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# Thromboembolic prophylaxis in hip fracture

The effect of either heparin-dihydergot or heparin-acenocoumarin on the incidence of deep-vein thrombosis in the legs was studied in 181 women undergoing Ender nailing for intertrochanteric fracture of the femur. All the patients were screened with the 125-I-fibrinogen uptake test, confirmed by a bilateral ascending venogram. Deep-vein thrombosis developed in 40 per cent of the heparin-dihydergot group and in 61 per cent of the heparin-acenocoumarin group ($p < 0.015$).

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According to Bergqvist et al. (1979), the incidence of thrombosis in hip fracture is around 90 per cent, whereas fatal pulmonary embolism has an incidence of 6 per cent, as shown by Bergqvist (1983) in collective statistics.

Prophylaxis with low-dose heparin alone has been found insufficient for protection against thrombosis (Evarts & Alkfidi 1973, Williams et al. 1978). Therefore, we have added acenocoumarin and compared the effect on thrombosis of this medication with heparin-dihydroergotamin.

## Patients and methods

Only women more than 60 years of age and operated on for intertrochanteric fracture with Ender nails were included in the study. Moreover, only patients in whom surgical stabilization with Ender nails was planned and carried out within 24 hours of admission were included. The patients were predominantly anesthetized by spinal anesthesia; general anesthesia (halothane) was used in only 8 per cent of the patients. The average hospitalization time was 18 days. Patients with unstable angina pectoris, liver disease, hemorrhagic diathesis, renal insufficiency, gastrointestinal ulcers, Raynaud's disease, visible peripheral arterial diseases, and hypertension (diastolic values > 120 mmHg) were excluded. Further, patients undergoing aggregation-inhibitor treatment were excluded.

Totally, 181 patients were allocated randomly to receive either heparin-dihydergot (5,000 IU heparin-sodium, 0.5 mg dihydroergotamin-methansulfonate) three time daily for 14 days (the HDHE group), or heparin-sodium 5,000 IU three time daily until the third postoperative day, starting with acenocoumarin on the day of surgery (the H/Ac group). This was controlled by the thrombotest until the day of discharge. Acenocoumarin doses were adjusted on the basis of a prothrombin time measurement using a range between 10 and 25 per cent (2.8–1.6 INR) in accordance with recent recommendations by Loeliger et al. (1985).

## Diagnosis of deep-vein thrombosis (DVT)

All patients were screened with the 125-I-fibrinogen uptake test (FUT) according to Kakkar et al. (1969) and by venogram. The FUT was carried out every day at eight different points on both legs, starting on the day of surgery and was continued for 7 days. A bilateral standard ascending venogram with fluoroscopic control with Meglumine iothalamate-Conray 35 was always carried out upon a positive FUT.

One criterion for the diagnosis of DVT was a difference in counts of 20 per cent or more for at least 24 hours from an adjacent point on the same leg, except for the point above the knee joint of the operated leg or the same point on the opposite nonoperated on leg. If the FUT was negative during the first week, a venogram was obtained in all the patients 10–12 days after surgery. Upon positive diagnosis of DVT, the patient was dropped from the study and referred to subsequent thrombosis treatment.

The sensitivity of FUT versus venogram was 85 per cent, the specificity 84 per cent, the accuracy 84 per cent, and the predictive value 73 per cent. In addition, the kappa index (Gray et al. 1984) was calculated.

## Statistics

The average age was 81 years in the HDHE group and 83 years in the H/Ac group. Of the 181 female patients in both groups, 22 were dropouts and 9 patients died, 5 in the HDHE group and 4 in the H/Ac group. Thus in each groups 75 patients met the criteria for the investigation. The statistical analyses were done using the common chi-square test in 2 × 2 tables and the common chi-square test in R × C tables (Sachs 1974).

## Results

Of the 150 patients in the two groups, 5 patients died in the HDHE group and 4 in the H/Ac group. The overall mortality was 6 per cent for both groups. In the HDHE group one patient died of pulmonary embolism in the night following surgery; the autopsy revealed massive preexistent thrombosis of the deep femoral veins. No difference in wound complications was noted between the two groups. One patient in each group had a gastrointestinal hemorrhage. In one patient (HDHE group) the hemorrhage was not diagnosed, whereupon the patient died.

Prophylaxis Days 2–4 following trauma was better in the HDHE group ($P < 0.054$). Also, the occurrence of thrombosis in the FUT postoperatively confirmed an impact of thrombosis prophylaxis in the HDHE group ($p < 0.014$) as against the H/Ac group.

In both groups, thromboses were predominant in the operated on extremity as compared with the nonoperated side (Table 1). The distribution of DVT in the calf veins alone showed an increase of thrombosis in the H/Ac group as compared with the HDHE group ($P < 0.012$).

