in Scandinavia on the basis of α-FP measurements in mothers known to be at risk.[1 2] Features suggestive of this diagnosis in the present case, in which there was no previous history, were the large abnormal placenta[3] and the fetal proteinuria. Although raised urinary α-FP levels have been reported in a fetus with congenital nephrosis,[2] gross selective intrauterine proteinuria has not, to our knowledge, been reported.

The pathological diagnosis in this case could not be made by conventional histological methods but only by electron microscopy of the deeper, more mature glomeruli. Since this is a difficult diagnosis complicated by the process of glomerulogenesis, there is a real danger that such cases will be dismissed as being false-positive for neural tube defect. An attempt should therefore be made to collect fetal urine from any apparently normal fetus aborted because of high liquor α-FP values. Urinary protein concentrations similar to those reported here will at least give a provisional diagnosis and encourage painstaking electron microscopic examination of the kidneys.

Congenital nephrosis is invariably fatal, usually in the first months of life, and, although it is relatively uncommon in Britain, other sporadic cases without family history will probably be identified by α-FP measurements.

References

[1] Seppala, M, *et al*, *Lancet*, 1976, **2**, 123.
[2] Kjessler, B, *et al*, *Lancet*, 1975, **1**, 432.
[3] Kouvalainen, K, Hjelt, L, and Hallman, N, *Annales Paediatriae Fenniae*, 1962, **8**, 181.

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Preventing thromboembolism after myocardial infarction: effect of low-dose heparin or smoking

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Summary

A trial of low-dose subcutaneous heparin to prevent thromboembolic complications after myocardial infarction was carried out in 78 patients. Of the 37 heparin-treated patients only two (5%) developed evidence of leg vein thrombosis, while 14 (34%) of the 41 controls did so, and five controls developed pulmonary emboli. Leg vein thrombosis developed in 12 (50%) of the 24 controls who did not smoke cigarettes but in only two (13%) of the 17 controls who were cigarette smokers. Non-smokers who have a myocardial infarction should be given low-dose heparin subcutaneously to prevent leg vein thrombosis and pulmonary embolism.

Introduction

Leg vein thrombosis, as detected by the fibrinogen uptake test, complicates myocardial infarction in about a third of patients.[1-3] Pulmonary infarction occurs in some 10-15% of patients and probably causes death in about 3-6%.[4-6]

These complications can be effectively prevented by prophylactic heparin in therapeutic doses,[2 7] but this carries the risk of haemorrhagic complications. These complications are avoided with low dose heparin prophylaxis given subcutaneously, but it is not yet established whether such treatment prevents leg vein thombosis after myocardial infarction.

In a previous study,[8] we reported that cigarette smoking was also associated with a decreased incidence of leg vein thrombosis after myocardial infarction. The present study was therefore made to examine the efficacy of low-dose heparin prophylaxis and to re-examine the relation of thrombosis to cigarette smoking.

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Patients and methods

All patients admitted to the coronary care unit at Westminster Hospital were considered for the study. The protocol excluded patients with severe hypertension or evidence of an active peptic ulcer or who had had a cerebrovascular accident, but no such patients were admitted during the period of the trial. The patients were allocated to a control or a heparin prophylaxis group on the basis of random number selection from a sealed envelope.

All the patients were examined for leg vein thrombosis on alternate days for two weeks by clinical observation and by the fibrinogen uptake test. The clinical results were recorded by the doctor (PM) in charge of the coronary care unit, but the fibrinogen scans were recorded by the technician in our lung function laboratory and he did not know whether the patients were receiving heparin prophylaxis or not.

The fibrinogen uptake test was performed according to the method of Kakkar *et al.*[9] Leg vein thrombosis was diagnosed only if there was a difference in count of 20% between adjacent positions on the same leg or similar positions on the two legs. The initial dose of ^{125}I-labelled human fibrinogen (Radiochemical Centre, Amersham) was given as soon as possible after admission and, if necessary, repeated after 10 days to maintain the level of radioactivity.

