Thromboembolic complications after arthroscopic knee surgery

Incidence and risk factors in 101 patients

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Deep venous thrombosis (DVT) and pulmonary embolism (PE) are less common after knee arthroscopy than after elective hip and knee arthroplasties. There is no consensus on the optimal prophylaxis. In this prospective cohort study, we used ultrasound, phlebography and lung scan pre- and postoperatively to assess the incidence of thromboembolic complications in 101 consecutive patients who underwent knee arthroscopy. Preoperatively, patients were screened for typical risk factors for DVT such as age, obesity, varicose veins, contraceptive pills and nicotine abuse. All patients received a once-daily injection of 5000 IU of low molecular weight heparin, at least 12 hours prior to surgery.

5 weeks after surgery, the same screening tests were repeated. In 12 of the 101 patients either DVT or PE was diagnosed. DVT occurred in 8 cases, 4 of which were silent and 4 symptomatic. The number of PEs was 9, 8 silent and 1 symptomatic. We found no correlation between DVT or PE and individual clinical risk factors, but there was a tendency towards the development of DVT and PE, with a higher number of risk factors. We found no correlation between DVT and intraoperative risk factors such as use of a tourniquet, type of anesthesia or duration of surgery. The relatively high rate of thromboembolic events after knee arthroscopy in our study suggests the need of all patients for routine use of thromboprophylaxis, probably in a higher dose than given.

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Complications in diagnostic and therapeutic knee arthroscopy are relatively uncommon. Instrument breakage, cartilage damage, nerve lesions, hemarthrosis, compartment syndrome, deep venous thrombosis (DVT) and pulmonary embolism (PE) have been reported by DeLee (1985) and Collins (1989).

We performed a prospective study on patients who underwent arthroscopic knee surgery and who received perioperative thromboprophylaxis to assess the incidence of and risk factors for thromboembolic complications.

Patients and methods

The study included 101 consecutive patients (mean age 49 (19–82) years, 52 men), who underwent knee arthroscopy for acute or chronic problems such as meniscal tears, chondromalacia, arthrosis, medial shelf syndrome or fat pad hypertrophy. The patients had no major health problems and were independent ambulators. Exclusion criteria were any of the following: history of previous DVT or PE, patients with malignancy, pregnancy, abnormal lung scan and patients with an allergy to contrast media. Furthermore, the arthroscopic procedure should not include any major reconstruction like ligament repair, bone drilling procedures or cartilage transfer.

Preoperatively, all patients were screened with chest radiograms, a ventilation perfusion scan and a duplex ultrasound examination of both legs to exclude DVT. Possible risk factors for DVT and PE were recorded in each patient (Table 1). This study was approved by our Ethics committee and each patient signed informed consent at the time of enrolment.

All patients received perioperative low molecular weight heparin (5000 IU Dalteparin Natrium, Pharmacia & Upjohn, Uppsala, Sweden) once daily at least 12 hours prior to surgery and until discharge. The arthroscopy was performed with either regional or general anesthesia, chosen by the patient and the anesthesiologist. A tourniquet was placed above the knee and was employed only when visualization became a problem. When used, the tourniquet was inflated to 300 mmHg. Standard anterolateral and anter-

Table 1. Incidence of relative risk for thromboembolic events depending on clinical characteristics after knee arthroscopy

Characteristics	Variable	No. examined	No.with thrombosis [b]	Relative risk (95% CI)
Gender	male	52	4 (1/1/2)	0.67 (0.31–1.29)
	female	49	8 (2/3/3)	1.00
Body mass index [a],	< 30	82	9 (3/4/2)	0.81 (0.15–2.32)
kg/m^2	> 30	19	3 (0/0/3)	1.00
Varicose veins	yes	45	9 (2/4/3)	1.00
	no	56	3 (1/0/2)	0.14 (0.07–1.05) [c]
Anesthesia	regional	48	5 (1/3/1)	0.89 (0.23–2.10)
	general	53	7 (2/1/4)	1.00
Tourniquet	yes	30	2 (1/1/0)	0.52 (0.10–2.15)
	no	71	10 (2/3/5)	1.00
Operation time	short (< 20 min)	53	8 (2/3/3)	1.00
	long (> 20 min)	48	4 (1/1/2)	0.51 (0.13–1.98)