*Table 1. Site of venous thrombosis after Ender nailing of intertrochanteric fracture*

| | HDHE | H/Ac |
|---|---|---|
| Operated on leg | 14 | 22 |
| Nonoperated on leg | 7 | 6 |
| Both legs | 9 | 18 |
| Total | 30 | 46 |

In the femoral veins, less evidence of thrombosis was seen in the HDHE group ($p < 0.026$) as against the H/Ac group. The substantically higher incidence of affected femoral veins was of particular importance because autofibrinolysis is much lower in the thigh than in the lower leg veins.

Following detection of the thromboses by FUT and confirmation by positive venogram, a significant difference as to the incidence of thrombosis was determined between the HDHE and H/Ac groups (Table 2). The incidence of thrombosis was still substantial (40 per cent in the HDHE group, 61 per cent in the H/Ac group; $P < 0.01$).

## Discussion

The incidence of thrombosis in fractures of the hip is higher than in elective hip surgery, and we fully agree with the experience reported by Bergqvist et al. (1979). We, too, found 61 per cent thrombosis in the H/Ac group, whereas Bergqvist noted 63 per cent with only two administrations of 5,000 IU heparin per day. However, he did not verify FUT by venogram, as we did routinely. We differentiated thrombosis diagnosed by venograms into various lev-

*Table 2. Incidence of thrombosis in patients with intertrochanteric fractures with thrombosis prophylaxis (HDHE versus H/Ac)*

| Group | Admitted | Drop-outs | N | Dead | Evaluated patients | Venogram positive |
|---|---|---|---|---|---|---|
| HDHE | 90 | 10 | 80 | 5[a] | 75 | 30 |
| H/Ac | 91 | 12 | 79 | 4 | 75 | 46 |
| Total | 181 | 22 | 159 | 9 | 150 | 76 |

[a] One early pulmonary embolism.

els. The highest number of thromboses in both groups was at the level of the calf when compared with the knee and thigh levels.

In a phlebographic study following total hip replacement, Nillius and Nylander (1979) found thrombosis in 58 per cent of the patients without prophylaxis with 50 per cent of the thromboses at two or more levels (calf and thigh). By comparison, our study revealed only 24 per cent at two levels in the HDHE group, and 29 per cent in the H/Ac group. This means that the incidence of thrombosis is higher in the calf veins, where endogenous fibrinolysis mostly dissolves the thrombi. Furthermore, our study was done in hip fractures, where the incidence of thrombosis is higher than in total hip replacement.

In a study on the prophylaxis of thrombosis with Dextran 70 and Dextran 70 + DHE, the incidence of thrombosis decreased from 31 per cent in the Dextran group to 3 per cent in the group with additional DHE (Bergqvist et al. 1984). Addition of DHE increased the efficacy of Dextran 70 considerably.

Kakkar et al. (1979) decreased the incidence of thrombosis in elective hip surgery from 52 per cent with heparin to 20 per cent with heparin and DHE (3 times 5,000 IU per day). In nailing of the fractured neck of the femur, Lahnborg (1980) decreased the incidence of thrombosis with heparin and heparin-DHE.

Surgical stabilization with Ender nails is well tolerated. Still, we see a high incidence of thrombosis despite prophylactic treatment. Galasko et al. (1976) showed that in intertrochanteric and transcervical fractures of the femur the incidence of thrombosis was only 23 per cent with nailing alone as against 62 per cent with nail and plate and 60 per cent with arthroplasty. The extension of surgery to the surrounding soft tissue may promote thrombosis and should be limited if the patient's age is advanced. For this reason, Ender nailing seems to be a safe and reliable therapeutic modality especially for elderly people.

The high incidence of thrombosis in our study is in contradiction to the presumed effect of anesthesia. Ninety-two per cent of both study groups were operated on with spinal anesthesia. A direct relationship between the incidence of thrombosis and anesthetic technique was not confirmed. In the reports by Davis et al. (1980), Modig et al. (1981), and Thorburn et al. (1980), spinal and epidural anesthesia were ascribed a decrease in the incidence of thrombosis in hip fractures and elective hip surgery as compared with general anesthesia.

We observed no complication of spinal anesthesia related to heparin, e.g., hemorrhages adjacent to the spinal canal or neurologic deficits. In our experience, heparin or HDHE may be used for prophylaxis of thrombosis without being a contraindication to spinal anesthesia (Allemann et al. 1983).

Vascular spasm as a complication of prophylaxis with HDHE was not encountered in any of our patients. We can confirm the results reported by Kakkar (1982), who found no vasospasm in a similar patient population of 500 patients with the same dose of HDHE.

In conclusion, thrombosis prophylaxis is mandatory in intertrochanteric fractures. Subcutaneous administration of HDHE seems to be an effective prophylactic treatment for thrombosis in these high-risk patients.

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