Use Of Deep Venous Thrombosis Prophylaxis By Family Physicians

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Abstract: ***Background:*** **Accumulated data indicate that the administration of low-dose subcutaneous heparin reduces the incidence of deep venous thrombosis in high-risk surgical and medical patients. Because deep venous thrombosis predisposes to pulmonary embolism, it is generally accepted that reducing deep venous thrombosis will reduce pulmonary embolism, the most common preventable cause of death in hospitalized patients. There are few data, however, regarding physicians' use of heparin for deep venous thrombosis prophylaxis in medical patients.**

Methods: **We reviewed charts of medical patients aged 50 years and older who were admitted to family practice services in a community teaching hospital and excluded patients who were not candidates for heparin prophylaxis.**

Results: **Eighty (65 percent) of 123 patients received heparin for deep venous thrombosis prophylaxis. Patients admitted to a residency teaching service were more likely to receive heparin for deep venous thrombosis prophylaxis than were patients admitted to nonteaching services (odds ratio 3.37, 95 percent confidence interval 1.26–9.21, $P = 0.012$). An association between the patient's number of risk factors for deep venous thrombosis and likelihood of receiving deep venous thrombosis prophylaxis approached statistical significance ($P = 0.078$).**

Conclusions: **In our institution, heparin for deep venous thrombosis prophylaxis is frequently but not uniformly prescribed for appropriately selected family practice inpatients. No similar data for nonsurgical patients were found for comparison. (J Am Board Fam Pract 1992; 5:369-73.)**

A consensus panel on prevention of venous thrombosis and pulmonary embolism was convened in 1986 by the National Institutes of Health (NIH). Its report begins: "Deep venous thrombosis (DVT) and pulmonary embolism (PE) constitute major health problems in the United States. It is estimated that DVT and PE are associated with 300,000 to 600,000 hospitalizations a year. . . ."[1 p 744] Some authors estimate that up to 200,000 deaths occur annually from pulmonary embolism.[2-4] Pulmonary embolism remains the most common preventable cause of death in hospitalized patients.[3]

The venous thromboses that cause pulmonary embolisms originate in the deep veins of the legs in 90 percent or more of cases.[3] Because of the cascade of events that occur in a decreasing frequency of occurrence — leg deep venous thrombosis, pulmonary embolism, and death — the panel calculated that showing an effect of deep venous thrombosis prophylaxis on mortality would require a study of 100,000 patients. If the associations among leg deep venous thrombosis, pulmonary embolism, and death are accepted, however, then deep venous thrombosis can be used as a marker: a demonstrable reduction in leg deep venous thrombosis would be presumed to correspond to a reduction in the rate of pulmonary embolism and pulmonary embolism-related mortality. Combining data from 12,000 patients participating in randomized controlled studies of low-dose heparin, the panel found a 68 percent reduction in deep venous thrombosis, a 49 percent reduction in pulmonary embolism, and a decrease in overall death rate attributable to the decrease in fatal pulmonary embolism. The panel concluded: "The evidence for a benefit of prophylaxis in preventing PE is compelling when using DVT as a marker."[1 p 744]

The panel addressed deep venous thrombosis prophylaxis in both medical and surgical patients.

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In stroke patients, the risk of deep venous thrombosis in the paralyzed leg, diagnosed by scanning using fibrinogen iodine 125, can be as high as 75 percent, compared with a 7 percent risk in the unaffected leg. Age, immobilization, and acute myocardial infarction are other common medical risk factors. Multiple risks increase the risk for thromboembolism but by an unknown amount.

For general surgical patients at high risk, "those over the age of 40, or obese, or with malignancy or prior DVT or PE, or undergoing large or complicated surgical procedures,"[1 p 747] low-dose subcutaneous administration of heparin for prophylaxis (5000 U subcutaneously every 8 or 12 hours, beginning 2 hours before surgery and continuing at least until the patient is ambulatory) was recommended. The panel recognized that,

> Limited clinical trials support the use of low-dose heparin for patients with heart failure, acute myocardial infarction, or pulmonary infection to prevent DVT. Although studies do not exist to support extension of these observations to other medical patients at bed rest and at risk for thromboembolism, administration of low-dose heparin may be indicated, especially as long as other conditions predisposing to DVT coexist.[1 p 748]

The panel recommended that "stroke patients in whom hemorrhagic stroke has been excluded by computed tomographic scan should receive low-dose heparin."[1 p 748] Because of the absence of a surgical wound, prophylaxis with heparin was considered safer in medical patients than in surgical patients for whom, despite the statistically increased risk of bleeding, the risk of clinically important complications or death was considered minimal. For medical patients, data for prophylactic regimens other than heparin were considered inadequate to render an opinion.[1]

Recent evidence suggests that deep venous thrombosis and pulmonary embolism continue to be major contributors to unrecognized morbidity and mortality during hospitalization. In one 5-year autopsy study, pulmonary embolism was the cause of 10 percent of deaths. Of these patients, 83 percent had deep venous thrombosis in the legs, but only 19 percent had symptoms of deep venous thrombosis. Only 3 percent of patients with deep venous thrombosis at autopsy had undergone antemortem investigation for it. Medical patients accounted for 76 percent of patients dying of pulmonary embolism.[5] Of patients who die from pulmonary embolism, two-thirds do so within 30 minutes, leaving little time for effective diagnosis and management.[3,6] Because deep venous thrombosis is often clinically silent and because pulmonary embolism might not allow adequate time for intervention, there is strong rationale for deep venous thrombosis prophylaxis.

