

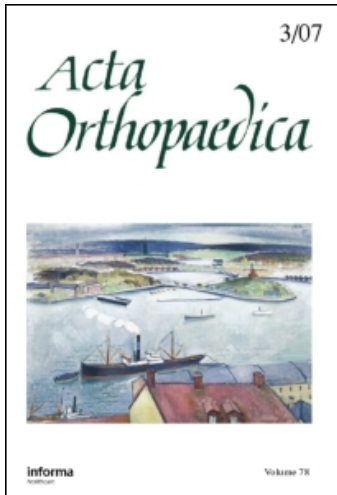
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Late occurring clinical deep vein thrombosis in joint-operated patients

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ABSTRACT — In a prospective study of 4,840 patients, we determined the annual incidence of clinical deep vein thrombosis (DVT) in mobilized, discharged orthopedic-operated “high-risk” patients (hip replacement surgery, knee replacement surgery, nailed hip fracture) and assumed “low-risk” patients (diagnostic knee arthroscopy). In addition, the time from the operation to the time when the patients were readmitted with clinically suspected DVT and the distribution of radiologically-confirmed DVT were recorded. Thromboprophylaxis was routinely given for about 10 days to the high-risk groups during the hospital stay but not to patients undergoing knee arthroscopy.

During 9 years, the annual incidence of DVT following major procedures was 2.1% (95% CI 1.6–2.6) vs. 0.6% (95% CI 0.2–1.1) after diagnostic knee arthroscopy. Symptoms appeared, on average, 27 (3–150) days after total hip replacement surgery, 36 (3–150) days after nailed hip fracture, 17 (6–30) days after total knee replacement and 1 (1–6) day after knee arthroscopy. In hip-operated patients, 50% of the DVT's were found in the proximal veins vs. 40% following knee arthroplasty.

oped in about 20–25% of the patients one month after discharge (Dahl et al. 1995, 1997, Planes et al. 1996). However, several authors have questioned the clinical importance of surrogate end-points and studies dealing with symptomatic thromboembolism are warranted (Alatri et al. 1998, Bulstrode 1998, Clagett et al. 1998). Therefore we studied the annual incidence of postdischarge symptomatic DVT after orthopedic surgery.

Patients and methods

From 1989 to 1998, hip- and knee-operated patients readmitted to Buskerud Central Hospital with suspected DVT were prospectively registered. During this time, 3,485 patients underwent hip replacement surgery, nailing of hip fractures (including cervical and trochanteric fractures) and knee replacement surgery. Diagnostic arthroscopy (mostly performed with a tourniquet), regarded as a minor orthopedic procedure, was performed in an additional 1,355 patients who served as controls. Regional analgesia was routinely given.

Thromboprophylaxis

The patients requiring a major joint reconstruction were given dalteparin (Pharmacia-Upjohn, Sweden/USA) 5000 IU/d or enoxaparin (Rhône-Poulenc Rorer, France) 40 mg/d, starting 12 hours before the operation in elective cases and after admission in emergency cases during the hospital stay, i.e., about 10 days. No thromboprophylaxis was given routinely to patients undergoing diagnostic arthroscopy of the knee.

Despite low molecular weight heparin (LMWH) prophylaxis during hospitalization, i.e., 1–2 weeks, clinical trials have shown that 15–20% of major joint-operated patients may leave the hospital with asymptomatic, venographically-diagnosed DVT (Andreassen and Dahl 1997, Dahl et al. 1997, Planes et al. 1999). In addition, recent studies on postdischarge thromboembolism have shown that the coagulation system was reactivated after prophylaxis was stopped. This occurred when venographically-proven new DVTs devel-

Table 1. The annual number of major joint-operated patients (hip replacement surgery, nailed hip fracture and knee arthroplasty), the number of patients with deep vein thrombosis (DVT) and the annual incidence of patients with symptomatic deep vein thrombosis given as mean percentage and 95% confidence intervals

	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
No. patients	261	230	279	396	475	429	456	450	509	3,485
No. DVT	5	7	5	13	6	10	11	9	8	74
DVT incidence	1.9	3.0	1.8	3.0	1.3	2.3	2.4	2.0	1.6	2.1
95%CI	0.6-4.4	1.7-6.1	0.5-4.1	1.7-5.5	0.4-2.7	1.1-4.2	1.2-4.2	0.9-3.7	0.6-3.0	1.6-2.6

Radiology

Patients who were readmitted to the hospital with clinically suspected DVT were routinely screened with compression B-mode ultrasonography (Ultrasonograph Hitachi EUB-450, Kashiwa, Japan, and Picker L, 7000 A, Kashiwa, Japan) (Gudmundsen et al. 1990). The deep, superficial and common femoral vein were examined. If no DVT was found, venography was performed using the technique described by Rabinov and Paulin (1972). About 50 mL of radiological contrast medium was injected into a foot vein. The tibial, fibular, popliteal, femoral and iliac veins were examined separately. An intravascular defect consistent with DVT should be visible in at least two of three projections.

Statistics

No hypotheses were proposed and tested. Descriptive statistics was used. The annual incidence of DVT is given as mean, 95% confidence interval (95% CI) and percent of the total number of operated patients in each surgical group. The appearance of DVT is given as mean (range) days after surgery.

