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A comparison of intermittent calf compression and enoxaparin for thromboprophylaxis in total hip replacement

A pilot study

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Summary. *A prospective randomised trial was carried comparing the use of Enoxaparin with intermittent pneumatic calf compression garments for thromboprophylaxis in total hip replacement. Fifty consecutive patients were studied and randomised to evaluate these two methods. There were 2 deep vein thromboses, one in each group, and no cases of pulmonary embolism. The operative field was judged to be drier in the compression group, but the mean fall in the postoperative haemoglobin level was the same in each. In the peroperative period, 6 patients in the Enoxaparin group needed 2 units of blood and one 3 units. In the compression group, 3 patients needed transfusions of 2 units. Intermittent calf compression has fewer problems than the use of Enoxaparin and has no contraindications.*

Résumé. *Une étude expérimentale prospective et randomisée fut conduite pour comparer l'efficacité d'Enoxaparin (Rhône Poulenc – Rorer) et des bandages à compression intermittente 'Flowtron DVT' (HNE Healthcare) pour la thromboprophylaxie au cours de l'arthroplastie totale de la hanche. Dans cette étude, les effets secondaires et les complications furent les éléments principaux, plus que l'efficacité contre la thrombose. Cinquante sujets consécutifs furent choisis au hasard pour reçevoir ou l'une ou l'autre des méthodes de thromboprophylaxie. Il y eut deux incidents de thrombose veineuse (un sujet dans chaque groupe) et il n'y eut pas d'embolie pulmonaire. Le saignement opératoire fut moindre quand le Flowtron DVT fut employé que quand l'Enoxaparin fut employé ($\chi^2=12.13$, $p<0.05$). La réduction moyenne de concentration d'hémoglobine était comparable dans chaque groupe. Cependant, pendant la période périoperatoire, 6 sujets du groupe 'Enoxaparin' ont reçu un litre de sang et un autre a eu besoin d'un litre et demi. Par contre, dans la groupe 'Flowtron DVT' il n'y avait que 3 sujets qui ont recu chacun un litre de sang pour préserver leur taux d'hémoglobine. La compression intermittente de la jambe par Flowtron DVT donne moins de complications que l'Enoxaparin, avec l'avantage de n'avoir presque pas de contre-indications.*

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Introduction

The true incidence of deep vein thrombosis (DVT) and pulmonary embolism (PE) has not been established [1], nor is the effectiveness of various methods of prophylaxis known. Each carries its own risks which must be considered when choosing which to use.

We set out to compare the mechanical method of intermittent calf compression with a pharmacological method using Enoxaparin.

Patients and methods

Consecutive patients admitted for primary total hip replacement were entered into the trial. The criteria for exclusion are listed in Table 1. The patients were randomised to group 1 or 2.

Table 1. Reasons for exclusion from the trial

Antiplatelet therapy (Aspirin)	10
Known cancer	3
Thromboembolism/PE	0
GI ulcer in past year	0
Social circumstances	1
Complex medical problems	2
Human error	1

Group 1 wore a Flowtron DVT garment on the opposite leg during the operation, a second garment being applied to the operated limb at the end of the procedure.

Group 2 received Enoxaparin 40 mg daily beginning on the evening before the operation and continuing until discharge from hospital, usually after 10 days. The patients were visited regularly by research assistants to ensure compliance.

All the patients had a cemented Charnley prosthesis inserted through a posterior approach using a standard technique. The skin and subcutaneous tissues were infiltrated with 1:400 000 adrenaline solution before the incision. Postoperative rehabilitation followed a standard protocol, the patient being allowed up on the second day and discharged when judged able to cope at home.

During operation, a judgement was made about the state of the operative field by the surgeon and assistant. The field was described as dry if, after coagulation of bleeding vessels after the incision, there was no further bleeding unless another incision was made in the same area. It was described as normal if such areas continued with a slow ooze which did not require swabbing to enable the procedure to continue. The field was regarded as oozing when it required swabbing to maintain good visualisation of the tissues.

The haemoglobin concentration was measured on the day before operation and on the second and fifth day afterwards. Blood loss into the drains and the amount of blood transfused during or after the operation were recorded. The wounds were inspected for any sign of infection or haematoma when the drains were removed and before discharge from hospital.

