

Deep vein thrombosis after thoracotomy

F R JACKAMAN, B J PERRY, AND HAROLD SIDDONS

From the Departments of Surgery and Medical Physics, St George's Hospital, London SW1, UK

Jackaman, F R, Perry, B J, and Siddons, H (1978). *Thorax*, 33, 761-763. **Deep vein thrombosis after thoracotomy.** In a prospective study of 183 patients undergoing lateral thoracotomy the ¹²⁵I fibrinogen uptake test and perioperative heparin prophylaxis for deep-vein thrombosis were investigated. There was an incidence of deep vein thrombosis of 51% in untreated control patients. The heparin prophylaxis effectively reduced the incidence of deep venous thrombosis to 28% (P<0.005) without increasing postoperative blood loss. Unilateral thrombosis was found to be significantly more frequent in the leg opposite the side of the thoracotomy (P<0.005). The ¹²⁵I fibrinogen test is essential in assessing methods of prophylaxis but is not recommended as a routine.

The incidence and methods of prevention of deep vein thrombosis (DVT) in surgical patients have been studied increasingly since the introduction of the ¹²⁵I-labelled fibrinogen uptake test (Flanc *et al*, 1968; Kakkar *et al*, 1969; Browse *et al*, 1971; Loudon, 1976). Published investigations have included patients undergoing many types of major and minor surgical procedures (Browse and Negus, 1970; Williams, 1971; Gordon-Smith *et al*, 1972; Kakkar *et al*, 1972; Nicolaidis *et al*, 1972; Venous Thrombosis Clinical Study Group, 1975).

Although some series include a few thoracic surgical patients (Atkins and Hawkins, 1968; Gallus *et al*, 1973) no other experience of this test in a large series has so far been presented.

Patients undergoing lateral thoracotomy form a compact group, which is particularly suitable for detailed study because of the uniformity of pre-, intra- and postoperative management. This paper reports the results of routine screening for DVT with and without a specific method of prophylaxis for such a group.

Patients

In a three year period all patients undergoing lateral thoracotomy for the conditions listed in table 1 have been routinely screened for DVT by the ¹²⁵I fibrinogen test. Lateral thoracotomy was performed in most cases by one of us (HS). Blood loss at and after operation was measured.

In the first year of the study no specific prophylaxis against DVT was given; thereafter a low-dose heparin regimen was used in patients over 40 years of age. Heparin sulphate 5000 IU 12-

Table 1 Diagnoses of 183 patients undergoing lateral thoracotomy

Malignant		Non-malignant	
Men			
Squamous cell carcinoma of lung	87	Spontaneous pneumothorax	8
Adenocarcinoma of lung	11	Hiatal hernia	3
Round cell carcinoma of lung	8	Bronchiectasis	2
Carcinoid tumour	3	Lung cyst	2
Squamous cell carcinoma of oesophagus	2	Empyema (decortication)	2
		Tuberculosis	4
		Others	6
Total 111		Total 27	
Women			
Squamous cell carcinoma of lung	16	Spontaneous pneumothorax	2
Adenocarcinoma of lung	6	Hiatal hernia	6
Round cell carcinoma of lung	4	Bronchiectasis	1
Carcinoid tumour	2	Lung cyst	1
Carcinoma of stomach	1	Empyema (decortication)	2
Fibrosarcoma	1	Others	3
Total 30		Total 15	

hourly was given subcutaneously for five days, the first dose being given one hour before operation. Routine pre- and postoperative nursing and physiotherapy were similar for all patients.

¹²⁵I fibrinogen test

The intravenous injection of 1.1 ml (100 μCi) ¹²⁵I-labelled fibrinogen (Radiochemical Centre, Amersham—Code IM 53P) was given on the day before the operation, the thyroid having been blocked by potassium iodide 120 mg, given by mouth 24 hours previously. The uptake of radioactivity was

measured with a Pitman 235 Isotope Localisation Monitor using the detector and collimator normally supplied and with the collimator in its fully retracted position. A set of measurements consisted of readings at marked positions 5 cm apart on the medial aspect of each leg. They were expressed as a percentage of the activity measured by the initial reading of each set, which was taken over the heart. Measurements were normally made immediately before operation and then daily for seven consecutive days. If abnormally high counts were being detected, however, measurements were continued at less frequent intervals up to 14 days. A second ^{125}I fibrinogen injection was never given.

The criterion for abnormal ^{125}I fibrinogen uptake was taken to be a rise of 20% at any one position compared with adjacent positions on at least two consecutive days.

