Dysphagia is not uncommon after oesophageal transection for varices and disordered motility has also been shown in this group of patients.17 The present study has confirmed the work of others and, in addition, demonstrated objectively that considerable disturbances of oesophageal motility occur after injection sclerotherapy.

REFERENCES

Atherosclerosis — multi-organ involvement the rule rather than the exception

A. M. TRAVERS, C. J. C. NEL, R. BARRY, C. W. PIENAAR, B. FILMATER

Summary

Atherosclerosis is a systemic disorder and significant lesions often occur in organ systems other than the symptomatic area. Three groups of patients, those admitted to hospital with either coronary artery disease, carotid artery stenosis or peripheral vascular disease, were examined for concomitant atherosclerotic lesions. Non-invasive tests, namely duplex scanning of the carotid arteries, arm ergometer exercise testing, and segmental pressure of the limbs, were used during evaluation. A clear association between ischaemic heart disease, carotid artery stenosis and femoropopliteal disease was found. Women appear to be more prone to multi-organ involvement than men; their higher average age on admission to hospital is a possible explanation for this in some cases, but not all.

Atherosclerosis is a systemic disorder and the lack of symptoms in some organs does not preclude the presence of disease. The patient usually presents with symptoms in only one organ, but making the diagnosis of concomitant atherosclerosis is important in the holistic approach to the problem. This approach has been aptly illustrated in vascular surgery, where cardiac and/or carotid artery disease influence both short- and long-term morbidity and mortality, and may nullify the benefits derived from peripheral revascularisation.1 Although less ominous than the above two areas of disease, early detection of peripheral vascular disease is beneficial in that medical prophylaxis or possibly even transluminal angioplasty can be considered before arterial occlusion occurs.

In view of these important implications, a study was undertaken to investigate the distribution patterns of atherosclerosis in patients presenting with any symptom due to atherosclerosis, in the hope of highlighting the importance of non-invasive evaluation of the arteriopath for additional atherosclerotic disease.

Patients and methods

All patients admitted to Universitas Hospital, Bloemfontein, with acute myocardial infarction (ischaemic heart disease) or for elective coronary artery bypass surgery (CABS) (group A), carotid artery stenosis (CAS) (group B) or peripheral vascular disease (PVD) (group C), were examined for concomitant atherosclerotic disease (Table I). Non-invasive tests were used during evaluation. During the study period a number of
patients underwent emergency CABS subsequent to myocardial infarction and were excluded from the study. Some patients underwent emergency surgery for abdominal aortic aneurysms or acute arterial occlusion, which excluded the possibility of pre-operative assessment for additional vascular disease.

Diagnostic criteria in making primary diagnosis

Patients in group A were those admitted to hospital with myocardial infarction or presenting for elective CABS. The diagnosis of infarction was confirmed by standard 12-lead ECG changes and a serum creatine kinase level above 300 IU/l. The presence of a causative atherosclerotic lesion was subsequently verified by coronary angiography in most cases. All patients admitted for elective CABS had severe correctable coronary artery disease. Table 1 shows the composition of this group.

Table IV summarises the composition of group C — patients presenting with primary occlusive disease of the limbs and/or aneurysmal disease.

Non-invasive evaluation methods

PVD. Segmental pressures and ankle/arm indices were measured at rest using a Kranzbühl 762 Doppler ultrasonographic device. A combination of a resting index of \( \leq 0.8 \) and monophasic flow were interpreted as significant stenosis.

CAS. Patients were evaluated using an ATL-MK 600 duplex Doppler scanner according to the technique described by the Seattle group.2 Significant disease was defined as stenosis > 50% of the luminal diameter with or without ulceration and/or intraplaque haemorrhage or 16 - 49% stenosis with clear ulceration.