[a] Bray 1987
[b] Number of DVTs, PEs, and DVTs and PEs in parentheses
[c] $p < 0.05$

omedial portals were used. The patients were supine, with the foot never allowed to hang free. To visualize the lateral compartment, the standard "figure of four position" was used. Postoperative compression stockings (Sigvaris Company, St. Gallen, Switzerland) were placed on both legs in the operating room. Patients were instructed to wear the stockings for 14 days. Mobilization was begun on the evening of surgery after general anesthesia and the next morning after regional anesthesia. On average, patients were discharged on the second postoperative day.

Clinical follow-up was done at 14 days postoperatively for suture removal. If there were any clinical signs or symptoms of either DVT or PE, sonography was performed and phlebography, if any doubt remained. In case of suspected pulmonary embolism, a ventilation perfusion scan was done. At 5 weeks follow-up all patients underwent duplex ultrasound and ventilation perfusion scan. Phlebography was done if the results of sonography were questionable. The tests were interpreted by two independent radiologists blinded to the history of the patients.

Statistical computations included quantitative (Student's paired t-test and 2-way ANOVA analysis) and qualitative comparisons (chi-square test for trend). We considered differences between groups to be statistically significant if the p-value was less than 0.05.

Results

12 of 101 patients had a thromboembolic event, either DVT or PE or both. 8 patients developed DVT, 4 silent and 4 symptomatic. 9 patients developed PE, 8 silent and 1 symptomatic. 5 of the patients with DVT also developed PE. The only statistically significant patient risk factor was the presence of varicosity (Table 1). We found no statistical differences with different combinations of risk factors although there was a tendency towards more body constitutions with a higher number of risk factors (Table 2).

Table 2. Estimation of overall risk of thromboembolic events by the number of risk factors (obesity, age > 50, varicose veins, smoking, oral contraceptives)

Risk factors	No. examined [a]	Relative risk (95% CI)	P-value
0	40 (20%)	0.21 (0.09–1.07)	0.2
1	31 (45%)	0.39 (0.07–1.12)	0.08
2	25 (84%)	0.65 (0.32–1.34)	0.06
3 or more	5 (100%)	1.00	

[a] Percentage of men in parentheses
CI confidence interval

Discussion

As in our study, Williams et al. (1995) studied arthroscopic patients with Duplex Ultrasound and found that risk factors did not correlate with the onset of DVT or PE. However, the lack of statistical significance could be because of the few patients and the low incidence of DVT in both studies.

In elective hip and knee arthroplasties, regional anesthesia has been shown to reduce the incidence of DVT compared with general anesthesia (Modig 1985, Nielsen et al. 1990). The role of anesthesia in arthroscopic knee surgery in reducing DVT is unclear because to our knowledge no studies have yet addressed this problem. In our study, we found no association between the rate of thrombosis and type of anesthesia.

The rates of DVT, asymptomatic and symptomatic, were 8% and for PE 9% in our study. This is much higher than has been reported, although our patients received LMWH prophylaxis; the rate of DVT in other studies varies from 0% to 7% and the incidence of pulmonary embolism from 0% to 3% (DeLee 1985, Small 1986, Stringer et al. 1989, Kakkar et al. 1970, Poulsen et al. 1993, Williams et al. 1995). DVT and PE are probably underestimated, as they are often asymptomatic and therefore not clinically detected. Probably, the main reason for our high rates is the follow-up with duplex sonography and ventilation lung scan after 5 weeks. Without these tests 8 of the 9 pulmonary embolisms would have remained undiagnosed.

Little is known as to which types of thrombi are relatively safe and free from complications and which types are prone to pulmonary emboli. However, Kakkar et al. (1970) stated if the thrombus extends proximally, active treatment should be instituted, because there is a significant risk of PE. All patients who had proven DVT or PE, whether asymptomatic or not, were treated with LMWH in a dose of 100 IU/kg per day of Fragmin® or 2 mg/kg per day of Lovenox®.

We found a much higher rate of thrombosis than earlier reported, despite prophylaxis with LMWH. For this reason, we strongly recommend routine prophylaxis in arthroscopic knee surgery, probably in a higher dose than that we used.

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