An English language survey of MEDLINE databases indicated that the most recent data about physicians' attitudes and practices regarding deep venous thrombosis prophylaxis were published in 1982.[7] Recent data on physicians' use of medications for deep venous thrombosis prophylaxis are not readily available.

This study was designed to determine the extent of prophylaxis provided by low-dose heparin in patients admitted to the inpatient services of family physicians in our institution.

Methods

In our 520-bed community teaching hospital, we studied charts of all patients 50 years of age or older admitted to family practice services from April through December 1990. Patients were excluded if there were medical contraindications to use of heparin (e.g., coagulopathy), if therapeutic intravenous heparin was used (e.g., for deep venous thrombosis), or if there were antecedent warfarin therapy, previous adverse reaction to heparin, or hospitalization of 48 hours or less. To be categorized as receiving prophylaxis, prophylaxis had to be initiated within 48 hours of admission.

The following diagnoses or problems were counted as risk factors: previous deep venous thrombosis or pulmonary embolism; malignancy; immobilization; obesity; lower extremity edema; congestive heart failure, pulmonary edema, or cardiomyopathy; myocardial infarction; and stroke. Age, an entry criterion, was not counted as a risk factor.

Teaching status of attending physicians was stratified into ordered groups: residency group (residency inpatient service), a residency-affiliated group (family physicians who involved the family practice residents in the care of their patients), and a nonteaching group.

Statistical analyses were performed using two-tailed nonparametric exact tests (e.g., Cochran

Armitage, Fisher's exact test). Comparisons were considered statistically significant for tests of unordered data if $P < 0.05$, and were considered to indicate a possible association if the P value was between 0.05 and 0.10. In ordered data, a trend was considered to be present if $P < 0.10$.

Results

Of 164 eligible patients, 41 met exclusion criteria; therapeutic use of heparin (most often unstable angina), medical contraindications to heparin use (most frequently gastrointestinal bleeding), and antecedent coumadin use accounted for 37 of these exclusions, leaving 123 cases for evaluation.

Heparin or a heparin combination therapy for prophylaxis was used for 80 (65 percent) patients (Table 1). Some form of prophylaxis, including single-modality therapy with aspirin or pressure gradient stockings, was used for 89 (72 percent) patients. Intermittent pneumatic compression stockings were not used with any patients. A possible association between number of deep venous thrombosis risk factors and likelihood of using heparin for prophylaxis was observed; patients with three or more identified risks received prophylactic measures about 76 percent of the time, compared with 59 percent for those with fewer risks (Fisher's exact test, $P = 0.078$).

Patients in the nonteaching group were older (mean 75 years) than those in the residency group (mean 70 years) and residency-affiliated group (mean 71 years) (Cochran Mantel-Haenszel chi-square, $P = 0.02$). The number of risk factors per patient, however, did not differ among groups (Cochran Mantel-Haenszel chi-square, $P = 0.49$). The teaching affiliation of the attending physician correlated directly with the likelihood of patients receiving prophylactic heparin therapy (Cochran Armitage exact, $P = 0.012$) (Table 1). Residency physicians were more likely than nonteaching physicians to prescribe heparin prophylactically (71 percent versus 39 percent, fitted odds ratio [OR] 3.37, 95 percent confidence interval [CI] 1.26–9.21), as were the residency- affiliated physicians (70 percent versus 39 percent, fitted OR 1.83, CI 1.12–3.04). Controlling for patient age and number of risk factors did not alter this result.

Discussion

The goals of this study were, for our institution, to ascertain how commonly heparin was used for deep venous thrombosis prophylaxis in family practice inpatients, to identify patient characteristics associated with deep venous thrombosis prophylaxis, and to determine whether physician teaching status was associated with deep venous thrombosis prophylaxis. Earlier work indicated that physicians might know the content of and concur with consensus guidelines but fail to change their behavior in response to the guidelines.[8-10] Thus, we believed it more productive to ascertain behaviors than attitudes.

Table 1. Methods for Prophylaxis of Deep Venous Thrombosis Used by Each Physician Group.

Prophylactic Method	Physician Group			Total (All Physicians) No. (%)
	Residency No. (%)	Residency Affiliated No. (%)	Nonteaching No. (%)	
Heparin and heparin combination				
Heparin alone	29 (38)	12 (52)	3 (13)	44 (36)
Heparin-combination therapy*	26 (33)	4 (18)	6 (26)	36 (29)
Total	55 (71)†	16 (70)†	9 (39)†	80 (65)
Other				
Aspirin alone	3 (4)	1 (4)	2 (9)	6 (5)
Stocking alone	1 (1)	1 (4)	1 (4)	3 (2)
Total	4 (5)	2 (9)	3 (13)	9 (7)
Total heparin or other	59 (77)	18 (78)	12 (52)	89 (72)
No prophylaxis	18 (23)	5 (22)	11 (48)	34 (28)
Total patients	77 (100)	23 (100)	23 (100)	123 (100)

*Heparin-combination therapy includes heparin in combination with aspirin, compression stockings, or both.
†Statistically significant association between teaching status and likelihood of heparin prophylaxis (Cochran Armitage exact test, $P = 0.012$).