Results

In 118 patients of the 183 studied the pattern of ^{125}I fibrinogen uptake was normal, and in 65 patients there was abnormally high uptake (table 2). Sixty-three patients had no heparin prophylaxis, and in 120 heparin was used as described.

Table 2 *Effect of prophylactic heparin*

	Test normal	Test abnormal (high)	Totals
No heparin	31	32	63
Heparin	87	33	120
Totals	118	65	183

$\chi^2=8.8$ $P<0.005$.

There was a significantly lower incidence of abnormal test results among those patients who had received heparin—33/120 (28%) in comparison with 32/63 (51%) for the non-heparinised controls (Chi-squared test with Yates's correction 8.8 $P<0.005$). The same pattern of lower incidence was found in men and women and in patients with malignant and non-malignant disease. No patients in the study developed clinical evidence of pulmonary embolism.

SITE OF ABNORMAL FIBRINOGEN UPTAKE

Of the 65 patients with abnormally high uptakes, in 32 one leg only was affected, while in the remaining 33 both legs were affected. Of these 33 the bilateral uptake was symmetrically placed in 26. The criterion for symmetry was taken as an increased uptake of comparable duration in the same or immediately adjacent measurement posi-

tion in both legs. The analysis of abnormal uptakes with respect to site was left leg only (14), right leg only (18), bilateral asymmetrical (7), and bilateral symmetrical (26).

These data have been analysed with respect to the side of operation. The figures are given in table 3 for the group of patients where there was abnormal uptake in one leg only. For this selected group there was a higher incidence of abnormal uptake in the leg opposite the side of the thoracotomy (Chi-squared test 8.0 $P<0.005$). If all abnormalities are included, however, χ^2 gives a value of 2.6 ($P=0.1$).

Table 3 *Analysis of site of abnormal scans with respect to side of operation (abnormal uptake in one leg only)*

Side of operation	Site of abnormal uptake	
	Same side as operation	Opposite side to operation
Right	4	10
Left	4	14
Totals	8	24

$\chi^2=8.0$ $P<0.005$.

BLOOD LOSS AT OPERATION

All classes of operation had a wide range of blood loss values. The spread was such that average values have little meaning, but there was no evidence to suggest that greater blood loss occurred when heparin was used.

Discussion

The value of the low dose heparin in preventing postoperative DVT has been well proved in many series of major and minor general surgical operations (Williams *et al*, 1971; Gordon-Smith *et al*, 1972; Kakkar *et al*, 1972; Nicolaides *et al*, 1972; Gallus *et al*, 1973). In these series the incidence of abnormal ^{125}I uptake tests in non-heparinised controls varied between 16% and 42%. Our results show an incidence of thrombosis of 51% in control patients. Although with our heparin regimen we have shown a reduction in this incidence at a level of significance that is similar to most other studies ($P<0.005$), our residual thrombosis rate of 28% after prophylaxis remains high. A large proportion of patients with malignancy (77%), and the extent of the surgical procedure in this series, may have contributed to this high incidence. It should be noted, however, that unlike most of the trials of heparin prophylaxis reported, this was a sequential rather than a prospective randomly

allocated study, and this has resulted in 83% of cases with cancer in the non-treated group as distinct from 74% of cases in the treated group. The high incidence of DVT in a series that is a typical case-mix of thoracic surgical practice, emphasises the need for effective prophylaxis.

LIMB TRAUMA DURING SURGERY

Our results show a definite correlation between the side of operation and the opposite leg in those patients with high uptake in one leg (24 out of 32 patients), although this group is only half of all abnormal cases.

In most patients the increased uptake was detected in the first few days after operation, suggesting that the thrombotic process starts during the operation. With the patient in position for lateral thoracotomy there may be direct trauma to the calf veins and impaired venous blood flow in the legs during the operation. The leg lying on the table may be more affected than the other leg.

In addition, accidental bruising of patients due to handling while under anaesthesia can occur, and we have seen symmetrical bruising of both lower calves. The bruising may be slight in most cases and at the surface of the limb. The poor depth response of the detector to ^{125}I , especially when it is used close to the skin, will give an unwanted significance to such near surface concentrations of radioactivity, confusing them with truly deep thrombi.

A significant reduction in the incidence of DVT after operation has been achieved by intermittent pneumatic calf compression (Hills *et al*, 1972) and these pneumatic leggings may prevent some effects of trauma as well as venous pooling. Perhaps a combination of this physical method of prophylaxis and perioperative subcutaneous heparin would be appropriate for patients undergoing lateral thoracotomy.

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- Requests for reprints to: Mr F R Jackaman, Department of Surgery, South Nottingham District General Hospital, Nottingham NG1 6HA.