Ischaemic heart disease. Non-invasive assessment was carried out with an exercise ECG using the Wirburg adaptable arm ergometer according to the protocol suggested by Williams et al., where the workload is a function of body weight. A standard 12-lead ECG was performed initially during rest and repeated after termination of exercise. ECG tracings were evaluated independently by a cardiologist. Exercise-induced ischaemia was considered present in the event of angina, new or additional horizontal down-sloping ST-segment depression of 1 mm or more, a fall in systolic blood pressure of 10 mmHg or more from one stage to the next or the appearance of three or more premature ventricular contractions.4

Results

Additional atherosclerosis in patients with ischaemic heart disease

The prevalence of PVD and CAS in this group is shown in Table V. PVD (including aneurysm) occurred in 34 patients or
TABLE V. PREVALENCE OF CONCOMITANT ATHEROSCLEROSIS IN GROUP A PATIENTS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aorta-iliac disease</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Femoropopliteal disease</td>
<td>12</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>AI + FP</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Aneurysm</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CAS</td>
<td>9</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

PVD = 34/259 (13%); CAS = 12/259 (4.5%).

13% of the total. There was a significant difference between the occurrence in women (27%) and men (10%) (P < 0.01). Twelve patients had significant carotid artery disease; a prevalence of about 4.5%. One patient only had occlusive disease of the upper limb and 1 patient had both PVD and significant CAS.

Additional atherosclerosis in patients admitted with CAS

Figures in this group are shown in Table VI. Fifty-eight percent of patients in this group had PVD (71% of women and 53% of men). Ischaemic heart disease occurred in 77% (100% of women and 68% of men; P > 0.05).

Additional atherosclerosis in patients with PVD and/or aneurysms

Table VII contains the data in this group. CAS occurred in 17% of this group (women 29% and men 12%; P < 0.05). Ischaemic heart disease was present in 64% of the patients, once again showing a female preponderance of 74% to 61% of men.

Discussion

The results of this study clearly illustrate the systemic nature of atherosclerosis and the importance of examining the arteriopath for concomitant atherosclerosis when dealing with patients with manifestations in a single organ system.

Asymptomatic CAS

The prevalence of asymptomatic CAS in patients with PVD varies from 15% to 50%, depending on the diagnostic method used and variation in the definition of significant stenosis. In this study 17% of patients presenting with PVD had a stenosis > 50%. In patients admitted to hospital for elective CABS, our study showed a 4.5% prevalence of CAS, with a reported prevalence of 1 - 14%.

Reviewing four studies, Nicolaides et al. indicated that there was little increase in the overall risk of stroke in the presence of internal CAS in patients undergoing PVD or CABS. Patients with a tight stenosis (> 80%), however, run a much higher risk of developing symptoms in the long term, the figure varying from 15% to 46% per annum compared with a 2% per annum stroke rate in the normal population. The presence of CAS in patients with lower limb ischaemia can further serve to warn of the possible presence of coronary artery disease given the strong association between the two disorders. In this study 72% of patients with PVD and CAS also had ischaemic heart disease.

Ischaemic heart disease

The strong association that exists between PVD or CAS and ischaemic heart disease makes examination for coronary artery disease imperative in these patients. In this study 64% of patients admitted with PVD and 77% of patients admitted with CAS had ischaemic heart disease. The figure for claudicants varies from 25% to 90% in other studies, and is about 50% for patients with cerebrovascular disease or aortic aneurysm. In a review article Nicolaides et al. reported that severe correctable coronary artery disease carries a perioperative mortality rate of about 10% when PVD surgery is performed compared with 1.5% if CABS is undertaken first. Of equal importance is the 5-year survival rate, which is increased from 43% to 72% in this group following CABS.