Results

Eighty-one patients entered the study. Three were subsequently withdrawn because the diagnosis of myocardial infarction was not confirmed. Only one of the patients died before the end of the two-week study. She was a control patient who developed leg vein thrombosis and clinical evidence of a pulmonary embolism. She died on the seventh day, probably as a result of further pulmonary embolism, but no necropsy was permitted to confirm this. The two groups (table I) were equally matched for known high risk factors—that is, age over 70 years and presence of cardiac failure. There were more patients with varicose veins in the control group, but none of these developed a leg vein thrombosis.

Of the 37 patients given heparin prophylaxis only two (5%) developed evidence on the fibrinogen uptake test of a leg vein thrombosis. One had had a cardiac arrest and a cut down done on a vein, and the fibrinogen test was subsequently positive on that side, prob-

TABLE I—*Details of patients in control and heparin prophylaxis groups*

	Control group	Heparin prophylaxis group
No admitted to trial	43	38
No withdrawn	2	1
No studied	41	37
Mean age (years)	62	59
Ratio of men:women	2·7	3·6
Mean Peel index score	10·1	9·6
No with cardiac failure	14	13
No with cardiogenic shock	1	0
No with significant varicose veins	8	2
No of cigarette smokers	17	18
No with pulmonary embolism	3 (?+2)	0

ably because of the tying of the vein. In the other patient the scan indicated thrombosis in the popliteal fossa between the 10th and 14th days; no treatment was given and there were no complications. There were no significant complications that could be attributed to the prophylactic heparin injections.

Of the 41 controls 14 (34%) developed evidence on the fibrinogen uptake test of leg vein thrombosis. Only two of these patients had clinical evidence of leg vein thrombosis. The difference in the incidence of leg vein thrombosis between the two groups was statistically significant ($\chi^2=8{\cdot}17$; $P<0{\cdot}005$).

Pulmonary embolism was diagnosed on clinical and radiological evidence in three patients and suspected in another two with isotopic evidence of leg vein thrombosis. All were in the control group. Pulmonary embolism was neither diagnosed nor suspected in any of those who received heparin nor in any of the controls who did not have leg vein thrombosis. Only one of the patients with pulmonary embolism had clinical evidence of a leg vein thrombosis.

Table II compares the patients in the control group who did develop a leg vein thrombosis with those who did not. Of the 14 controls who developed evidence of leg vein thrombosis, only two (14%) smoked cigarettes and one smoked a pipe, whereas of the 27 who did not develop evidence of leg vein thrombosis 15 (56%) smoked five or more cigarettes a day. Another two smoked cigars, but none smoked a pipe. This difference between the incidence of leg vein thrombosis in the two groups was statistically significant ($\chi^2=4{\cdot}88$; $P>0{\cdot}05$).

TABLE II—*Comparison of controls who developed leg vein thrombosis with controls who did not*

	No leg vein thrombosis	Leg vein thrombosis
No of patients	27	14
Mean age (years)	61	63
No over 70 years old	5	3
Ratio of men:women	2·8	2·5
Mean Peel index score	8·8	12·9
No with cardiac failure	6	8
No with cardiogenic shock	1	0
No with significant varicose veins	8	0
No of cigarette smokers	15	2
No of pipe or cigar smokers	2	1

None of the three patients who were thought to have had a pulmonary embolism were smokers. Of the two in whom the clinical diagnosis of pulmonary embolism was more doubtful, one was a smoker and one was not.

The other noticeable difference was that heart failure was more common in the group of patients who developed leg vein thrombosis. Of the 14 patients with cardiac failure eight (57%) developed leg vein thrombosis whereas only six (22%) of the 27 patients without cardiac failure did so ($\chi^2=3{\cdot}56$). This was just short of statistical significance ($P>0{\cdot}05$).

There was no evidence of any sex bias or other factor to explain the different experience of the smokers and non-smokers.

