrombi between 5 and 9 cm, and 8 had thrombi of less than 5 cm in length. No patient died and no patient presented with clinically suspected pulmonary embolism. One patient was diagnosed as having an asymptomatic pulmonary embolism because a lung scan, which was performed as a requirement for another study, showed a high probability. In addition to the above-mentioned 33 patients, 1 patient presented to another hospital with pain in the calf 5 days before the scheduled venogram and deep vein thrombosis in the calf was diagnosed by venous ultrasonography. Two other patients refused to undergo venography during the follow-up and returned with symptomatic deep vein thrombosis 6 and 7 days following the operation (1 proximal and 1 distal).

Twenty patients (60.6%) of 33 with deep vein thrombosis had symptoms suggestive of deep vein thrombosis at the time of their visit or earlier, showing the lack of sensitivity of clinical diagnosis. In addition, 25 patients (16.6%) without deep vein thrombosis had symptoms suggestive of venous thrombosis, indicating the poor specificity of clinical diagnosis. The positive and negative predictive value of symptoms was 44.4% and 90.6%, respectively. Among the 13 asymptomatic patients with deep vein thrombosis, clot sizes were distributed as follows: proximal (2 patients), more than 20 cm (1 patient), between 10 and 20 cm (3 patients), between 5 and 9 cm (1 patient), and less than 5 cm (6 patients). There was a high percentage of agreement between the official report of the venograms and the panel evaluation: 181 (98.4%) of 184 for all venograms and 31 (93.9%) of 33 for venograms with abnormal findings only.

RISK FACTORS

Several factors were analyzed as potential risk factors for venous thrombosis (Table). Age, sex, personal or family history of venous thromboembolism, medication use, type of anesthesia used, type of procedure performed, duration of surgery, and duration of immobilization were not significant risk factors for venous thrombosis. The risk of deep vein thrombosis was significantly higher among patients who had a tourniquet applied for a longer time: 15.4% and 46.7% for tourniquet duration of less than or more than 60 minutes, respectively (P<.01).

COMMENT

To our knowledge, this study is the first to provide a reliable estimate of the incidence of deep vein thrombosis after knee arthroscopy. The results of our study demonstrate that 18% of patients develop deep vein thrombosis after knee arthroscopy with most either involving the proximal veins or being extensive calf vein thrombi. Not surprisingly, clinical assessment for deep vein thrombosis was inaccurate.
It is important to address the validity of our results since they contrast with other published studies. In all but 1 published study, diagnosis of deep vein thrombosis was made on clinical grounds, which is unreliable. The only study in which venography was systematically performed reported a deep vein thrombosis rate of 4.2%, but a small number of patients were evaluated (n=48) and the 95% CI on the observed rate is wide and overlaps with ours. In addition, the true incidence of deep vein thrombosis after knee arthroscopy may be increasing since currently most arthroscopies involve therapeutic interventions, which probably increase the incidence of deep vein thrombosis. Consistent with this hypothesis, 98% of the knee arthroscopies performed in this study were for therapeutic purposes.

We chose a cohort design because before embarking on a randomized trial it was critical to have a reliable estimate of the true incidence of deep vein thrombosis in this population. Such a design could provide a biased estimate if there were a patient selection or a systematic overdiagnosis of deep vein thrombosis by the committee interpreting venographies. There was a high percentage of agreement between the official report of the venograms and the panel evaluation.

It is unlikely that the study is biased, even though 98 patients did not have an available venogram. Among the 98 patients, only one third refused the venogram and 6 of them (17.1%) were symptomatic at the time of the follow-up visit or developed a deep vein thrombosis later. Assuming that none of the patients who did not have an adequate venogram or Doppler ultrasonography had a deep vein thrombosis, the deep vein thrombosis rate would still be relatively high (12.8% [36/282]).

We decided to perform venographies to determine the outcome measure because noninvasive diagnostic tests, such as impedance plethysmography and compression ultrasonography, are insensitive to deep vein thrombosis in orthopedic patients. Unilateral venography was performed to increase acceptability of the study and because we reasoned that the risk of isolated contralateral deep vein thrombosis was likely to be low. The only variable that was associated with an increased risk of deep vein thrombosis was a tourniquet duration of more than 60 minutes. This suggests that complex knee arthroscopies might carry an increased risk of deep vein thrombosis.

To summarize, a significant proportion of patients develop deep vein thrombosis after knee arthroscopy. We believe that it is reasonable to perform randomized trials of prophylaxis to determine whether the incidence of venous thrombosis can be safely reduced. In our view, the next step is to evaluate if a short-term prophylaxis could decrease the deep vein thrombosis rate in this population without increasing the bleeding risk.

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REFERENCES