TABLE VII. PREVALENCE OF CONCOMITANT ATHEROSCLEROSIS IN GROUP C PATIENTS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Ischaemic heart disease</th>
<th>Carotid artery disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>51</td>
<td>10</td>
</tr>
<tr>
<td>Women</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>74 (64%)</td>
<td>19 (17%)</td>
</tr>
</tbody>
</table>

TABLE VI. PREVALENCE OF CONCOMITANT ATHEROSCLEROSIS IN GROUP B PATIENTS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Aorto-iliac disease</th>
<th>Femoropopliteal disease</th>
<th>AI + FP</th>
<th>Aneurysm only</th>
<th>Aneurysm + PVD</th>
<th>Ischaemic heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Women</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>20</td>
</tr>
</tbody>
</table>

PVD = 15/26 (58%); Ischaemic heart disease = 20/26 (77%).
PVD and aneurysm

Little mention is made in other studies of the prevalence of PVD in patients admitted to hospital primarily with symptoms due to CAS or coronary artery disease. In this study 58% of patients admitted with CAS and 13% of those admitted with coronary artery disease had serious PVD. Although the presence of asymptomatic PVD is far less ominous than asymptomatic CAS or coronary artery disease, early detection would make medical prophylaxis or transluminal angioplasty possible before arterial occlusion occurs. In patients with ischaemic heart disease symptoms of occlusive disease may only become apparent once angina is relieved by surgery, and preoperative screening would afford the cardiothoracic surgeon the opportunity of sparing the long saphenous vein in the most ischaemic limb.1

Abdominal aortic aneurysms, however, are less benign, with the risk of rupture increasing with an increase in size.20 An improvement in life expectancy is reported following successful aortic surgery.21 Most patients with abdominal aortic aneurysms are asymptomatic in respect of the aneurysm. The diagnosis is often made on routine examination, and what better opportunity than in the patient presenting for coronary or carotid artery surgery?

Apart from the above general distribution tendencies of atherosclerosis, a number of additional observations can be made concerning the disease:

1. The overwhelming majority of patients admitted to hospital with symptoms or complications of atherosclerosis are male (in the order of 80% for all three groups in this study). The prevalence of multi-organ involvement, however, is higher in women: (i) in group A 27% of women had PVD as opposed to 10% of men (P < 0.01); although not significantly higher, 7% of women in this group had significant carotid artery stenosis compared with 4% of men; (ii) in group B all women had ischaemic heart disease while 68% of men were similarly affected (P > 0.1); 71% of women had PVD and 58% of men (P > 0.5); and (iii) in group C CAS and ischaemic heart disease occurred respectively in 29% and 74% of women compared with 12% and 50% of men (P < 0.05 in both cases).

Age could account for the above findings in some of the groups. In group A significantly more women than men were older than the mean (P < 0.02). In groups B and C, however, there was no significant age difference between the sexes, indicating the importance of risk factors other than age, but unaccounted for in this study.

2. A further observation about distribution patterns of atherosclerosis is the clear association between femoropopliteal disease, ischaemic heart disease and CAS. In group A, patients admitted with ischaemic heart disease, 85% of those with concomitant PVD had disease in the femoropopliteal area, while 15% had aorto-iliac or aneurysmal disease only. Conversely, patients in group C (those admitted with PVD) had an 89% prevalence of ischaemic heart disease if the femoropopliteal arteries were involved.

In group B (patients admitted with CAS) 73% of those with PVD had femoropopliteal disease; in patients admitted with PVD (group C), 89% of those with significant CAS had femoropopliteal involvement.

Conclusion

This study confirms the systemic nature of atherosclerosis, highlighting the importance of screening for concomitant atherosclerotic lesions. Patients admitted with either CAS, coronary artery disease or PVD were evaluated for lesions in the other two organ systems using non-invasive methods, namely hand ergometry exercise testing, duplex Doppler scanning and segmental pressures of the limbs. This holistic approach not only leads to a reduction in the peri-operative mortality rate during peripheral recanalisation, but also improves the long-term mortality and morbidity of the arteriopath. Knowledge of specific distribution tendencies and also of the apparent predisposition of women to multi-organ involvement can lead to earlier detection and possibly correction of coexisting lesions in specific patients.

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REFERENCES