Discussion

Our results show that low-dose heparin given subcutaneously was effective in reducing the incidence of leg vein thrombosis, as detected by the fibrinogen uptake test, after myocardial infarction in our group of patients. These findings are similar to those of Warlow *et al*,[10] but conflict with those of Handley's smaller study.[11]

In both these trials the fibrinogen uptake test was used to diagnose leg vein thrombosis and the methods were similar to those of our study. When the results of all three trials were taken together the incidence of leg vein thrombosis was 25% in the control patients and only 8% in those given low-dose heparin prophylaxis (table III). These differences are highly significant ($\chi^2=11{\cdot}98$; $P<0{\cdot}0001$). The percentages are the same as those reported in a recent international multicentre trial of low-dose heparin prophylaxis of leg vein thrombosis after surgery.[12]

Thus low-dose heparin seems to reduce the incidence of leg vein thrombosis from 25% to 8%—a reduction of nearly 70%. But does it also reduce the incidence of pulmonary embolism? Pulmonary embolism was diagnosed clinically in three and suspected in another two of the patients with evidence on the uptake test of leg vein thrombosis but in none of the others. Although the numbers were too small to be statistically significant, the findings do support other evidence that low-dose heparin prophylaxis helps to prevent pulmonary embolism. Steffensen[13] reported clinical pulmonary embolism after myocardial infarction in six out of 103 patients in a control group but in only two out of 103 patients given low-dose heparin prophylaxis. In the international multicentre trial[12] 16 patients were considered at necropsy to have died of massive pulmonary embolism after surgery in the control group of 2076 patients, but only two patients in the low-dose heparin group of 2045 patients were thought to have died of pulmonary embolism.

This evidence and the fact that it is unusual for a patient to have a pulmonary embolism without having isotopic evidence of leg vein thrombosis strongly suggests that low-dose heparin prophylaxis does reduce the incidence of both leg vein thrombosis and pulmonary embolism after myocardial infarction by at least 70%.

We were particularly interested to find that cigarette smoking seemed to be almost as effective in preventing leg vein thrombosis as low-dose heparin prophylaxis.

We reported a study that showed a decreased incidence of leg vein thrombosis after myocardial infarction in cigarette smokers compared with non-smokers,[8] and Handley and Teather[14] obtained similar results in a different coronary care unit. These results are summarised in table IV.

TABLE III—*Numbers of patients who developed evidence on fibrinogen uptake test of leg vein thrombosis after myocardial infarction in three trials*

	Control groups		Low-dose heparin groups	
	No of patients	No (%) with leg vein thrombosis	No of patients	No (%) with leg vein thrombosis
Warlow *et al*[10]	64	11 (17)	63	2 (3)
Handley[11]	24	7 (29)	26	6 (23)
Present trial	41	14 (34)	37	2 (5)
Total	129	32 (25)	126	10 (8)

TABLE IV—*Numbers of patients who developed evidence on fibrinogen uptake test of leg vein thrombosis in relation to their smoking habits in three separate trials*

	Cigarette smokers		Non-smokers	
	No of patients	No (%) with leg vein thrombosis	No of patients	No (%) with leg vein thrombosis
Marks and Emerson[8]	65	7 (11)	37	23 (62)
Handley and Teather[14]	38	7 (18)	22	9 (41)
Present trial	17	2 (12)	24	12 (50)
Total	120	16 (13)	83	44 (53)

Although it has been shown that smoking does not cause venous thrombosis,[15] it is at first surprising to find that smokers with myocardial infarction are so much less likely to develop a leg vein thrombosis, and presumably pulmonary embolism, than smokers. As Doll[16] has pointed out, however, patients with a removable cause for their disease do better when that cause is removed, and it is well established that smoking cigarettes is one of the causes of myocardial infarction. As we suggested earlier, patients who enter a coronary care unit with myocardial infarction may be drawn from two populations. One group may be intrinsically more susceptible to both arterial and venous thrombosis so will suffer myocardial infarction whether they smoke or not; the other group do not have this susceptibility to thrombosis but suffer a myocardial infarction because they smoke. This is undoubtedly an oversimplified account, but it is a reasonable explanation of why non-smokers are more likely to develop leg vein thrombosis after myocardial infarction.

We therefore conclude that low-dose heparin prophylaxis should be given routinely to all patients admitted to hospital with myocardial infarction who do not smoke ciagrettes.

