ORIGINAL ARTICLES

Outpatient management of deep vein thrombosis

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Abstract

Objective—To assess whether patients with deep vein thrombosis (DVT) could be satisfactorily treated on an outpatient basis with low molecular weight (LMW) heparin and warfarin.

Design—A 22 month prospective study of adults attending St Peter's Hospital accident and emergency department with DVT.

Results—1093 patients were referred and assessed; 160 were venogram positive, of which 159 patients between the ages of 22 and 89 years of age have now been treated with LMW heparin as outpatients. Direct liaison with community nurses has minimised the impact on general practitioner workload.

Conclusions—1272 bed days were saved during this period (an estimated £320 000). The outpatient treatment of thromboembolism has been shown to be effective and safe.

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Keywords: deep vein thrombosis; outpatient treatment; low molecular weight heparin; light reflective rheography

Before this study, patients in St Peter's Hospital, Chertsey with proved deep vein thrombosis (DVT) received traditional inpatient treatment with five days of intravenous heparin infusion and conversion to warfarin, the average length of stay being eight days. The known complications of intravenous unfractionated heparin treatment are major haemorrhage 5.0%, minor haemorrhage 3.2%, and rethrombosis 6.9%.¹⁻³

The effectiveness and safety of a subcutaneous low molecular weight (LMW) heparin for venous thromboembolism has been demonstrated.¹⁻³ This treatment has the advantage that it is given once daily by subcutaneous injection for six days and requires no monitoring. Haemorrhage is reduced to 0.5% and rethrombosis to 2.8%. This study assesses outpatient investigation and treatment of DVT with LMW heparin.

Patients and methods

Consecutive patients with suspected DVT, but no signs or symptoms of a pulmonary embolus, attending the accident and emergency (A&E) department from January 1995 were initially

referred for light reflection rheography (LRR). This is a non-invasive, plethysmographic technique which we have shown is a useful screening method for DVT.⁴ It relies on the principle that infrared light is absorbed by red cells in the dorsal venous plexus. In normal subjects, calf exercise will reduce lower limb venous pressure and the amount of blood in the venous plexus, thus decreasing light absorption and increasing light reflectivity. The negative predictive value is consistently high in all studies,⁴⁻⁶ reaching 97% in a recent audit of 148 consecutive patients attending our A&E department. Those patients with a negative LRR were discharged, while those patients with a positive or equivocal LRR test underwent venography, as LRR has a significant false positive rate. If patients attended "out of hours" they were treated with LMW heparin as an outpatient until confirmatory tests could be done.

If thrombus was demonstrated in the deep veins, patients were treated by subcutaneous injection of LMW heparin (tinzaparin). Pre-packaged treatment kits were available in the A&E department. These kits, made up in the pharmacy department, contained preloaded syringes of tinzaparin, 1 mg and 3 mg warfarin tablets together with instruction sheets. Patients were weighed and given the first dose of LMW heparin. Warfarin was given at maintenance doses from day 1 of diagnosis (adjusted for sex of patient and other drugs). Arrangements were made with the district nurse to perform the subsequent five once daily injections. An appointment was made to see the consultant haematologist at the next twice weekly anticoagulation clinic, at which the first international normalised ratio (INR) was done. LMW heparin was discontinued when the INR reached 2.0. The haematology department monitored the INR for 12 weeks⁷ and investigated the cause of the DVT.

Results

Between January 1995 and October 1997, 1093 patients were referred to the A&E department with suspected DVT. Altogether 1088 were screened with LRR, of which 735 were LRR negative and did not require further investigation. Five patients were unsuitable for LRR and had venograms immediately, which were negative. Of the 353 patients who were LRR positive or equivocal, 191 were venogram negative, 160 venogram positive, and two were

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uncertain, but treated as if they had a positive venogram.

One hundred and fifty nine patients were treated with LMW heparin according to the protocol. Three patients were treated with LMW heparin as inpatients because they were referred from the psychiatric hospital. The majority (83%) had no cause ultimately found for their DVT. Sixteen patients had carcinoma, of whom 11 have now died. Six had a recognised thrombophilia (protein S, protein C, factor V Leiden). None of the 159 have had further thrombotic events while on treatment or in the subsequent three months. None of the 735 who were LRR negative were subsequently rereferred with a thrombosis. Minor bleeding occurred in two (when on warfarin), but no major bleeding. All 1088 have been tracked and, unless they have died (as a result of their cancer), they are being included in a patient satisfaction survey. There were no clinically significant pulmonary emboli (meaning that none had symptoms, and we did not perform scans to look for asymptomatic embolism).

Discussion

Our fast track investigation of DVT with LRR in the A&E department enabled us to consider treating patients on an outpatient basis. We did not anticipate discharging all patients from the A&E department initially, however 159 patients were considered suitable to be treated with LMW heparin according to the protocol.