Results

66 of the 3,485 patients operated on with hip and knee prostheses and hip fractures were readmitted with symptoms of DVT, confirmed by imaging techniques. The overall annual incidence of symptomatic DVT varied slightly between nearly 2% and 3% and within the confidence limits (Table 1). Diagnostic arthroscopy was performed in an additional 1,355 patients and DVT was diagnosed in 8 patients during the study.

Table 2. Age and sex ratio of patients with deep vein thrombosis, who had undergone total hip replacement surgery (THR), nailed hip fracture (NHF), total knee replacement surgery (TKR) and diagnostic arthroscopy (DA)

	Age mean (range)	Ratio women/ men
THR	70 (53-87)	3/4
NHF	77 (51-91)	3/4
TKR	72 (53-84)	2/3
DA	52 (32-65)	1/3

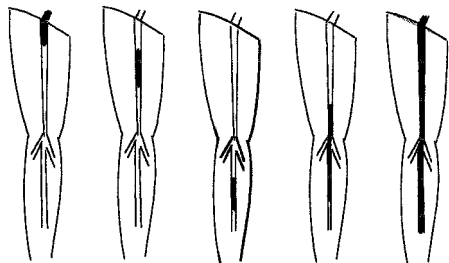
Major reconstructed patients were mostly women above 70 years while knee arthroscopy patients were mainly middle-aged men (Table 2).

Symptoms of DVT developed, on average, 27 (3-150) days, 36 (3-150) days and 16 (6-30) days after hip replacement surgery, nailing for hip fracture and knee replacement surgery, respectively. Clinical DVT was found 1 (1-6) day after diagnostic arthroscopy.

Half of the venographically diagnosed DVTs were located in the proximal veins in hip fracture- and hip arthroplasty-operated patients vs. 40% in the knee arthroplasty group. Following diagnostic arthroscopy, nearly all DVTs were confined to the calf veins (Figure).

Discussion

Autopsy studies have repeatedly shown that the diagnosis of fatal pulmonary embolism is missed by clinicians, and that it continues to be an important cause of death (Havig 1977, Sandler and Martin 1989, Campling et al. 1993, Hunter and Frostick 1995, Karwinski 1995). We found an overall incidence of 2% clinical DVT in major



THR	6	3	50	19	22
NHF		3	50	20	27
TKR			63	25	13
DA			89	11	

Percent distribution of symptomatic DVTs visualized on ultrasonography and/or venography in the postdischarge period. THR total hip replacement, NHF nailed hip fracture, TKR total knee replacement and DA diagnostic arthroscopy.

joint-operated patients. This is in accordance with other data (Seagroatt et al. 1991, Clarke et al. 1997, Warwick and Whitehouse 1997). Venographic screening studies have shown a much higher frequency of asymptomatic DVT after orthopedic surgery (Bergqvist et al. 1996, Planes et al. 1996, Dahl et al. 1997). This discrepancy indicates that posttraumatic DVT is an incidental clinical finding. In addition, patients with clinical DVT are treated with thrombolytic therapy. Thus, the patients with subclinical DVT may be at risk of serious pulmonary embolism and not the patients with clinical DVT.

Several studies have indicated that the thrombotic process may continue after cessation of thromboprophylaxis although the patients are mobilized and discharged from the hospital (Bergqvist et al. 1996, Planes et al. 1996, Dahl et al. 1997, Lassen et al. 1998, Hull and Pineo 1999). Mobility increases venous blood flow (McNally et al. 1997a), but it remains low for several days after knee replacement and for many weeks after hip replacement surgery (McNally and Mollan 1993, McNally et al. 1997b). This contributes to the long-lasting procoagulant state found in some of these patients (Dahl et al. 1995), reflected by an increased incidence of postdischarge subclinical DVT in about 25% after hip replacement surgery (Planes et al. 1996, Dahl et al. 1997, Hull and Pineo 1999). Similar findings have been reported in patients at risk of thromboembolic diseases in studies with several anticoagulants (Gallino et al.

1986, Gold et al. 1993, Granger et al. 1995), indicating reactivation of the coagulation system if the antithrombotic treatment is stopped during an ongoing thrombin-generating healing process.

Little information exists on the natural occurrence of clinical DVT in patients who have undergone diagnostic arthroscopy; we found an incidence of 0.6%. In contrast to major joint surgery, DVT developed shortly after the operation and was mainly confined to the calf veins. This may indicate that symptoms of DVT are easier to suspect after this mini-invasive intervention where hardly any calf swelling is expected vs. after major joint surgery where postoperative swelling and pain effectively mask the symptoms of DVT.

The low frequency of clinical DVT should be compared with the much higher frequency of subclinical DVT, reported in studies with mandatory venography. This underlines the subclinical nature of this process. The clinical diagnosis of posttraumatic DVT remains an incidental finding. Pulmonary embolism continues to be a postmortem diagnosis, indicating that the main cause of fatal pulmonary embolism is subclinical DVT. The few diagnosed patients with DVT are treated with anticoagulants which almost eliminates the risk of fatalities.

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