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References

1 Murray, T S, *et al*, *Lancet*, 1970, **2**, 792.
2 Maurer, B J, Wray, R, and Shillingford, J P, *Lancet*, 1971, **2**, 1385.
3 Nicolaides, A N, *et al*, *British Medical Journal*, 1971, **1**, 432.
4 Wood, P, *Diseases of the Heart and Circulation*, 3rd edn, p 856. London, Eyrie and Spottiswood, 1969.
5 Hilden, T, *et al*, *British Medical Journal*, 1961, **2**, 327.
6 Hellerstein, H K, and Martin, J W, *American Heart Journal*, 1947, **33**, 443.
7 Handley, A J, Emerson, P A, and Fleming, P R, *British Medical Journal*, 1972, **2**, 436.
8 Marks, P, and Emerson, P A, *British Medical Journal*, 1974, **3**, 232.
9 Kakkar, V V, *et al*, *Lancet*, 1970, **1**, 540.
10 Warlow, C, *et al*, *Lancet*, 1974, **1**, 934.
11 Handley, A J, *Lancet*, 1972, **2**, 623.
12 International Multicentre Trial, *Lancet*, 1975, **2**, 45.
13 Steffensen, K A, *Acta Medica Scandinavica*, 1969, **186**, 519.
14 Handley, A J, and Teather, D, *British Medical Journal*, 1974, **3**, 230.
15 Vessey, M, and Doll, R, *British Medical Journal*, 1969, **2**, 651.
16 Doll, R, *British Medical Journal*, 1974, **3**, 466.

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Wound sepsis after cholecystectomy: effect of incidental appendicectomy

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Summary

The records of a consecutive series of 224 patients were analysed to discover the effect of incidental appendicectomy on the wound sepsis rate after cholecystectomy. One hundred and five patients had had a cholecystectomy alone and 119 cholecystectomy with incidental appendicectomy. The incidence of wound sepsis in patients not given adequate antibiotic prophylaxis was significantly lower (16·1%) when cholecystectomy alone was carried out than when the appendix was removed as well (41·1%).

Introduction

Many surgeons remove the normal appendix during a potentially contaminated laparotomy on the grounds that it is the only way to prevent later acute appendicitis. Hewitt *et al*[1] calculated the risk of subsequently developing appendicitis and found a progressive decline from 16% at the age of 2½ years to 0·02% at the age of 87½ years.

The arguments against incidental appendicectomy in totally clean abdominal surgery are overwhelming, and few people would care to risk the contamination that might arise from removing the appendix during, for example, an abdominal aortic replacement. On the other hand, opinion is divided about the merits of incidental appendicectomy with operations such as cholecystectomy. The possibility of an increased liability to malignant disease after appendicectomy is still being debated.

Reports on the effects of incidental appendicectomy during abdominal operations—for example, by Howie[2]—have been mainly concerned with the incidence of wound sepsis. In retrospective analyses of hospital case notes estimation of the sepsis rate is unreliable, and we have shown[3] that nearly 40% of all cases of wound sepsis can be either so trivial or so late in onset that they are not mentioned.

This review was undertaken to compare the incidence of septic complications after cholecystectomy alone with those after cholecystectomy plus appendicectomy in patients who had been included in a series of prospective, controlled clinical trials of cephaloridine and other antibacterial substances as wound sepsis prophylactic agents. The effects of incidental appendicectomy on sepsis rates after gastric surgery will be presented in detail elsewhere. We found in these trials that the wound sepsis rates after removal of an inflamed appendix were 7·8% and 12·4% respectively in patients protected and not protected by cephaloridine, and 1·9% and 7·6% respectively after removal of a normal appendix.

Patients and methods

All patients under the care of one surgeon who were to have potentially contaminated abdominal operations were randomly allocated to receive either cephaloridine or no prophylaxis,[4 5] gentamicin,[6] povidone-iodine,[7] framycetin,[8] ampicillin,[3] or water irrigation (in progress). Details of each patient, including a double-blind assessment of wound sepsis for at least four weeks after operation, were entered on punch cards. We reviewed the cards, selecting patients who had had either a cholecystectomy alone or one with incidental appendicectomy. All other operations on the biliary tract, including choledochotomy, were excluded to ensure comparability within the

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