Colour duplex ultrasound scans were made in all cases to look for popliteal or a more proximal thrombus at one and 6 weeks after operation. If there were clinical signs of a DVT, scanning and appropriate anticoagulant treatment was undertaken.

Results

Sixty-seven patients were entered; of these 17 were excluded (Table 1). Of the remainder 25 were randomised to group 1 and 25 to group 2.

Group 1 consisted of 10 men and 15 women with a mean age of 64 years (range 42 to 83 years) and mean weight of 69 kg (range 48 to 90 kg).

Group 2 consisted of 8 men and 17 women with a mean age of 64 years (range 37 to 82 years) and a mean weight of 67 kg (range 41 to 92 kg).

No significant differences were found on inspection of the wounds at 7 days. One patient in group 1 developed leakage from the wound which settled with antibiotic treatment. No organism was isolated from cultures of wound swabs. There were no problems with the wounds in group 2. One patient in group 2 developed swelling of the leg which scanning showed was not due to a thrombosis.

There were 2 DVTs detected by the postoperative scans, one in each group. Neither caused symptoms. They were noticed at the sixth week, and only the popliteal segment was affected. Neither had been present in the scan at one week. Pulmonary embolism did not occur in either group.

The operative field was judged to be drier in group 1 compared with group 2 ($p < 0.05$, $\chi^2 = 12.13$). In group 1, the field was judged to be oozing in 4, normal in 10 and dry in 11. In group 2, the findings were 16 oozing, 5 normal and 4 dry. Wound drainage was not significantly different, group 1 losing a mean of 517 ml and group 2 443 ml (SE diff = 209, $p > 0.5$).

The mean haemoglobin concentration fell from before operation (12.8 g/100 ml) by 2.53 g/100 ml on the second day in group 1 and by 2.86 g/100 ml in group 2 (starting level 12.7 g/100 ml). Between these two measurements, 6 patients in group 2 required 2 units of blood transfusion and the seventh required 3 units. Three patients in group 1 required a 2 unit transfusion which is not significant at this sample size ($\chi^2 = 3.2$, $p > 0.05$ but < 0.10).

Discussion

There is medico-legal pressure to use some form of thromboprophylaxis during total hip replacement. Many methods have been shown to have a similar effect in reducing the incidence of asymptomatic DVT in small or uncontrolled trials [2, 3]. Low molecular weight heparin compounds significantly reduce objectively diagnosed DVT compared to a placebo, Dextran 70 and unfractionated heparin [3]. However, comparisons have not been made with mechanical methods, except for simple compression stockings [4].

Intermittent calf compression has been shown to reduce the indicence of DVT after total hip and knee replacement [5] and has fewer adverse effects. Individual trials have also suggested that intermittent calf compression gives results comparable with other methods [6, 7]. The choice of which method to use is influenced by a number of factors including cost, patient preference, and the problems and side effects, once there is available data on efficacy.

The diagnosis of DVT in this study was made by colour duplex ultrasonography which has been shown to have a sensitivity for detection of 100%

for clots occurring above the knee and of 79% for thrombosis below this level.

Both methods gave low rates of thromboembolism and the significance of this needs to be evaluated by trials with larger numbers of patients. When the intermittent calf compression garment was used the operative field was drier and easier to work in than when low molecular weight heparin was given. There was no difference in the amount of blood lost into drains but operative oozing, blood loss into the tissues and possibly bleeding into other sites may have been responsible for the larger number of blood transfusions required to maintain a similar haemoglobin concentration in the group treated with Enoxaparin.

The use of low molecular weight heparins is also contraindicated in patients who have bleeding disorders or active gastrointestinal ulceration, and some patients also need to have monitoring of their haemotological parameters. These compounds interact with, and have to be used with care in patients already taking nonsteroidal anticoagulants and anti-inflammatory drugs, including aspirin. On the other hand, intermittent mechanical compression by the Flowtron garment has no specific contraindications. At present this can only be worn on the leg which is not being operated on, and this problem needs to be addressed.

Our preliminary results lead us to believe that the use of intermittent calf compression garments is a safe method of prophylaxis for general use in a unit performing total hip replacement.

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