Among the study patients, 65 percent received a deep venous thrombosis prophylaxis regimen that included heparin. An additional 7 percent of patients received aspirin or elastic pressure gradient stockings without heparin. Intermittent pneumatic compression devices and dextran were not used. Propensity to prescribe prophylaxis increased as teaching affiliation increased. Controlling for patient age and risk differences among the groups did not alter this association. When three or more deep venous thrombosis risks were present, use of deep venous thrombosis prophylaxis tended to increase (Fisher's exact test, two-tailed, $P = 0.078$).

Most of what has been published on deep venous thrombosis prophylaxis has focused on surgical patients[1]; a recent review summarized 70 randomized surgical trials of heparin therapy for prophylaxis.[11] For medical patients we found no reports with which to compare our results, no comparative effectiveness studies, and no cost-effectiveness studies. Such studies, however, have been performed for surgical patients.

As with earlier studies (Morris,[12] Bergqvist[13]) the most recent survey by Conti and Daschbach[7] indicated a moderate misunderstanding among surgeons about deep venous thrombosis prophylaxis, with 19 percent believing deep venous thrombosis and pulmonary embolism were too infrequent to warrant prophylaxis and 36 percent believing complications hindered effective prophylaxis. These three studies measured self-reported (not actual) use of deep venous thrombosis prophylaxis.

From these studies it was evident that physicians underestimated the scope of the problem and overestimated complication rates. Many venous thrombi are clinically silent and are therefore frequently undiagnosed. Because an estimated 90 percent of venous thrombi produce no clinical symptoms, the individual physician could perceive that the complications of prophylaxis occur more frequently than clinical events.[14] To compound the problem, the clinical symptoms often occur after hospital discharge — 10 days after orthopedic surgery, for example. Postphlebitic syndrome might not occur until 5 years after an initial episode of silent thrombosis, drastically decreasing the likelihood of linking the two events correctly.[14] Combining the experience of 70 surgical trials, the approximate reduction in the odds of both deep venous thrombosis and pulmonary embolism from prophylaxis is "striking," approximately 65 percent, and more than compensates for complications from the prophylaxis.[11]

We focused on low-dose heparin for prophylaxis because it is the best-studied method, and recommendations for its use, at least in surgical patients, are more than a decade old. In 1977, the Council on Thrombosis of the American Heart Association recommended heparin for all hemostatically competent patients older than 40 years undergoing abdominal or thoracic surgery,[15] a position reaffirmed by the NIH panel in 1986.[1] Available methods of deep venous thrombosis prophylaxis can be subdivided into pharmacologic and mechanical approaches. Of the pharmacologic methods, oral anticoagulants have a delayed onset of prophylactic action, cannot be used in patients unable to swallow oral medications, and cause a higher frequency of clinically important bleeding than does subcutaneous heparin.[3,16] In contrast to its effect on arterial thrombosis, aspirin is not effective in preventing venous thrombosis[6,17,18] except in isolated instances.[4] Dextran must be given as an intravenous infusion and has rare but potentially fatal side effects.

Of the mechanical methods for reducing deep venous thrombosis, stockings that have a compression gradient and avoid a tourniquet effect at the top are effective in reducing the frequency of deep venous thrombosis in low-risk surgical patients,[16] although the efficacy of these stockings in higher risk patients remains uncertain.[3] Knee-length stockings appear to be as effective as or more effective than thigh-length stockings.[19,20] Intermittent pneumatic compression is also effective.[21] Leg elevation does not reduce deep venous thrombosis, but uncontrolled data have suggested that early ambulation after surgery does reduce deep venous thrombosis risk.[16]

The mechanical methods appear to be less effective than subcutaneous low-dose heparin in preventing deep venous thrombosis. Efficacy estimates vary substantially and depend on such variables as patient age and diagnosis.[22] Unlike heparin, none of the mechanical methods has been tested against the more rigorous end-points of pulmonary embolism or total mortality.[23]

In appropriately selected surgical patients (e.g., those older than 40 years), deep venous thrombo-

sis prophylaxis is cost-effective for hospitals reimbursed under a prospective payment (diagnostic-related group) system.[6,24] We found no cost estimates for medical patients.

In quality-assurance studies, altered behavior during the audit period, which reverts to preaudit levels when the study terminates, has been reported.[25] This phenomenon could have artificially elevated the rates of deep venous thrombosis prophylaxis found in this study because all attending physicians were aware of the study. The administrative assistant who performed the data collection was a departmental employee, and the data were analyzed by independent statistical consultants.

The generalizability of this single institution is limited; the practice of medicine is heavily influenced by local and regional factors.[26] Replication in other institutions or with a multicenter study would provide a more accurate indication of current practice patterns.

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