This study, together with a concurrent audit in our hospital and subsequent reports in the literature,³ confirmed our previous report of the value of LRR as a screening method for DVT.⁴⁻⁸ Duplex scanning could be used in place of either LRR or venography.

The protocol, which covers seven days of the week, involved a multidisciplinary approach. The A&E and radiography departments initiated the investigation of DVT and subsequent treatment with LMW heparin. The haematology department provided the follow up care of the patients. The pharmacy prepared prepackaged treatment kits. Approval was sought from hospital doctors, general practitioners, and district nurses before the study began. A similar model has been instituted in an A&E department in Canada.^{9,10}

The daily cost of LMW heparin (tinzaparin) is approximately £11.00, the cost falling as more places use the drug. The recommended course is five to six days and requires a district

nurse if given as an outpatient. Nevertheless the costs compare favourably with those of continuous intravenous heparin given by infusion pump and monitored daily with activated partial thromboplastin time measurements. Moreover, the regimen released 1272 (159 × 8) hospital bed days during the year. This figure does not include those who were treated and investigated "out of hours" who subsequently had a negative test and were discharged. There were no thrombotic or embolic complications and therefore the outpatient treatment of DVT can be considered safe and effective. We are now considering extending the technique to include patients who have had DVT with uncomplicated pulmonary emboli.¹¹⁻¹⁵

- 1 Hull RD, Raskob GE, Pineo GF, *et al.* Subcutaneous low-molecular-weight heparin compared with intravenous heparin in the treatment of proximal-vein thrombosis. *N Engl J Med* 1992;326:975-82.
- 2 Prandoni P, Vigo M, Cattelan AM, *et al.* Treatment of deep vein thrombosis by fixed doses of a low-molecular-weight heparin (CY216). *Haemostasis* 1990;20(suppl 1):220-3.
- 3 Duroux P. A randomised trial of subcutaneous low-molecular-weight heparin (CY216) compared with intravenous unfractionated heparin in the treatment of deep vein thrombosis: a collaborative European multicentre study. *Thromb Haemost* 1991;65:251-6.
- 4 Thomas PRS, Butler CM, Bowman, *et al.* Light reflection rheography: an effective non-invasive technique for screening patients with suspected deep venous thrombosis. *Br J Surg* 1991;78:207-9.
- 5 Brottman P, Propp D, Goldstein C. The use of light reflection rheography to rule out deep vein thrombosis in emergency patients [letter]. *Am J Emerg Med* 1997;15:215-6.
- 6 Innes GD, Dillon EC, Holmes A. Low-molecular-weight heparin in the emergency department treatment of venous thromboembolism. *J Emerg Med* 1997;15:563-6.
- 7 Arora S, Lam DJK, Kennedy C, *et al.* Light reflection rheography: a simple noninvasive screening test for deep vein thrombosis. *J Vasc Surg* 1993;18:767-72.
- 8 Sampson MG, Lutter KS, Kerr TM, *et al.* Comparison of light reflection rheography and venous Duplex scanning in lower extremity acute venous thrombosis. *Journal of Vascular Technology* 1991;15:311-13.
- 9 Mitrani AA, Gonzalez ML, O'Connell MT, *et al.* Detection of clinically suspected deep vein thrombosis using light reflection rheography. *Am J Surg* 1991;161:646-50.
- 10 British Thoracic Society. Optimum duration of anticoagulation for deep vein thrombosis and pulmonary embolism. *Lancet* 1992;340:873-6.
- 11 Simonneau G, Sors H, Charbonnier B, *et al.* A comparison of low-molecular-weight heparin with unfractionated heparin for acute pulmonary embolism. The THESEE Study Group. [Tinzaparine ou heparine standard: evaluations dans l'embolie pulmonaire]. *N Engl J Med* 1997;337:663-9.
- 12 Schafer I. Low-molecular-weight heparin—an opportunity to home treatment of venous thrombosis [editorial]. *N Engl J Med* 1996;334:724-5.
- 13 Levine M, Gent M, Hirsh J, *et al.* A comparison of low-molecular-weight heparin administered primarily at home with unfractionated heparin administered in the hospital for proximal deep vein thrombosis. *N Engl J Med* 1996;334:677-81.
- 14 Koopman MMW, Prandoni P, Pionelle F, *et al.* Treatment of venous thrombosis with intravenous unfractionated heparin administered in the hospital as compared with subcutaneous low-molecular-weight heparin administered at home. *N Engl J Med* 1996;334:682-7.
- 15 Hirsh J, Crowther M. Low molecular weight heparin for the out-of-hospital treatment of venous thrombosis: rationale and clinical results. *Thromb Haemost* 1997;78:689-92.